

Research, Design, and Design Research: A Comprehensive Framework for PhD Scholars

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Abstract

This paper offers a thorough examination of research, design, and design research, providing a comprehensive framework for PhD scholars in the design discipline. It establishes a fundamental understanding of systematic knowledge generation by delineating the core principles of rigorous inquiry. The paper then explores the multifaceted nature of design, including its interpretations, the essential competencies of a designer, and the various levels of design intervention. The central focus of this work lies in converging research and design, defining design research as a distinct and robust area of inquiry. It elaborates on its systematic, iterative, and reflective processes, its key characteristics, and the critical typologies that frame its practice. Additionally, the paper explores the expansive scope of design research, emphasizing its disciplinary breadth, methodological pluralism, and strategic integration within contemporary organizations. Finally, it highlights the significant contemporary value of design research, emphasizing its contributions to human-centered innovation, economic efficiency, risk mitigation, competitive advantage, future-proofing, and ethical design. This framework is intended as an indispensable guide for PhD scholars in design, equipping them with the nuanced understanding necessary for advanced academic pursuit and impactful practice.

Introduction: The Confluence of Rigorous Inquiry and Creative Innovation

In today's complex global landscape, the historically distinct fields of research and design are significantly converging, a synergy that powerfully drives innovation and solves multifaceted problems. This confluence establishes "design research" not merely as an application of existing research methods to design problems, but as a robust and distinct area of inquiry. This is a critical observation, signifying a fundamental shift in how knowledge is generated and applied within the design discipline. If design research were simply an application, it would lack its own theoretical underpinnings and unique contributions to knowledge. By asserting its distinctness, it becomes clear that design research has developed, or is actively developing, its own epistemologies, methodologies, and processes for knowledge generation specific to the unique nature of design problems and creative practice. This elevates its academic standing and justifies its study as a specialized field for PhD scholars, indicating a disciplinary formation that moves beyond simple interdisciplinary borrowing. This paper aims to elaborate upon the foundational principles of research, delving deeper into their sophisticated integration within the discipline of design. It will further clarify the systematic nature of this combined discipline, its diverse

methodological approaches, and the essential critical considerations necessary for its effective and impactful practice. For PhD scholars, this paper serves as a foundational text, providing the comprehensive understanding necessary for rigorous academic pursuit and meaningful contribution to the evolving field of design.

The Foundational Principles of Research

To fully appreciate the intricacies of design research, a robust understanding of general research principles is essential. Research is formally defined as a systematic process of inquiry and investigation aimed at discovering and interpreting facts, establishing new conclusions, and acquiring knowledge. This rigorous endeavour involves a careful and diligent search, studious inquiry, and thorough examination of materials and sources. The overarching objective of research is to address specific questions and generate communicable knowledge that is both intelligible and coherent within a defined framework of understanding for an appropriate audience. More precisely, research is characterized as a "careful or diligent search," a "studious inquiry or examination," and a "systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions" (Webster's, 1999). This characterization resonates deeply with established academic principles, emphasizing methodical rigor, intellectual honesty, and the relentless pursuit of novel insights.

Several critical attributes underpin the integrity and utility of research. Systematic Inquiry denotes that research is executed according to a meticulously developed plan, entailing a methodical search for knowledge. This structured approach ensures reproducibility and validates the findings, moving beyond casual observation or anecdotal evidence to ensure robust and replicable results. For instance, in design research, a systematic approach might involve a detailed protocol for user interviews, ensuring consistency and reliability in data collection across multiple participants or iterations. A primary aim of research is the discovery and subsequent interpretation of facts. This involves not merely data acquisition but also the crucial analytical process of deriving meaning and insight from the collected information, transforming raw data into actionable knowledge. The process inherently involves the gathering of information pertaining to a particular subject. The methodologies employed for this collection are diverse and are dictated by the nature of the research question and the disciplinary context, and must be carefully selected to ensure the validity and reliability of the collected data. Research necessitates a thorough and painstaking investigation or examination to uncover, identify, or comprehend phenomena. This underscores the demanding and detailed nature of the research process, often requiring significant time, effort, and precision. Through systematic investigation of materials and sources, research strives to establish verifiable facts and formulate novel conclusions. This iterative process of evidence-gathering and logical deduction is fundamental to advancing knowledge within any field. Every research endeavour is purposefully initiated with specific

objectives, meticulously outlined in a "task description" or research proposal. These objectives guide the entire process, from question formulation to data analysis, ensuring that the investigation remains focused and purposeful. For example, a design research goal might be to understand the pain points of users interacting with a specific digital product, which then informs subsequent design interventions. The ultimate output of research transcends the mere accumulation of raw data or information. Its ambition is to generate profound, actionable, and insightful knowledge that advances understanding within a given domain, involving synthesizing data, interpreting patterns, and drawing conclusions that contribute to a broader body of theoretical or practical knowledge. A cornerstone of valid research, communicability dictates that findings must be intelligible, well-articulated, and situated within an understandable conceptual framework for an appropriate and relevant audience. This necessitates clear reporting, rigorous peer review, and effective dissemination to ensure that new knowledge can be scrutinized, built upon, and applied by others.

Beyond its fundamental definition, several operational aspects and epistemological considerations further delineate the nature and practice of research, particularly in contemporary scientific inquiry. Intriguingly, the "Scientific Revolution" is notably characterized not as a revolution of established knowledge, but rather as a profound "revolution of ignorance" (Harari, 2011). The willingness to acknowledge what is unknown has propelled modern science into a state of heightened dynamism, suppleness, and inquisitiveness. This embrace of the unknown and the recognition of knowledge gaps are critical for fostering genuine inquiry and driving scientific progress. For PhD scholars in design, this implies that a willingness to challenge assumptions, explore ambiguity, and actively identify knowledge gaps is not a weakness but a core strength and a prerequisite for genuine innovation. It suggests that the research process in design should actively seek out what is not known, rather than merely confirming existing hypotheses, thereby leading to truly novel insights. Contemporary research exhibits an "irresistible drift towards the exact sciences," marked by an increasing reliance on sophisticated mathematical tools. Consequently, statistics courses have become fundamental requirements across a wide array of disciplines, highlighting the pervasive integration of quantitative methodologies (Harari, 2011). This underscores the importance of empirical data analysis, statistical validation, and the pursuit of measurable outcomes in modern research paradigms, including those increasingly adopted in design research. Experimental methodologies serve as crucial analytical instruments, conceptualized as "microscopes or strobe lights" that facilitate the deceleration of human behaviour, isolation of individual forces, and their detailed examination. This enables the direct and unambiguous testing of underlying mechanisms driving human actions (Ariely, 2008). In design research, this translates directly to methodologies such as controlled user testing, A/B experiments, and usability studies, which allow for the precise examination of user interactions and the impact of design variables.

It is critical to acknowledge the inherent susceptibility of the human brain to cognitive biases such as "motivated reasoning," "biased evaluation," and the "My-Side bias" (Pinker, 2018). These biases can lead to the selective acceptance or rejection of evidence and the argumentation towards favoured conclusions, thereby compromising research integrity. To mitigate these human vulnerabilities, the culture of science has institutionalized practices such as open debate, rigorous peer review, and double-blind experimental designs. A foundational tenet of scientific inquiry is the imperative to avoid self-deception, as an individual is considered the "easiest person to fool" (Feynman, as cited in Pinker, 2018). This highlights the profound ethical and methodological imperative for objectivity, transparency, and self-correction in all research endeavors. Given the human brain's susceptibility to biases, particularly in design research where qualitative data from user interviews or observations might be subject to researcher interpretation, the risk of biased evaluation is substantial. Therefore, the scientific practices of open debate, rigorous peer review, and double-blind experimental designs must be adapted and integrated into design research methodologies. This means PhD scholars need to be acutely aware of their own biases and employ structured methods, such as inter-rater reliability or diverse research teams, to ensure that insights derived from user studies or design evaluations are robust and not merely reflections of the researcher's preferred conclusions. This directly impacts the validity and communicability of design knowledge. The "lifeblood of science" is sustained by the continuous cycle of conjecture and refutation, where hypotheses are proposed and then subjected to rigorous tests for falsification (Popper, as cited in Pinker, 2018). This Popperian view emphasizes that scientific knowledge advances not by proving theories true, but by disproving false ones. This iterative process of proposing, testing, and refining ideas is central to scientific progress and is increasingly embraced in iterative design processes. If scientific knowledge advances by falsifying theories, then design progress similarly benefits from actively seeking to invalidate design solutions or assumptions. This moves beyond simply "testing" a prototype to rigorously testing for its weaknesses and limitations. For PhD scholars, this implies that their design research should not just aim to demonstrate a design concept works, but rather to identify its shortcomings, the contexts where it fails, and the boundaries of its applicability. This critical approach, akin to scientific rigor, leads to more resilient, adaptable, and truly innovative design solutions, as flaws are identified and addressed through successive iterations, strengthening the underlying design principles.

Research endeavors possess distinct objectives that differentiate them from practical applications and pure scholarship. While practice involves the creation or performance of works (e.g., creating a product, performing a surgery), and scholarship denotes comprehensive knowledge within a specific field (e.g., being an expert in art history), research within a given discipline, by contrast, focuses specifically on the discovery of new knowledge, the identification of novel epistemologies (ways of knowing), or the refutation of extant commentary (Leedy &

Ormrod, 2016). It rigorously generates knowledge or insights that are effectively shareable and contribute to a cumulative body of understanding. The research process typically involves formulating a clear question, selecting appropriate methodologies (both qualitative and quantitative), empirically testing the question, meticulously analyzing the resultant data, and unambiguously disseminating the conclusions. Furthermore, a critical contribution of research is the establishment of reliable knowledge and methods that are amenable to replication by future researchers, thereby fostering cumulative scientific progress and building a robust disciplinary foundation.

Research can be broadly categorized into several types, each serving distinct purposes and methodologies. Applied Research is a systematic inquiry directed towards acquiring, converting, or extending knowledge for specific practical applications. Its primary aim is often to solve real-world problems or address immediate practical challenges (Leedy & Ormrod, 2016). In design, applied research might focus on developing a new user interface to address specific usability issues identified in an existing product, or evaluating the effectiveness of a particular design solution in a real-world context. Action Research involves systematic inquiry conducted through practical action, with the goal of devising or testing new information, ideas, forms, or procedures, ultimately generating communicable knowledge. It often entails a cyclical process of planning, acting, observing, and reflecting, making it particularly relevant in iterative problem-solving contexts (Leedy & Ormrod, 2016). This type of research is highly pertinent in design contexts where iterative development, participatory design, and immediate feedback loops are crucial for refining solutions. Fundamental (Basic) Research, also known as basic research, is primarily driven by intellectual curiosity and the expansion of knowledge without immediate practical concerns. While not directly aimed at solving immediate problems, fundamental research often lays the theoretical and methodological groundwork that enables future applied innovations (Leedy & Ormrod, 2016). For instance, basic research into human cognition or perception might inform design principles years later. Strategic Research bridges the gap between basic and applied research, focusing on knowledge areas with anticipated future applications. It involves a long-term vision for potential practical benefits, often exploring nascent technologies or theoretical frameworks that hold promise for future development (Manzini, 2007). Option Research typically involves exploring various possibilities or alternatives. In design, this could involve exploring different conceptual directions for a product or service, investigating multiple material choices, or assessing various interaction models before committing to a single solution.

Design: A Multifaceted and Evolving Discipline

Design is a multifaceted field that combines creativity, systematic problem-solving, and a deep understanding of human needs. It is frequently characterized as the process of "making sense of things," a concept notably articulated by Krippendorff (1989) and Heskett (2005). It encompasses

a systematic methodology for "organizing, manipulating, pruning, and filtering gathered data into a cohesive structure for information building" (Kolko, 2007). This methodical process enables proficient designers to "create normalcy out of chaos" (Veen, as cited in Kolko, 2010). Fundamentally, design constitutes "the product of thought and deliberate action that is composed by intentions and imagination and its effects are refined by iterative explorations and supported sensitive judgments and convictions where actions come before the provision of proof of concept" (Ranjan, 2014). Charles and Ray Eames famously posited that design necessitates "humility, sensitivity, and empathy". This assertion critically highlights design's inherently human-centered nature, advocating a holistic approach primarily focused on "generating new opportunities, improving standard of living and preserving the values of traditional society" (Mehta, 2017). As Peter Downton concisely asserts, "'Design is a way of inquiring, a way of producing knowing and knowledge; this means it is a way of researching'" (Downton, 2003). Richard Buchanan (2001) contends that a significant strength of design resides precisely in its resistance to a singular, rigidly circumscribed definition. He suggests that disciplines characterized by overly constrained definitions often exhibit stagnation or decline, analogizing the endeavor to define design to the challenge of defining a butterfly: "As soon as you pin it down, it dies" (Thackara, as cited in Tan, 2012). This perspective underscores the dynamic, evolving, and inherently interdisciplinary character of design. Thackara's "butterfly" analogy is not just a clever metaphor but a profound statement about the nature of the discipline itself. If fields with overly rigid definitions tend to be stagnant or in decline, then design's inherent resistance to a singular definition implies its vitality and adaptability. For PhD scholars, this suggests that pursuing a rigid, universal definition of design might be counterproductive to understanding its dynamic essence. Instead, the focus should be on understanding its characteristics, processes, and contexts of application, embracing its interdisciplinary and evolving nature, which encourages a more fluid and expansive approach to design theory and research. The frequently cited phrase, "design is to design the design of a design," (Heskett, 2005) further elucidates its multifaceted interpretations. The initial "design" denotes "a general concept, policy"; the second "design" refers to "an activity"; the third "design" signifies "a plan or intention"; and the final "design" represents "a finished outcome, a product". This recursive definition highlights that design is not just about creating a final product, but also about the strategic intent, the activity of creation, and the underlying plan. This implies that designers, and by extension design researchers, must be proficient in operating at various levels of abstraction simultaneously. For PhD scholars, this suggests that design research needs to investigate how designers navigate these different levels, how insights from one level inform another, and how abstract concepts are translated into concrete outcomes, revealing the complexity of design cognition and practice.

The expansive role of design encompasses several critical aspects. Designers impose structure

and coherence on complex problems (bringing order), and design transcends purely aesthetic creation to serve functional and societal needs (service orientation). Designers demonstrate proficiency in addressing problems from a comprehensive, interconnected perspective (holistic problem solving). A profound comprehension of the user, particularly concerning the "Functional Use of the Product," is paramount (user-centric understanding), and the ultimate objective of design is to improve human experience and well-being (enhancement of quality of life) (Conley, 2004). To effectively fulfill these roles, designers cultivate a distinct set of competencies. These include the capacity to comprehend contextual circumstances and to frame problems in unique and insightful ways, adeptness in operating across multiple levels of abstraction, ranging from overarching concepts to intricate details, and skill in modeling and visualizing potential outcomes, even in the presence of incomplete information. Designers also possess the ability to generate and critically evaluate diverse alternative solutions, the aptitude for maintaining or augmenting value through the integration of disparate elements into a cohesive and effective solution, and the capability to establish meaningful relationships between design elements and between a solution and its broader contextual environment. Furthermore, mastery of form and visual languages to effectively embody and communicate complex ideas is essential, along with possession of the requisite skills and mindset that facilitate comfortable engagement with unfamiliar concepts, ill-defined problems, and high levels of ambiguity. An intrepid approach to experimentation, a willingness to challenge established norms and the status quo, a holistic vision that integrates various perspectives and considerations, an unwavering commitment to quality across all facets of their work, and a specialized understanding of consumer needs and desires are also critical competencies (Conley, 2004; Kolko, 2007; Owen, 1998).

Design projects operate across distinct levels of intervention, each addressing specific facets of a problem. While all levels are present to varying degrees in any given project, the primary focus shifts accordingly. The Strategic Level, characterized by "Vision Led Design," concentrates on "Systems Thinking, Opportunity Mapping, [and] Strategic Initiatives" (Ranjan, 2013). Its objectives include the "Creat[ion of] New Industries, Creat[ion of] New Markets, Re-engineering strategies, Mass Customisation strategies, Eco-Friendly strategies, [and] Anticipatory strategies" (Ranjan, 2013). This involves broad, long-term planning and foresight. The Tactical Level, driven by "Skill Led Design" and "Sense Led Design," focuses on tangible improvements in "Quality, Performance, Cost, Finish, Color, and Ornament" (Ranjan, 2013). It meticulously addresses elements such as form, detail, technology, finishes, tools, ornamentation, and practical know-how, thereby optimizing existing products and processes. The Elaborative Level, associated with "Market Led Design," explores "Variety & Style, Differentiation, Choice/Fashion" (Ranjan, 2013). Its impact is manifested in "Product Differentiation, Product Collections, Style and Fashion, [and] Market Segmentation," catering to diverse consumer preferences and market demands. The Creative Level, characterized by "Patent Led Design," emphasizes "Inventive, Innovative, [and]

"Creative" breakthroughs (Ranjan, 2013). It leads to the development of "Breakthrough Products, Novel Constructions, [and] Innovative Processes," thereby advancing the boundaries of possibility and generating entirely novel solutions.

Design Thinking is defined as "a creative approach to problem solving that starts with people and ends with innovative solutions that are tailor made to suit their needs" (IDEO, 2018). Often referred to as human-centered design, this methodology "relies on our ability to be intuitive, to recognize patterns, to construct ideas that have emotional meaning as well as functionality, to express ourselves in mediums other than words or symbols" (Brown, 2009). It is fundamentally an "exploratory process," emphasizing discovery and iterative refinement. The evolution from "design" to "design thinking" signifies a profound paradigm shift, reflecting "the story of the evolution, from the creation of products to the analysis of the relationship between people and products, and from there to the relationship between people and people" (Brown, 2009). The core mission of design thinking is "to translate observations into insights and insights into products and services that will improve lives" (Brown, 2009). It is neither "art nor science nor religion. It is the capacity, ultimately, for integrative thinking" (Brown, 2009). Key tools and practices of design thinking include "getting out into the world to be inspired by people, using prototyping to learn with our hands, creating stories to share our ideas, [and] joining forces with people from other disciplines are ways of deepening what we know and widening the impact of what we do" (Brown, 2009). A crucial aspect is its initial phase of "divergence, the deliberate attempt to expand the range of options rather than narrow them divergent, synthesis-based methods" (Beckman & Barry, 2007).

Design is widely regarded as "a Systematic Problem Solving Methodology" (Cross, 1984). As Bruce Archer astutely observed, "Design, in a certain sense, is research done backwards. Research starts with the particular and moves towards the general. Design starts with the general and works towards the particular" (Archer, 1995). This observation is a critical conceptual bridge between the two disciplines. Research typically moves from specific observations to generalizable theories (induction), while design moves from general problems or goals to specific solutions (deduction). This "backwards" relationship implies that while their directions differ, both are systematic processes of inquiry and knowledge generation. For PhD scholars, this highlights that design is not merely an application of existing knowledge but a method for generating new knowledge through synthesis and creation. It also suggests that design research can leverage both inductive (e.g., ethnographic studies in the 'Discover' phase) and deductive (e.g., testing specific hypotheses in the 'Develop' phase) approaches, making it a rich ground for methodological innovation.

One of the most prominent models illustrating the design process is the Double Diamond, proposed by the Design Council in 2005. This model systematically breaks down the design

journey into four key phases, visualizing the alternating pattern of divergent (exploring broadly) and convergent (focusing on solutions) thinking that is inherent throughout the design process, moving from a wide array of possibilities to a focused, viable solution. The Discover phase is deemed "one of the most critical, and the one which makes best use of the designer's knowledge and skills" (Design Council, 2005). It involves deep immersion in understanding people's daily experiences, mapping stakeholders, identifying recurring themes, and discerning causal influences that shape the problem space. This phase is heavily research-oriented, focusing on gathering information and insights. Following the extensive exploration of the Discover phase, the insights gained are synthesized to formulate a clear, actionable opportunity or design brief. This convergent phase precisely articulates the problem to be solved, effectively translating research findings into a defined design challenge. In the Develop phase, designers rapidly generate and test various ideas, seeking prompt feedback from users. This iterative process allows for continuous refinement and adaptation based on real-world interaction. This phase involves practical application and experimentation, often incorporating user research to refine solutions. The final Deliver phase focuses on bringing the refined concept to fruition. This includes refining the business model, measuring the impact of the solution, and ensuring the production of a functioning and proven concept ready for implementation. This phase represents the culmination of both research and design, where the insights gathered and solutions developed are brought to life and evaluated for their real-world impact.

Design Research: Bridging Inquiry and Creation

The convergence of rigorous inquiry and creative innovation culminates in the discipline of design research. Design research constitutes systematic and methodical inquiry into practice, producing knowledge for, about, and through design. It can be defined as a systematic, iterative, and reflective inquiry process that investigates human experiences, behaviours, needs, and contexts to inform, inspire, and evaluate the conceptualization, development, and implementation of design solutions. Research carried out using the tools of design (Manzini, 2007) contributes to the systematic creation of purposeful design knowledge (Ozlem and Alpay, 2006). Unlike traditional market research, which often focuses on quantifiable market segments and existing preferences, design research delves deeper into tacit needs, emotional responses, and the holistic interaction between users and their environments. It is inherently multidisciplinary, drawing upon methodologies from anthropology, psychology, sociology, computer science, and business studies to construct a holistic understanding.

The core attributes that define design research include problem framing and discovery, where design research often precedes the articulation of a specific design problem, engaging in "generative" or "exploratory" research to uncover latent needs and unexplored opportunities. There is an emphasis on contextual understanding, focusing on users within their natural

environments, acknowledging that behavior is highly context-dependent. It is iterative and participatory, typically involving cycles of inquiry, ideation, prototyping, and testing, often engaging users as co-creators rather than mere subjects. The process also involves insight generation, which includes critical inquiry, interpretation, understanding, and articulation to produce knowledge from information, experimentation, and experience, ultimately leading to design knowledge that informs design practice.

Christopher Frayling identifies three crucial types of design research, providing a fundamental framework for understanding the diverse epistemological stances within the discipline. "Research into design" examines the design process itself, its methods, and its underlying principles. "Research through design" uses the act of designing as a mode of inquiry, where the creation of artifacts or systems generates new knowledge. "Research for design" gathers information and knowledge to directly inform a specific design project (Frayling, 1993). This typology is invaluable for PhD scholars because it helps them precisely articulate the nature of their own research contribution. Understanding these distinctions allows scholars to correctly position their work within the academic landscape of design, choose appropriate methodologies, and clarify their knowledge contribution, preventing mischaracterization of their research. It implies that "design" can be simultaneously a subject of study, a method of inquiry, and an outcome of inquiry. Buchanan (1999) highlights that the strength of design research lies not solely in developing theory but in fostering the proper relationship between theory and practice, finding a critical balance.

The scope of design research has broadened significantly beyond its initial applications in product development to encompass a wide array of fields and strategic functions. This expansive reach is critical in addressing the interconnected challenges of the 21st century. Design research is no longer confined to industrial or interaction design but permeates various design domains, influencing both physical and conceptual projects. Examples of practices and initiatives include Architecture for Humanity, Design for Development, Design for the other 90%, Massive Change, Social Design Site, and Public Services by Design (Tan, 2009). Specific domains where design research is extensively applied include Product Design (Physical & Digital), which involves investigating user interactions with tangible goods (e.g., consumer electronics, furniture) and digital interfaces (e.g., mobile applications, websites) to enhance usability, desirability, and overall experience. Methodologies include usability testing, A/B testing, and eye-tracking. Service Design involves researching entire service ecosystems, including customer journeys, touchpoints, and backstage processes. This often involves ethnographic studies, service blueprinting, and stakeholder mapping to identify pain points and opportunities for seamless service delivery. System Design addresses complex adaptive systems, such as healthcare systems, educational frameworks, or urban mobility. This necessitates macro-level research on policy, social structures, and cultural norms, often employing participatory design and co-design approaches.

Architectural & Urban Design focuses on understanding human interaction within built environments, public spaces, and urban infrastructure. This can involve post-occupancy evaluations, spatial behavior studies, and community engagement research. Strategic Design & Innovation involves researching future trends, emerging technologies, and societal shifts to inform long-term organizational strategy and identify opportunities for disruptive innovation. This often leverages foresight methodologies and speculative design.

Design research employs a robust and diverse toolkit of research methods, broadly categorized into qualitative and quantitative approaches. Brenda Laurel's *Design Research, Methods & Perspectives* (2003) highlights various research tools for conducting academic ethnography. Qualitative Methods aim to provide in-depth understanding of behaviors, motivations, and experiences. They often involve "verbal" methods such as oral histories, group interviews, and structured and semi-structured interviews. Other qualitative methods include expert interviews, literature reviews, wake-up interviews, camera surveys, focus groups, contextual interviews, shadow studies, storyboard sketches, informance/focus groups, and prototype trials. Visual methods such as videotaping and photography, artifact and material culture collection, local model and representation collection, passive observation, and participant observation are also utilized. Quantitative Methods are employed for statistical analysis and generalizability, often to validate qualitative insights or measure specific metrics. These include statistical data collection, surveys and questionnaires, linguistic data collection, and archival and document collection. Quantitative design research is used for assessing potential market and new product opportunities, identifying consumer needs, feature testing, usability testing, refining, messaging, and branding. Increasingly, design research integrates both qualitative and quantitative approaches (Mixed Methods) to provide a comprehensive and triangulated understanding, leveraging the strengths of each. The typical design and design research process involves moving from a problem statement to a re-defined problem statement, then to concepts/creative phase, followed by refinements, prototypes, and testing.

Beyond informing specific design projects, design research is becoming integral to organizational strategy. This "Strategic Integration" of design research into market insight, innovation management, and risk mitigation signifies a profound shift from design being merely a tactical function to a strategic imperative within organizations. It provides deep insights into underserved markets, cultural shifts, and emergent needs, thereby informing market entry strategies and product diversification (Market Insight & Niche Identification). It fuels the ideation process with empirical data, ensuring that innovation efforts are grounded in real user problems rather than mere technological feasibility (Innovation Pipeline Management). It pre-empts design flaws and market rejection by validating concepts with target users early in the development cycle, significantly reducing rework costs and time-to-market (Risk Mitigation & Validation). A well-constructed brief allows for serendipity, unpredictability, and the capricious whims of fate, which

are essential for breakthrough ideas (Brown, 2009). Furthermore, it fosters empathy for the user across an organization, shifting internal conversations from "what we can build" to "what users need and value" (Building Design-Led Cultures). This particular outcome points to a deeper organizational transformation beyond specific projects. Design research doesn't just produce knowledge for a product; it cultivates empathy for the user across an entire organization. This implies a cultural shift where user needs become central to all decision-making, not just design decisions. For PhD scholars, this suggests that their research can contribute to organizational change management and the development of more human-centric corporate philosophies, influencing how businesses perceive and interact with their customers and employees. This highlights the systemic impact of design research beyond immediate deliverables.

In an era characterized by hyper-competition, rapid technological obsolescence, and increasing user expectations, the value of design research is more pronounced than ever. Its primary value proposition is its ability to ensure that innovation is truly human-centered (Driving Human-Centered Innovation). By placing the user at the core of the design process, it moves beyond incremental improvements to foster truly disruptive solutions that resonate deeply with human needs and aspirations. This focus on desirability alongside feasibility and viability leads to products and services that are not only effective but also emotionally engaging and deeply satisfying. This directly correlates with enhanced customer loyalty and brand equity. Empirical evidence consistently demonstrates that investing in design research leads to significant long-term cost savings (Economic Efficiency and Risk Reduction). Identifying design flaws or misaligned features during the research and conceptualization phases is substantially cheaper than rectifying them post-launch. The project is the vehicle that carries an idea from concept to reality, and the bounds of a project may appear as unwelcome constraints, but the mark of a designer is a willing embrace of constraints (Brown, 2009). In saturated markets, product features are easily replicated, but a superior user experience is a powerful differentiator (Sustaining Competitive Advantage). Design research enables organizations to build deeply intuitive, useful, and delightful experiences that are difficult for competitors to imitate. This cultivates a distinct brand identity and fosters a loyal customer base, providing a sustainable competitive advantage. The knowledge gleaned from design research provides organizations with a foresight into emerging trends, shifts in user behavior, and potential disruptive technologies (Future-Proofing and Adaptability). This proactive understanding allows companies to adapt their strategies, develop resilient products, and remain relevant in dynamic markets, effectively future-proofing their offerings against rapid changes. As technology becomes more pervasive, the ethical implications of design are paramount (Ethical Design and Social Impact). Design research, by rigorously examining user contexts and potential impacts, contributes to the development of ethical, inclusive, and socially responsible designs. It allows designers to anticipate unintended consequences and design for equity, accessibility, and well-being, thereby contributing positively to societal challenges.

Intersections and Broader Perspectives

Ultimately, the utility of knowledge is a central theme in evaluating research, strongly positing that "knowledge is power" (Bacon, 1620). The true measure of knowledge is not merely its absolute truthfulness, but rather its capacity to empower individuals and societies to act more effectively. Scientists frequently operate under the premise that no theory achieves "100 percent correctness," suggesting that truth alone is an insufficient criterion for evaluating knowledge in its entirety. Instead, utility emerges as the paramount test, wherein a theory enabling new actions is recognized as constituting valuable knowledge. This perspective underscores the pragmatic and transformative potential of well-executed research. The concept that the utility of knowledge is paramount over "100 percent correctness" for scientists has profound implications for how design research outcomes should be evaluated. If, as the text states, "truth alone is an insufficient criterion for evaluating knowledge in its entirety," then design research, which is inherently applied and problem-solving, must prioritize the actionable and transformative potential of its findings. For PhD scholars, this means that their research should not just aim for theoretical purity but for generating knowledge that directly enables better design actions, solutions, or processes. This shifts the emphasis from purely academic validation to real-world impact and effectiveness, challenging scholars to consider the practical implications and utility of their theoretical contributions. In the context of design research, this means that successful inquiry generates knowledge that directly enables the creation of more effective, user-centered, innovative, and impactful designs, thereby demonstrating its tangible value and contribution to solving real-world problems.

The relationship between "Theory" and "Practice" is not a unidirectional flow but rather a dynamic and iterative cycle. As McCullagh noted, "'practice [is] informed by theory, and theory informed by practice'" (McCullagh, cited in Dudley and Mealing, 2000). This reciprocal relationship emphasizes that theoretical frameworks provide the conceptual underpinnings and guiding principles for practical application. Conversely, practical experience provides invaluable empirical data, real-world observations, and feedback that, in turn, critically refine, challenge, and advance theoretical understanding. This continuous feedback loop is essential for intellectual growth and effective problem-solving in any domain. This symbiotic relationship is crucial for designers, as it allows them to ground their creative endeavors in robust theoretical understanding while continuously refining their approaches through real-world application and user feedback.

While a singular, explicit definition of "design" is avoided, it is implicitly depicted as a profoundly iterative, fundamentally problem-solving, and inherently creative human endeavor. The very act of designing is inextricably linked to navigating and embracing constraints, which can manifest in myriad forms—technical specifications, budgetary limitations, user needs, environmental

considerations, or even aesthetic parameters. The transformation of abstract concepts into tangible realities is a hallmark of design, often achieved through a dynamic and cyclical process involving ideation, meticulous prototyping, and continuous refinement. A particularly insightful aspect highlighted is the concept of a "well-constructed design brief". Far from being a rigid or stifling mandate, such a brief is presented as "a set of mental constraints that gives the project team a framework from which to begin, benchmarks by which they can measure progress, and a set of objectives to be realized" (Brown, 2009). This perspective is critical, as it reframes constraints not as impediments to creativity, but rather as powerful catalysts for breakthrough ideas. The reframing of "constraints" as "powerful catalysts for breakthrough ideas," rather than impediments, is a fundamental shift in design philosophy. Common perception views constraints as limiting creativity. However, the text argues that a "well-constructed design brief" provides a "framework" and "benchmarks" that can actually channel creative energy. For PhD scholars, this implies that embracing and intelligently defining constraints in their research or design projects is not a sign of limitation but a strategic move towards focused and truly innovative solutions. It suggests that the most creative solutions often emerge from navigating specific challenges, forcing designers to think more deeply and inventively within defined boundaries, rather than being paralyzed by infinite possibilities. This highlights the importance of problem framing in design. A well-formulated brief "will allow for serendipity, unpredictability, and the capricious whims of fate, for that is the creative realm from which breakthrough ideas emerge" (Brown, 2009). This underscores a profound truth in design: true innovation often blossoms at the intersection of structured requirements and unscripted creative exploration. The project itself is viewed as the "vehicle that carries an idea from concept to reality" (Brown, 2009), and the ability of a designer to "willingly embrace of constraints" is presented as a distinguishing mark of their craft, transforming potential limitations into opportunities for ingenious solutions.

The economic landscape has undergone a profound transformation over time. Historically, economies were characterized as an "industrial economy," primarily centred on mass production and manufacturing. This evolved into a "knowledge economy," where information and intellectual capital became increasingly central to economic growth and development. Subsequently, the emphasis shifted further to an "innovation economy," driven by the generation and application of novel ideas, products, and processes. This progression culminates in what is now predominantly characterized as a "creative economy," emphasizing creative solutions, intellectual property, and unique human ingenuity as primary drivers of value and economic prosperity (Oxford Dictionaries, 2013). This fundamental shift in economic value generation highlights a transition from tangible goods and physical labor to intangible assets such as knowledge, innovation, and creativity, profoundly influencing societal and industrial structures. This economic evolution underscores the increasing importance of design as a driver of value and a critical function within this dynamic landscape, necessitating a re-evaluation of

how organizations perceive and integrate design into their core strategies.

A cornerstone of understanding, particularly within the context of design, is the assertion that "the world is understood through the hand, not the mind- the hand is the cutting edge of the mind" (Bronowski, 1970). This perspective highlights the crucial role of practical engagement, tactile interaction, and embodied cognition in the acquisition of knowledge. Extending this notion, John Heskett (2002) posits that "It is the hand allied to the senses and the mind that forms the coordinated trinity of powers by which human beings have asserted ever-greater control over the world". This suggests that a holistic and effective understanding emerges from the intricate integration of sensory experience, physical interaction, and cognitive processing, rather than purely intellectual contemplation. Furthermore, the concept of abstraction is central to effective design thinking and problem-solving. Abstraction facilitates a move "to move beyond an accumulation of pragmatic experience into the realm of ideas as abstractions...." (Heskett, 2005). This process enables capacities to be "separated from specific problems, to be generalized and flexibly adapted to other problems" (Jones, 1970). In essence, design involves the critical skill of extracting universal principles, underlying structures, and adaptable frameworks from specific, often complex, empirical experiences. This capability facilitates their flexible application to diverse, novel, and unforeseen challenges, enabling designers to develop solutions that transcend individual instances. As part of his study, Amit Patankar (2004), a student designer, observed an everyday product like a bowl being ingeniously repurposed by users in ways often unanticipated by their original creators. This simple item can function effectively as "a mould for rice, sweets like sheera, etc:", be utilized "To make 'dosa' on a pan," or even serve "As a pattern maker for poories". Stating that "The simplicity of the product made me study its innovative uses by the Indian housewives. The uses (affordances) might not even have been thought of, before it's manufacture...." Amit deduced that "...the simpler the product, the more it is useful, in other words, the less is more" (Patankar, as cited in Mehta and Mokashi-Punekar, 2012). The observation that "The simpler the product, the more it is useful, in other words, the less is more" highlights a crucial principle of design and design research.

Conclusion: The Indispensable Nexus of Research and Design

This paper has meticulously explored the foundational principles of research, the multifaceted and evolving discipline of design, and their powerful convergence into the distinct field of design research. It has demonstrated that rigorous inquiry, characterized by systematicity, objectivity, and a commitment to communicable knowledge, forms an indispensable bedrock for effective design practice. Concurrently, design, with its human-centered ethos, iterative processes, and capacity for integrative thinking, provides a unique lens through which to approach complex problem-solving. Design research, as a systematic, iterative, and reflective inquiry process, stands at the nexus of these two domains. It is a field that not only informs and inspires the creation of

artifacts, services, and systems but also generates new knowledge about and through the very act of designing. Its expansive scope, encompassing diverse disciplines and employing a rich methodological pluralism, underscores its adaptability and relevance across a broad spectrum of challenges. The strategic integration of design research within organizations highlights its critical role in driving market insight, managing innovation pipelines, mitigating risk, and fostering design-led cultures.

The contemporary value of design research is undeniable. It is a potent force for driving human-centered innovation, ensuring that solutions are not only feasible and viable but also deeply desirable and emotionally resonant. By identifying flaws early and validating concepts with users, it contributes significantly to economic efficiency and risk reduction. Furthermore, in saturated markets, the superior user experience cultivated through design research provides a sustainable competitive advantage, while its foresight into emerging trends ensures future-proofing and adaptability. Critically, design research also plays a pivotal role in promoting ethical design and positive social impact, enabling designers to anticipate consequences and create inclusive, responsible solutions. The recurring theme of "complexity" in global challenges and the need for "agile, informed, and human-centered solutions" throughout this discussion implies a growing demand for the interdisciplinary and iterative problem-solving approach inherent in design research. The continuous emphasis on complexity and rapid change suggests that traditional, siloed approaches to problem-solving are insufficient. Design research, with its methodological pluralism, human-centered focus, and iterative nature, is uniquely positioned to address these challenges. For PhD scholars, this means their training in design research equips them with highly sought-after skills for navigating ambiguity, synthesizing diverse information, and developing resilient solutions in dynamic environments, positioning them as critical contributors to future societal and industrial advancements. In an increasingly complex and interconnected world, the ability to deeply understand human needs and translate those insights into effective, impactful, desirable, and ethically sound solutions is not just a valuable asset, but a fundamental prerequisite for success. As design continues to expand its influence, the rigor and strategic importance of design research will only continue to grow, underscoring the vital role of PhD scholars in advancing this critical discipline.

[The paper "Research, Design, and Design Research: A Comprehensive Framework for PhD Scholars" serves as an expansion of the concepts introduced in the presentation 'Research, Design, and Design Research'.]

References

Archer, Bruce. 1995. "The Nature of Research." *Co-design, Interdisciplinary Journal of Design* (January).

Ariely, Dan. 2008. *Predictably Irrational*. New York: HarperCollins.

Bacon, Francis. 1620. *The New Instrument: a scientific manifesto*

Beckman, Sara L., and Barry, Michael. 2007 "Innovation as a Learning Process: Embedding Design Thinking." In *Design Management Review*.

Bronowski, Jacob. 1973. *The Ascent of Man*.

Brown, Tim. 2009. *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovations*. New York: Harper Business.

Buchanan, Richard. 2001. "Design and the New Rhetoric: Productive Arts in the Philosophy of Culture." *Philosophy and Rhetoric* 23, no. 3: 193-209.

———. 1999. "Design Research and the New Learning." *Design Issues* 17, no. 4: 3-23.

Conley, Chris. 2004. "Leveraging Design's Core Competencies." *Design Management Review* 15, no. 3 (Summer).

Cross, N. 1984. *A History of Design Methodology*.

Design Council. 2005. "The Double Diamond: A Universally Accepted Depiction of the Design Process."

Downton, Peter. 2003. *Design Research*. RMIT University Press.

Dudley, Esther and Mealing, Stuart. 2000. "Becoming Designers: Education and Influence"

Fallman, Daniel. 2003. "Design-Oriented Human-Computer Interaction." In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 225-232.

Frayling, Christopher. 1993. "Research in Art and Design." *Royal College of Art Research Papers* 1, no. 1: 1-5.

Harari, Yuval Noah. 2011. *Sapiens: A Brief History of Humankind*.

Heskett, John. 2005. *Design: A Very Short Introduction*.

———. 2002. "Toothpicks and Logos: Design in Everyday Life"

IDEO. 2018. "IDEO's Human Centered Design Process: How to Make Things People Love." Accessed July 21, 2025. <https://www.usertesting.com/blog/how-ideo-uses-customer-insights-to-design-innovative-products-users-love>.

Jones, John Chris. 1970. *Design Methods*.

Kolko, Jon. 2007. *Thoughts on Interaction Design*. Morgan Kaufmann.

———. 2007. "Information Architecture and Design Strategy: The Importance of Synthesis during the Process of Design,"

———. 2010. "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis"

Krippendorf, Klaus. 1989. "On the essential contexts of artifacts or on the proposition that 'design is making sense (of things)"

Laurel, Brenda. 2003. *Design Research, Methods & Perspectives*.

Leedy, Paul D., and Ormrod, Jeanne Ellis. 2016. *Practical Research Planning and Design*.

Manzini, Ezio. 2007. "Design Research for Sustainable Social Innovation."

———. 2009. "New Design Knowledge."

Mehta, Shashank. 2017. *Sustainability; Context and Design*

——— and Mokashi-Punekar Ravi. 2012. "Exploring Indigenous Innovations; Insights and Experiential

Reflections on Module Development and Delivery"

McCullach, John. 2000. In Dudley and Meating, The Design of Things to Come.

Muratovski, Gjoko. 2015. Research for Designers: A Guide to Methods and Practice.

Nelson, Harold G., and Erik Stolterman. n.d. The Design Way: Intentional Change in an Unpredictable World.

Oxford Dictionaries. 2013.

Owen, Charles L. 1998. "Design Research Building the Knowledge Base."

Ozlem ER and Alpay ER. 2006. "Design research in the periphery: A review of the foundations and development characteristics of industrial design research in Turkey"

Patankar, Amit. 2004.

Pinker, Steven. 2018. Enlightenment Now: The Case for Reason, Science, Humanism, and Progress.

Ranjan, M P. 2014. University wide course on Design Thinking

_____. 2013. Design Thinking Models – A Primer

Tan, Lauren. 2009. "Perspectives on the Changing Role of the Designer: Now and to the Future."

---. 2012. "Understanding the Different Roles of the Designer in Design for Social Good. A Study of Design Methodology in the DOTT 07 (Designs of The time 2007) Projects"

Veen, Jeffrey. 2000. The Art of the Start.

Webster's. 1999.