

DESIGN THINKING DIFFUSION MODEL: EMPIRICAL INSIGHTS INTO THE STATUS QUO

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Design Thinking Diffusion Model: Empirical insights into the status quo

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Abstract: When integrated within an organization, Design Thinking (DT) can be the foundation of competitive advantage. However, systematic assessments of how DT is diffused in practice have received limited scholarly attention. In this paper, we present and apply a visual model developed to assess, describe, analyze and plan the roles DT can assume within organizations based on localization and application diffusion archetypes. The application of the model to 547 organizations of different sizes and industries gives insights into the current state of the role and diffusion of DT within organizations. Patterns, current frontiers, and shifts are analyzed across all organizations by industry type and by firm size allowing for a nuanced, empirical view into the role and diffusion of DT in practice. We provide practitioners a useful tool to map and benchmark their organizations, analyze, plan and communicate the role of DT, and guide future DT researchers seeking practitioner-relevant insights.

Keywords: Design Thinking; Diffusion Model; Application; Localization; Integration; Status Quo; Empirical; Survey

1 Introduction

Design Thinking (DT) and its organizational integration have generated significant scholarly and business press attention (Liedtka, 2015; Micheli *et al.*, 2019). Described as a novel problem-solving capability with the potential to shape corporate culture, DT's role within organizations is declared to have evolved from its form-giving and product-oriented roots (Kolko, 2015).

When integrated within an organization, DT can be the foundation of competitive advantage (Micheli *et al.*, 2019). However, the journey towards integrating DT within an organization is challenging, and diffusion approaches are plentiful. Practitioners struggle to assess, analyze, plan and communicate how they integrate DT within their organization in a comparative manner (Mayer *et al.*, 2021; Schmiedgen *et al.*, 2016). This can lead to design efforts remaining disconnected and fragmented rather than common purpose-oriented.

Yet, although anecdotal reports are abundant, systematic assessments of how DT is diffused in practice receive limited scholarly attention (Carlgren *et al.*, 2016; Liedtka, 2015). The described gap of incoherence between DT in academic and practical terms is fuelled by a lack of empirical evidence on the current diffusion landscape (Carlgren *et al.*, 2016).

The study aims to create new knowledge and practical insights into the current DT diffusion within organizations. Correspondingly, the following research question is derived:

What is the current state of the diffusion of Design Thinking application and localization within organizations when accounting for industry and firm size differences?

We want to draw a representative picture of organizations' current landscape implementing DT, including organizations from various industries, sizes, and regions using a large sample size. Seeking to fill the described gap between theory and practice, we build a foundation for application-oriented future research and offer practitioners a benchmarked assessment tool sensitive to industry and firm size.

This paper is organized as follows. Following this introduction, we discuss related work and deduce the *Design Thinking Diffusion Model*. In the third section, we present our research methodology, followed by a discussion of our findings. We conclude this paper with theoretical and practical contributions and a discussion of limitations.

2 Related Work & Model Development

2.1 Design Thinking in organizations

A generally accepted definition of DT has yet to emerge (Micheli *et al.*, 2019). However, for this study, we follow Nakata and Hwang (2020, p. 117), who describe DT as a “design-based approach to solving human problems” that aims to combine viability, feasibility, and desirability. Human-centeredness, collaboration in multidisciplinary teams, abduction, learning through experimentation, and usage of tools and activities from various fields are characteristics of DT best suited to “decision contexts in which uncertainty and ambiguity are high” (Liedtka, 2015, p. 927).

In support of the relevance of DT for business and management that goes beyond the traditional application to design problems, scholars showed that DT could positively

influence growth and profitability (Chiva and Alegre, 2009; Clark and Smith, 2010; Collins, 2013), innovation capability (Menguc *et al.*, 2014), stock market prices (Hertenstein *et al.*, 2005), strategy formulation and post-merger integration (Liedtka, 2014), and shape different organizational cultures (Elsbach and Stigliani, 2018).

Besides the discourse around the impact of DT and the more recent linkage of DT to innovation, the discussion on how organizations can use DT is topical in both research, and popular business press. Marked by a proliferation of DT in theory and practice from design as a science towards design as a mindset (Johansson-Sköldberg *et al.*, 2013), recent scholars emphasize the organizational conditions required for DT to attain a long-term impact (Wrigley *et al.*, 2020). Further, while most of DT's implementations come from the context of product and service development, "the subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience" (Buchanan, 1992, p. 16).

Regarding how to best introduce DT in an organizational context, some scholars argue that integration in a company's systems and policies and senior management commitment should support its adoption (Martin and Martin, 2009; Wrigley *et al.*, 2020). In this sense, DT enables a change in an organization's structure, policies, and culture towards catalyzing a paradigmatic shift in strategic vision (Collins, 2013).

2.2 Design Thinking diffusion model

Existing research on the role of DT within organizations describes integration areas such as purpose (Danish Design Centre 2001), application area (Kootstra, 2009; Wrigley *et al.*, 2020), or localization (Junginger, 2009). Most studies rely on single or small-N case studies in scholarly articles or are limited to anecdotal reports and models from popular management press (Carlgren *et al.*, 2016). With the Danish Design Ladder (Danish Design Centre, 2001), for instance, practitioners can categorize the role of design within their organization into *non-design*, *design as form-giving*, *design as a process*, and *design as strategy*. While the tool is helpful for traditional product design, its application is limited to more general problems DT can address. Similarly, the Design Management Staircase (Kootstra, 2009) describes *project*, *function*, and *culture* as ways in which an organization can use design. Integrating these classifications around DT application with Wrigley *et al.*'s (2020) empirical findings on successful DT integration, we identify *traditional design problems and products*, *services and experiences*, *business model and strategy*, and *culture and ecosystem* as stages of DT application diffusion within organizations. A detailed explanation of the application diffusion stages can be found in Table 1.

Table 1 Stages of Design Thinking application diffusion within organizations

<i>Application</i>	<i>Explanation</i>
Traditional design problems and products	Design Thinking is used to solve traditional design problems of form and to develop specific products.
Services and experiences	Design Thinking is applied to the development of internal and external services and experiences.
Business model and strategy	Design Thinking shapes strategy and is applied to new business model development and strategic decision-making.

Culture and ecosystem	Design Thinking is part of the organizational culture and is applied beyond products, services and strategy to an organization's ecosystem.
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Source: Adapted from Koostra (2009) and Wrigley et al. (2020).

As a second integral part of organizational diffusion, we identify the localization of DT within the organization. Accounting for the limitation of existing tools to traditional design problems, the localization model by Junginger (2009) identifies *peripheral*, *somewhere*, *central*, and *everywhere* as archetypical localizations of DT within organizations. For our model development, we adopt these categories. A detailed explanation of the localization types based on Junginger (2009) can be found in Table 2.

Table 2 Types of Design Thinking localization within organizations

<i>Localization</i>	<i>Explanation</i>
Peripheral	Design Thinking has no continuous presence in the organization but is booked as a resource on demand. It takes place <u>separately</u> from operational activities.
Somewhere	Design Thinking is practiced as a <u>part of</u> one or two organizational functions, such as the marketing or R&D department.
Central	Design Thinking has a <u>central</u> position in strategic decision-making. It is linked to leadership and an overall strategy. Design Thinking shapes aspects of the organization and has the potential to transform it.
Everywhere	Design Thinking is integral to <u>all</u> parts of the organization. The organization is questioned, formed and shaped by ongoing Design Thinking.

Source: Adapted from Junginger (2009).

The described tools are looking at aspects of the role of DT individually. In practice, however, DT's role can have different manifestations on multiple dimensions, such as its localization and application that only in combination determine success, require different strategies, or consume distinct types of resources (Wrigley *et al.*, 2020). Still, little is known about the current state of organizations within those dimensions and which shifts are most likely to happen in the future that can be framed as areas of opportunity. The practical value of assessment models not guiding how to interpret the current state based on real-world benchmarking data is limited. Correspondingly, studies in popular management press offering descriptive insights into DT's use in practice enjoy widespread popularity (Schmiedgen *et al.*, 2016).

When looking at the role of DT within organizations, we therefore provide both a model for DT diffusion, and insights from its practical application relying on a representative dataset. Wrigley et al.'s (2020) recommendations for practitioners seeking DT integration can serve as a foundation for an empirical assessment of DT application diffusion meeting these criteria. For localization diffusion, we identified the archetypes provided by Junginger (2009). Integrating the stages of application diffusion (Table 1) and the localization types (Table 2) within a matrix (Figure 1) offers the possibility to differentiate between localization and application within one integrative overview while accounting for the variety of combinations that are possible in practice. Further, when provided with real-

world data, the matrix offers a classification into different horizons that potentially mark evolution stages and areas of opportunity.

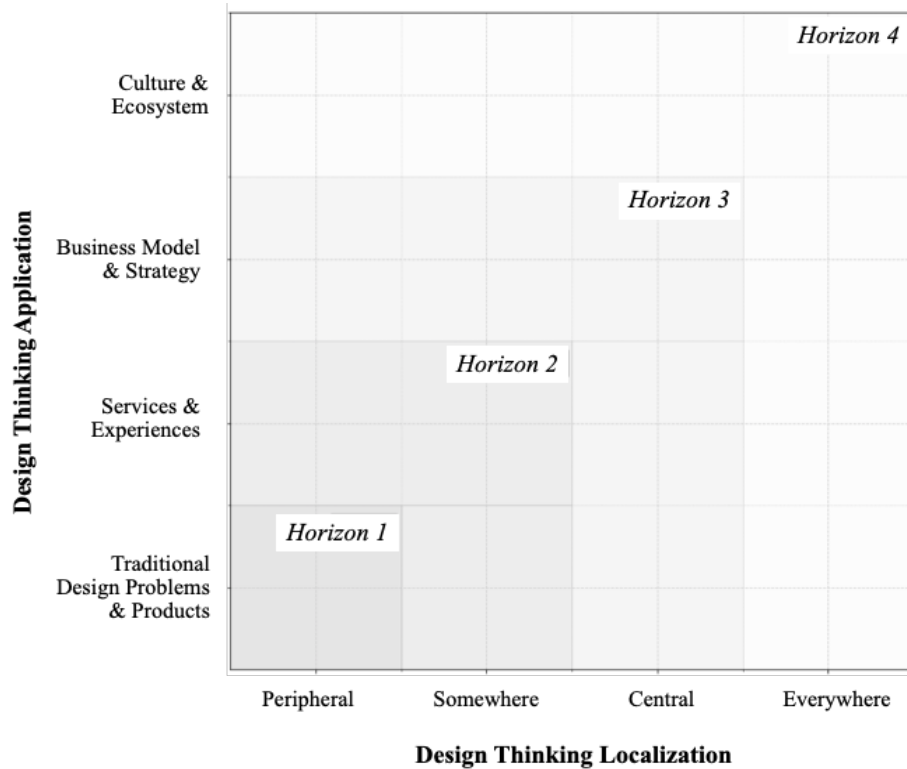


Figure 1 Four horizons of Design Thinking diffusion within organizations.

Figure 1 shows the integrated framework developed for this study, which we call *Design Thinking Diffusion Model*. Organizations facing the *first horizon* apply DT mostly to solving traditional design problems and to product development that takes place separately from operational activities. An example of the peripheral localization of those DT applications is hiring an external DT consultancy for the human-centered development of a specific product. Firms that expand the application of DT to services and experiences or localize DT as a part of the organization, for instance in their R&D department or innovation unit, can be categorized as those facing the *second horizon*. When combining any application diffusion stage except culture and ecosystem with localization of DT as a central position in strategy and decision-making, or when applying DT to business models and strategy in combination with a peripheral, somewhere or central localization of DT, an organization is facing the *third diffusion horizon*. A final evolution frontier marks *horizon four*, which is visible to organizations that apply DT to their culture and ecosystem or anchor it as an integral part throughout the whole organization.

3 Methodology

To gather empirical insights into the DT diffusion state based on a large-scale assessment, the paper follows a quantitative survey method. The integrative diffusion model (Figure 1) based on Wrigley et al.'s (2020) recommendations on DT application integration and Junginger's (2009) model on archetypical localizations served as the foundation for the survey. It incorporates application diffusion ranging from traditional design problems via design-led strategy and culture to ecosystem-centered DT on the y-axis and localization diffusion (Junginger, 2009) on the x-axis. The model is structured into four horizons marking evolution frontiers within the matrix. Fully integrated DT localized within the whole organization paired with an ecosystem-centered application focus, for instance, marks the fourth horizon.

This model has been applied via an online survey sent to 6,155 DT-interested participants of a massive open online course (MOOC) titled "Mastering Design Thinking in Organizations". 1,161 participants answered between October and November 2020. Due to the structure and the content of the MOOC, the invited participants were DT interested practitioners from various industry fields, departments, regions, and firm sizes with different backgrounds, seniority- and experience levels in DT. After consolidating participants from the same organizations and excluding incomplete answers, the final sample held 547 organizations. The survey consisted of five items with a 5-point rating scale ranging from "strongly disagree" to "strongly agree" based on Wrigley et al. (2020) to assess application diffusion. The items have been validated prior to the application with six DT experts in semi-structured interviews. Further, an assessment of the localization diffusion based on the participants' department and job title, industry, firm size (number of employees), and other demographic variables were included.

As a reliability test, the values of Cronbach's Alpha for the application diffusion variable are all higher than 0.7. Moreover, since the items used were adopted from previous studies, face validity and content validity are secured. To validate the interpretation of the results, we discussed our findings in a workshop format with DT experts and researchers from the Hasso Plattner Institute (HPI) and Stanford University in the course of the *HPI-Stanford Design Thinking Research Program* community workshop in March 2021.

4 Discussion of Findings

The overall diffusion depth can be considered low on the localization diffusion dimension, indicating a focus on somewhere (57.6 %) and peripheral (18.6 %), compared to central (14.6 %) and everywhere (8.9 %). The results show that most firms (57.6 %) anchor DT in specific departments where isolated business units are dealing with project-related DT activities facilitated by the respective organizational function. Less than 10% state that DT has diffused throughout the whole organization as an integral part of practice and culture. This general pattern is reflected by the growing popularity of dedicated organizational units for exploring and developing new digital innovations - so-called Digital Innovation Units - that make use of DT (Haskamp *et al.*, 2021).

Regarding the application of DT, the overall diffusion depth can be considered very low ($M = 2.28$, $SD = 0.89$), indicating application primarily to traditional design problems and product design. This shows that although the application possibilities of DT are theoretically universal in scope (Buchanan, 1992), in practice, most of DT's applications are located in the context of product and service design. This could be related to a lack of

awareness of the potential of DT application on a business model, culture and ecosystem level.

When looking at the combination of localization and application, the results indicate differences between the average application depth of the different localization types. An ANOVA conducted on the collected data confirms significant differences in the application diffusion between the four localization diffusion categories [$F(3, 543) = 4.22, p = 0.006$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the peripheral condition ($M = 2.54, SD = 0.89$) was significantly different from the somewhere condition ($M = 2.25, SD = 0.86$) and the central condition ($M = 2.09, SD = 0.91$). However, the central condition did not significantly differ from the everywhere condition ($M = 2.22, SD = 1.01$) and the somewhere condition and the mean score for everywhere did not significantly differ from the peripheral condition and the somewhere condition. Hence, depending on the type of DT localization within the organization, the depth of application diffusion (ranging from DT being applied to traditional design problems and products to DT being applied to the whole ecosystem) varies.

To answer the research question, the application diffusion means were mapped on the developed framework by localization diffusion type, including a visual indicator of frequency for each combination. We can see that the majority of companies apply DT on services and experiences while localizing DT activities somewhere in the organization. Only 8.9 % of organizations fully embed DT throughout their whole organization. The majority of those apply it to traditional design problems, products, or services, showing that the application transition towards an ecosystem-centered approach is far from being displayed in practice.

Extended by categorization into industry type, Figure 2 shows that firms within the information and communication industry and those assigned to other service activities have the highest application diffusion level, which could be interpreted as caused by their traditional service-oriented business models that naturally enable higher application diffusion. Moreover, we can see that organizations from traditional industries, such as the manufacturing and the transportation and storage industry, are those that mostly localize DT as a part of one or two specific departments, for instance within a dedicated digital innovation unit. Regardless of the tangibility of manufacturing and transportation and storage related products, the DT application focus within these industries is on services and experiences, which could indicate a shift towards applying DT on business models and strategic decisions in the future. In general, the results show relevant differences of DT application and localization depending on the industry type. For practitioners seeking guidance on how to integrate DT within their organization, this means that there is no “one size fits all”- path to success, but that environmental and organizational factors should always be taken into consideration when planning, communicating and steering the diffusion of DT within the organization.

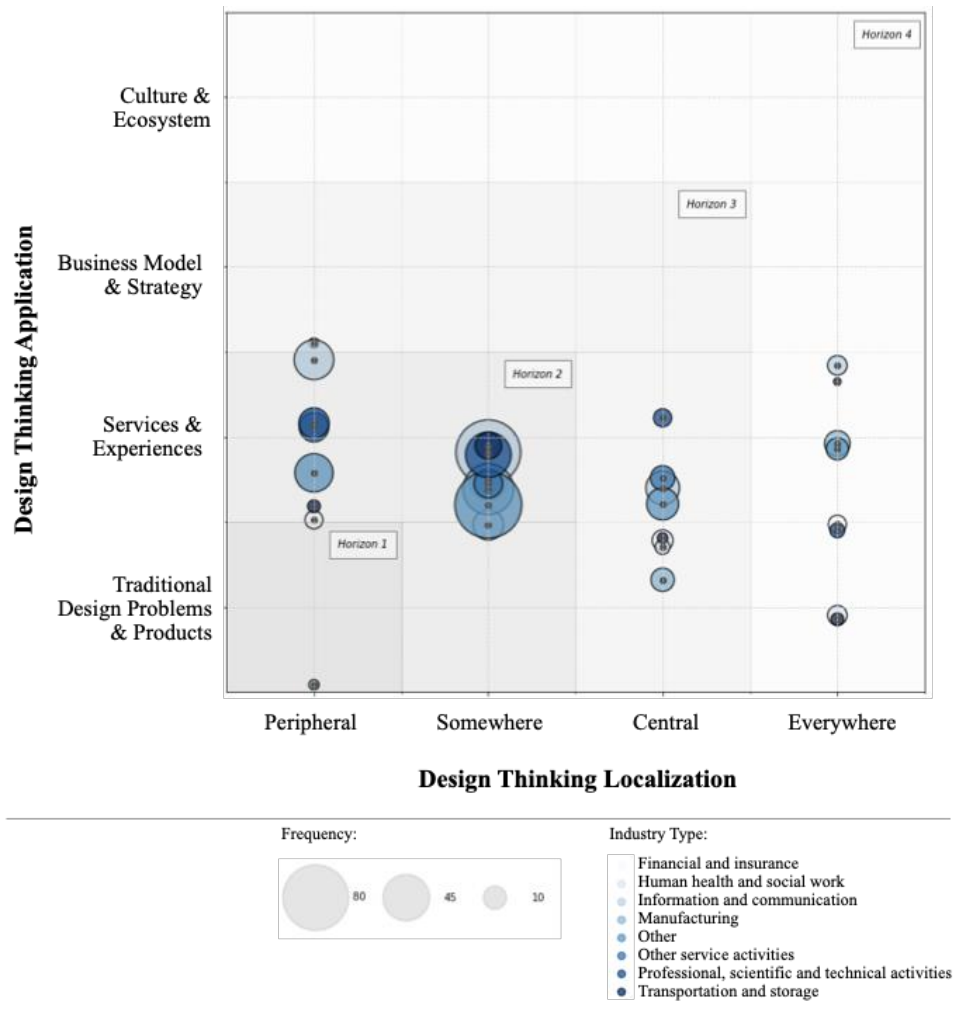


Figure 2 Four horizons of Design Thinking diffusion within organizations by industry type (n=547).

When looking at differences and patterns by firm size, as displayed in Figure 3, firms with less than 50 employees stand out with comparatively high application diffusion levels. A potential explanation could be the relatively small effort necessary to deeply diffuse the application of DT and related change when the organization is small. However, it is very large companies (> 5,000 employees) that, when choosing a peripheral localization of their DT activities, reach the highest application diffusion. Here, an explanation could be that large firms are more likely to own the necessary resources to invest in add-on DT activities.

Further, the peripheral localizations indicate the use of external design consultancies that facilitate the application of DT to service, experience and business model related areas with high expertise and potentially lower organizational barriers. However, our data also confirms that the combination of a peripheral localization of DT and a very deep application diffusion towards culture and ecosystem is currently very unlikely, independent of firm size or industry.

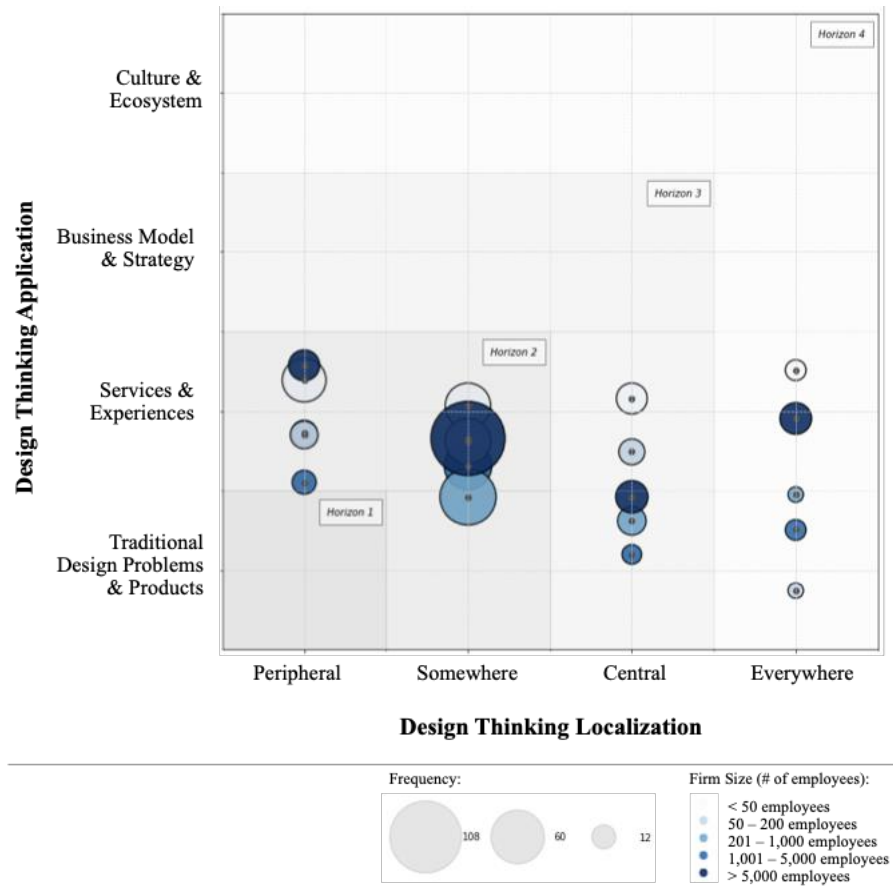


Figure 3 Four horizons of Design Thinking diffusion within organizations by firm size (n=547).

As for further insights into the use of DT in organizations, a descriptive analysis of the practitioners interested in DT shows the increasing relevance of digital in the practical DT discourse, as Information Technology (IT)-related roles (e.g., IT Manager, IT Architect, IT Developer, Head of IT, Engineer) account for a majority of the interested practitioners in our dataset and the IT department is the most frequently stated department within our sample. Further, we can see that DT is of high interest to management as management-related roles and C-level practitioners were represented more frequently than DT- or agile coaches in our dataset.

4 Conclusion

The presented model on DT diffusion within organizations and its real-world application generate valuable new knowledge on the current state of DT diffusion in practice. The findings underline the impact of firm-specific characteristics and contextual factors in the manifestation of various diffusion stages. Most interestingly, a paradigm shift towards an

ecosystem-centered application and a centralized or fully embedded localization of DT within organizations has not happened in practice (yet).

Unlike existing models, the presented model incorporates two diffusion dimensions scrutinizing firm-specific differences and contextual factors. The insights from the large-scale application further fill the described gap between theory and practice, show how the current landscape of diffusion looks like, and generate interesting avenues for future researchers.

Regarding limitations, we are aware of the low conceptual maturity of DT (Micheli *et al.*, 2019), which challenges the operationalization and can create overlaps between our diffusion dimensions. We encourage future studies to develop an operationalization of DT capabilities in stages of maturity that combined with the application of our *Design Thinking Diffusion Model* can generate deeper insights into the dimensional nature of organizational DT capabilities. Further, we used convenience sampling via an online course where DT interested practitioners from various industries and seniority levels were accessible. Even though this enabled a large-scale application, the estimates derived from convenience samples are often biased (Etikan *et al.*, 2016). We recommend to apply the *Design Thinking Diffusion Model* in the same setting at multiple points in time accounting for those limitations and to generate insights on trends within groups and paradigm shifts. Moreover, the model can be used to explore cause-effect relationships between different diffusion manifestations and outcomes, such as firm-specific capabilities or performance differences.

The developed diffusion model serves as a self-assessment tool for practitioners interested in the manifestation of their organization's DT efforts and gives industry- and firm-size-specific benchmarking guidance on interpreting the location within the model. The assessment increases awareness of DT's current role within the organization, stimulates discussions across silos, roles, and seniority levels, supports communication of current or targeted strategies and helps to identify possible opportunity areas. These insights allow managers to make more informed decisions regarding implementing, planning, and evaluating DT efforts. The model can be used to plan and strategize DT's role in a more nuanced way, for instance, by discussing various stakeholders, needs, resources, or activities based on the current or desired location within the model.

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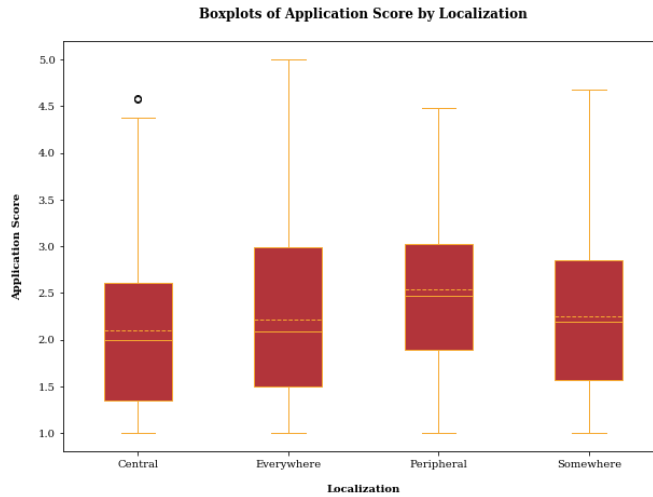
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Appendix

Application by Localization:



Localization	Application Score (Strategy)							
	count	mean	std	min	25%	50%	75%	max
Central	81.0	2.094487	0.913722	1.0	1.350960	2.000000	2.605171	4.584426
Everywhere	49.0	2.220636	1.014551	1.0	1.496278	2.091279	2.992556	5.000000
Peripheral	102.0	2.536622	0.894240	1.0	1.892045	2.471568	3.029050	4.477695
Somewhere	315.0	2.250182	0.856659	1.0	1.568369	2.186724	2.852938	4.682055

ANOVA Results:

	sum_sq	df	F	PR(>F)
Localization	9.955168	3.0	4.215944	0.005814
Residual	427.397823	543.0	NaN	NaN

Post hoc comparison using Tukey's HSD:

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
Central	Everywhere	0.1261	0.8443	-0.2876	0.5399	False
Central	Peripheral	0.4421	0.0048	0.1019	0.7824	True
Central	Somewhere	0.1557	0.4946	-0.1291	0.4405	False
Everywhere	Peripheral	0.316	0.1717	-0.0814	0.7134	False
Everywhere	Somewhere	0.0295	0.9	-0.3216	0.3807	False
Peripheral	Somewhere	-0.2864	0.0246	-0.5469	-0.026	True