

# The Product Design Process Explained: The 2025 Guide

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Great products fit seamlessly into our daily lives, but they don't just happen by chance.

They're the result of extensive research and problem-solving, creative ideation and innovation, and a ton of human empathy—otherwise known as the product design process.

Are you curious about how awesome products are designed and made? Want to know how product designers come up with their ideas and bring them to life?

Then, keep reading for a step-by-step breakdown of the product design process.

## 1. What is product design?

**Product design is both a technical and creative discipline with one main goal: to conceive and create successful products.**

In the context of product design, a successful product is one that fills a gap in the target market, helps to meet business objectives, and solves a specific problem for the people who will use it.

The product in question might be a physical product—like a selfie stick, a kettle, or an electric toothbrush—or a digital product, like a mobile app, an e-learning platform, or a video game. Product design encompasses anything, tangible or intangible, that can be used, experienced, or interacted with in some way.

Product design is steeped in research, strategy, and business. It considers the end users' needs and goals, as well as market trends and opportunities. It also factors in the big-picture vision for the business, considering how the product will help the company to drive revenue, attract new customers, and shape the brand identity.

And, most importantly, it covers the design of the product itself—focusing on the form, function, and appearance of the product—as well as the user experience (UX) it provides.

That's product design in brief.

For a more in-depth definition, check out our [beginner-friendly guide to product design](#)—and explore [how product design differs from UX design](#).

You can also see great product design in practice in our list of the [9 best examples of product design](#).

## 2. What is the product design process?

**The product design process is the general framework that product designers follow to create new products or improve existing ones.**

The process is not set in stone. Every product designer has their own approach depending on both the product and the industry. You can imagine how the process of designing a vacuum cleaner might differ from the process of designing a mobile app, for example.

But, whatever the product, every product design process comprises thorough research, hands-on design, product testing, and continuous iteration. And most importantly, the product design process is always firmly rooted in design thinking.

## What is design thinking, and what's it got to do with the product design process?

[Design thinking](#) is a problem-solving framework that centers on the end user.

Despite the name, it's not exclusively focused on design. Rather, it's about coming up with solutions to real human problems. As such, design thinking can be applied in almost any context to address complex social issues, improve the human experience in educational or healthcare settings, devise

business models and strategies, or resolve conflict and improve collaboration among teams.

The [design thinking process](#) focuses on cultivating empathy for the end user, defining a specific ‘human’ problem you’ll seek to solve, brainstorming potential solutions, and prototyping and testing those solutions.

The product design process closely mirrors this approach. It begins with extensive research to empathize with the target audience before moving on to ideation, design, and testing.

Ultimately, design thinking fosters an empathetic, user-first approach. By adopting a design thinking mindset, product designers can ensure that they’re prioritizing their target users. The better they understand their users’ needs, goals, and challenges, the more effectively they can design products that appeal to a specific audience.

In summary, design thinking and product design go firmly hand-in-hand! Now, let’s explore the product design process step by step.

## 3. The 5 steps in the product design process

The product design process can be broken down into five key steps:

- [Research](#)
- [Ideation](#)
- [Design](#)
- [Testing and iteration](#)

- [Development and launch](#)

Let's zoom in to see what happens at each stage.

# Step 1: Research

**The first step in the product design process is research.**

The research phase is critical for understanding the context around the product: the market it's competing in, the users it will serve, and the business goals it should fulfill.

All of this context shapes the direction the product will take, ensuring that it's something the target audience will actually want and need—and that it aligns with the business's strategic objectives.

As part of product research, you might:

- Conduct user interviews, surveys, card sorting exercises, diary studies, and other forms of user research to get to know the target audience and empathize with their needs and pain-points.
- Create user personas (or [user persona spectrums](#)) to summarize and represent the different types of users and / or needs you want to design for.
- Define the end user problem your product should address.
- Conduct market research to uncover trends and opportunities.

- Research existing products in order to understand the competitive landscape and identify opportunities for differentiation.
- Conduct stakeholder interviews to understand the business goals the product should help to fulfill, as well as the long-term product vision.
- Collaborate with internal stakeholders to determine what resources are available, both technological and financial, for creating (or improving) the product.

The research phase is all about exploration, discovery, and understanding. Once you fully understand your target audience, your target market, and the business goals, you're well-positioned to come up with a great product.

## Step 2: Ideation

**Next up in the product design process: ideation.**

During the research phase, you defined the user problem you want to solve. Now the goal is to come up with potential solutions to that problem.

This step is closely modeled on design thinking, which views ideation as a strictly judgment-free zone. Designers are encouraged to ideate collaboratively, to think outside the box, and to focus on quantity over quality. Who knows what awesome ideas you'll come up with when you're given full creative freedom?!

Some popular [ideation techniques](#) used by product designers include:

- Group brainstorming sessions involving key stakeholders and fellow designers.
- [Crazy 8s](#)—a Design Sprint technique that involves sketching eight unique ideas in eight minutes, with the goal of rapid and diverse ideation.
- Mindmapping, a visual ideation technique that builds a map of interconnected ideas branching off from a central theme or concept.
- Reverse thinking—a lateral thinking technique that focuses on the exact opposite of what you want to achieve. For example, if your goal is to design a product or feature that improves the online dating experience for millennials, a reverse thinking approach would be to consider: How can we ensure a terrible online dating experience for millennials? The ideas you come up with for the opposite challenge may bring you closer to what your users actually need.
- Concept sketching and storyboarding to visually capture how different solutions might look and function. This helps to identify potential flaws and validate or disqualify ideas early on.

The ideation stage isn't about coming up with a fully-fledged, entirely feasible concept—at least not to begin with. But, as you work through different ideas, you'll naturally start narrowing it down to a handful of promising avenues that are worth exploring further.

# User Brain: Harnessing Cognitive Science for Intuitive Design

[Neuromarketing](#)

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The key to designing intuitive digital experiences lies in understanding the user's brain—a complex, cognitive puzzle that UX designers must solve to create interfaces that feel effortless and engaging. This concept, often referred to as the “user brain,” has become increasingly crucial in the realm of modern digital experiences. As we navigate an ever-expanding digital landscape, the ability to craft interfaces that resonate with our cognitive processes has never been more important.

But what exactly is the user brain? It's not just a catchy phrase; it's a fundamental approach to design that draws upon the principles of cognitive science to create user experiences that feel natural and intuitive. By understanding how our brains process information, make decisions, and form memories, designers can craft digital environments that work in harmony with our mental processes rather than against them.

The importance of this approach cannot be overstated. In a world where attention is a precious commodity, and users have countless options at their fingertips, designing for the user brain can mean the difference between an app that becomes a daily habit and one that's quickly forgotten. It's about more than just making things look pretty; it's about creating experiences that feel like second nature.

To truly grasp the concept of user brain, we need to take a quick dive into the world of cognitive science. This interdisciplinary field combines insights from psychology, neuroscience, and computer science to understand how the mind works. For UX designers, it's a goldmine of knowledge that can inform every aspect of the design process.

## Understanding the User's Mental Model

At the heart of designing for the user brain is the concept of cognitive load theory. This theory suggests that our working memory has a limited capacity, and when we overwhelm it with too much information or complexity, our ability to process and retain information suffers. It's like trying to juggle too many balls at once – eventually, something's got to give.

This is where the idea of schema comes into play. Our brains are constantly trying to make sense of the world around us by organizing information into mental frameworks or schemas. When we encounter a new interface, we automatically try to fit it into our existing schemas. If it aligns well, we find it intuitive. If it doesn't, we struggle.

Think about the first time you encountered a smartphone interface. It probably felt a bit overwhelming at first. But as you used it more, your brain created new schemas to understand and navigate this digital environment. Now, you probably don't even think about how to use your phone – it just feels natural.

Perception and attention play crucial roles in how we interact with digital interfaces. Our brains are constantly filtering the massive amount of sensory information we receive, focusing on what's deemed important and ignoring the rest. This is why [Brain Hook: The Psychological Technique That Captures Attention](#) is so crucial in design. By understanding how to capture and direct user attention, designers can create more engaging and effective interfaces.

Memory and recall are also key considerations. How easily can users remember where to find certain features? How intuitive is the navigation? These questions tap into our understanding of how the brain forms and retrieves memories. By aligning

interface design with these cognitive processes, we can create experiences that feel more natural and require less mental effort to use.

## **Applying User Brain Principles in Design**

Now that we've laid the groundwork, let's explore how these principles translate into practical design strategies. One of the most fundamental aspects is visual hierarchy and information architecture. Just as our brains organize information into schemas, good design organizes visual elements in a way that guides the user's attention and helps them make sense of the interface.

This is where Gestalt principles come into play. These principles, derived from psychology, describe how our brains tend to group and organize visual elements. For example, the principle of proximity states that we perceive elements that are close together as being related. By leveraging these principles, designers can create interfaces that feel intuitive and easy to navigate.

Color psychology is another powerful tool in the designer's arsenal. Colors can evoke emotions, guide attention, and even influence decision-making. By understanding the psychological impact of different colors, designers can create interfaces that not only look good but also feel good to use.

Microinteractions and feedback loops are the unsung heroes of user experience. These small, often overlooked details can make a huge difference in how intuitive an interface feels. A subtle animation when you like a post, the satisfying "whoosh" sound when you send an email – these microinteractions provide immediate feedback that aligns with our brain's expectation of cause and effect.

## **User Brain and Decision-Making**

Understanding how users make decisions is crucial for creating interfaces that feel natural and effortless. This is where choice architecture comes into play. By carefully structuring the options presented to users, designers can guide decision-making without overwhelming the user's cognitive resources.

However, it's important to be aware of decision fatigue. Our brains have a limited capacity for making decisions, and each choice we make depletes this resource. This is why many successful apps and websites aim to reduce the number of decisions a user needs to make, especially for routine tasks.

Heuristics and cognitive biases also play a significant role in user behavior. These mental shortcuts help us make quick decisions, but they can also lead us astray. By understanding these biases, designers can create interfaces that work with our natural thought processes rather than against them.

This brings us to the topic of persuasive design techniques. While these can be powerful tools for guiding user behavior, they also raise important ethical considerations. As designers, we have a responsibility to use these techniques in ways that benefit the user, not just the business. It's a delicate balance that requires constant reflection and adjustment.

## **Measuring and Optimizing for User Brain**

So how do we know if our designs are truly aligning with the user's cognitive processes? This is where measurement and optimization come in. Eye-tracking studies and attention heat maps can provide valuable insights into how users visually process an interface. These tools allow designers to see exactly where users are looking and for how long, helping to identify areas of confusion or interest.

A/B testing is another powerful tool for cognitive optimization. By comparing different versions of an interface, designers can see which one performs better in terms of user engagement and task completion. This data-driven approach allows for continuous improvement based on real user behavior.

User feedback and qualitative research methods are equally important. While quantitative data can tell us what users are doing, qualitative research helps us understand why they're doing it. This deeper understanding of user motivations and thought processes is crucial for designing truly intuitive interfaces.

In recent years, neuromarketing techniques have also made their way into UX research. These methods use neuroscience tools to measure brain activity and physiological responses as users interact with digital interfaces. While still a developing field, it offers exciting possibilities for gaining deeper insights into the user brain. As explored in [Brain Sells: Unlocking the Power of Neuromarketing in Modern Advertising](#), these techniques are already revolutionizing how we approach user experience design.

## **Future Trends in User Brain Research**

As technology continues to evolve, so too does our understanding of the user brain. Artificial intelligence and machine learning are opening up new possibilities for predicting user behavior and creating more personalized experiences. Imagine an interface that adapts in real-time to your cognitive state, presenting information in the most optimal way for your current mental capacity.

Virtual and augmented reality interfaces present exciting new challenges and opportunities for user brain design. These immersive technologies have the potential to create experiences that feel more natural and intuitive than ever before,

but they also require a deep understanding of how our brains process three-dimensional space and movement.

Personalization and adaptive user experiences are likely to become increasingly sophisticated. As we gather more data about individual users' cognitive preferences and behaviors, we can create interfaces that feel tailor-made for each person. This level of personalization could dramatically reduce cognitive load and make digital experiences feel more effortless than ever.

Accessibility and inclusive design for diverse cognitive abilities is another crucial area of development. As our understanding of neurodiversity grows, so too does our ability to create interfaces that work well for people with different cognitive strengths and challenges. This isn't just about accommodating disabilities; it's about recognizing and designing for the full spectrum of human cognitive diversity.

The concept of [Grug Brain: Exploring the Concept and Its Impact on Modern Thinking](#) offers an interesting perspective on how our primitive brain functions still influence our interactions with modern technology. Understanding these primal instincts can help designers create interfaces that feel more natural and satisfying to use.

As we look to the future, it's clear that the field of user brain research is only going to become more important. The [Brain Boost Search Engine: Enhancing Cognitive Performance with Digital Tools](#) is just one example of how our growing understanding of cognitive science is being applied to create more effective digital tools.

In conclusion, designing for the user brain is not just a trend; it's a fundamental shift in how we approach user experience design. By understanding and applying

cognitive science principles, we can create digital experiences that feel intuitive, engaging, and even delightful to use.

The relationship between cognitive science and UX design is evolving rapidly, with new insights and technologies constantly emerging. As designers, it's our responsibility to stay informed about these developments and to continually refine our approach to creating user-centered experiences.

So, what's the call to action for designers? It's simple: prioritize user brain considerations in every aspect of your design process. From the initial concept to the final polish, always ask yourself: "How does this align with the user's cognitive processes?" By doing so, you'll not only create more effective and engaging interfaces but also contribute to a digital world that works in harmony with our minds rather than against them.

Remember, great design isn't just about making things look good – it's about making them feel right. And that feeling comes from a deep understanding of the most complex and fascinating interface of all: the human brain.

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## Step 3: Design

**After ideation comes design—the part of the product design process where ideas are brought to life!**

During the design phase, product ideas are developed into more refined concepts. The focus turns to how the product might look and function, as well as the materials and / or technologies that will be used to build the product.

This step in the process varies considerably depending on the product in question. For digital products such as apps and websites, the design stage might include:

- Defining the product's [information architecture](#).
- Creating low-fidelity sketches and wireframes to map out the initial structure of the product.
- Applying UX design principles to ensure that the product is usable, user-friendly, and accessible.
- User interface (UI) design; creating all the visual and interactive elements that determine how the product looks and functions. This includes things like icons, colors, typography, buttons, animations, and images.
- Working with a UX writer to craft the messaging and microcopy that will feature throughout the product.
- Creating interactive, high-fidelity prototypes that replicate how the product will look and function once it's developed.

For physical products, the design phase might include:

- Sketching and rendering—using computer software to create 2D or 3D digital mock-ups of the product's form and features.

- CAD modeling—using CAD software to develop more detailed 3D product models.
- Determining which materials will be used to build the product and the various product components or features.
- Creating physical prototypes to replicate how the product will look and function in real life.

No matter what type of product you're designing, the design phase focuses on the product's form and function, as well as the overall user experience it provides. The end goal, of course, is to design a product that's easy and enjoyable to use—and that effectively solves a specific user problem.

The design phase doesn't result in a market-ready product, though. Far from it! Usually, you'll end up with an MVP—a minimum viable product—that you can take forward for product testing.

# Human Factors in Product Design: Meaning, Principles and Examples

Christian Bourgeois . December 20, 2024

Have you ever tried to open a package and found it extremely difficult, requiring you to reach for a tool? Have you ever tried to pull on a door handle only to find out it's a push door? If so, it's easy to think it's your fault, but in reality, poor human factors design is likely at play.

When designing a product, it's crucial to keep the end user top of mind. In this post, we'll show you the importance of human factors in product design, teach you valuable principles, and show you examples of products we designed at StudioRed with human factors in mind.

# What Are Human Factors in Design?

Human factors design is about designing products with particular attention to human capabilities and limitations to improve usability. It also considers other systems and the environment in which the product will exist. The end goal is to create products and systems that are efficient, effective, safe, and simple to use.

Researching your target audience is also crucial in this process. It helps narrow your focus on specific design aspects to create an optimal user experience for the product's users.

## The Importance of Considering Human Factors in Product Design

While it's important to put energy and thought into a product's features, users should be able to seamlessly use those features. Considering users' physical and cognitive capabilities and limitations allows designers to create functional products that are intuitive and enjoyable to use.

When human factors design is part of your process, products become more accessible to a wide range of users, including those with disabilities. By creating a product that suits a diverse group of people, you will have much more success meeting users' needs.

Additionally, well-designed products can reduce user error, increase productivity, and enhance overall user satisfaction. Making human factors design a priority allows your products to meet and exceed user expectations.

## Human Factors vs. Ergonomics vs. UX

You may sometimes see human factors, [user experience \(UX\)](#), and ergonomics used interchangeably, but each has a distinct yet complementary role in creating user-friendly products. Here are the differences between the terms:

- **Human factors:** This broad discipline considers human capabilities, limitations, and behavior when interacting with products and systems. It looks at cognitive abilities, environmental factors, and physical characteristics.
- **Ergonomics:** A subset of human factors, ergonomics is the study of the physical interaction between humans and products. Ergonomics looks at factors like posture, reach, and physical exertion to create a comfortable and efficient design. Think of an ergonomic chair that supports your back or a keyboard that minimizes wrist strain.
- **UX:** [UX design](#) principles encompass the entire user journey when interacting with a product. It involves understanding user needs, emotions, and perceptions to create a positive and enjoyable experience throughout the product's use. For example,

a TV remote with good UX has an intuitive layout and may have extra features like backlit buttons and voice control.

Human factors and ergonomics lay the groundwork for creating usable and efficient products, whereas UX adds a layer of emotional appeal and user satisfaction to the experience. By combining these disciplines, designers can create products that enhance users' lives.

# Human Factors Design Principles

You can [overcome product design challenges](#) by turning to the five principles of human factors design. These principles should guide your design team to look at your product from different angles and decrease the likelihood of missing something crucial for usability.

We also provide some examples of products we designed at StudioRed using these principles to help you when working on your next project.

**1. Ergonomics:** The principle of ergonomics is about keeping people of all shapes and sizes in mind. Ergonomics includes a person's posture, reach, and force when using a product. This can also include accessibility features. Implementing ergonomics involves focusing on the extremes of human variability to ensure the design accommodates the broadest range of users and scenarios, inherently addressing the most typical use cases.

The image below is from a study for a biotech instrument focusing on comfort based on a user's height. By focusing on the extreme use case scenarios of 95th-percentile men and 5th-percentile women, the study aims to gauge how the product will feel with the lowest

lab bench height. The primary consideration was the reach and clearance needs of the tallest user.

**2. Cognitive load:** This human factors principle involves minimizing mental effort by creating intuitive and easy-to-use products.

Providing clear instructions or using familiar symbols and patterns minimizes cognitive load.

**3. Consistency:** Consistency in your product's look and function allows for a lighter cognitive load due to predictability. For example, levers may be placed at a consistent height from the floor to accommodate both seated and standing users.

**4. Efficiency:** This principle aims for users to complete a task in the shortest time possible. An example would be using an ergonomic study to consider already established user behavior, aiming to design products or systems that align with the user's already existing habits, patterns, and expectations. This approach leverages familiar behaviors to minimize the learning curve and the cognitive and physical effort.

In the following image, you can see our team working on a self-checkout system for retail stores. We analyzed the existing workflow from both the clerk's and customer's perspectives to ensure efficiency for anyone using the product. The top row shows the process of the clerk reaching for a product from behind, while the bottom row shows how a customer would interact with the front of the device.

**5. Familiarity:** Products should have some familiarity to reduce the chance of confusion and additional cognitive load when used for the first time. Products with similar features to others in an ecosystem or comparable products enhance predictability and reduce cognitive effort.

## Human Factors Considerations When Designing a Product

As you set out to create a plan for human factors in product design, it's helpful to consider the following:

- **Simplify onboarding:** Bringing users in for testing should be seamless, and it starts with breaking down tasks into smaller, manageable steps while providing the user with clear guidance at each stage. Avoid overwhelming the user with information when providing instructions by prioritizing the most critical features and functionality.
- **Give users a sense of control:** Empowering users with a sense of control is paramount. Clear feedback, intuitive controls, and the ability to customize settings can help you foster a positive user experience.
- **Provide error handling:** Consider who will use the product and what challenges they may encounter when interacting with it. Adjust the design and provide audible cues or visual alerts if something is wrong to minimize the impact of potential user errors.

*When we designed the warehouse scanner in the image below, we acknowledged that many warehouse workers wear gloves. This makes*

*it difficult to press the buttons effectively, so we evaluated the button placement, size, spacing, and force requirements to accommodate gloved hands.*

- **Implement clear feedback mechanisms:** Similar to error handling, you can include physical, auditory, and visual feedback mechanisms. For example, a button or switch might click into place when turning a machine on, letting the user know it worked.
- **Test for real-world usability:** When testing the product, ensure it's tested in scenarios the user is likely to encounter. A product for outside use will be designed differently than one used in an office.

## Approaches To Identify Human Factors in Design

Designers use various techniques to identify opportunities for human factors in design. We've listed them below, along with some examples:

- **User testing:** During the testing phase, have a diverse group of people test multiple designs. This allows you to see how they interact with a product and get a variety of perspectives.

*When redesigning the steering controls for a skid steer, we did a study on both the handles and the physical controls to make sure the user felt safe and stable when steering while also feeling comfortable.*

- **Surveys:** Conducting surveys is a great way to gather insights and feedback. They can help you identify user needs and expectations, potential user limitations, and what features to prioritize. Surveys after testing allow you to gauge user satisfaction and the pain points they experienced.
- **Observation:** Gathering quantitative data, like completion times and error rates, can help you focus on specific aspects of the product when you make revisions.
- **Prototyping:** [Prototypes](#) take your vision of human factors and bring them to life in a test version. You can create inexpensive mockups of products to test your theories about ergonomics, efficiency, cognitive load, and other factors. Something as simple as a paper mockup can go a long way.

*The following prototypes are for a warehouse scanner we designed. We wanted to evaluate the ergonomic tilt of the device — we were able to test for different hand sizes by using iterative foam mockups and 3D-printed prototypes.*

## Create User-Centric Designs

Human factors are critical if you hope to create a user-friendly product. Prioritizing usability leads to increased adoption, improved productivity, a positive brand image, and more. Here at StudioRed, we have an experienced team that applies the principles of human factors design to every product we create.

Our team has expertise in [industrial design](#), engineering, and UX and UI. We help bring your product to life, from conception and prototyping to the final product. We work closely with each client to ensure their vision becomes reality while also satisfying users.

[Get in touch today](#) so we can work together to elevate your product design.

# Your Ultimate Guide to Design for Manufacturing (DFM)

Christian Bourgeois . October 1, 2024

Design for Manufacturing (DFM) is the process of designing products with the manufacturing process in mind, optimizing for cost, efficiency, and quality.

The product development journey is rewarding, but it's not without its challenges. One of the most critical aspects of this journey, and one that can make or break your product's success, is Design for Manufacturing. As [seasoned industrial designers](#), we've seen firsthand how DFM optimizes production, cuts costs, and boosts product quality.

In this guide, we'll share our expertise on DFM best practices, common pitfalls to avoid, and how to leverage DFM principles to create better products more efficiently.

# What Is Design for Manufacturing?

Design for Manufacturing, or DFM, is the process of examining how to make a product easier, faster, and more cost-effective to produce without compromising on quality or functionality. This process involves considering various factors such as materials, manufacturing methods, assembly techniques, and the capabilities of the production facility.

“A famous designer told me, ‘if you learn how things are made, you will be a better designer.’”

– Philip Bourgeois, Founder of StudioRed

DFM is critical for creating products that can be produced at scale efficiently and profitably. Without DFM, you risk ending up with a design that looks great on paper but is a nightmare to actually manufacture, leading to production delays, quality issues, and skyrocketing costs.

At StudioRed, we often start DFM conversations before a project officially kicks off. By considering manufacturing constraints and opportunities early, we can save significant time and money down the road.

DFM isn't just a one-time activity — it's a proactive, iterative process that spans the entire [product development](#) lifecycle. It starts with the initial concept and continues through design, engineering, prototyping, and production. At each stage, DFM considerations play

a crucial role in shaping the product's design and ensuring its successful transition from concept to reality.

It's important to note that DFM is not a standalone concept. It's closely related to other design methodologies, such as Design for Assembly (DFA). While DFM focuses on optimizing individual parts for manufacturing, DFA concentrates on making the overall assembly process more efficient. Together, these concepts form what we call **Design for Manufacturing and Assembly (DFMA)**, a holistic approach to product design that considers both manufacturing and assembly aspects.

## DFM Benefits

Implementing DFM principles can have a massive impact on the success of a product. Here are some of the key benefits we've experienced firsthand:

- **Lower production costs:** Optimizing designs for manufacturing can reduce material usage, minimize waste, and streamline production processes. This can lead to significant cost savings, especially at higher volumes.
- **Reduced risk:** DFM helps catch and correct potential manufacturing issues early before they turn into expensive production problems.
- **Faster time to market:** Considering manufacturing early on helps avoid major redesigns later in development. This can shave weeks or months off product launch timelines.
- **Improved product quality:** DFM helps eliminate design features that are prone to defects or variability in

manufacturing. The result is more consistent, higher-quality products.

- **Enhanced reliability and maintainability:** DFM principles often lead to simpler designs with fewer parts. This typically results in reliable products that are easier to maintain, service, and repair over their lifetime.
- **Increased production flexibility:** A DFM-optimized design can be more easily adapted to different manufacturing processes and scaled up or down as needed.
- **Improved communication and collaboration:** DFM fosters better communication and teamwork between design, engineering, and manufacturing teams.
- **Increased innovation:** DFM encourages creative problem-solving to optimize designs, often leading to innovative solutions.
- **Improved sustainability:** Optimizing material usage and manufacturing processes can reduce waste and energy consumption.
- **Greater customer satisfaction:** By offering higher-quality products delivered faster and at lower costs, you can exceed your customers' expectations and boost loyalty.

## Design for Manufacturing Principles

By understanding and applying DFM's core principles, you can create designs optimized for efficient, high-quality production. These principles form the foundation of our approach to DFM at StudioRed and have proven invaluable in countless projects.

# 1. Minimize Part Count

Think of [product development](#) as a puzzle — the fewer pieces there are, the easier it is to put together. The same concept applies to manufacturing. Each part of your product represents a potential point of complexity, cost, and failure. Minimizing part count means:

- Decreased material costs
- Fewer components to source and inventory
- Reduced quality control steps
- Minimal assembly times
- Less opportunity for defects or errors

At StudioRed, we always challenge ourselves to look for opportunities to combine multiple functions into single parts or eliminate unnecessary components. For example, instead of using separate fasteners, can we design snap fits or living hinges that are integrated into the parts themselves?

Of course, there's a balance to strike. Overly complex multi-function parts can sometimes be more difficult or expensive to manufacture than multiple simple parts. But in general, a thoughtful reduction in part count pays dividends in manufacturing efficiency.

# 2. Standardize Parts and Materials

Opt for off-the-shelf parts whenever possible to avoid reinventing the wheel with each new project. This streamlines your inventory management, cuts procurement costs, and ensures consistency in production. Reusing the same parts across multiple products also

creates economies of scale. By avoiding custom-made components, you can eliminate the time and cost of tooling and setup.

We encourage our designers to start with standard parts and only move to custom solutions when absolutely necessary. It's also valuable to develop internal standards for commonly used components across product lines.

For materials, we default to widely available options that our manufacturing partners are experienced in working with. Uncommon materials may sometimes be necessary but often introduce additional cost and complexity.

### 3. Modular Design

Modular design involves creating independent subassemblies or modules that can be easily put together to form the final product. Imagine your product as a LEGO creation — a collection of individual bricks that come together to form a cohesive whole.

By breaking down your product into smaller, self-contained modules, you create a flexible system where each module can be manufactured and tested independently. Just like LEGO bricks, these modules can then be easily assembled and disassembled, allowing for customization, streamlined repairs, and faster upgrades without scrapping the entire product.

### 4. Ease of Fabrication

A core tenet of DFM is designing parts to be as easy to fabricate as possible using the available production processes. This may involve

adding [draft angles](#), adjusting wall thickness, or optimizing geometry for the specific manufacturing techniques you'll use, such as [injection molding](#), sheet metal stamping, CNC machining, or 3D printing.

Whenever possible, choose fabrication methods that align with the capabilities of your manufacturing partners. Avoid pushing the boundaries too far beyond industry norms, as this increases risk and cost. Instead, aim for a design that plays to the strengths of the factory.

For example, if a client only produces a hundred devices a year, they might prefer we use sheet metal parts rather than invest in an expensive injection molding tool. Conversely, for clients producing thousands of units annually, injection molding becomes more cost-effective and allows for more complex surface development.

## 5. Optimize Assembly

While this principle starts to blur the line between DFM and DFA, it's a fundamental consideration to a future-proof design process.

Assembly optimization includes:

- Designing parts that are easy to align and assemble from a single direction (ideally top-down)
- Using symmetrical parts to reduce orientation issues
- Incorporating self-locating features, such as tabs, slots, or grooves, to minimize handling
- Including self-fastening elements, such as snap fits or press fits, to eliminate the need for additional fasteners like screws or adhesives

- Minimizing the need for specialized tools to **reduce tooling costs** and improve production line flexibility

In a recent project for a self-checkout system, we asked the manufacturer for input during the design phase. During their review, they suggested several improvements, such as adding wire clips to manage cable routing. They also ran a mold flow analysis, which checks how plastic is injected to help **prevent sink marks** and warp. This feedback allowed us to update our files before investing in tooling, saving time and money.

## 6. Tolerances and Specifications

While it may be tempting to specify **extremely tight tolerances** everywhere, this level of precision is often unnecessary and expensive to achieve consistently. Instead, be judicious in how you apply tolerances to the design. Allow looser fits where possible and only tighten up on critical interfaces. This reduces rework and scrap rates while keeping costs under control.

We perform a tolerance analysis to check that parts will fit together correctly, even accounting for the worst-case scenarios of manufacturing variations. For instance, we might run an analysis to ensure that a plastic part coming out of a mold with a tolerance of plus or minus a few thousandths of an inch will still fit properly with other components without gaps or interference.

# DFM Best Practices

Through decades of experience at StudioRed, we've developed a set of best practices that ensure the successful implementation of DFM principles:

- **Involve manufacturing partners early in the design process:** We often seek input from manufacturers before we even start designing. By involving them from the start, we can identify potential issues before they become costly problems. This collaboration helps us understand manufacturing constraints and gives us the opportunity to optimize designs for production.
- **Conduct DFM reviews at key milestones:** We hold regular DFM reviews throughout the design process. These reviews bring together designers, engineers, and manufacturing partners to evaluate the design from a manufacturability perspective.
- **Use DFM simulation tools to evaluate designs:** Modern CAD and simulation tools offer powerful capabilities for evaluating designs from a manufacturing perspective. At StudioRed, we regularly use tools for mold flow analysis, finite element analysis (FEA), and tolerance analysis.
- **Create prototypes to validate DFM decisions:** While simulation tools are incredibly useful, there's no substitute for physical [prototypes](#) when it comes to validating design decisions. We often create prototypes at various stages of the design process to test manufacturability, assembly processes, and overall product function.
- **Collaborate closely with suppliers:** Suppliers can and should be valuable partners in the DFM process. We tap into their

expertise on things like material selection, part geometry, and assembly methods to inform our design decisions.

# Examples of Design for Manufacturing

Let's examine some real-world Design for Manufacturing examples from our work at StudioRed. These illustrate how DFM principles can lead to significant improvements in product design and manufacturing.

## Cable Box

In a project for a national cable company, StudioRed was tasked with designing a set-top box. During a design review, the manufacturer suggested we flip the printed circuit board (PCB) upside down to enable "in-process testing." This meant testing could be done on the manufacturing line without additional fixtures, significantly reducing costs.

The change required about 30 hours of CAD rework but saved significant time and resources in the long run. Had this DFM input been received later in the process, the redesign effort would have been much greater.

## Sheet Metal Assembly

In a [sheet metal assembly](#) project, StudioRed was faced with a decision on how to connect two parts to form a "T" shape. While screws, spot welding, or rivets were options, our partner, a major

computer manufacturer, recommended something we hadn't considered — a toggle lock. This simple change, incorporated directly into the metal stamping process, proved more cost-effective than other joining methods and eliminated the need for additional assembly steps or equipment.

By collaborating with the manufacturer and leveraging their expertise, we avoided the need for new files, drawings, and potentially even additional prototype and testing rounds.

## Small Wearable Device

A client approached StudioRed with the challenge of redesigning a wearable ring with embedded electronics. They had a very specific price point in mind and an ambitious production goal. Their existing ring design was expensive to manufacture and had a high failure rate due to tight tolerances and complex machining processes.

Recognizing the challenges of thin-walled, high-tolerance parts, we reached out to a partner specializing in hearing aid manufacturing. By collaborating with them, we were able to redesign the ring using two plastic parts plated in metal. This change improved the product's reliability and consistency while reducing costs by over 90%.

By applying DFM principles from the very beginning, we were able to develop a superior design that could be produced at scale while exceeding the client's target cost.

# Streamline Your Product Development Process With DFM by StudioRed

Design for Manufacturing is about approaching product design with a deep understanding of manufacturing constraints and opportunities. At StudioRed, we've honed our DFM expertise through years of experience and a commitment to excellence. Our team of [industrial designers](#) and mechanical engineers collaborates closely with clients and trusted manufacturing partners to ensure every product we create is optimized for production from the very beginning.

Partner with StudioRed to transform your product development process. [Contact us](#) to learn how we can apply our DFM expertise to your next project.

## FAQ

You might still have questions about how to implement Design for Manufacturability for your specific situation. Let's address a few common ones that come up in our discussions with clients and partners.

### How Long Does DFM Take?

The DFM process is iterative and never truly "done" until you launch the product. However, the upfront DFM work typically takes a few

weeks to a few months, depending on the size and complexity of the project. It's tempting to rush through it or skip steps to save time, but it's always worth investing the time upfront to avoid much costlier delays and re-spins later.

## How Do You Start the DFM Process?

The first step in DFM is assembling a cross-functional team with representation from design, engineering, manufacturing, quality, supply chain, and other relevant areas. Then, you need to establish the key requirements and constraints for the product, such as target cost, annual volumes, and required materials and processes. This will guide the design effort and DFM analysis.

## What's the Difference Between Design for Manufacturing and Design for Assembly?

Design for Manufacturing and Design for Assembly are closely related but distinct disciplines. DFM focuses on optimizing the design of individual parts for fabrication, while DFA is about optimizing the design of the whole product for putting it together.

In practice, many of the same principles apply to both, such as reducing part count, using standardized components, and leveraging self-locating features. The key is to consider both DFM and DFA together in an integrated way to create a design that's truly optimized for the entire manufacturing value chain.

# Step 4: Testing and iteration

**The penultimate step in the product design process focuses on testing and iteration.**

Before you send the product off to be built or developed, it's essential to test your prototypes, gather feedback, and address any usability issues or general design flaws.

The testing phase should involve real users (or test participants who closely represent your target users) and internal stakeholders.

Product testing and iteration usually encompasses:

- Usability testing—asking users to complete certain tasks with the product prototype and evaluating through observation/usability metrics (such as task completion time or error rate) how easy it is to interact with the product in its current form.
- Conducting user interviews to gather qualitative feedback on the product and identify areas for improvement.
- Conducting stakeholder interviews and design reviews to gather internal feedback on the design and ensure that the product aligns with business goals.
- Improving and updating product prototypes based on both user and stakeholder feedback.

Note that the product may go through several rounds of testing and iteration before it's ready to be built. Once you're confident that the product is functional, usable, and desirable—and that it's feasible from a business perspective—you can take it forward for development.

## Step 5: Development and launch

**In the final stage of the product design process, product prototypes are handed over for development.**

This step requires close collaboration with developers or manufacturers, depending on the nature of the product. The product designer shares all the technical specifications, documentation, and design assets necessary for bringing the product to life.

This is known as the “design handoff”, and it typically involves:

- Presenting final designs to key stakeholders, including developers/manufacturers.
- Compiling and sharing relevant design assets such as prototypes, style guides, and technical specs.
- Establishing a feedback loop between the design, development, and product teams.

Once the product has been built and quality assurance checks are complete, it's ready for launch!

# Medical Device Design and Development: Everything You Need To Know in 2024

Christian Bourgeois . July 18, 2024

While doctors and nurses are often the face of healthcare, behind the scenes, there's a field that plays a vital role in advancing patient care: medical device design. This innovative discipline combines [engineering](#), creativity, and medical knowledge to develop the tools and equipment healthcare professionals rely on every day to diagnose, treat, and monitor patients.

This post will break down what medical device design is and the key stages of the development process, from napkin sketch to FDA approval. Whether you're a healthcare professional, an aspiring designer, or simply curious about the technology behind modern medicine, we'll peel back the curtain on this fascinating intersection of healthcare and engineering.

# What Is Medical Device Design?

Medical device design is the process of conceptualizing, developing, and refining diagnostic equipment, preventative devices, or instruments used to monitor or treat medical conditions. Medical devices range from simple tools like bandages to complex implantable devices like pacemakers.

Some popular types of medical products include:

- - **Diagnostic devices:** Used to detect or monitor medical conditions (e.g., X-ray machines, blood glucose meters, pregnancy tests)
  - **Therapeutic devices:** Designed to treat or manage medical conditions (e.g., insulin pumps, pacemakers, inhalers)
  - **Life-supporting or life-sustaining devices:** Essential for sustaining life or supporting vital functions (e.g., ventilators, dialysis machines, heart-lung machines)
  - **Surgical devices:** Instruments or tools for performing surgical procedures (e.g., scalpels, laparoscopic instruments, electrocautery devices)
  - **Implantable devices:** Surgically inserted into the body to replace, support, or enhance biological structures (e.g., artificial joints, stents, cochlear implants)
  - **Monitoring devices:** Track vital signs and other health parameters (e.g., blood pressure monitors, ECG machines, wearable fitness trackers)
- **Assistive devices:** Designed to aid individuals with disabilities (e.g., mobility scooters, hearing aids, screen readers)

Different types of medical devices are classified based on their function, intended use, and the risk they pose to patients. In the United States, the FDA categorizes medical devices into three classes: Class I (low risk), Class II (moderate risk), and Class III (high risk). This classification system determines the level of regulatory control and the approval process required for each device, with Class III devices undergoing the most stringent review before market authorization.

# Stages of Medical Device Development

Medical device development is the process of transforming a concept into a [commercially viable medical product](#). It's a structured process that typically involves several distinct stages.

## 1. Concept and Ideation

The initial stage of medical device product development begins with identifying an unmet medical need. This could stem from clinical observations, patient feedback, or gaps in existing healthcare practices. For example, a surgeon might struggle with a specific instrument, or a patient might find a particular medical procedure too invasive or uncomfortable. By pinpointing a specific issue, designers can target their efforts toward creating a meaningful solution through creativity and critical thinking.

Once they've identified the need, the next step is to generate ideas. This involves brainstorming sessions where no idea is too far-

fetches. The goal is to explore a wide range of possibilities without immediate judgment.

For example, imagine the identified need is helping individuals who suffer from a distorted sense of smell. Some brainstorming ideas might include a scent-neutralizing nasal spray, a smart air purifier that filters out specific odors, or an olfactory retraining app.

After brainstorming, it's time to evaluate the feasibility of these concepts. This analysis considers technological capabilities, potential manufacturing processes, and initial regulatory considerations. Designers ask questions like:

- Can this idea be turned into a functional device?
- Is it cost-effective to produce?
- Will it comply with regulatory standards?

The outcome is a clear, well-defined concept that lays the foundation for subsequent development stages.

## 2. Design and Development

Once a viable concept is in place, the [design and development phase](#) begins. This involves detailed design and engineering to transform the initial idea into a functional prototype. Engineers work closely with designers and clinicians to create detailed design specifications, focusing on functionality and usability.

[Medical device prototyping](#) is a crucial part of design and development. Initial prototypes are developed and subjected to

rigorous testing to evaluate their performance, safety, and durability.

For example, a prototype of a new insulin pump might be tested in a simulated environment to ensure it delivers the correct dosage, is resistant to water and impact, and maintains its functionality over extended periods. The goal is to identify potential issues early in development and refine the design accordingly.

This phase also includes the development of manufacturing processes. Engineers design the methods that will be used to produce the device, ensuring they are efficient, scalable, and capable of maintaining high-quality standards.

For instance, they may develop precise molding techniques for plastic components, optimize robotic assembly lines, or implement rigorous quality control checks at each stage of production. This preparation is essential for the next stage, where the device will undergo more extensive testing and regulatory scrutiny.

### 3. Verification and Validation

The goal of the verification and validation (V&V) stage is to ensure the medical device is safe, effective, and compliant with all regulatory standards. Verification confirms that the design meets the initial specifications and requirements, while validation shows that the final product meets the intended uses and user needs.

V&V typically includes clinical trials or evaluations. Here, the device undergoes rigorous testing in real-world scenarios to gather data on its performance, safety, and efficacy. This may involve collecting

patient-reported outcomes, monitoring vital signs, assessing the device's impact on quality of life, and comparing it to existing treatments or standards of care. The objective is to demonstrate that the device performs as intended under actual conditions. This process also includes risk analysis, where developers identify potential hazards and mitigation strategies.

Regulatory standards and guidelines play a significant role during this stage. The device must comply with various regulatory requirements, which are often stringent and detailed. The specific requirements vary depending on the target market, as different countries and regions have their own regulatory bodies and standards.

For example, medical devices intended for sale in the United States must meet FDA regulations, while those sold in Europe must obtain a CE mark, which is a license to sell within the European Union. Engineers and regulatory experts work together to ensure all aspects of the design and development process align with these standards.

The final step is compiling documentation to obtain regulatory approval to market and sell the medical device. In the U.S., the FDA requires either premarket approval (PMA) for higher-risk devices or 510(k) clearance for moderate-risk devices with substantial equivalence to existing products. Approval depends on providing clinical evidence, test reports, risk analysis, and other data showing the device is safe and effective for the intended uses.

## 4. Production and Scaling

Once the device passes V&V, it's time to transition to full-scale production. This involves ensuring manufacturing processes are robust and scalable enough to produce the device efficiently and in large volumes.

The medical device development company will conduct small-scale production runs to validate processes before ramping up to higher volumes. This helps identify any issues to address and streamline the assembly line. Product samples are also tested again to ensure there are no deviations from the initial design.

Production teams implement stringent quality control measures to comply with Good Manufacturing Practices (GMP). This includes careful monitoring of the environment, equipment, packaging, storage, and distribution. Comprehensive documentation and standard operating procedures for each process are required. Products are closely inspected and tested at multiple points. Any non-conforming products are rejected to ensure patient safety.

Once the small-scale production runs are successful, the process scales by adding more resources and automation. However, quality cannot be compromised in favor of quantity. Additional quality checks are put in place to account for the higher output. This scaling process continues until the maximum production target is reached.

## 5. Post-Market Surveillance

The development journey doesn't end with the product launch. Post-market surveillance is a continuous process of monitoring and improving the device's performance in real-world settings.

This involves collecting feedback from healthcare professionals and patients, analyzing data on device usage and adverse events, and making necessary updates to ensure the device's safety and effectiveness over time. Firms maintain regulatory compliance requirements through ongoing reporting and documentation.

As technology and clinical practice advance, the device may require updates to remain useful and safe. The manufacturer needs to plan for potential updates, recalls, and end-of-life strategies to properly phase out the device. An end-of-life plan helps ensure devices are replaced, serviced, or safely removed before they become obsolete or unsafe.

## Key Considerations in Medical Product Design

Designing a successful medical device requires careful consideration of various factors that can significantly impact its performance, safety, and user acceptance.

- **Target user focus:** There is a natural tendency to develop a product that can do almost everything, with deep capability and often many, if not infinite, adjustments available. While it may not be what power users prefer, it's important to simplify

functionality to offer only what the majority of medical professionals or [consumers](#) will actually use.

- **Safety and robustness:** Incorporate both primary and redundant safety systems. Minimize or eliminate potential workarounds to prevent unintended use that could compromise safety. This can be as simple as designing a disposable unit to be unusable after the first time, thereby reducing the possibility of introducing potential contaminants into the system.
- **Ergonomics:** Conduct real-world testing with actual device form and size for hand-held devices. The StudioRed team once monitored multiple surgeries involving an arthroscopic wand and asked surgeons what they might suggest to improve or change. The common answer was, “It’s fine.” However, showing them mockups of various concepts they could hold and react to sparked detailed feedback.
- **Sustainability:** Disposability and eco-friendly design are valuable in medical device design. Doctors, nurses, technicians, and hospital buyers often respond to thoughtful medical equipment design solutions that consider these factors. Not only will this resonate in the sales cycle, but it will also likely become a point of pride for the hospital.
- **Compliance:** Consider the device’s target countries and ensure compliance with relevant standards (e.g., UL, FDA, FCC, CSA, CE, RoHS). A safety consultant usually counsels the team during component selection, development, and testing.
- **Documentation:** Maintain detailed design history files throughout the development process, including emails, specifications, research, testing reports, and design files. It’s

important to keep files in chronological order to document the development process and rationale behind design choices.

The best medical device design companies maintain an internal copy of all file revisions. StudioRed has always followed this practice, and many clients return years later asking for a copy of the final design and engineering files.

## Trusted Medical Device Design Solutions Since 1983

StudioRed has been a trusted name in medical device product design for over 40 years. Our expertise and dedication to excellence ensure that your medical device will meet all regulatory standards and user needs. Partner with us for your medical product design projects, and let's bring your innovative ideas to life.

[Contact StudioRed](#) today to learn more about our [medical device design services](#) and how we can help you succeed.

# What Is New Product Introduction? + 6 Steps To Implement It

Christian Bourgeois . November 26, 2024

## Quick Answer

New product introduction (NPI) refers to the process of bringing a new product to market, involving stages such as ideation, design, manufacturing, testing, and distribution.

If innovation is the key to success, new product introduction (NPI) is the roadmap. A well-executed NPI can drive revenue growth, enhance customer satisfaction, and solidify a company's competitive position.

From evaluating the latest [design trends](#) to crafting an effective pricing strategy, businesses must navigate a complex landscape to plan successful product introductions. We'll dive into the NPI process, discussing tips and best practices to ensure a smooth launch.

# What Is New Product Introduction?

A new product introduction is the process of bringing a new product to market. It involves a series of stages, from ideation and product design to manufacturing, testing, and distribution.

Successful NPI requires careful planning and execution, including:

- Market research
- Product development
- Pricing strategy
- Marketing
- Sales

## The New Product Introduction Process in 6 Steps

The NPI process involves several key stages that must be carefully executed to ensure a successful product launch. These steps include:

### 1. Ideation

The first step in the NPI process is ideation, where the initial spark of innovation ignites. This phase involves generating and exploring [new product concepts](#) that have the potential to meet customer needs and drive business growth.

Ideation sessions often bring together diverse teams, including:

- Engineers
- Designers
- Marketers
- Subject matter experts

Through brainstorming techniques like mind mapping and design thinking, teams can explore different product ideas that address their target market's pain points and needs. The goal is to generate a wide range of concepts before narrowing down to the most promising ones based on factors like customer demand and technical feasibility.

**Example:**

A consumer electronics company wants to introduce a new wearable device. During the ideation phase, the team brainstorms ideas such as a fitness tracker, a smartwatch, a health monitoring device, or a fashion accessory. They explore these possibilities to identify the most promising concept based on customer needs and feedback, market trends, and technical capabilities.

## 2. Market Research and Analysis

Once you've landed on a promising product concept, the next step is to delve into market research and analysis to validate your idea, understand customer needs, and identify potential competitors. Conducting thorough research lets you make informed decisions about product features, pricing, and marketing strategies.

Market research can involve multiple methods, including:

- **Surveys:** Collecting data through questionnaires or online surveys
- **Interviews:** One-on-one or group interviews with target customers or industry experts
- **Focus groups:** Small groups of participants interviewed together to discuss a specific topic
- **Observations:** Observing customer behavior in natural settings
- **Ethnography:** Immersion in the target market to understand their culture and behaviors
- **Competitive and market analysis:** Analyzing industry data, market trends, and competitor information
- **Data mining:** Analyzing large datasets to identify patterns and trends
- **Social media listening:** Monitoring social media platforms to understand customer sentiment and discussions
- **Online communities:** Engaging with online communities relevant to the target market
- **Customer segmentation:** Dividing target markets into smaller, more manageable groups based on specific characteristics like age, lifestyle, and occupation, enabling teams to tailor product offerings and marketing strategies to meet the unique needs and preferences of each segment

By combining different research methods, you can gain a comprehensive understanding of your target market.

### **Example:**

The consumer electronics team conducts market research to support the wearable device concept. They survey potential

customers to determine their preferences for features, design, and price.

They also analyze the competitive landscape to identify existing wearable devices, their strengths and weaknesses, and their market share. This research helps the team refine the product concept, set appropriate pricing, and develop effective marketing strategies.

### 3. Design and Prototyping

With a solid understanding of your target market and product concept, you're ready to bring your vision to life through design and [prototyping](#). This phase involves:

- Translating your ideas into tangible products
- Creating detailed specifications and product requirements
- Building prototypes to test and refine your design

The building process involves multiple stages that serve distinct purposes. Low-fidelity prototypes allow for initial exploration, like testing core concepts and user flows, so you can iterate on ideas at a low cost. As you get closer to the final version, you'll create high-fidelity versions for a more realistic representation of the final product and to gain approval from stakeholders.

Your design and engineering team will work together to create blueprints, schematics, and other technical documents to define the product's:

- Scale
- Materials

- Functionality
- User interface

The design and engineering teams are then tasked with building a prototype to test the design's feasibility, functionality, and user experience. This is an iterative process that requires building and testing multiple prototypes to identify and address any issues before moving to production.

### **Example:**

The design team creates detailed specifications for the wearable device, including things like the dimensions of the user interface and the materials of the band. They design the device's hardware and software components.

The design team passes the specifications to the engineering team to create a prototype that will be used to test the device's functionality, comfort, and battery life during the testing phase.

## 4. Design Validation and Testing

After designing and prototyping your product, it's important to validate the data and conduct thorough testing to make sure it meets your — and your target market's — specifications and desired performance.

**Data validation** involves checking the accuracy and consistency of the data collected during development. You'll need to verify:

- [Product requirements](#)
- Measurements

- Calculations
- Simulations

**Testing**, on the other hand, subjects the product to various scenarios and conditions to assess its performance, reliability, and durability. This may include:

- Functional testing
- Stress testing
- Environmental testing
- User testing

After internal testing, you can choose to conduct beta testing or pilot programs with potential customers. This process lets you gather real-world feedback and identify any issues or areas for improvement before launching the product to the wider market.

Once you receive feedback, you can refine the product to better meet user expectations, market demands, and regulatory requirements. This iterative cycle ensures you address as many critical aspects of your product as possible before proceeding with full-scale production, helping reduce the risk of costly post-launch modifications.

**Example:**

The product team checks the prototype and verifies that all the numbers and calculations are correct. They also conduct various tests, such as stress tests to ensure the device can withstand extreme temperatures and usage, environmental tests to assess its performance in different conditions, and user acceptance testing to gather feedback from potential users.

Once the product has passed internal testing, the team asks potential users to try the device and give their feedback. This can help identify any problems and ensure the device works as it should.

## 5. Pre-Production to Mass Production

If your product passes rigorous testing and validation, you've got the green light to transition from pre-production to mass production. In this step, you'll:

- Finalize production plans
- Establish manufacturing processes
- Select manufacturing partners
- Procure the necessary materials and equipment

Once these preparations are complete, you can begin scaling up production to meet market demand.

### **Example:**

For the wearable device, the team finalizes production plans, selects manufacturing partners, and establishes quality control procedures. They also acquire all the necessary components, batteries, and packaging they'll need to get their new product on the shelves.

## 6. Launch and Post-Launch Evaluation

It's time for your marketing team to shine in the final step of the NPI process. The launch phase relies heavily on factors like:

- Advertising
- Sales

- Content marketing
- Social media marketing
- Influencer partnerships
- Word of mouth
- Retail distribution

Make sure you have a well-crafted launch plan that outlines your marketing and sales strategies, target audience, and key messages before you go to market. After your initial launch, continue monitoring sales performance and customer feedback for an idea of what's working and what's not.

By continuously gathering and analyzing customer feedback and reviews, you can gain valuable insights into product performance, pinpoint opportunities for improvement, and ensure your offerings remain relevant and competitive. You'll likely need to tweak your marketing approach to cater to changing customer preferences.

**Example:**

The wearable device product team launches a marketing campaign to create awareness and generate interest among their target audience before distributing the device through retail channels and online stores.

After the launch, the team monitors sales figures, tracks customer reviews, and gathers feedback through surveys. This data helps them determine what factors need to be tweaked to see optimal results.

## 6 Stages of New Product Introduction

### 1 Ideation

Product concepts are generated and explored

### 2 Market research and analysis

Data is gathered and analyzed to understand customer needs, market trends, and competition

### 3 Design and prototyping

Product designs are created and tested through physical models

### 4 Design validation and testing

Product designs are evaluated and tested to ensure they meet specifications and quality standards

### 5 Pre-production to mass production

Production plans are finalized, manufacturing processes are established, and large-scale production begins

### 6 Launch and post-launch evaluation

The product is introduced to the market, and its performance is monitored and evaluated

# Why Is NPI Important?

New product introduction is a crucial process for businesses seeking to thrive in today's competitive market. By effectively introducing new products, companies can:

- **Gain a competitive advantage:** NPI allows businesses to stand out from competitors, offer unique solutions, and capture market share.
- **Meet customer needs:** By developing products that address customer pain points and desires, companies can build a loyal fan base. This leads to more sales, a bigger market share, and long-term success.
- **Drive business growth:** NPI can pump up revenue by introducing new products that tap into untapped markets or address unmet customer needs. Successful launches can create excitement and attract new customers, helping your business grow.
- **Enhance brand reputation:** Introducing innovative and high-quality products can enhance a company's brand reputation. Happy customers and successful launches build trust, loyalty, and brand awareness.
- **Facilitate innovation:** NPI encourages a culture of innovation and creativity within an organization. By continuously developing new products, companies can stay ahead of the competition, adapt to changing market trends, and foster a culture of innovation.

StudioRed can guide you through the entire product development journey, from concept to launch. Our team of experts delivers tailored NPI solutions that help you bring innovative products to life.

[Contact StudioRed](#) today to start shaping your vision into reality.

## FAQ

Have questions about NPI? We've compiled a list of frequently asked questions to help you understand the process and overcome common challenges.

### What Is NPI in Engineering?

New product introduction in engineering is the process of turning a product vision into a tangible product. It involves several steps, including:

- Product ideation and concept development
- Market research and analysis
- Design and prototyping
- Engineering and technical development
- Manufacturing and production
- Testing and quality control
- Launch and post-launch evaluation

NPI is essential for engineering teams looking to create cutting-edge products that resonate with customers and boost the bottom line.

# What Challenges Do Companies Face During New Product Introduction?

Companies often encounter [several challenges](#) during new product introduction, like:

- **Market uncertainty:** Identifying the right market fit, understanding customer needs, and predicting market trends can be challenging.
- **Resource constraints:** Limited budget, time, and personnel can slow down product development and launch.
- **Technical difficulties:** Engineering challenges, design flaws, or supply chain disruptions can delay product development and increase costs.
- **Competitive pressure:** Fierce competition can make it difficult to differentiate new products and gain market share.
- **Regulatory compliance:** Adhering to industry regulations, safety standards, and environmental requirements can be complex and time-consuming.
- **Risk management:** Managing risks associated with product development, manufacturing, and market introduction is crucial but can be tricky.
- **Customer acceptance:** Getting customers to embrace a new product can be tough, especially if it involves a big change in behavior or technology.

## 4. Beyond the product design process: What happens next?

We've set out a linear product design process with a seemingly clear-cut end point. But, in reality, the product design process is ongoing. Once the product has been built and launched, the product designer will continue to monitor and iterate on the product.

They might run A/B tests to compare different versions of certain features and conduct ongoing usability tests to improve the user experience. They will also monitor the target market to identify new opportunities to deliver additional end-user and business value.

A successful product isn't static. It must evolve in line with the market and continuously adapt to the target users' needs. As such, the product design process is never really finished.

## 5. Key takeaways

The product design process is, at its core, a problem-solving endeavor. It's about understanding the challenges your target users face and coming up with effective solutions—then designing those solutions to ensure that they're desirable, usable, and accessible.

At the same time, the product design process seeks to balance user needs against business goals. The most effective products don't only deliver value to the end user; they also help to drive business growth and achieve strategic objectives.

And, while the product design process is highly adaptable, every successful product is rooted in continuous research, ideation, design, testing, and iteration. You can't build an effective product without those steps!

# Engineering Design Process: 7 Steps To Optimize Your Design

Christian Bourgeois . December 23, 2024

The engineering design process (EDP) is a method of collaboration that allows teams to design, build, and test new products or systems.

How do engineers turn a mere concept into a tangible reality? The answer lies in the engineering design process (EDP).

The engineering design process guides engineers and developers in generating various ideas and solutions and testing their potential. As an iterative process, this method is a useful strategy to create refined market solutions that excel in user experience.

This article will break down the [engineering design](#) process and discuss best practices for implementation.

**Key takeaways:**

- The engineering design process helps engineers break down problems into manageable components, identify potential solutions, and develop innovative designs.
- The EDP's cyclical approach allows engineers to learn from their concepts, improve their designs, and ultimately create optimal solutions.
- By understanding and utilizing this process, teams can approach problem-solving more systematically and creatively.

# What Is the Engineering Design Process?

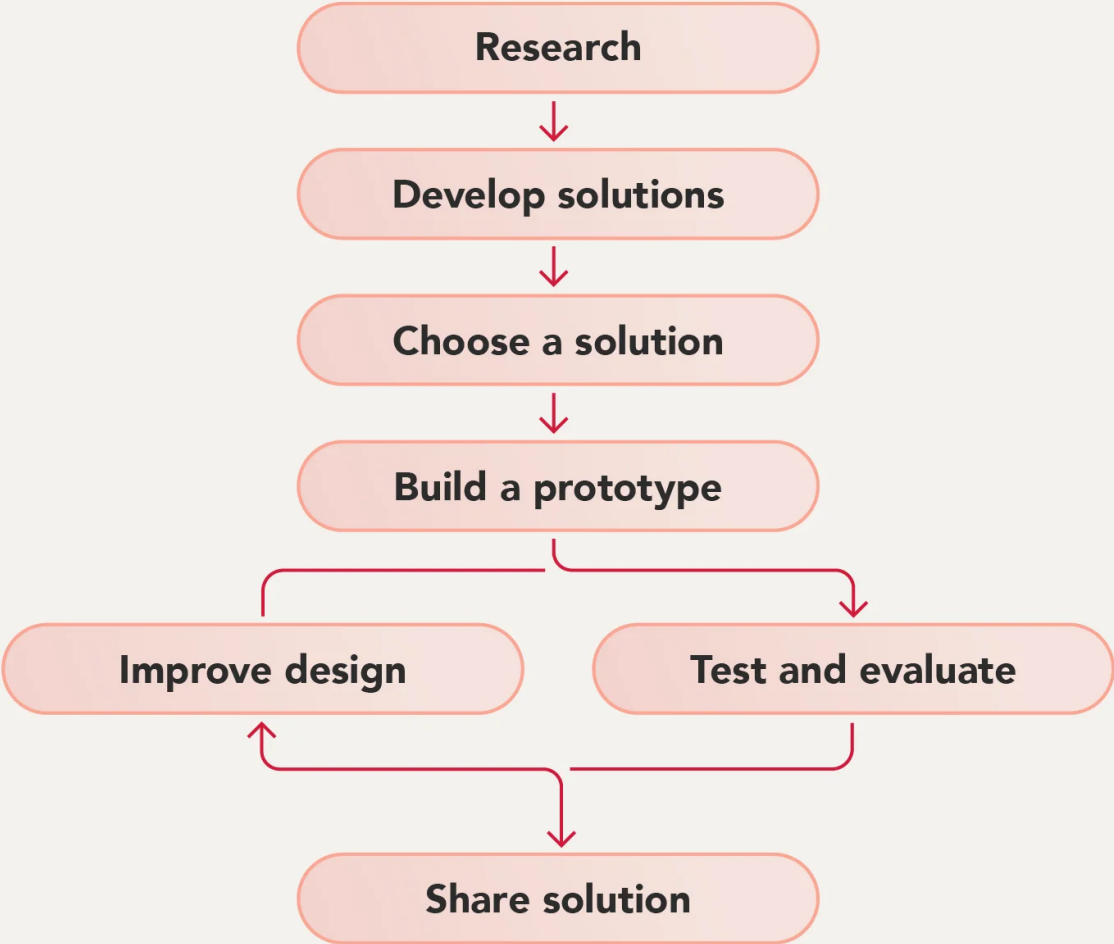
The engineering [design process](#) is a framework for teams to solve problems. It outlines how engineering teams identify a problem, brainstorm solutions, and test ideas and theories. The process is defined yet flexible, meaning teams can adjust goals, ideas, and solutions as they go.

The EDP is a creative and cyclical process where engineering teams collaborate to generate ideas, work together to plan execution, and make, test, and improve on the solutions generated.

# 8 Steps of the Engineering Design Process

The EDP steps outlined below provide a structured approach to improve team collaboration, and streamline product or system development and design.

# The Engineering Design Process



# 1. Identify the problem

This first step requires your team to identify the problem that needs a solution. This could include analyzing feedback from users or field specialists, surveying a market sector, or internally assessing the effectiveness of an existing product or system.

The engineering design process applies to electrical, mechanical, and civil design challenges. It is also central to product design, as it creates a path toward continual improvement and innovation. The EDP can also be used to improve existing systems, making it valuable in manufacturing process design and quality control systems.

## **Example:**

A beverage manufacturer may receive complaints from consumers about leaks and explosions when their beverages are placed in certain environments, a clear indicator that there's room for improvement in their beverage carton design.

# 2. Research the problem

Proper research is a critical step in the engineering design process, as it informs your team's problem-solving focus and design strategies. Part of the research can include market analysis to determine how a potential solution will be competitive and align with [current industry trends](#).

Thorough research will also help identify the urgency of a solution, such as falling market share or current product development among

competitors. This information can set the timeline for a speed-to-market solution.

If your team has identified an industry-wide problem, then the solution developed could become a widely applicable new standard.

### **Example:**

Market research may reveal common complaints stemming from one beverage manufacturer, or maybe they're focused on a single type of carton or beverage. The team could also conduct store checks to assess the condition of products on shelves or examine how competitors are packaging their products to identify potential weaknesses in their current packaging design or manufacturing process.

This is also a great time to create a [product requirements document \(PRD\)](#), outlining the product's purpose, target market, competition, and other important details.

## **3. Develop Possible Solutions**

Brainstorming allows engineering knowledge, technical skills, and creativity to contribute to innovative solutions. Working from the problem identified and the completed research, teams can use this step as an open forum to capture ideas.

### **Example:**

Your team is [challenged with finding a solution](#) to the integrity of carton lining in uncontrolled environments. Possible solutions could

surround packaging design, manufacturing processes, chemical treatments, or material selections. This step gives subject matter experts (SMEs) the space to propose solutions and get input from the team before moving forward.

## 4. Find the Best Solution

Next, your team can evaluate the ideas generated and identify the best solution to develop. Working together, the team can assess:

- How well the solution solves the problem
- If it is technically feasible
- The cost implications
- Any production challenges, such as the need to change equipment

A review of the research will also inform the team if the solution solves any additional issues or impacts currently well-performing aspects of a product.

### **Example:**

When solving the beverage carton problem, your team may have generated several concepts, from design adjustments to changes in the carton materials. Selecting the best solution would involve addressing regulatory requirements, logistics, production, and costs across a global supply chain. You can also add this information to the PRD you created in step 2.

## 5. Create a Prototype

The prototype stage of the EDP is where your team's technical skills are used to model a solution. This can include creating sketches, CAD, or other types of information-rich design plans that can be converted into [3D models and renderings](#). The prototype captures the most viable solution generated by the team in the previous steps of the engineering design process.

### **Example:**

Once the beverage carton team has designed a prototype, it can be put proto-fabricated and prepared for the next steps of the process. Regardless of the type of prototype, its value comes from the feedback gained, which the team can then incorporate into final product development.

## 6. Test and Evaluate

When a team follows the engineering design process, the intention is to solve a problem. This stage of the EDP is where the team can test their solution to verify its effectiveness. It's also an opportunity to test the prototype against existing performance metrics to see if the new model has any negative impacts.

### **Example:**

In the beverage carton example, testing prototypes in different temperatures and affecting settings like humidity would be important data to gather.

## 7. Improve the Design

The iterative nature of the engineering design process allows teams to evaluate their progress and refine the solution. The testing stage of the EDP can help inform teams of unforeseen problems with a prototype. In some instances, this can help the team adjust the design, or it may mean that a new solution is needed.

Where a prototype fails, the team can return to earlier steps in the EDP, revisit their research, and work through the process again.

### **Example:**

If your team proposed to change a carton material but did not adjust the assembly process, one or both of these issues may need to be resolved before reaching a final solution.

## 8. Communicate results

As teams move through the engineering design process, it's important to capture notes and information that can be organized and communicated. This step not only conveys the current solution to product development teams but it can inform other [product design teams](#). Communicating the results of the process can contribute to market-wide safety or quality control improvements.

### **Example:**

If the beverage carton prototype replaced a plastic with a metal, this would have implications for cooking. This type of information would

be crucial to the product development team so they can carry this throughout the product lifecycle to the end user.

## Best Practices for Implementing the Engineering Design Process

The engineering design process works most effectively when the team implements the intention behind each step. These best practices span industries and applications as a clear framework for teams to work within the engineering design cycle.

- **Set a clear goal:** Start with a well-defined problem to solve that has a specific market impact.
- **Iterate and revise:** Expect a trial-and-error process that produces several versions of a solution.
- **Gain diverse input:** Listen to technical experts, users, and other stakeholders such as client account managers.
- **Capture the process:** Document the process in full to capture lessons learned, which can inform future design iterations and improve overall efficiency.
- **Embrace prototypes:** Implement models to prove the success or failure of potential solutions through user feedback.
- **Test and get feedback:** Conduct rigorous testing to identify and address potential issues early in the design process. Incorporate user feedback to refine the design and ensure it meets the target audience's needs.
- **Set success metrics:** Establish clear, measurable criteria to evaluate the effectiveness of potential solutions.
- **Define design:** Provide detailed design instructions for the product development team to carry forward.

Take a Systematic Approach Toward Innovation

The engineering design process is about collaboration, communication, and innovation. It is a proven method for aligning teams toward clear goals that deliver for clients and users.

## **DESIGN PROCESS**

### **THE SUCCESS OF A PROJECT DEPENDS ON HAVING AN EFFECTIVE PROCESS IN PLACE**

We are passionate about our work and about teaching conceptual illustration and design for the transportation industry (utility, recreational and military vehicles) and related products (helmets and other accessories). We like to apply our knowledge to different types of products. We believe that “Everything that deserves to be made deserves to be made well.”

#### **1. Preliminary research**

- Index of competitors and strategic positioning
- Direct and indirect market trends and competition
- Analysis of existing products and activity analysis in the field (observation of users and operators)
- Analysis and portrayal of the typical buyer (lifestyle)
- Historical visual analysis of the client company’s products (DNA history)
- Creation of visual cues (features) unique to the client brand (DNA application)
- Visual guide for style development in conjunction with engineering, marketing, and design objectives (product positioning and mood boards)
- Proximity-based styling and design analysis (as per Scott Robertson’s theory (ACCD))

#### **2. Preliminary layouts, ideation – human factors & ergonomics (HF&E)**

#### **3. 2D-3D renderings, vehicle architecture’s layout**

#### **4. Digitization (scan) 3D reference/benchmarking**

#### **5. CAD preliminary surfaces**

#### **6. Small-scale or full-size clay models**

## 7. Clay model 3D scanning

## 8. Final “Class A” CAD surfaces

## 9. Graphic design, paint scheme

## 10. Follow-up

### QUALITY

Fast service, quality, feasibility, experience, imagination, precision, attention to detail, on-time delivery, attention to client needs, access to private specialized documents on industrial design and transportation. If needed, The Creative Unit, known for its passion for industrial design, can work with an extensive network of loyal partners who are all equally enthusiastic about their craft, who love creating, developing, and completing a project, and who value talent.





## WHAT IS INDUSTRIAL DESIGN ?

### **Industrial design**

is a creative activity that aims to determine the formal properties of industrially produced objects. This includes external features (style), but primarily the structural and functional relationships that give an object a consistent unit, both from the manufacturer's and the user's point of view. (ICSID)

### **Industrial design**

is a combination of applied art and applied science, whereby the aesthetics, ergonomics and usability of products may be improved for marketability and production. The role of an industrial designer is to create and execute design solutions towards problems of form, usability, physical ergonomics, marketing, brand development and sales. IDSA – Industrial Designers Society of America

### **Industrial design**

is also a creative activity whose will is to establish the qualities multifaceted objects, processes, services and systems in life cycles complete. The design has to do with products, services and systems conceived with tools, organizations and logic contributed by the industrialization (not only in the case of

serialized processes). International Council of Societies of Industrial Design (ICSID)

**The World Design Organization (WDO)<sup>™</sup>**, formerly the International Council of Societies of Industrial Design (Icsid), is an international non-governmental organization founded in 1957 to promote the profession of industrial design.

The World Design Organization (WDO)<sup>™</sup>, formerly known as the International Council of Societies of [Industrial Design](#) (Icsid), is an international non-governmental organization that promotes the profession of [industrial design](#) and its ability to generate better products, systems, services, and experiences; better business and industry; and ultimately a better environment and society.

From 12 founding professional design associations in 1957, WDO has grown to include over 170 member organizations from more than 40 nations, engaging them in collaborative efforts and providing them with the opportunity to be heard internationally.

A renewed vision and mission was approved by the members at the general assembly in October 2015 along with an approval to change the name of the organization to World Design Organization.

WDO has United Nations Special Consultative Status.

## LAND ACKNOWLEDGMENT

Based in Montréal (Canada) since 2005, World Design Organization acknowledges that its Secretariat is located on the unceded Indigenous territory of the Kanien'kehá:ka. For centuries, these lands have served as a traditional gathering place for many nations and WDO honours the Indigenous leadership and knowledge that continues to shape this territory, and others around the world in which we work.

For over 65 years, WDO has gathered design organizations and designers they represent into a global community. Today, we support a growing network of over 200 WDO Members and are the only organization connecting corporate, educational, professional, promotional and municipal design institutions.

Our global community recognizes the power of design-led transformation. Together, we work to advance the profession of industrial design and promote its contribution to economic, social, cultural and environmental development. Through collaboration, exchange and partnership, we invite you to join us as we work to design our way to a better world.

On **2 November 2021**, the WDO Foundation™ was established to further the organization's mission of improving global quality of life through design. Engaging with educational institutions, industry, and global non-governmental organizations, the WDO Foundation will develop partnerships in technology, research and development and **sustainability** to support a variety of design-led projects and programmes.

As an international organization, WDO and the WDO Foundation are committed to leveraging their position to support the profession of design and its role in building a more equitable and sustainable world. The establishment of this foundation represents an important next step for WDO in expanding the scope and impact of our global activities.

Alongside its partners, the WDO Foundation works to:

- support the development of design students and professionals by funding quality educational programmes, grants and scholarships that emphasize and facilitate interaction, collaboration and partnership across international communities;
- raise awareness and demonstrate the benefits and tangible outcomes of design-led programmes to solve local and global, social and environmental issues;
- provide stakeholders from the civil society, industry, governmental and non-governmental organizations with support from the design community;
- support and fund educational endeavors and community projects to explore design **innovation** as a means to improve the well-being of communities.

**THE CREATIVE UNIT INC. 2004-2024 / 20 YEARS OF INDUSTRIAL DESIGN AND TRANSPORTATION DESIGN / MARTIN AUBÉ, BDI, BA, ADIQ, IDSA, 36 YEARS OF INDUSTRIAL DESIGN AND TRANSPORTATION DESIGN**

**“Between two products equal in price, function and quality, the one with the most attractive exterior will win.” Raymond Loewy**

**“What is worth doing, is worth doing well.” Nicolas Poussin**

**“The first quality of style is clarity.” Aristotle**

**“Fashion fades, only style remains.” Coco Chanel**

**“Talent is the ability to focus on one or another object and see something new, something that others do not see.” Leo Tolstoy**

**“Who thinks little is mistaken much.” Leonardo da Vinci**

**“Imagination rules the world.” Napoléon Bonaparte**

**“Discipline equals freedom.” Jocko Willink**

**“Beauty is only a simulacrum, youth is only a lure”. Gotlieb**

# TO IDEATE & IMAGINEER IN THE DESIGN PROCESS

**Ideation** is the [creative](#) process of generating, developing, and communicating new ideas, where an [idea](#) is understood as a basic unit of thought that can be either visual, concrete, or abstract.<sup>[1]</sup> Ideation comprises all stages of a thought cycle, from [innovation](#), to development, to actualization.<sup>[2]</sup> Ideation can be conducted by individuals, organizations, or crowds. As such, it is an essential part of the [design process](#), both in education and practice.<sup>[3][4]</sup>

## Criticism

The word "ideation" has come under informal criticism as being a term of meaningless jargon.

The term "**Imagineering**", a [portmanteau](#), was introduced in the 1940s by [Alcoa](#) to describe its blending of imagination and engineering, and used by [Union Carbide](#) in an in-house magazine in 1957, with an article by Richard F. Sailer called "BRAINSTORMING IS IMAGInation engNEERING". Disney filed for a trademark for the term in 1989, claiming first use of the term in 1962. Imagineering is a [registered trademark](#) of [Disney Enterprises, Inc.](#)<sup>[4]</sup>

Both terms describe the **CREATIVE PROCESS**.

Creativity is a cornerstone of human evolution and is typically defined as the multifaceted ability to produce novel and useful artifacts. Although much research has focused on divergent thinking, growing evidence underscores the importance of perceptual processing in fostering creativity, particularly through perceptual flexibility. The present work aims to offer a framework that relates creativity to perception, showing how sensory affordances, especially in ambiguous stimuli, can contribute to the generation of novel ideas. In doing so, we contextualize the phenomenon of pareidolia, which involves seeing familiar patterns in noisy or ambiguous stimuli, as a key perceptual

mechanism of idea generation—one of the central stages of the creative process. We introduce “divergent perception” to describe the process by which individuals actively engage with the perceptual affordances provided by ambiguous sensory information, and illustrate how this concept could account for the heightened creativity observed in psychedelic and psychotic states. Moreover, we explore how divergent perception relates to cognitive mechanisms crucial in creative thinking, particularly focusing on the role of attention. Finally, we discuss future paths for the exploration of divergent perception, including targeted manipulation of stimulus characteristics and the investigation of the intricate interplay between bottom-up and top-down cognitive processes.

## The CREATIVE PROCESS in INDUSTRIAL DESIGN ENGINEERING for Products and Transportation

Creativity is the ability to produce or develop original work, theories, techniques, or thoughts. A creative individual typically displays originality, imagination, and expressiveness.

Creative thinking refers to the mental processes leading to a new invention or solution to a problem. Products of creative thinking include new machines, social ideas, scientific theories, artistic works, and more.

Imagination is the ability to mentally simulate situations and ideas not perceived by the physical senses – lays the foundation for creativity. Yet imagination alone is insufficient to produce creativity. We define two types of imagination important for creativity: social-emotional and temporal.

Social-emotional imagination is the ability to conceive of and reflect on multiple social perspectives and scenarios and the implications of these for one’s own and others’ lives. It promotes creativity by helping individuals understand multiplicities of identity and experience within themselves and others, reason ethically, and appreciate human diversity and potential.

Temporal imagination is the ability to engage in mental time travel, counterfactual thinking, and mind-wandering. It can lead to creativity by allowing individuals to engage in the kind of nonliteral, divergent, and future-oriented thought creativity necessitates.

For creativity to happen, imaginative thought is infused into mental simulations that are regulated, evaluated, and integrated to conjure new ideas and concepts. As such, in the brain, creativity relies heavily on the default mode network, which is known to be involved in mental simulations across time and especially about social content.

Creativity also relies on organized interactions between the default mode network and the executive attention and salience networks, in order for imaginings to be strategically organized into coherent, meaningful plans and actionable ideas. To harness the potential of imagination, individuals need conducive personal qualities, including openness to experience and intrinsic motivation, as well as a supportive context.

## Creativity and Imagination

Creativity is defined by psychological scientists as the generation of ideas or products that are both original and valuable. Creativity relies on imagination, the conscious representation of what is not immediately present to the senses. Although research on creativity has increased in quantity and quality since J. P. Guilford's presidential address to the American Psychological Association in 1950, this fundamental human ability remains understudied in comparison to other important psychological phenomena. We are currently conducting a number of different research projects designed to better understand the causes and consequences of creativity, as well as how to enhance it.

## **Motivation and Creativity**

One important antecedent of creative behavior is motivation. Why do individuals engage in creative work? What benefits, if any, do they anticipate? Past research on this important topic has shown that individuals who are intrinsically motivated tend to be more creative. In other words,

individuals who engage in creative activities for the sake of the activities themselves (and not for the sake of extrinsic constraints of rewards) are better able to come up with original and valuable ideas. In addition, a small but growing body of literature suggests that prosocial motivation, defined as the desire to contribute to the lives of others, may also enhance creative thinking. Our ongoing research projects attempt to broaden the scientific understanding of the role of motivation in creativity by further investigating the specific nature of creators' motivations, and the relationship between motivations, achievement, and well-being.

## **Creativity and Well-Being**

Past research suggests that creative activities may have therapeutic benefits and enhance well-being. To date, little research has however investigated the mechanisms explaining how creative thinking may confer its benefits. Current research projects at our center examine the possibility that creative thinking may enhance well-being by enhancing cognitive flexibility and problem-solving abilities, by providing individuals with an important sense of mastery and agency, and by helping individuals perceive benefits after going through adversity.

## **Creative imagination**

“**Creative imagination**” is what we normally consider to be creativity with a large C – composing an opera or discovering something groundbreaking. This is different from everyday creativity, such as coming up with imaginative solutions to household problems or making crafts.

Creative inspiration is notoriously elusive. Being able to train creativity or induce a state of creativity has therefore long been the aim of many artists and scientists.

Research has suggested that creative imagination can also be boosted through our environment or simply putting in lots of hard work. For example, experimental studies **have shown** that when children engage with creative content or watch others be highly creative, they become more creative themselves.

There are two phases to creative imagination. “Divergent thinking” is the ability to think of a wide variety of ideas, all somehow connected to a main problem or topic. It tends to be supported by [intuitive thinking](#), which is fast and automatic. You then need “convergent thinking” to help you evaluate the ideas for usefulness within the main problem or topic. This process is supported by [analytical thinking](#) – which is slow and deliberate – allowing us to select the right idea.

So if you want to design that masterpiece, having lots of brainstorming sessions with friends may help you come up with new ideas.

Research suggests that the first requirement is actually [exposure and experience](#). The longer you have worked and thought in a field and learned about a matter – and importantly, dared to make many mistakes – the better you are at intuitively coming up with ideas and analytically selecting the right one.

The best preparation for the future is paradoxically to imagine the process – not the outcome – of your desired future event.

We all have imaginative ability to various degrees, and it’s difficult to imagine where humankind would be without it. So even though you are yet to actually write that novel you’ve got in you somewhere, keep trying. There are many routes to boost creativity, with play, practice, and experience being crucial. It may even make you smarter.

As Einstein himself reportedly once said: “The true sign of intelligence is not knowledge but imagination.”

# UNLOCKING THE POWER OF THE MIND: THE BRAIN REGION BEHIND CREATIVITY AND IMAGINATION

Last updated: February 7, 2024

Most of us think about creativity and imagination in relation to the arts, such as writing, theater, or fine art. However, creativity and imagination play a role in virtually all vocations and hobbies. The two terms aren't synonymous, even if they do often get mentioned in tandem. Imagination involves simulating mental pictures, new ideas and concepts, and sensations without input from the senses. Creativity, on the other hand, involves taking those visualizations and turning them into something new. Both imagination and creativity are essential to problem-solving and finding workarounds for difficult situations. These traits are helpful in everything from software development to customer service. But have you ever considered what part of the brain is responsible for creativity and imagination?

## WHAT PART OF THE BRAIN CONTROLS CREATIVITY AND IMAGINATION?

The answer to “what part of the brain controls creativity and imagination” is as complex as the brain itself. No single area of the brain is solely responsible. Instead, there are several regions of the brain that contribute to what we call imagination and creativity. Among these are the following:

### **The Prefrontal Cortex**

The prefrontal cortex is the part of the brain that handles higher cognitive activity, such as making decisions and solving problems. Relatively [recent](#)

research shows a link between the prefrontal cortex and creativity. In addition, a part of the prefrontal cortex called the ventromedial prefrontal cortex (VMPFC), is charged with regulating emotions and self-reflection, both of which spur the creative process.

## **The Limbic System**

The limbic system is a collection of brain structures located next to the thalamus and underneath the cerebral cortex. These structures help to control our emotions and our motivations. The hippocampus and amygdala, both parts of this system, are especially relevant to creativity and imagination. The hippocampus is charged with storing and retrieving memories, and the amygdala is responsible for processing emotions. In conjunction, these two parts of the brain help to form ideas.

## **The Parietal and Occipital Lobes**

When you imagine what something or someone might look like (even if you've never seen it or them), that's your parietal and occipital lobes at work. These two parts of the brain are responsible for spatial orientation and visual processing. It is also widely believed that mental images and ideas are formed in these two areas.

## **Neuroplasticity and Creativity**

Neuroplasticity refers to the brain's ability to "re-wire" itself and thus change the way you view the world around you. In essence, you can teach yourself to be more creative. Neuroplasticity is how the brain heals after a traumatic brain injury or stroke. It's also behind how we learn and retain new skills.

According to the tenets of psychology, creativity comes from divergent thinking. Divergent thinking is when we think laterally, which means thinking of various possible outcomes, solutions, or scenarios, not just the most expected one. Children are experts at divergent thinking (and, therefore, often more creative), since they don't know what the most likely

solution is to a given situation and, therefore, must consider all possible solutions.

The good news is that divergent thinking – and thus creativity – can be taught. Several techniques can boost your ability to think creatively. For example, take two unrelated objects, such as a car key and a thimble, and spend five minutes thinking about their possible associations. Another exercise involves thinking about alternative uses for everyday objects – like The Little Mermaid’s Ariel combing her hair with a fork. Lastly, you can practice the SCAMPER technique. This psychological exercise is used for brainstorming and generating ideas. SCAMPER is an acronym for:

- Substitute – What can you change in a given situation?
- Combine – Does combining elements help the situation?
- Adapt – What existing element can you repurpose?
- Modify – What can you change?
- Put to another use – Should you use the project in another way?
- Eliminate – What do you need to get rid of?
- Reverse – Do you need to look at the situation from another point of view?

## **IMPROVING CREATIVITY AND IMAGINATION**

It’s a myth that your creativity and imagination are innate from birth. You can improve both in several ways, no matter your age. Some of these methods include:

### **Meditation**

Meditation can help you clear your mind so that you’re more receptive to divergent thinking and less consumed by the distracting minutiae of the average day.

## **Visualization**

Visualization is a part of divergent thinking. Actively practice envisioning different solutions and scenarios to make your mind more flexible and used to creativity.

## **Mind Mapping**

Mind mapping involves putting down on paper the flow of possible solutions to a given situation. Sometimes, seeing something on paper aids in the overall visualization process.

## **Your Environment**

It's also helpful to set up an environment that encourages creativity. For example, look at how children's playrooms have toys, posters, and art supplies to help the children explore their creativity. Adults can set up a similar environment, perhaps by a window with a scenic view, with creative elements and a calming ambiance.

# **CREATIVITY AND MENTAL HEALTH: REDUCE STRESS, ANXIETY, AND DEPRESSION**

Creativity has been shown to have a positive effect on mental health, specifically on reducing stress, anxiety, and depression. According to "[Forbes](#)" magazine, even just "coloring in those trendy coloring books" can improve your overall mental health. Making music, knitting, drawing, and any number of creative pursuits result in the production of dopamine, the hormone that makes us happy and a natural anti-depressant. Creating something also reduces your heart rate and helps lower anxiety. Even gardening can trigger this effect.

Creativity can also be useful in [keeping your mind sharp](#) and reducing your risk of dementia, as well as lessening the incidence of depression and loneliness.

# CREATIVITY AND CHILDHOOD DEVELOPMENT

Creativity is great for adults, but children can also benefit from increasing their creativity. According to [“PBS Ideastream,”](#) creativity “fosters mental growth in children by providing opportunities for trying out new ideas and new ways of thinking and problem-solving.” They add that creative play allows children to express their feelings and celebrate their uniqueness. According to the [National Association for the Education of Young Children](#) (NAEYC), creative art processes also support a child’s motor development (since they have to handle crayons, paint brushes, etc.) and “the development of self-regulation and self-control as the child focuses, makes choices and feels successful.” According to the NAEYC, children learn best when there is no “set” project but rather when they are given materials and the freedom to make anything they want.

# How To Unleash Your Creative Imagination

by [philmckinney](#)

Have you ever found yourself lost in your thoughts, daydreaming, or ideating [without barriers](#)? That's your creative imagination at work! Creative imagination is an incredible power within us—it can manifest our hopes, dreams, and aspirations. Unleashing the power of our creative imagination can be the key to realizing our personal and professional goals.



## What is Creative Imagination?

Creative imagination is our ability to form mental images, concepts, and ideas that are unique and original. It is the source of our creativity, innovation, and imagination. Our creative imagination enables us to think outside the box and develop unconventional ideas, perspectives, and solutions.

It's a multidimensional process that involves both conscious and subconscious minds. It's a rich blend of our experiences, knowledge, intuition, and emotions. With creative imagination, we can visualize scenarios or solutions

that don't yet exist, bridging the gap between the present and myriad possible futures.

Our creative imagination allows us to challenge conventions, break boundaries, and create new paradigms. It empowers us to perceive the world uniquely and interpret our experiences through fresh lenses. From creating a beautiful piece of art to pioneering a groundbreaking scientific theory, the power of creative imagination underlies all forms of human innovation and progress.

Each one of us possesses this power. However, like any other skill, it must be nurtured, cultivated, and practiced to reach its full potential.

## **How Does Creative Imagination Manifested?**

“In a world of over 7 billion people, not a single person shares your unique creative imagination – that's your unmatched superpower.”

Creative imagination manifests in many ways, including daydreaming, visualization, ideation, and creativity. It is the source of our inspiration, motivation, and passion. Creative imagination is also associated with our ability to create and innovate and our capacity to explore and develop new ways of thinking. We use our creative imagination in our personal and professional endeavors, such as:

### **1) Problem-solving:**

Whether figuring out a complex business challenge at work or deciding the best route to navigate a traffic jam, our creative imagination fuels our problem-solving abilities. It allows us to visualize multiple scenarios and outcomes, helping us to choose the most effective strategies.

### **2) Art and Creativity:**

This is the most apparent manifestation of creative imagination, evident in the works of artists, writers, and musicians. These individuals draw upon their creative imagination to conceive and express unique ideas, emotions, and perspectives.

### **3) Innovation:**

Every groundbreaking invention or discovery in history has been the product of someone's creative imagination. From Thomas Edison's light bulb to Elon Musk's vision for SpaceX, these innovations were once mere thoughts in the minds of their creators.

### **4) Learning and Education:**

Students use creative imagination to understand and remember complex concepts. For instance, a student of history might imagine themselves in a historical event to understand its nuances better.

### **5) Personal Development:**

Creative imagination can guide us in our personal growth and self-improvement efforts. By visualizing our ideal selves, we can map out the steps needed to reach our goals.

So, whether we are conscious of it or not, we constantly use our creative imagination to shape our world and experiences with its power.

## **The Power of Creative Imagination**

Creative imagination has immense power! It can transform our lives by enabling us to serendipitously ideate, create, and innovate. Harnessing the power of our creative imagination can inspire us to achieve our goals and realize our ambitions. We can visualize our perfect lives, careers, and relationships and use our creative imagination to manifest these into reality. Here are some key aspects that highlight its significance:

### **1) Realizing Possibilities:**

Creative imagination empowers us to visualize endless possibilities and solutions beyond our physical senses and immediate environment. It allows us to escape the constraints of the present moment, enabling us to travel in time and anticipate future outcomes. This ability to foresee potential

scenarios aids in decision-making and strategizing, thus giving us an advantage in navigating life's challenges.

## **2) Driving Innovation:**

The power of creative imagination is the cornerstone of all technological and societal advancements. It fuels the minds of scientists, inventors, and entrepreneurs, enabling them to create products, services, and solutions that reshape our world. Without creative imagination, there would be no iPhone, internet, or electric car.

## **3) Elevating Artistic Expression:**

Creative imagination allows artists, writers, musicians, and performers to conceive and communicate unique ideas, emotions, and narratives in art and literature. It is the foundation of their creative process, transforming abstract thoughts and feelings into tangible works of art.

## **4) Personal Transformation:**

On a personal level, creative imagination aids in self-improvement and personal development. Through visualization techniques, we can imagine our ideal selves, helping us to establish and pursue personal goals. By imagining our desired future, we can align our actions and behavior to those visions, leading to personal transformation and growth.

# **Increasing Your Creative Imagination**

There are several actionable tips and steps to increase your creative imagination, including:

## **Foster curiosity**

Curiosity, the innate desire to know and understand, is a fundamental driver of creative imagination. It prompts us to explore the unknown, question the familiar, and seek new experiences and perspectives. Fostering curiosity is an effective way to stimulate and harness your creative imagination. Here's how:

1. **Embrace the Unknown:** Step out of your comfort zone and delve into topics, cultures, or disciplines you know little about. This foray into the unfamiliar can trigger new ideas and insights, stimulating your creative imagination.
2. **Ask Questions:** Don't accept things at face value. Instead, ask "why," "how," and "what if" to delve deeper. This inquisitive mindset can lead to new connections and ideas.
3. **Seek Diverse Experiences:** Novel experiences broaden your perspectives, fueling your creative imagination. Travel to new places, read across various genres, engage with people from diverse backgrounds, or try out different cuisines.
4. **Lifelong Learning:** Commit to lifelong learning. Stay open to acquiring new skills, knowledge, and experiences. This continuous learning helps maintain a fresh and active mind ripe for creative imagination.

You keep your creative imagination vibrant, versatile, and ready by fostering curiosity. Remember, every great invention, every brilliant piece of art, and every revolutionary idea started with a curious mind.

## Cultivating Creativity

**Creativity** forms the bedrock of the imaginative process, and fostering it can significantly enhance the power of your creative imagination. It translates your intangible thoughts into concrete expressions, cultivating your ability to conceive unique and innovative concepts. Here are some effective strategies to cultivate your creativity:

1. **Immerse in Diverse Art Forms:** Explore different artistic disciplines such as poetry, architecture, painting, or music. These arts incite fresh perspectives and can stimulate creative thinking. By appreciating the **creativity of others**, you can inspire your own.
2. **Free Writing or Drawing:** Set aside a specific time for free writing or drawing each day. This unstructured and spontaneous activity allows your thoughts to flow freely, releasing withheld creativity.
3. **Creative Spaces:** Designate a space for creative pursuits. This could be a room filled with art supplies, a corner with a musical instrument, or a quiet spot for writing. A dedicated creative space can help invoke your creative spirit.

4. **Collaboration:** Engage in group activities that require creative problem-solving. Collaboration exposes you to different ideas and perspectives, stimulating your creative imagination.

Creativity extends beyond art—it applies to every aspect of life. From solving complex problems to making everyday decisions, cultivating creativity can make you a more innovative thinker and help you harness your creative imagination to its fullest potential.

## Engaging in Imagination

Engaging in imaginative activities is key to cultivating and strengthening your creative imagination. This practice allows you to flex your imagination, encouraging fresh perspectives and innovative ideas. Here's how you can engage in imagination:

1. **Visualization:** This is a powerful tool for mentally simulating a situation, concept, or object. By visualizing, you can explore possibilities, foresee challenges, and create solutions in your mind before taking any real-world actions. Athletes often use this technique to enhance their performance, and artists use it to conceive their creations.
2. **Daydreaming:** Contrary to popular belief, daydreaming isn't always a waste of time. It's a spontaneous, self-generated thought that allows your mind to wander freely. This can lead to the birth of original ideas and unique solutions you might not have discovered through analytical thinking alone.
3. **Reading Fiction:** Reading fiction is a form of 'indirect' imaginative engagement. As you delve into different worlds, characters, and narratives, you indirectly stimulate your creative imagination, broadening your horizons and fostering empathetic and creative thinking.
4. **Playing 'What If' Games:** Regularly challenging yourself with 'what if' scenarios is a great way to stimulate your creative imagination. Pondering hypothetical situations forces you to think outside the box and develop creative solutions.

By regularly engaging in these imaginative exercises, you can effectively cultivate and enhance your creative imagination. Remember, your imagination is like a muscle – the more you use it, the stronger it gets.

## Look With Fresh Eyes

Seeing the world with 'fresh eyes' is a powerful way to harness your creative imagination. This involves perceiving things from a new perspective, challenging preconceived notions, and daring to think differently. Here are some ways to achieve this:

1. **Challenge Assumptions:** Question the status quo and challenge established assumptions. This may not only lead to innovative thoughts but can also stimulate out-of-the-box thinking.
2. **Reframe Problems:** View obstacles as opportunities and try to reframe problems into challenges. This shift in perspective can spark creative solutions.
3. **Practice Empathy:** Try to understand situations from other people's perspectives. This empathetic approach can broaden your worldview and stimulate diverse thought processes.
4. **Explore Multiple Angles:** Don't be content with the first solution or idea that comes to mind. Cultivate the habit of considering various facets of a problem or concept.

Keeping your eyes fresh and mind open, you can tap into the depths of your creative imagination, unlocking endless possibilities and fostering innovation. Remember, a fresh perspective is all you need to uncover the hidden gems waiting to be found in the world.

## Keeping an Open Mind

Maintaining an open mind is a quintessential prerequisite for fostering your creative imagination. It allows you to explore new ideas, accept differing opinions, and step outside your comfort zone, which can fuel your creativity. Here are some ways to cultivate your creative imagination by keeping an open mind:

1. **Embrace Uncertainty:** Instead of fearing the unknown, embrace it. The uncertainty of new experiences can stimulate your imagination, pushing you to think in ways you haven't before.
2. **Welcome Different Perspectives:** Seek out and respect opinions that differ from your own. This can give you a broader range of ideas to draw from and enhance your creative thinking.
3. **Be Open to Learning:** Maintain a lifelong learner's attitude. This willingness to learn can expose you to many concepts and ideas, feeding your creative imagination.

4. **Experience Diversity:** Diversify your experiences and interactions. Engage with different cultures, philosophies, and lifestyles. The more varied your experiences, the richer your imagination becomes.
5. **Question Everything:** Adopt a questioning attitude. Explore the ‘ why ‘ behind things rather than taking information at face value.

Keeping an open mind facilitates a conducive environment for your creative imagination to flourish. It enables you to see beyond the obvious, question the ordinary, and venture into extraordinary possibilities. Remember, an open mind is the doorway to a world of [creative potential](#).

## Conclusion:

Your creative imagination is not just an intangible concept; it's a powerful force that can transform your personal and professional life. It can turn the ordinary into extraordinary, and the routine into remarkable. By nurturing your creative imagination through exercises, fresh perspectives, an open mind, and celebrating creativity, you're not just enhancing your problem-solving skills or improving your innovative thinking but unlocking a world of limitless possibilities. Thus enabling yourself to dream, explore, and create beyond the boundaries of common thought. You're equipping yourself with the ability to look at life through different lenses and to find opportunities where others see none.

But perhaps the most inspiring aspect of your creative imagination is its uniqueness. It's inherently yours – a reflection of your experiences, knowledge, and perspectives. No one else in the world possesses your creative imagination. Therefore, your creativity has the potential to contribute something truly unique and valuable to the world.

So, dare to imagine, create, and share your creativity with the world. Through your unique creative imagination, you can inspire others, make a difference, and leave a lasting impact.

Remember, every incredible creation today began as a mere figment of someone's imagination. So, who's to say what extraordinary creations your nurtured imagination might bring to life? Embrace your creative imagination, cherish it, and let it guide you through uncharted territories. The world awaits your creativity.

# 10 Best Industrial Design Companies in 2024

Christian Bourgeois . June 17, 2024

Transforming ideas into reality is no simple feat, especially when it comes to crafting innovative products that capture users' attention. That's where the best [industrial design companies](#) shine. These firms marry creativity, technical expertise, and a deep understanding of user needs to develop products that are as functional as they are beautiful.

From sleek consumer electronics to life-saving medical devices, the top industrial design companies have the skills and experience to bring even the most ambitious visions to life.

In this article, we'll introduce you to 10 of the most impressive industrial design firms making waves in 2024. Whether you're a startup looking to disrupt an industry or an established brand seeking to stay ahead of the curve, these companies have the talent and track record to help you achieve your goals.

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# 10 Top Industrial Design Companies

We've rounded up the best industrial design companies that can take your product from concept to consumer sensation. Whether you need to design a new gadget, update your product line, or create a unique user experience, these top industrial design studios have the skills and experience to make your product dreams a reality.

## 1. [StudioRed](#)

### StudioRed



#### Best for

First-rate industrial design

#### Headquarters

Palo Alto, CA

#### Founded

1983

**Notable clients**

Meta, Microsoft, 7-Eleven, Medtronic

**Industries:** Consumer products, smart home products, Biomedical, Automation, Commercial and industrial

**Target audience:** Executives, product managers, directors of innovation, and other decision-makers in Fortune 500 companies

**Production scale:** Low-volume to million-unit production runs

StudioRed, a pioneering industrial design firm nestled in the heart of Silicon Valley, has been crafting innovative and economically viable solutions for over four decades. With an impressive portfolio spanning over 4,500 projects, StudioRed has established itself as the partner of choice for businesses seeking to transform bold ideas into market-defining products.

What sets StudioRed apart is its holistic approach to product development. The firm's multidisciplinary team of designers, engineers, and creators collaborates closely with clients, ensuring every aspect of the product lifecycle is carefully considered. From concept to manufacturing, StudioRed's expertise encompasses industrial design, ergonomics, user experience [\(UX\) design](#), graphical user interface (GUI) design, mechanical engineering, and [prototyping](#).

Unlike many other firms, StudioRed boasts in-house mechanical engineers and industrial designers. For most projects, they manage the entire process from concept through to manufacturing, resulting in tangible products. Many firms outsource their mechanical engineering, but StudioRed handles it internally.

StudioRed's highly collaborative culture between industrial designers and mechanical engineers allows them to streamline the development process, maintain better quality control, and efficiently bring innovative products to market.

Clients consistently praise StudioRed for its exceptional professionalism, structured approach, and ability to bring ideas to life. The firm's commitment to shepherding clients from blank slates to market leaders is validated by enduring partnerships with industry titans.

A deep empathy for stakeholder needs allows StudioRed to balance technical and creative demands while eliminating blind spots. This reliability has earned exceptional loyalty, with 90% of new clients returning and 95% of returning clients collaborating on three or more projects.

With a proven track record of successful product launches and over 200 international design awards, StudioRed continues to shape the future of product design. As a trusted advisor, the firm guides clients through the unknown challenges of product development, ensuring each project achieves enduring value and market success.

## 2. Whipsaw

### Whipsaw

W H I P S A W

#### **Best for**

Innovative consumer product design

#### **Headquarters**

San Francisco, CA

#### **Founded**

1999

#### **Notable clients**

Uber, Tile, Google

Whipsaw is a renowned industrial design consultancy based in San Francisco. Whipsaw has spent over two decades creating award-winning product solutions across industries like consumer electronics, housewares, medical devices, robotics, and more. With a client roster featuring top brands like Google, Nike, Samsung, and Uber, Whipsaw's influence is evident in over 1,000 successful product launches.

The firm's design philosophy centers around crafting intuitive experiences that connect emotionally with end users. Whipsaw's creations exhibit a signature blend of beauty, functionality, and simplicity — qualities that have earned it over 300 major design

accolades. Its human-centered approach, multidisciplinary talents, and commitment to design innovation have solidified Whipsaw as one of the world's preeminent industrial design practices.

## 3. Bould Design

### **Bould Design**

bould

#### **Best for**

Close collaboration

#### **Headquarters**

San Mateo, CA

#### **Founded**

2018

#### **Notable clients**

GoPro, Roku, Logitech

Bould Design is an industrial design studio that specializes in crafting innovative and successful products through user-centric design. The studio focuses on four key principles: function, simplicity, quality, and character, aiming to create products that are both functional and beautiful.

With a process that emphasizes collaboration and communication, Bould Design has worked with a wide range of clients, from startups

to multinational corporations, and has consistently produced designs that earn high praise from users and critics alike. Its capabilities extend beyond industrial design to include branding and identity, packaging design, product visualization, and engineering support, ensuring Bould Design's clients receive comprehensive solutions that bring their products to life.

## 4. Speck Design

### **Speck Design**

The logo for Speck Design features the word "speck" in a bold, lowercase, sans-serif font, followed by "design" in a lighter, lowercase, sans-serif font.

#### **Best for**

Medical devices

#### **Headquarters**

San Jose, CA

#### **Founded**

1996

#### **Notable clients**

Cisco, Google, PopSockets

Speck Design, a Silicon Valley-based industrial design company, has been at the forefront of product design and strategy for nearly 30 years. The firm stands out for its ability to integrate innovation, aesthetics, and functionality, creating products that impact everyday life across homes, hospitals, and offices.

Speck Design's diverse expertise allows it to tailor solutions throughout the innovation process, from ideation to manufacturing, particularly excelling in medical devices, consumer products, and wearables. Speck Design's commitment to designing products that enhance human experiences reflects its dedication to a more inclusive and impactful future.

## 5. Frog



### **Best for**

Legacy and global influence

### **Headquarters**

San Francisco, CA

### **Founded**

1969

### **Notable clients**

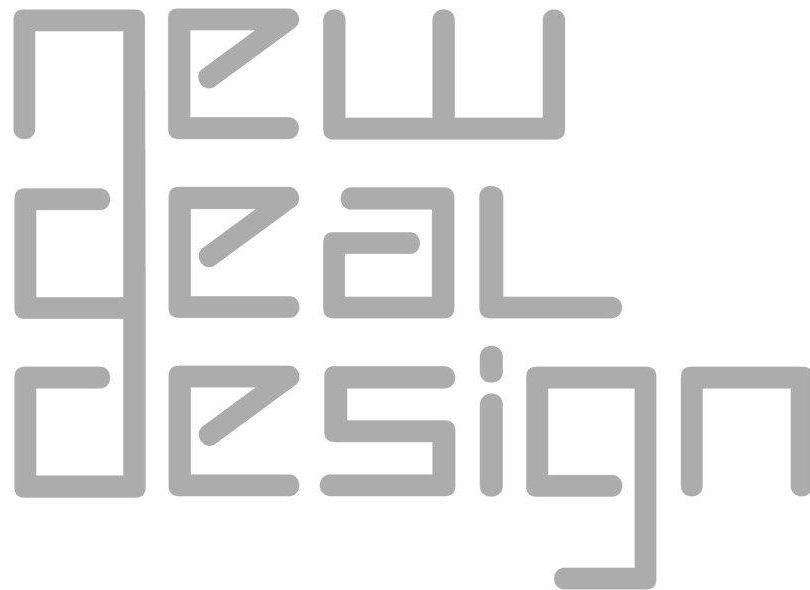
GE, Volvo Group, Purina

Frog is a global industrial design powerhouse crafting innovative products since 1969. Founded by Hartmut Esslinger in Germany, Frog pioneered an era of emotional design in response to the function-oriented products of the time. The company's work caught the attention of Steve Jobs, leading to a partnership with Apple that produced iconic designs like the Apple IIc.

Over the decades, Frog has continued to evolve, integrating engineering, branding, and digital capabilities to help clients navigate technological disruptions and deliver exceptional customer experiences. Today, Frog collaborates with visionary leaders and entrepreneurs to build experiences and products that disrupt the status quo and realize the future.

## 6. NewDealDesign

**NewDealDesign**



**Best for**

Emerging technologies

**Headquarters**

San Francisco, CA

## **Founded**

2000

## **Notable clients**

Fitbit, Herman Miller, Verizon

NewDealDesign is a San Francisco-based design studio founded in 2000 by Gadi Amit. The company is known for its innovative and human-centered approach to design, focusing on uniting technology and humanity in unconventional ways.

NewDealDesign consists of a team of industrial, graphic, and interaction designers and mechanical engineers who collaborate to develop cutting-edge technology products for clients such as Fitbit, Google, Intel, and more. The studio is recognized for its work in consumer electronics and wearable technology, and its designs have been praised for expanding appeal beyond niche markets to broader consumer audiences.

# 7. Box Clever

## Box Clever



### **Best for**

Consumer electronics and connected devices

### **Headquarters**

San Francisco, CA

### **Founded**

2012

### **Notable clients**

Intuit, Arlo, Caraway

Box Clever is an industrial design company known for its various areas of expertise, including industrial, brand, packaging, and digital design. Fast Company has recognized Box Clever as one of the Top 10 Most Innovative Design Companies.

Box Clever is involved in a wide range of projects, including cookware, payment readers, and soap dispensers. They focus on creating innovative, high-quality products that challenge conventions. Box Clever approaches design by considering the full user journey, from use to cleaning and storage, and aims to create products that are functional, visually appealing, and modern.

## 8. Ammunition

### **Ammunition**

ammunition

#### **Best for**

Lifestyle brands

#### **Headquarters**

San Francisco, CA

#### **Founded**

2007

#### **Notable clients**

Beats by Dre, Polaroid, Williams Sonoma

Ammunition is an industrial design and brand strategy consultancy recognized for its focus on user experience and its ability to integrate design, engineering, and brand strategy to create innovative products and experiences.

The company was influenced by Apple's design approach and philosophy, where co-founder Robert Brunner previously worked.

This influence is reflected in Ammunition's attention to detail and commitment to creating visually appealing and high-quality products.

From Beats headphones to smart kitchen appliances, Ammunition's approach to design involves a deep understanding of the user and the market, as well as a focus on creating products that are both beautiful and functional. The company's work has garnered over 200 accolades, including the 2016 Cooper Hewitt National Design Award for Product Design.

## 9. Lifestyledesign

**Lifestyledesign**  
**lifestyledesign**

**Best for**

Wearables

**Headquarters**

Santa Barbara, CA

**Founded**

2002

**Notable clients**

Patagonia, Under Armor, LG

Lifestyledesign is an industrial design consultancy that delivers solutions for brands in various industries, including lifestyle, consumer electronics, outdoor, sport, wearable technology, and IoT.

Lifestyledesign is known for its fashion-forward approach to design, aiming to connect with customers culturally and emotionally. With a focus on strategy, design, and development, Lifestyledesign offers a

range of services, including brand strategy, product strategy, industrial design, UI/UX design, brand development, digital content creation, engineering, prototyping, and eyewear design.

## 10. Delve

**Delve**



**Best for**

Integrating strategy, creative, and technology

**Headquarters**

Madison, WI

**Founded**

1967

**Notable clients**

Black & Decker, Fiskars, First Alert

Delve is an industrial design agency with over 55 years of experience. It has a proven track record of delivering successful products, earning 1,500 patents and 200 design awards. Delve's

approach involves human-centered strategy, design, and engineering to solve complex problems.

With expertise in various fields, including medical, industrial, automotive, and [consumer products](#), Delve has delivered over 10,000 completed projects. The company is known for its multidisciplinary teams, which consist of product engineers, designers, and user researchers.

# The Best Industrial Design Companies at a Glance

<b>Company</b>	<b>Best for</b>	<b>Location</b>	<b>Years in Business</b>
<b>StudioRed</b>	First-rate industrial design	Palo Alto, CA	41
<b>Whipsaw</b>	Innovative consumer product design	San Francisco, CA	25
<b>Bould Design</b>	A collaborative approach	San Mateo, CA	6
<b>Speck Design</b>	Medical devices	San Jose, CA	28

<b>Company</b>	<b>Best for</b>	<b>Location</b>	<b>Years in Business</b>
<b>Frog</b>	Legacy and global influence	San Francisco, CA	45
<b>NewDealDesign</b>	Emerging technologies	San Francisco, CA	24
<b>Box Clever</b>	Consumer electronics and connected devices	San Francisco, CA	12
<b>Ammunition</b>	Lifestyle brands	San Francisco, CA	17
<b>Lifestyledesign</b>	Wearables	Santa Barbara, CA	22
<b>Delve</b>	Integrating strategy, creative, and technology	Madison, WI	57

# Why Work With an Industrial Design Company?

By tapping an industrial design company for product development, you gain access to a team of experienced professionals who can help you navigate this complex process. Some of the key benefits and services they provide include:

- **Market insight and trend analysis:** Industrial design companies keep their finger on the pulse of consumer preferences, [industry trends](#), and emerging markets. They leverage this knowledge to inform the development of products that resonate with your target audience and stay ahead of the competition.
- **User-centric product development:** At the heart of every successful product is a deep understanding of the end user. Industrial designers excel at putting the customer first, conducting thorough research to uncover pain points and design solutions that truly meet their needs.
- **Brand strategy and consistency:** An industrial design firm helps ensure that any new product fits your brand identity and style guidelines. They recommend shapes, forms, materials, colors, and finishes that align with your brand vision.
- **Innovative and creative solutions:** Industrial designers are professionally trained to think outside the box. With their multidisciplinary expertise and access to the latest design tools and technologies, they are able to push boundaries and deliver breakthrough solutions that set your products apart.

- **Improved product usability and aesthetics:** Industrial designers strike the perfect balance between form and function, creating products that are both visually appealing and intuitive.
- **Access to specialized skills and technology:** Partnering with an industrial design firm gives you access to a cross-disciplinary team of specialists, integrating skills from engineering, [human factors](#), and visual design. This allows you to tap into a wealth of knowledge and capabilities that may be difficult to replicate in-house.
- **Reduced time to market:** Industrial design companies have well-established processes and workflows that streamline the product development lifecycle, helping you get your innovations into customers' hands faster.
- **Maintaining design integrity and quality throughout product development:** An industrial design firm ensures that design intent is meticulously maintained throughout the entire product development process. With a focus on detail, with every aspect of the design carefully managed and monitored from concept through to production.

## Services Industrial Design Companies Offer

Industrial design companies provide a wide range of services to assist with the entire product development lifecycle, from initial concept to final production. Although the specific offerings may vary between firms, the core services they usually provide include:

- **Market and user research:** Analyze trends, evaluate the competition, and determine what customers want to inform the product development process.
- **Concept development:** Generate and refine ideas for new products based on market research and client requirements.
- **Design for manufacturability (DFM):** Analyzing and selecting the appropriate colors, materials, and finishes to enhance the aesthetic appeal, functionality, and brand identity of a product.
- **Prototyping:** Build physical prototypes to test and validate product concepts, functionality, and usability.
- **Collaboration with engineering and manufacturing partners:** Work closely with engineering teams and manufacturing partners to ensure seamless integration of design concepts into final products.
- **Branding and packaging design:** Develop a cohesive visual identity and packaging designs that elevate the brand experience and attract customers.

Some industrial design companies may also offer more specialized services like [DFM](#), UX, sourcing and supply chain management, and marketing and growth strategy. The key is finding a partner with the right capabilities and experience to match your specific product vision and goals.

## How To Choose the Right Industrial Design Company

With so many industrial design firms to choose from, picking the right one to bring your product idea to life can feel overwhelming. But by focusing on a few key criteria, you can narrow the field and

find a company that perfectly fits your needs. Here are five things to keep in mind during your search:

## 1. Define Your Budget and Project Requirements

Before shopping around for an industrial design firm, determine how much you can afford to invest in your product design. Do you have \$10,000 to invest or \$100,000? Are you seeking an industrial design company to conceptualize your startup idea or to facilitate the manufacturing process once the design is finalized? Be realistic about your budget and timeline.

Keep in mind that the total cost of your product development includes design, engineering, prototyping, testing, revisions, materials. Factor in expenses like tooling, manufacturing, and marketing to determine how much you can allocate to the product development.

It's also important to have a clear understanding of your product goals, requirements, and constraints. Think through factors like:

- Product function and must-have features
- Target users and intended use cases
- Desired development timeline and milestones
- Required deliverables (concepts, CAD files, prototypes, etc.)
- Level of design support needed (research, branding concept development, design for manufacturing, and engineering support)

A well-defined design brief will make it easier to communicate your needs to potential partners and ensure you get relevant proposals to

compare. Be as specific as possible about your requirements while staying open to the creative ideas and recommendations an experienced industrial design company can provide.

## 2. Evaluate Their Portfolio

A great way to gauge the design chops and range of an industrial design company is to review its past work. Study its [portfolio](#) to see what kinds of products it has designed in the past and whether its style matches what you're looking for.

Pay attention to details like material choices, ergonomics, and design intuitiveness. High-caliber design firms will have a proven track record of creating exceptional, impactful work. If products don't seem thoughtfully designed or you're left unimpressed, keep looking. Design is highly subjective, so go with your gut instinct here.

Look for companies that have experience designing a range of products similar to yours. Some firms specialize in certain industries or product types, while others are generalists. Either can be a great choice, depending on your needs.

## 3. Consider Industry Experience

While it's not necessarily a deal-breaker, working with an industrial design agency with experience in your particular industry can be a major advantage. With relevant experience comes valuable industry connections. Design firms develop close partnerships with contract manufacturers, component suppliers, and other players in the

supply chain. Leveraging these connections can help get your product to market faster and more cost-efficiently.

Along the same lines, seek out firms that have designed for companies comparable to yours. Look at their client list and portfolio to find examples of work with companies of a similar size, market position, and business model as your own. Industrial design firms that typically partner with major multinationals may not provide the level of service and flexibility that smaller companies require.

## 4. Assess Their Process

The product development process can be long and complex, so it's important to understand how your potential design partner works and if their approach aligns with your needs and expectations. Ask them to walk you through their typical process from start to finish, including notable milestones, deliverables, and client touch points along the way.

Some important aspects to look for include:

- Thorough research and discovery phase to understand the market and user needs
- Iterative concept development with regular client feedback and collaboration
- Rapid prototyping and user testing to validate and refine the design direction
- Detailed design documentation and handoff to support manufacturing

- Proactive project management and communication to keep things on track

An experienced product design and development firm should have a mature and proven process in place but also be flexible enough to adapt to your unique needs and constraints. Avoid partners that are either too rigid in their ways or lack a clear methodology altogether.

## 5. Check Client Testimonials and References

When choosing a design firm, look for reviews from previous clients for insights into the company's work ethic and quality of service. Look for reviews that mention how quickly the company responded to questions and concerns. For a [complex product design project](#), you'll want a partner that communicates well and addresses issues promptly.

Ask the companies you're interested in for client references and case studies of past projects. Reach out to the references they provide and ask specific questions about their experience, like:

- How did the overall experience working with the company go?
- Did they deliver concepts and designs on time and within budget?
- Were there any unexpected costs or delays?
- Were they receptive to feedback and willing to revise their designs?
- Did the final product meet your expectations and needs?

Speaking directly with references is the best way to judge an industrial design firm's capabilities and work style. Pay attention to

both the content of the reviews and the enthusiasm in the client's voice. Lackluster or mediocre reviews and companies unwilling or unable to provide references are red flags.

## FAQ

Have more questions about the ins and outs of industrial design companies? In this FAQ, we'll answer some common questions to help you understand what they do and how much it might cost to work with one.

### What Is Industrial Design?

Industrial design is the professional practice of designing products, devices, objects, and services used by millions of people around the world every day. It is a multidisciplinary specialization aimed at creatively solving problems to improve products, systems, services, experiences, and businesses.

### What Does an Industrial Designer Do?

Industrial designers consider the function, value, aesthetics, and usability of a product from the user's perspective. They blend art, science, and technology to create innovative solutions that benefit both the end user and the manufacturer. Key responsibilities of an industrial designer include conducting research, brainstorming ideas, prototyping, selecting materials, finalizing designs, and overseeing the manufacturing process.

# How Much Does It Cost to Hire an Industrial Design Company for a Project?

The cost of hiring an industrial design company can vary significantly depending on several factors, including project scope and complexity, the design firm's expertise and reputation, project duration, and the specific services required.

Given these factors, the cost of an industrial design project can range from a few thousand dollars for a small, simple project to hundreds of thousands of dollars for a large, complex one.

It's important to note that many industrial design firms work on a project-based or hourly billing system, so the total cost can be challenging to estimate without a detailed project brief. The best approach is to consult with several reputable industrial design firms, provide them with your project requirements, and request detailed quotes for comparison.

# The Value of an Experienced Industrial Design Firm

Choosing the right industrial design company is one of the most important decisions you'll make when developing a new product. A skilled and experienced firm can be the difference between a successful launch and a costly flop.

At StudioRed, we have a proven track record of guiding businesses through the entire product development process. Our

multidisciplinary team works closely with clients to create innovative [industrial design solutions](#) that meet their unique needs.

If you're seeking a reliable and reputable [industrial design company](#) to work with, [contact us](#) today. With our creativity, technical know-how, and commitment to user-centered design, StudioRed is the ideal partner for businesses looking to innovate and grow.

# **The Science of Creativity: How Your Brain Innovates**

Creativity is the engine of human progress, driving groundbreaking innovations and transforming how we see the world. From the invention of the wheel to the development of artificial intelligence, creative thinking fuels every significant leap forward. But what exactly happens in your brain when inspiration strikes?

Understanding the intricate science of creativity can reveal not only how ideas are born but also how you can nurture your innate ability to innovate.

## **The Neuroscience Behind Creativity**

At its core, creativity is the result of complex neural interactions. Rather than originating from a single “creativity center,” it involves multiple regions of the brain working together in harmony. Neuroscientists have identified key players like the prefrontal cortex, responsible for decision-making and problem-solving, and the hippocampus, which retrieves memories and generates new connections. These areas communicate via intricate neural pathways, allowing the brain to blend logic with imagination seamlessly.

Interestingly, studies show heightened activity in the brain’s alpha waves during creative processes. These oscillations help suppress external distractions, enabling deeper focus and fostering a mental state conducive to generating novel ideas.

## **Left Brain vs. Right Brain: Debunking the Myth**

For decades, popular culture has perpetuated the myth of the left brain being logical and the right brain being creative. While it’s true that different hemispheres of the brain specialize in certain functions, creativity isn’t confined to one side. Instead, it’s the result of dynamic collaboration between both hemispheres.

For example, the left hemisphere excels at linguistic and analytical tasks, while the right hemisphere contributes spatial and emotional insight. Together, they create a balanced synergy, enabling nuanced thought processes and innovative breakthroughs. By debunking this outdated dichotomy, we can better appreciate the brain’s holistic approach to creativity.

## The Role of the Default Mode Network in Innovation

The default mode network (DMN), a network of interconnected brain regions, is a pivotal player in creativity. This network activates during rest, daydreaming, or introspection—moments when the mind wanders freely. The DMN facilitates divergent thinking, the process of exploring multiple possibilities and solutions.

Interestingly, some of the most creative ideas arise when people are least focused on the task at hand. Known as the “incubation effect,” this phenomenon underscores the importance of downtime in fostering innovation. By allowing the DMN to operate unrestrained, the brain can form unexpected connections and unlock fresh perspectives.

## Factors That Enhance Creative Thinking

Creativity isn't just an innate trait—it's a skill that can be cultivated. Various factors, both intrinsic and extrinsic, play a role in enhancing creative thinking:

1. **Curiosity:** A curious mind actively seeks new experiences and knowledge, which provide raw material for creative synthesis.
2. **Openness to Risk:** Taking calculated risks encourages unconventional thinking and the exploration of uncharted territories.
3. **Environment:** Stimulating environments filled with diverse stimuli can spark inspiration and fuel ingenuity.
4. **Mindfulness:** Practicing mindfulness increases self-awareness, allowing for deeper insights and sharper focus.

## The Connection Between Emotions and Creativity

Emotions are a profound driver of creativity, shaping how we perceive and interpret the world. Positive emotions like joy and curiosity broaden cognitive flexibility, encouraging the exploration of new ideas. Conversely, emotions such as sadness can prompt introspection, leading to deeply meaningful and expressive creations.

Research highlights that emotional intensity, rather than the type of emotion, is often a key catalyst for creative breakthroughs. By embracing and channeling these feelings, individuals can unlock extraordinary creative potential.

## Practical Ways to Boost Your Creative Potential

Nurturing creativity requires deliberate effort and practice. Here are actionable strategies to enhance your creative abilities:

1. **Engage in Cross-Disciplinary Learning:** Expose yourself to diverse fields to draw inspiration from unexpected sources.
2. **Practice Brainstorming:** Set aside time for unfiltered idea generation, allowing wild and unconventional concepts to emerge.
3. **Embrace Failure:** Treat mistakes as learning opportunities that pave the way for refinement and growth.
4. **Schedule Downtime:** Incorporate moments of relaxation into your routine to activate the default mode network.
5. **Experiment with Constraints:** Paradoxically, limiting resources or time can inspire innovative solutions by forcing you to think outside the box.

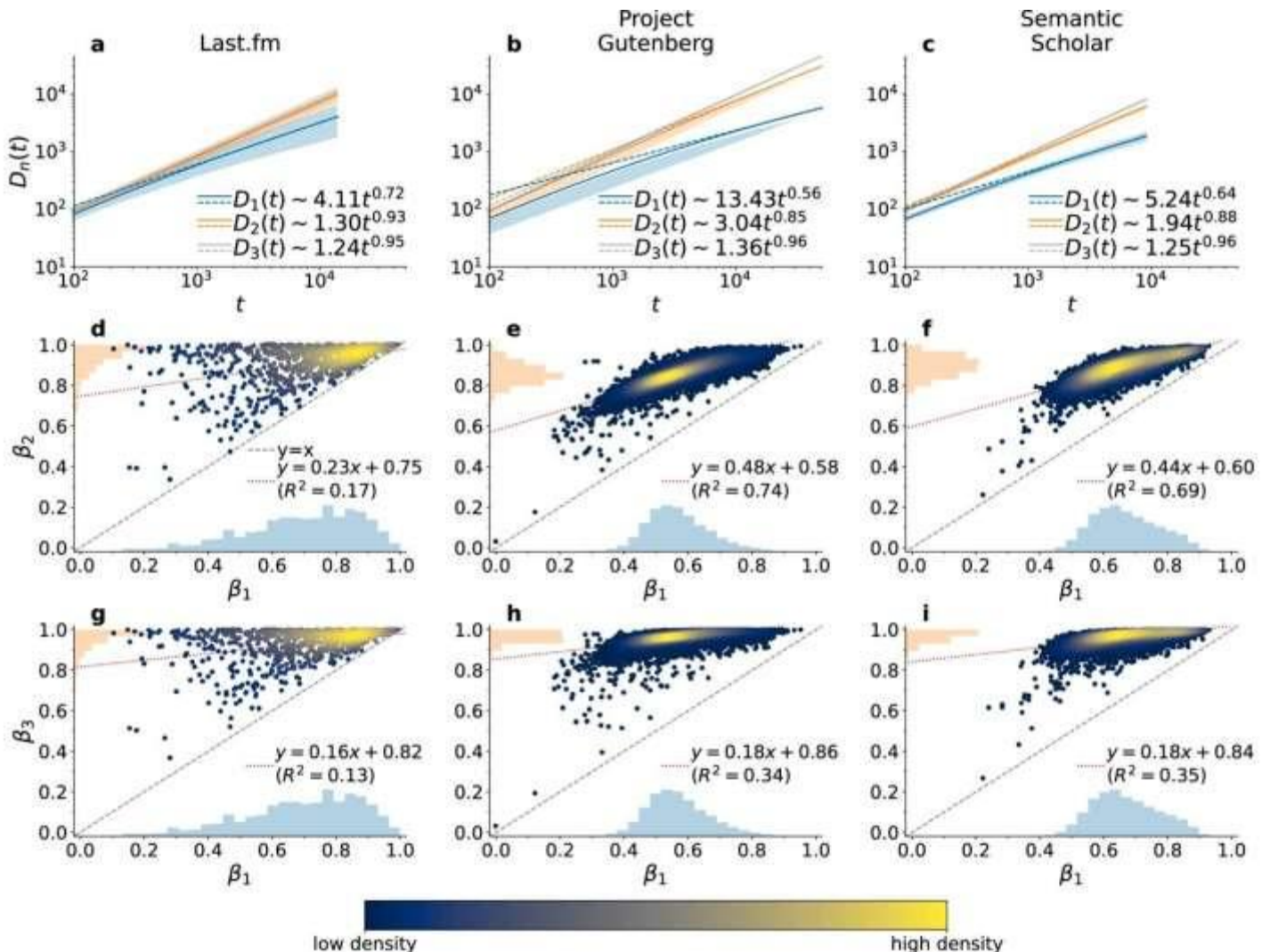
### Summary

Creativity is a multifaceted phenomenon that reflects the brain's boundless potential. By understanding the neuroscience behind it, we gain valuable insights into how ideas are formed and nurtured. Whether through engaging the default mode network, leveraging emotions, or adopting deliberate practices, anyone can enhance their capacity for innovation. Embrace your brain's natural ingenuity, and let creativity guide you toward limitless possibilities.

JANUARY 29, 2025

# Scientists map the mathematics behind how we create and innovate

by Tejasri Gururaj , Phys.org



Higher-order Heaps' exponents in real-world data sets. Credit: *Nature Communications* (2025). DOI: 10.1038/s41467-024-55115-y

A new study in *Nature Communications* explores the dynamics of higher-order novelties, identifying fascinating patterns in how we combine existing elements to create novelty, potentially reshaping our understanding of human creativity and innovation.

Novelties—a common part of human life—refer to one of two things. The first is the discovery of a single item, like a place, song, or an artist. The second covers discoveries new to everyone, such as technological developments or drug discoveries.

The researchers in this study aimed to understand how both kinds of novelties emerge. The team was led by Prof. Vito Latora from the Queen Mary University of London, who spoke to Phys.org about the work.

"I have always been attracted by creativity and innovation, which are the driving forces of human progress. This paper is one of a sequence of theoretical and applied works of my research group to study and model the mechanisms underlying creativity, with the goal of understanding what makes a new idea, team, product, or technology successful," said Prof. Latora.

The team analyzed real-world data from three sources to study higher-order novelties.

## **First-time appearances**

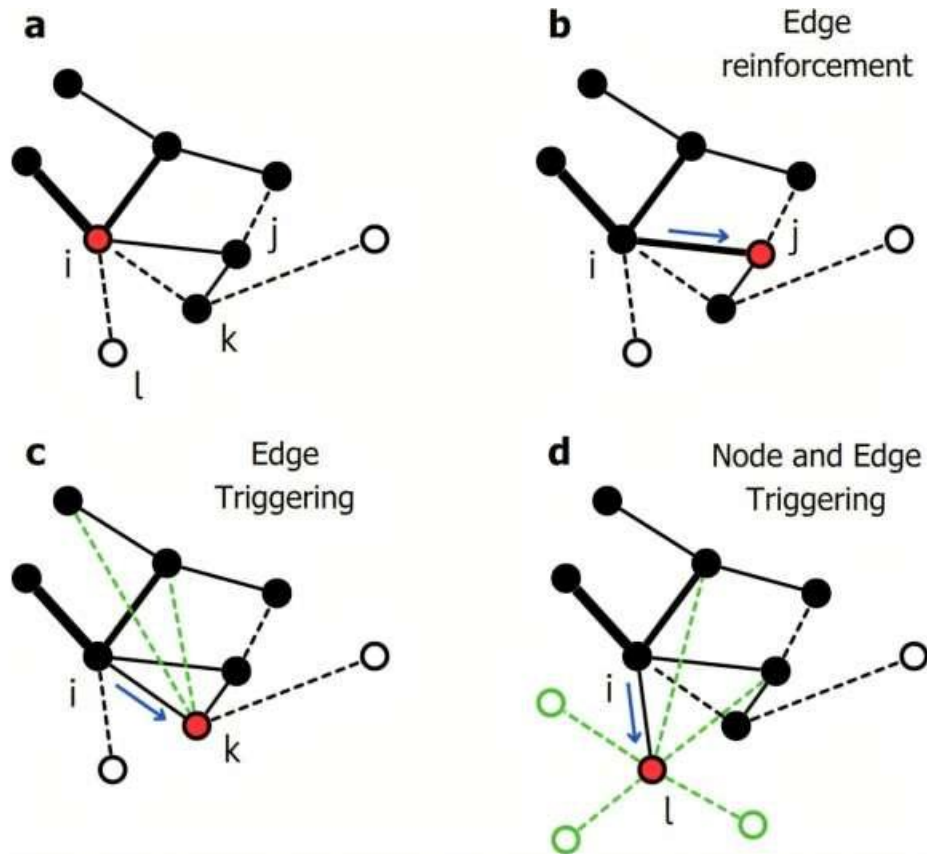
One of the main challenges with studying novelties is that most previous research has focused on first-order novelties, i.e., first-time appearances of individual elements.

For example, eating something new or visiting a new place for the first time. However, this approach overlooks an important innovation mechanism—combining existing elements to create something new.

For example, words can be strung together in different ways to create new poetry or stories, or musical notes can be combined to create a whole new song. The latter is known as higher-order novelties.

Prof. Latora said, "In our study, we introduced and explored a more general notion of novelty, which we named higher-order novelty, defined as the first time two or more elements appear together in a sequence."

To simulate how these combinations occur, the research team developed a framework called Edge-Reinforced Random Walk with Triggering or ERRWT.



The Edge-Reinforced Random Walk with Triggering (ERRWT) model. Credit: *Nature Communications* (2025). DOI: 10.1038/s41467-024-55115-y

## Random walk and ERRWT

The ERRWT model is based on the random walk, a [mathematical model](#) that describes the evolution of a system based on discretized steps. In this method, the next position of the walker depends only on its current position.

The movement between positions is completely random, with each movement in each direction having equal probabilities.

Prof. Latora explained the process: "Imagine all the items we can explore, or all the ideas that we can have can be described as the nodes of a network, whose links represent relations or similarity between two items or concepts."

The model's innovation lies in how it simulates the evolution of these networks. As the walker moves through the network, it doesn't just traverse existing paths—it creates new connections, triggering the emergence of new nodes, mirroring how real-world discovery processes expand our horizon of possibilities.

The creation of new connections—when novel combinations occur—is known as edge triggering, and the strengthening of connections between frequently used combinations is known as edge reinforcement.

The team used this ERRWT model to analyze three datasets. They chose to analyze music listening patterns (Last.fm), literary texts and books (Project Gutenberg), and scientific articles (Semantic Scholar).

Prof. Latora explained how the model works, saying, "The more we listen to a song or we associate two songs, the higher is the probability that we will repeat the song or the association in the future. Moreover, this also implies that the discoveries of new songs or associations generate an expanding space of opportunities that are only available to us in the moment we unlock what is adjacent to them."

## Heaps' law

The team discovered that the combinations followed predictable patterns, governed by Heaps' law, a power-law growth relationship. This is a mathematical relationship that describes how new combinations emerge over time, offering a quantitative way to measure and predict innovative processes.

According to their simulations, different processes can have the same rate of discovering individual elements but very different rates of discovering combinations.

More specifically, they found that for the Last.fm dataset, users with the same rate of discovering new songs can have very different paths in how they sequence these songs.

For the literature dataset, they found that writers tend to generate new word associations more often than introducing new words. Finally, [scientific articles](#) showed more creative word combinations compared to narrative texts, especially in paper titles.

The ERRWT showed how network structure and exploration patterns co-evolve, demonstrating that reinforcement (strengthening existing paths) and triggering (creating new connections) are necessary to explain real-world patterns.

## Implications and future work

The new framework provides a new basis for understanding innovation and creativity, bridging the gap between individual discovery and combinatorial innovation.

The findings help us understand the relevance of this model, especially seeing how new scientific discoveries emerge from combinations of existing knowledge. It could also inform educational approaches to creativity.

Prof. Latora commented, "Studying creative processes and understanding how new ideas emerge and how novelties can trigger further discoveries is fundamental, if we want to devise effective interventions to nurture the success and sustainable growth of our society. We believe that our findings and proposed models can be directly used to answer questions about the rise and fall of popular items or ideas."

The research team aims to generalize the model further and also include a social component, which is presently missing.

**More information:** Gabriele Di Bona et al, The dynamics of higher-order novelties, *Nature Communications* (2025). DOI: [10.1038/s41467-024-55115-y](https://doi.org/10.1038/s41467-024-55115-y).

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# How Creativity Positively Impacts Your Health

**Creativity** helps us perceive the world in new and different ways. It helps us create works of beauty, problem solve, and refresh our bodies and our minds. It's fun, and when you are having fun, you are positively impacting your health.

## Creativity Improves Mental Health

Expressing yourself through artistic and creative activities is like a prescription for your mental health. Turning to creativity has been proven in extensive research to relieve both stress and anxiety. Creativity also helps lessen the shame, anger, and depression felt by those who have experienced trauma.<sup>1</sup>

The Walter Reed National Military Medical Center has an art therapy program for soldiers with PTSD. Veterans often find it difficult to express their trauma verbally. Art therapy manager Tammy Shella, PhD, ATR-BC, says, “Through art therapy, patients can convey how they really feel on the inside and reveal things that they weren’t comfortable sharing with the world.”<sup>1</sup>

## Creativity Puts You in a Flow State

Have you ever been so immersed in writing in your journal, creating postcards out of your recent photographs, or dancing to your favorite band that you lost all sense of time?

Psychologist Mihaly Csikszentmihalyi, one of the cofounders of positive psychology, calls this “flow state.”<sup>2</sup> During this time, you’re focused with optimal attention on a task or activity. It’s sometimes called being *in the zone*.

This is an excellent and often euphoric state to be in. In this state, we are more mindful and relaxed. This allows us to feel more positive and brings a sense of accomplishment. People who experience flow report higher levels of creativity, productivity, and happiness.

## How to Enhance Your Creativity

Maybe we don’t think of ourselves as artists or as innovators trained in coming up with bold, new ideas. However, the key traits of innovators include energy, intelligence and discipline, which we all have in varying amounts.

Although we might not be artists or innovators by profession, that doesn’t mean we can’t tap into ways to expand our creativity. We all have the ability to express ourselves and come up with alternate ways of looking at things.

The good news for those of us who didn’t excel at art during our childhood is that the beneficial effects happen during the art process. They are not based on the end product. Laurel Healy, LCSW, says, “Engaging in a creative process, like singing, dancing, painting or drawing, has full body benefits. When we focus on something that is challenging and/or fun, we make new neuropathways, increasing connectivity in the brain.

“Increased connectivity, especially in the left prefrontal cortex of the brain, makes us more emotionally resilient in a way that is similar to what occurs when we meditate. The release of dopamine brings an enhanced sense of well-being as well as improved motivation,” Healy says.

### Draw or Paint

A growing body of research demonstrates that activities like drawing and painting can relieve stress and depression. Artistic activities have been linked to improving memory and resilience in older adults, even helping seniors with dementia reconnect with the world. Actively making art rather than simply appreciating art has also been shown to stave off cognitive decline.