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Exploring Design Thinking for Innovation in Higher Education: A Comprehensive Review of Varied Influential Factors

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Abstract

This paper reviews current research about the use of design thinking in inspiring innovation at higher education institutions. One such aspect of design thinking, a human-centered approach, has found a foothold in various industries, including the educational sector, with many perceiving design thinking as the way to tackle complex matters. This study synthesizes different possible variables related to the applicability of higher education design thinking. Important among these are empathy, collaboration, and iteration, as well as their role in enhancing innovative growth among faculty, students, and staff. It looks at the extent of the culture of an organization, the openness and support of leadership, and choices, while at the same time examining the stumbling blocks that would face the regular diffusion of design thinking in educational practices, e.g. the resistance to change, the absence of support within the educational environment, and reluctance in training. This work, then, is very much pertinent to the broader understanding of design thinking as a lever for innovation in higher education by practitioners, policymakers, and researchers.

Keywords: design thinking, innovation, higher education, problem-solving, organizational culture, collaboration, leadership, empathy, iteration, resistance to change

Introduction

Design thinking emerged as a potent methodology that can stir innovation in domain after domain, including education (Chen et al., 2018; Cankurtaran & Beverland, 2020). Its methods centre on empathy, collaboration, and iterative problem-solving, presenting opportunities for a fresh look at the realization of higher education within complex challenges. It is believed that universities will soon need design thinking to become future-proofed against the very rapidly agitated social and technological landscape (Brown, 2008; Dorst, 2011; Chen & Venkatesh, 2013; Brand et al., 2021). Despite the enthusiasm around design thinking, there is still a dearth of comprehensive understanding about its application in higher education and related domains (Ben Mahmoud-Jouini et al., 2019). Further, while several studies have looked at the benefits of design thinking for business or product development, there is very little exploration of design thinking in the broader context of higher education-especially South African higher education (Kelley & Kelley, 2013; Plattner et al., 2010; Ashman et al., 2021).

There is a growing recognition across South African higher education institutions that it is imperative to promote change so that the institutions can better respond to the challenges posed by changing needs of students, society, and the economy. Institutions are responding to the needs of relevance, accessibility, and quality by exploring numerous strategies to foster innovation (Cagnin, 2018). One approach that is starting to stand out as a strategy is design thinking, a human-centred methodology. Empathy, collaboration, experimentation, and undertaking sophisticated problem-solving from the DEC days of the good old days of the Palo Alto design community constitute respectable names and effective principles. Design thinking has indeed produced successes in many different sectors, but in the context of South African higher education, the research is still in its infancy (Brand et al., 2021). Design thinking indeed promises to address a variety of challenges in higher education including enhancing student engagement, improving teaching and learning outcomes, and driving radical

transformation (Ben Mahmoud-Jouini et al., 2016; Butler & Roberto, 2018; Chen et al., 2018). Design thinking, by its cardinal principles of focusing on user needs and iterative prototyping, tends to foster a culture of innovation and agility in educational settings (Cankurtaran & Beverland, 2020). Despite its apparent benefits, the implementation of design thinking in South African higher education faces unique contextual factors and challenges; this should consequently receive considerable scrutiny.

To date, there has been very limited availability of information regarding use of design thinking within South African higher education, although the context has certainly not been ignored. This study aims to fill this gap by carrying out a thorough review of the literature published to date on design thinking within the context of South African higher education. The findings from empirical studies, theoretical contributions, and case analyses will be elicited to shed some light on the current adoption of design thinking and its implications for innovation in higher education institutions (Beckman, 2020). Drawing upon the mélange of education, business, and design literature, the study will offer insight into the central concepts, methodologies, and outcomes of design thinking in the South African context (Butler & Roberto, 2018). The justification for focusing on South African higher education is owing to its central role in advancing socioeconomic development and addressing historical inequities. Design thinking is one successful approach to confront these challenges by privileging student-centred approaches, co-creating solutions with a diverse community of stakeholders, and promoting social innovation (Ashman et al., 2021). While observing the key aspects of design thinking in its application in higher education for solving challenges, South African higher education opportunities should not go unexamined and effective (Tessema & Mapheleba, 2024).

Literature Review

With increased imbibing in innovation in several fields including education, design thinking is now being heralded as a further way to ensure innovation. Given that the principles of empathy, collaboration, and experimentation underpin design thinking, one could regard design thinking as a behaviour-oriented process aimed towards solving complex collective problems and effecting real change (Brown, 2008; Chouki et al., 2021). In higher education, however, design thinking has attained international exclamation as a promising framework for transforming teaching and learning, thus promoting student engagement, even at the level of institutional administration (Crouch & Mazur, 2001; Kelley & Kelley, 2013). Thus, the application of design thinking principles with varying potential benefits presents a unique scenario within the South African higher education context that warrants examination (Tessema & Mapheleba, 2024). Some investigations have indicated that design thinking as an approach has been found to enhance creativity, critical analysis, and problem-solving skills amongst learners in education (Suri, 2003; Dym et al., 2005). Design thinking strategy requires adequate time for further participation and hands-on experiential learning during the course, enabling the learner's renegotiation of one's power to question and participate with teachers and peers in the co-creation of solutions (Leifer et al., 2000; Chouki et al., 2021; Belaid, 2024). Within South Africa, with their cardinal concerns around access, equity, and relevance, the application of these design-thinking principles holds hope for deploying systemic solutions in education toward advancing educational equity (Chigona & Cwoyens, 2010).

In addition, design thinking has been applied as a key process for forging collaboration and expertise-sharing relationships among stakeholders in higher education institutions (Brown & Wyatt, 2010). Design thinking, if implemented by a broad aggregation of stakeholders-from faculty members, students, administrators, and industry partners-can facilitate innovative options for academic design, program development, and institutional change (Belaid, 2024; Cross, 2006). The collaborative mode of education essential for inclusive and sustainable development toward overcoming socioeconomic divide is an international South African priority given the enduring impacts of apartheid (Gelb & Wade, 2008). A wide array of empirical studies have been conducted to identify the successful implementation of design thinking methods (Chouki et al., 2021). Integrating design thinking into the curriculum would promote student engagement, creativity, and problem-solving skills positively. In their study, Edelson et al. (1999) examined a sustainable practice across elementary and secondary education where pedagogical methods demonstrate sound engagement, student learning (responsive to learners' social standards), professional development for the teacher. Though very useful, they point to much-needed studies similar to those documented here after further exploring the benefits of design thinking in South African higher education (Tessema & Mapheleba, 2024).

On the note of design thinking in higher education, literature underscores that the institutional culture, backed by appropriate support and leadership, and sound organizational structures are critical when it comes to successful implementation (Kolko, 2015; Kouprie & Sleeswijk Visser, 2009). In South Africa, where resources, governance, and initial capacity differ widely among higher education institutions, any understanding of contextual factors affecting the adoption and sustainability of design thinking would be crucial (Belaid, 2024; Hofmeyr et al., 2013). Furthermore, faculty training as well as improvement in pedagogy and assessment are

supporting factors for the integration of design thinking in teaching and learning (Boland et al., 2014; Mngomezulu & Ajani, 2024; Plattner et al., 2010). Again, the literature is well-furnished with a plea for continuous evaluation and improvement of design-thinking initiatives in order to maximize relevance, effectiveness, and sustainability (Kolko, 2015; Edelson et al., 1999). Nonetheless, despite the ability to be flexible and iterative, design-thinking exercises require considerable attention to contextual nuances, learner divergence, and institutional distinction once transplanted in educational settings (Kelley & Kelley, 2013; Plattner et al., 2010). With issues of social justice, transformation, and decolonization very much at the forefront of South African higher ed, using design thinking effectively depends on an overall alignment with the ultimate goals of the institutions and societal needs (Nkomo et al., 2018).

Literature does not offer comprehensive insights into design thinking in higher education (Tessema & Mapheleba, 2024). The study finds with relevance to African higher education design thinking for educational innovation and transformation. Yet some knowledge gaps exist concerning the effective application of the design thinking in the context of higher education in South Africa. This study, therefore, seeks to fill these gaps through a comprehensive review of the literature and its theoretical underpinnings, including empirical findings and practical insights. This could lay the groundwork for continuing and future research, policy, and practice.

Theoretical Framework

The underlying theories of organizational change and innovation are the theoretical framework of the study. Design thinking is crucially important for the student learning functions of numerous higher educational establishments within the confines of South Africa. Therefore, exploring the study with the relevant theory in order to provide profound information and justification regarding the frame of analysis is highly important for the researchers. Theories of organizational change and innovation provide a very accommodating theoretical framework for understanding and interpreting the dynamics of design thinking in higher education settings. The theories of organizational change, including that change model, inform understanding of the processes of designing, launching, and implementing strategies of change holistically with those of a complex context in institutions. Introducing change as a multi-staged process that unfreezes existing norms, intervenes on those change behaviours, and refreezes new behaviour helps scholars of Higher Learning Center apply it methodologically on how design thinking initiatives can be ushered into and convergent integrated within higher education institutions (Daniel, 2016; Cummings & Yur-Austin, 2021).

An innovation theory view that is concerned with the perceived characteristics of innovations, such as Rogers' Diffusion of Innovations (Rogers, 2003), suggests various factors that dictate the adoption and diffusion of new or alternative ways of doing things, such as design thinking, within organizations. Chiefly, he highlights that the publication of new technologies and product innovations is also equated to those merely viable. Literature for the mirror system), and related theories of innovation may help in looking at issues of design thinking with learners, faculty, administrators, and other stakeholders.

Thus, organisational change and innovation theories provide a very useful vantage point from which to view various contextual factors that drive success or failure of design thinking initiatives in higher education. Using theories including Contingency Theory (Donaldson, 2001) that stress organizational strategy alignment with its external environment and Institutional Theory (Meyer & Rowan, 1977) that underscores that attention to institutional pressures in determining organizational behaviour will help researchers (**Fig. 1 below)** look into how institutional contexts, leadership practices, and cultural norms influence the adoption and sustenance on design-thinking initiatives within higher education institutions (Scott, 2014).

Theories of organizational change and innovation culminate in the establishment of a framework to discern how effective design thinking techniques are and what their impacts have been on educational development. This line of thought hints that if design thinking is included as a methodology in the higher education curriculum, the broad characteristics of the IPO model (input-process-output) of actual determinants of IOs would likely be considered in the implementation context relative to successful intervention. Further examples of elements of IP and also process are resources, leadership-support stakeholders, and routes in which student outcomes and cultural fit interact with these behaviours, respectively. Therefore, a comprehensive assessment is possible and requisite to fully and rectified constitutionally in addressing and overcoming barriers and hurdles, thereby solving questions and obtaining positive results (Bryson et al., 2018). Moreover, theories of organizational change and innovation provide functional advice with respect to the development and application of effective change strategies within the higher education enterprises. Through models like Burke-Litwin's Model of Organizational Development and Change (Burke & Litwin, 1992), researchers can diagnose the problems of the organization, find root causes, and point the way toward the interventions that will be most needed. The use of such models within the context of design-thinking implementation allows researchers to pinpoint entry points for intervening,

anticipate possible barriers to change, and enact strategies that can overcome the resistance of stakeholders and create buy-in (Cameron & Green, 2015).

Unlike for an organizational change argument, theories of organizational change and innovation connect because higher education institutions assume a given complexity and dynamism in their operation, according to Long and Siegel. By giving theoretical foundation derived from these two adaptive theories, researchers become exposed to a great deal of interesting considerations about how design thinking experiments entangle with much broader organizational processes, structures, and cultures. This then creates a heightened understanding from which to understand the problems confronting the successful implementation of design thinking in higher education thereby empowering the representation of research-based strategies and recommendations to help stimulate innovation and change in these particular settings (Cunha et al., 1999). Hence, theories within the schools of organizational change and innovation help bring forward considerations for a grounded empirical and theoretical context. This opens up pathways to borrowing from well-known theories and established frameworks in organizational literature to build on and possibly contribute to the theoretical development of the field-the generation of fresh ideas, formation of testable hypotheses, and innovation into research programs specifically addressed to meet the relevant higher education challenges and opportunities (Eisenhardt & Graebner, 2007).

This is contrary to the idea of combining theories of organizational and innovation to realize higher education systems within the development and implementation of design thinking. Drawing insights from those theories by researchers can rightfully describe themselves to associate with an understanding of the variety of relationships between factors-individual level, organization level, and context-level-shaping the innovation processes at those higher learning centres. This leads to a more profound admission of the barriers and opportunities that are faced during the execution of design thinking initiatives, taking care of a better strategic capacity to nurture innovation and change across the higher education landscape.

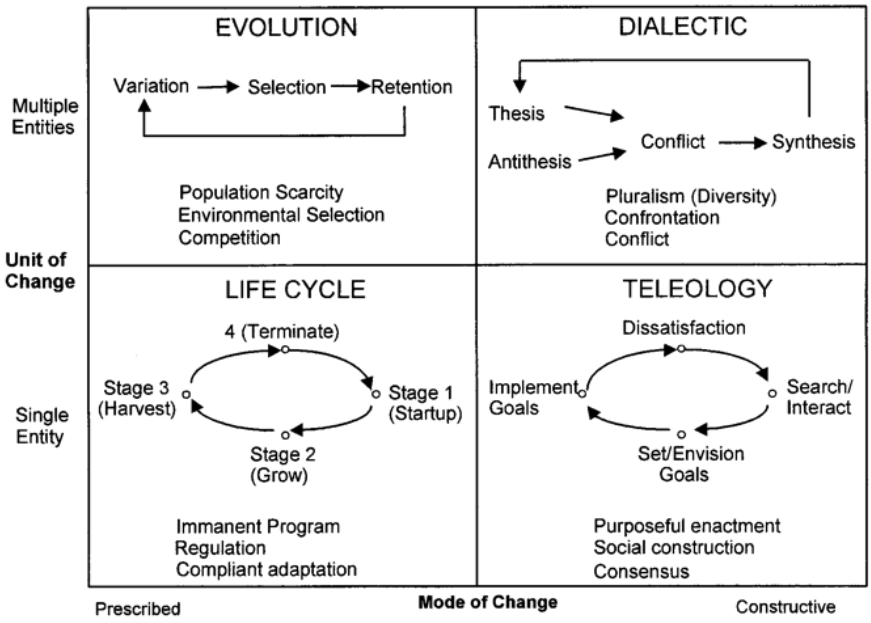

Fig. 1: *Adopted from Aldritch (1999).*

Various propositions exist for frameworks of organization change and development divided according to modes of change and units of change. Begun by Aldrich (1999), the four exemplary change engines are life-cycle theories, evolutionary theories, dialectic theories, and teleological theories. Life-cycle theories, made on orderly change, propagate change through the metaphor of organic growth, explaining the various stages of organizational development. Aldrich (1999) refers to the three types of change within the life-cycle theories: the development model; the scenario model; and the metamorphosis model. The development model hypothesizes a cycle of emergence, growth, maturity, and decline. The scenario model adds stages of decision making within this cycle, while the metamorphosis model foretells of sudden changes when organizational structures start to cease aligning to the environment -some kind of niche evolutionary change. Lifecycle theories stress sequential stages with deterministic components emphasizing the interdependence of output from earlier phases in relationship to subsequent development. Although analyzing the organization as the unit of analysis, some of these would give themselves to be turned to higher levels of analysis. Whereas keeping in mind that the mechanisms within any of these laws can be claimed to be regulated by some natural, environmental, or

institutional norms by which the level of determinism implicit in the change processes will be operationalized. These theories supply precious insights into organizational change dynamics and thus provide a stable framework to understand how organizations transform over time into what they are (Aldrich, 1999; Van de Ven, 1995).

Therefore, the selection of organizational change and innovation theories as the theoretical model for this study is justified by their great comprehensiveness and applicability to the context of higher education in South Africa. In organizational change theories such as life-cycle, evolutionary, and dialectical theories, one gets a good idea of the dynamics of change within educational institutions, which would provide deductive reasoning for the adoption of innovation and consequent operation (Aldrich, 1999; Van de Ven, 1995). The use of these theories would make a range of antecedents influencing the adoption and success of the design-thinking initiatives in South African higher education institutions very explicit. Moreover, these theories would provide a new window through which we can attempt to come up with solutions on those barriers, challenges, outcomes, and impacts of design thinking practices that would improve the management of change and foster the new innovation in educational settings.

Method

This study aims to provide a comprehensive review of Design Thinking by synthesising existing literature around the subject. Drawing largely on existing methodologies in systematic literature review such as those suggested by Kraus et al., 2003, 2020, 2022; Linnenluecke et al., 2002; and Tranfield et al., 2003, we conducted a synchronized search in the Web of Science (WoS) and Scopus databases exclusively on articles where "design thinking" was stated in the title to ascertain a lot of relevance. The searches proved a massive number of hits with these databases, 794 from WoS and 5036 from Scopus, validating the premise that design thinking had become a researched topic (Kraus et al., 2020).

To facilitate achieving a more focused set of literature, the searches were again split into two groupings, "business" and "management," following the suggestion by Kraus et al. (2020), and would only include research articles in English published until May 17th, 2025. The WoS sample decreased to 129 papers, and the Scopus sample narrowed down to 184. We then implemented quality thresholds, eliminating those papers that came from journals with an Impact Factor or CiteScore lower than one since we prioritised relevance as the minimum. After throwing away duplicates, the final dataset numbered 164 articles. Going with best practice in reviewing literature (Denyer and Tranfield, 2009), the data were synthesized with bases in the central concepts; first, an in-and-out skim of the abstracts for an overall picture, then every detail with the full texts. We chose Excel to catalogue our findings, detailing main statements in table form. While finally adumbrating meaningful interrelations found to synthesize a framework around significant themes and research gaps.

Findings

The systematic literature review conducted here offers valuable insights into the body of research in design thinking (DT). By analysing a comprehensive assortment of scholarly articles, this study synthesizes the main findings related to the definitions and methodologies of DT, contextual issues, the outcomes achieved by DT, the challenges it poses, interdisciplinary perspectives, DT in education and training, and future avenues for DT (Mngomezelu & Ajani, 2024). Considering the multiple applications of DT in diverse fields, the fact that innovation will only be born when new ideas, practices, methods, and culture are inculcated unfolds within the literature (Sundani & Mangaka, 2023). It jettisons upon the literature review themes in the chapters below the light in the grey in the texture of the definitions of this domain as a theory and as practical implementing activities. EXT DTC tends to be understood as a human-centred, iterative process, driven through empathy, collaboration, and experimentation, focused on addressing complex problems (Brown, 2009). Internationally, DTC has been gaining popularity as an educational solution meant to promote creativity and critical thinking in students, coinciding with broad curriculum reform and educational transformation goals in South Africa (Chigona et al., 2013).

The ESC DTCs have brought academia to recognize a design model that is inter-disciplinary in various ways, blending design principles with cognitive psychology and organization management theories (Liedtka, 2015). In South Africa, this inter-disciplinary view is very important due to the diverse socio-cultural landscape with the need for inclusive solutions that are contextually relevant (Pillay, 2013). Moreover, DTC is viewed as a dynamic, adaptive process encouraging continuous learning and iteration, which in sync are principles of lifelong learning and professional development as currently emphasized in education through various South African policies (Department of Basic Education, 2014). Yet, in spite of its benefits. the Central Idea Concerning DT in the South African context remains conceptualization. There were agitations on the part of scholars to give clear definition-specifically-applicable-to-context meaning DTCs in widely different domains (Chigona et al., 2013). Also, there is an urgent call for more empirical research to see if DT approaches are effective in addressing very-real-severe

socio-economic deficits facing South Africa, such as poverty, inequality, and unemployment (Chigona et al., 2013). In concluding the various dimensions of DT and its import into the South African context, this study seeks to grasp in depth on how DT might be harnessed to fuel an innovative and beneficial social change for this country.

Process and Methodology

This theme delves into the process and methodology of design thinking, examining the stages, techniques, tools, and approaches used in DT practice (Chouki et al., 2021). It also goes into how DT is applied in various contexts and industries; methodologies and idiosyncrasies. The process and methodology of design thinking (DT) have gained prominence as a systematic approach to innovation and problem-solving within various sectors, including education, business, and social development (Chigona et al., 2013). An inherently structured design thinking framework follows the stages of empathy, define, ideate, prototype, and test (Brown, 2008). On the other hand, scholars have argued that DT methodologies needed to be adapted to the unique socio-cultural context of South Africa, considering diversity, inequality, and the historical legacies of apartheid (Bhana, 2017). This would include integration of indigenous knowledge systems, community engagement, and inclusion in decision-making processes (Chigona et al., 2013).

One crucial aspect of the DT process specific to the South Africa context is the stress on collaboration and co-creation and their extension to diverse stakeholder groups (Bhana, 2017). Given the Country's history of social division and marginalization, DT methodologies often uplift participatory approaches within various communities as means of empowerment and promoting social cohesion (Chigona et al., 2013). This collaborative ethos aligns with the principles of Ubuntu, a traditional African philosophy that places much emphasis on interconnectedness and collective responsibility (Bhana, 2017). Through multiple viewpoints and voices in problem solving, DT methodologies within South Africa are designed to develop contextually driven solutions responding to the needs and aspirations of all stakeholders. The strong commitment to social justice and equity informs the process and methodology of DT in the South African context (Chigona et al., 2013). They argue that DT can be a powerful tool for promoting inclusive development and addressing systemic inequalities in nearly inequitous sectors like health, education, and economic empowerment (Bhana, 2017). By emphasizing empathy and understanding, DT methodologies try to amplify the voices of marginalized communities and challenge existing power structures (Chigona et al., 2013). DT in South Africa targets democratization of innovation and the creation of avenues for social transformation by way of various participatory research approaches and community engagement strategies (Bhana, 2017).

Contextual Factors

The aim of this thread is meant to delve deeper into the contextual forces on the adoption and efficiency of design thinking, like the organizational, cultural, environmental, and socio-economic factors. The application and efficacy of design thinking (DT) are influenced by various contextual considerations. One significant factor is the socio-economic configuration of a country marked by highly unequal wealth distribution, severe pockets of poverty, and ever-present social divides (Chigona et al., 2013). These contextual realities influence the priorities, challenges, and opportunities taken up by people and communities, thereby determining where DT initiatives would be aimed towards and what outcomes could be achieved. For example, DT implementation in and about South Africa will generally be done to address some critical social issues of healthcare, quality education, and sustainable livelihoods reflecting the immediate needs of the dominant and marginalized populations (Chigona et al., 2013; Bhana, 2017).

Apartheid history and the ongoing processes of reconciliation and nation-building of South Africa are additional factors. "Apartheid" in itself suggests the need for unity. The cultural richness, the many ethnic groups, and multilingual society need to underline how important cultural sensitivity and inclusivity are in DT initiatives. They stress the need to engage different stakeholders and embrace indigenous knowledge systems with respect (Chigona et al., 2013). The evolvement of democracy necessitates the increasing recognition of the rights and agency of historically marginalized groups, influencing the design of DT projects for empowerment and social justice (Bhana, 2017). Therefore, understanding about these contextual settings is necessary in fitting DT strategies into the culturally diversified and distinct South African situations.

Outcomes and Impacts

The topic revolves around the outcomes of DT-based interventions, impact, issues, and questioning the advantages acting on the dimensions of economy, social welfare, e-business, and more. It seeks to provide empirical and anecdotal facts about the tangible and intangible benefits of DT. It is somehow evident that outcomes and impacts coming out of DT initiatives are wide-ranging beyond traditional metrics of success. For example, DT among a myriad other South African organizations, have yielded tangible results including new innovative products, services, and solutions intended to counter pressing socio-economic challenges (Chigona et

al., 2013; Bhana, 2017). Furthermore, DT has facilitated the design of affordable medical devices, educational tools, and community structures for underserved populations (Chigona et al., 2013). The outcomes boost service access, quality life, and economic upliftment in marginal communities.

Conversely, DT-based efforts in South Africa often result in broader societal impacts as they create collaborations, empowerment, and social cohesion (Bhana, 2017). DT projects involve a diverse set of stakeholders, including government agencies, civil society organizations, and local communities, in agreeing upon projects for participatory decision-making and co-creation processes that build internal trust and interconnect social networks (Chigona et al., 2013; Bhana, 2017). Accordingly, the extensive array of DT approaches endeavours to rest upon the core principles of human-centred design which try to be more empathic, inclusive, and sustainable, and build upon solutions that are in alignment with the cultural, social, and environmental contexts of South Africa (Chigona et al., 2013; Bhana, 2017). The result is a precedent that is set on close links between DT processes and effecting systemic change, driving social innovation, and supposedly contributing to realizing the developmental goals of the nation.

Barriers and Challenges

The theme is a commentary on the numerous constraints and impediments challenging DT adoption in driving it from a state of acquired knowledge in training to actual practice. Despite all the consequential efforts and resources invested in increasing appreciation and capacity around DT, there still emerge many impediments in the way of operating DT because of various systemic and situational reasons. One such hindrance is merely theoretical accepting of the central rules of DT, one of which is empathy. One cannot readily equate with the user-centred experience in practice though cognitive self acknowledges the importance thereof. It is assertive that genuinely engaging with lived experiences through empathetic acceptance and genuinely reframing problems from the users' perspectives is an underdeveloped and hence complicated skill. Through this defensive behaviour, designers tend to arrive at solutions by largely ignoring the real confines or terrain of the problem space. By doing this, they depart from the essence of DT in soliciting real user needs (Coco et al., 2020).

To worsen the scenario, in the vast South African context, such a participatory action, submission of the integrated units of instruction on Design Thinking, and perceived piecemeal training for key partners from the policymaker to educators to leaders (organizational change) figure for deficit. To this end, then, the inertia of institutions, limitations related to resources and deep-seated hierarchical systems that discourage experimentation and co-innovation work further. The presence of structural or systematic problems encompasses the increased middle-layer management role, underfunded infrastructure, digital disparities, and unreduced bureaucratic procedures or pathways in slipping past DT into the typical organizational order (Bhana, 2017; Da Silva, 2020). Administrative red tape and restrictive regulatory frameworks, particular to the formation of partnerships lying on the fence of overlapping action in sectors, are bureaucratic impediments hindering the potential of DT from addressing complex socioeconomic problems.

In conclusion, we can see that it must be realized that there is need for ongoing support subsequent to the initial training. The teams need kind mentorships, reflection periods, and the encouragement of the organization would be extremely welcome in overcoming the arising ambiguities around user-driven innovation. Without these kinds of reinforcements, Design Thinking shall become rapid prototyping toolkits, instead of the mindset that can begin the transformation. This analysis may not have captured post-training follow-through thoroughly in all cases but serves as an argument for systemic readiness and engagement toward a full-flourished DT destiny in South Africa (Coco et al., 2020; Bhana, 2017; Gough et al., 2019).

Integration and Interdisciplinary Perspectives

Interdisciplinary perspectives coalesce around Design Thinking (DT) in real-world contexts (Krause et al., 2019; Peters et al., 2020). For particularly the most challenging socio-economic concerns, Krause et al. (2019) noted that Design Thinking principles are most effective when dovetailed with interdisciplinary perspectives and collaboration across several sectors. Building from multi-perspective experiences from engineering, social sciences, and business affords an organization better comprehension of seed prospects and exclusive end-to-end designs (Krause et al., 2019; Peters et al., 2020). These methods involve co-discovering and, mixing multiple thoughts for promoting creativity and providing a strong platform to solve multifaceted problems (Krause et al., 2019; Peters et al., 2020).

The integration of DT in the South African context calls for the recognition of an inclusive approach and increased participation of stakeholders, cutting across social constructionist lines from South Africa with perspectives, including in particular marginalized communities and traditionally understated communities (Krause et al., 2019; Coco et al., 2020; Peters et al., 2020). Only by bringing in a diversity of perspectives and lived experiences in the design process can an organization truly ensure that the resultant solutions bootstrap on the fundamental tenets of culture, context, and the amalgamated needs of all their stake-holders (Krause et al, 2019;

Da Silva et al, 2020; Peters et al, 2020). This focus on inclusion and drive toward diversity is more than just adding weight behind DT activities but also looks at social harmony, equity, and empowerment within South African communities (Krause et al., 2019; Peters et al., 2020).

Education and Training

This section explores design-thinking education and training-the development of curricula, pedagogical approaches, and professional-development programs. It probes how DT is taught and learned within academia, thereby fostering a culture supportive of creative thinking and innovation. The infusion of design thinking (DT) into educational and training programs presents new possibilities for stimulating innovation and solving societal problems (Peters et al., 2017; Pillay, 2018; Da Silva et al., 2020). Educational institutions are crucial in preparing students with skills and mindsets to thrive in a rapidly changing world, and DT is a perfect space for promoting creativity as well as problem-solving techniques and entrepreneurial thoughts (Peters et al., 2017; Pillay, 2018). Across disciplines, the use of design-thinking methodologies promotes social engagement in education as learners are trained to become change agents that identify opportunities, design innovative solutions, and effect positive social change (Peters et al., 2017; Pillay, 2018; Da Silva et al., 2020).

There are more and more voices concerning the fact that educators should receive professional training to help them implement DT ideas in teaching. Shared efforts at teacher training can see to it that educators learn the models DT provides its teachers to make the instructional experience a place where skills like creativity, collaboration, and critical thinking are nurtured (Peters et al., 2017; Pillay, 2018). Teacher-training courses and curriculum development offered in the area of design thinking would have a positive impact on the promotion of innovators and problem solvers who could address the complex challenges in South Africa and contribute to building up the country's economic development (Peters et al., 2017; Pillay, 2018).

Future Directions and Research Gaps

The paper stakes out the future of design thinking research and practice, often indicating directions for additional research and exploration. It will review previous research, delineate gaps, and suggest opportunities for advancing knowledge of DT in various domains and contexts. Thus, further research is needed to determine areas where DT could be applied in addressing the daunting socio-economic challenges faced in various sectors; also, to explore any possibility of nurturing innovations. Future studies could look into the efficacy of DT methodologies in activities fostering entrepreneurship education, advancing sustainable development, and solving major problems such as unemployment, inequality, and environ mental sustainability (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020). Further research could also analyse how DT might facilitate the transformation of marginalized communities and enhance social inclusion and indigenous knowledge systems to effects positive change at the grassroots (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020).

Thus, in regard to the longitudinal study of evaluating DT integration into curricula and professional development programs in South Africa, this is necessary for future research (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020). Longitudinal research will be a good way to understanding the sustainability of DT initiatives, how students' capabilities to innovate change over time, and the scalability of DT interventions in different educational and developmental contexts (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020). Furthermore, comparative research could be used to evaluate the benefits and shortcomings of various DT pedagogies, methodologies, the best practice, and inform evidence-based policy-making in different educational settings and socio-economic contexts (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020). These research areas will represent important successive steps in understanding the capability of DT to foster innovation and socio-economic development in South Africa.

Discussion

DT is one such phenomenon, and its potential to assist in innovations in South Africa is alluded to by this study. Dalsgaard (2014) emphasizes that the objective is to incorporate design thinking into curricula as a means to cultivate an innovative cultural ecosystem from a young age (Appleyard et al., 2020). Design thinking is viewed as a possibility for students to address complex issues, create innovative means for practical solutions to challenges in real-time (Nkosi and Sikhosana, 2020). Allowing principles of design thinking into the ways teaching and learning occur enables the teaching fraternity to nourish and grow critical thought, teamwork, and entrepreneurial minds in students to thrive in the complexities of the 21st-century workforce (Mbigi and Maree, 2019; Nkosi and Sikhosana, 2020). The findings of these articles impress upon design thinking as a possible vehicle by which to address socio-economic disparities and promote inclusive development in South Africa (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020). This speculated theory advocates that DT methodologies may empower indigenous communities to co-create solutions that meet their unique needs and aspirations (Mbigi & Maree, 2019). DT could engage different stakeholder groups into the process to provide avenues for social inclusion, narrowing the divide

between individuals and communities, and serve to broaden the sharing of resources and access to opportunities (Nkosi & Sikhosana, 2020). Although there is some acceptance of discussions and challenges identified by the study in promoting inclusive innovation, lack of access to DT training in disadvantaged communities and among various barriers identified by stakeholders would require targeted intervention and policy support to find sustainable relief (Mbigi & Maree, 2019; Nkosi & Sikhosana, 2020).

The findings of the investigation emphasize how DT can be merged to offer a transformational impact on sustainable development and environmental conservation in situ in South Africa (Mbigi and Maree, 2019; Nkosi and Sikhosana, 2020). The DT approach can serve as an inspiration for designing eco-friendly products, promoting the application of circular economy principles, and aiding the transition toward sustainability and resilience (Nkosi & Sikhosana, 2020). Through the employment of DT principles, policymakers, businesses, and civil society organizations can come together to innovate ways of addressing current environmental challenges such as climate change, pollution, and depletion of natural resources. (Mbigi & Maree, 2019). Moreover, the study calls for the necessity of a comprehensive approach in contemplating both social, economic, and environmental interlinkages to drive the outcomes of sustainable development (Mbigi & Maree, 2019; Dell'Era et al., 2020; Nkosi & Sikhosana, 2020). The study also discloses that design thinking is a very effective technique to enhance the competitiveness and resilience of South African firms in the global marketplace (Mbigi & Maree, 2019). Embracing DT principles should stir an innovation culture within these firms as well as make them adaptable and being customer-centric to be able to respond well to the new market dynamics and emerging opportunities (Nkosi & Sikhosana, 2020). Also, DT methodologies induce cross-sectoral partnerships, knowledge exchange, and technology transfer, which drive economic growth, job creation, and sustainable development (Deyanova et al., 2022). However, the study likewise observed a number of challenges at the local level, among them: resistance to change, scarce resources, and low awareness of DT's potential, but also directed at improving capacity-building initiatives, policy support, and stakeholder engagement.

Conclusions

In conclusion, this study provides insight into how design thinking (DT) offers a framework to stimulate innovation in South Africa. Throughout the study, we reviewed and synthesized research and other information and arrived at several important themes, challenges, and opportunities of DT adoption and implementation in South Africa. Findings showed that the inclusion of DT principles in educational curricula is of utmost importance; it is very much associated with inclusivity and diversity in design processes and is likewise important in ensuring the inculcation of a supportive ecosystem for DT innovation. It is thus essential to address the barriers, build upon the opportunities, and utilize DT as a facilitator for change and social-economic development. With concerted efforts toward DT and innovation, we can leapfrog from a development perspective into global leadership by positively transforming critical issues of society and confronting challenges with the world.

Recommendations

A number of major recommendations had emerged from this study and thereby considered South Africa's diverse educational landscape for the effective way to integrate and apply design thinking (DT) as an innovation tool and inclusive development.

The most pressing task is to embed the design thinking principles into education curricula in a more formalized way at all levels in education starting from basic education in schools to higher learning institutions. This approach must be more than just theoretical exposure but must also involve highly structured scaffolded learning activities to enable guided entry by both students and academics into the complexities of DT practice. Such learning activities include tasks and iterative design challenges, and reflective sessions facilitated, drawing incrementally the DT competencies. Insights from practice show that without such structuring, both staff and students tend to be drawn to one or more of the conventional problem-solving methods, undermining the very essence of transformation associated with DT training. Hence the call is for curriculum designers and educational leaders to prioritize pedagogical frameworks that set out developmental pathway(s) to build DT capability as well (Daniel, 2016; Mbigi & Maree, 2019).

Second, DT needs to be transformed as a socially constructive pedagogy by making inclusivity and cultural relevance central to its practice. This entails the specific empowerment of marginalized communities and diverse stakeholder inputs to ensure that co-created projects are indeed genuine expressions of what all constituents really care about. To be truly inclusive, especially in underprivileged circumstances and contexts, such initiatives must give centrality to the voices of silenced or underrepresented groups and promote consideration of local knowledge in the practice of DT, thereby grounding the practice of DT-driven innovation in equity and social justice imperatives (Nkosi & Sikhosana, 2020).

A strong emphasis must be placed on increasing and strengthening the local capacities to sustain and scale DT integration. This will empower the capacity of local knowledge holders through adequate training and make opportunities available for them to share aspirational avenues for innovation in instruction. These will be supported by mentorship programs and professional training on design thinking for educators to provide lessons drawing on real-life experiences in design innovation. National and institutional-level policies must facilitate access to infrastructure, funds, and technical capacity, particularly in under-resourced contexts. Innovation labs, design sprints, and hackathons are turning points towards making specialized learning programs and activities more impactful and sustainable (Mbigi & Maree, 2019; De Paula et al., 2022).

In order to higher learning, the development of very robust DT ecosystems will very much be a matter for robust policy frameworks and strengthened incentive schemes. Both were to be created in that initiative, with the capacity of the government regulating such on the policy setting, while substantial interest groups from the philanthropic field and the industry engage constructively to generate the most conducive environments ever (!) through the offering of incentives for innovative pedagogies, setting up of DT Innovation Hubs, and propelling intersectoral partnership interventions (Nkosi & Sikhosana, 2020). It is clear how crucial these efforts are towards long-term DT implementation, and adoption and sustainability in education, community development, and public service innovation.

By gating in scaffolded pedagogical platforms, continuous support systems, and inclusive practices, South Africa may, therefore, increase the efficiency of DT training and head toward more profound, inspiring application of design thinking that can empower both staff and student to address real-world challenges with creativity and empathy.

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