



# Four Dimensions in Learning Design Thinking: Capabilities, Constraints, Collaboration, and the Diffusion of Ideas

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## Abstract

Over the last few years, design thinking has been indicated to be an approach for making sense of complexity by focusing on collaborative work and interdisciplinary approaches. That being said, the concept itself and its applications still remain fluid and emerging today, posing an immediate question for education: How to educate design thinkers and what is the foundation of thought that this learning should be based on? This paper examines four foundational dimensions of design thinking in terms of the needed capabilities, the world of constraints that restricts the application of capabilities, the nature of collaboration, and the diffusion of ideas. The foundational work of Sen in the area of capabilities and constraints is linked to Deleuzian thinking about concepts, collision, and affect in the area of collaboration and the rhizomic diffusion of ideas in order to form a wide framework of thought that serves as a foundational base for design thinking.

**Keywords:** Design thinking, Amartya Sen, Capabilities, Constraints, Gilles Deleuze,  
Concepts, Affect, Rhizome

## **Introduction**

Over the last decade, design thinking (DT) has emerged as an approach to help make sense of complex issues in society. A mix of design and management, it builds on the idea of interdisciplinary (ID) collaboration as a key method for addressing complex issues such as user engagement and customer preferences in new product, service, and business development. It has also increasingly been applied in the context of truly wicked societal problems, such as inequality, social exclusion, environmental degradation, poverty, and a lack of opportunities. Typically, these complex issues and wicked problems do not fall into any specific domain of knowledge; they are systemic in nature and cut across multiple disciplines. It follows that any response also needs to cut across similar dimensions.

While this is clear on the surface and seemingly solid as an approach, there are notable difficulties in putting this into practice. Observable tensions exist both within the conceptual base of DT and between it and the ideas of interdisciplinarity, and the theoretical bases of both are fluid and depend on whom you ask. Embedded in this is a wicked problem for higher education: If you wanted to teach DT, what foundations would you build it on?

This paper argues that any effort in higher education to teach DT needs to have a four-dimensional foundation. Firstly, in-depth disciplinary knowledge is needed to create capabilities. Secondly, significant constraints need to be removed so that capabilities can be applied. Thirdly, there is a need to build up collaboration, and, finally, ideas need to be diffused. The paper is exploratory, introducing a mental model for each one of the dimensions, contributing to the discussion of the foundational level of human-centric design and management practice.

## **Looking for a natural fit: DT and ID**

The current construct of DT builds on the ideas of creativity, innovation, and systemic thinking, and fusing design and analytic methods to build a holistic and iterative approach can be seen as useful in multiple contexts when seeking solutions to problems that are wicked in nature (Brown, 2008; Dunne & Martin, 2006; Lockwood, 2010). The roots go back at least three decades, with Nigel Cross talking of “designerly ways” (Cross, 2001), and the thinking on reflective practice and creativity (Schön, 1983; Lawson, 1980).

As a concept, DT remains somewhat ambiguous, with multiple parallel and overlapping approaches, sometimes critiqued as nothing more than a rehash of old ideas. The epistemological and ontological foundation of DT involves abduction, reflective practice, and reframing, together with multiple viewpoints, balancing human desirability issues with technical feasibility and economic viability. The DT mindset is inherently optimistic, future-oriented, and exploratory, requiring a high tolerance of ambiguity (Johnson & Woodilla, 2009, 2010; Hassi & Laakso, 2011). DT is typically used today to develop new

product, service, and business concepts that operate in areas that are vague, wicked, complex, and difficult to define (Buchanan, 1992; Brown, 2009).

On the other hand, DT builds on the idea that an (emerging) discipline called design can cross-fertilize the processes and methods of another relatively new discipline, management, in a cross-disciplinary manner. As a discipline, design is still more in its formative stage than management. There is an evolutionary parallel between marketing and design. As a discipline, marketing was largely in the same situation as design is today around 30 years ago. Marketing has, however, moved very much into the realm of quantifiable metrics and application, whereas design outcomes still fail to be fully measurable.

Management has struggled over the years to adopt the attributes of science, leading back to Frederick Taylor and his “Principles of Scientific Management” from 1911. The counterweight of the Fayolian administrative approach (Fayol, 1916) has evidently balanced the picture somewhat, and today we recognize the socially constructed nature of organizations, leadership, and management practices (Drucker, 1985). Typically, this is manifested in the recent thinking of strategy as an emerging practice and not a sustained analytic practice that is able to chart its way forward with predictable precision.

The recent perceptions of management as an imprecise science and practice have evidently paved the way for design practice and thinking to have an impact on examining and making sense of human-centered issues. Design is based on the idea that human thinking and the action that users take are often not foreseeable with any degree of precision, and thus developed solutions need to be based on close observation and the iterative practices of sense-making.

A central argument for interdisciplinarity is that wider-than-disciplinary issues can be addressed through collaborative work (Klein, 2010; Koria, Salimäki, Karjalainen, 2011; Koria, Graff, Karjalainen, 2011). It could be argued that the current idea of interdisciplinarity is in many cases a call to move back to a “pre-disciplinary” situation, wherein the centrifugal forces of exponentially expanding knowledge were not yet tearing apart the common basis of understanding. It is of course clear that there is no return to the past, but ID scholars seem to like to position themselves as a supra-disciplinary layer (Weingart, 2010; Klein, 2010). This marriage between interdisciplinarity and DT is not entirely comfortable, however, as the two approaches have different backgrounds.

## **Dimension 1: Creating disciplinary capabilities**

Disciplines were relatively unimportant as socially structuring functions until the eighteenth century, serving mostly as repositories of knowledge as they were organized through structures that were based on idealized hierarchies that dated back as far as the ancient Greeks. As Wiengart (2010) notes, it was only in the late eighteenth century that hierarchically organized knowledge and the (university) structure that it represented began to disband, leading to the emergence of disciplines with their own categorizations. Both the volume of data that emerged from the increasing number of investigations in the natural

sciences (consider the voyages of Darwin or the work of Linnaeus), and the increasing abstraction (often mathematically reconstructed) of the objects of study led to (and were also derived from) a growth of new instruments, theories, and concepts that mediated the immediate reality, forming schools of thought, methods, and communities.

Ever since the beginning of the “disciplinification” of society, there has been a certain amount of unease about the loss of unity of science, and repeated calls have been made to regain integration, *inter alia* through interdisciplinarity. As an example, Gibbons (1994) outlined the decline in the leading role of universities in knowledge production, with transitory networks and contexts replacing traditional disciplines. In line with this, external-to-disciplinary knowledge production was based on applied research, while solutions emerge from their contexts, and with results no longer only transmitted through scientific journals. Social, political, and economic criteria are used in assessing the impact of the research.

That being said, while there appears to exist an increase in ID research in the applied sciences, often driven by new scholarly associations and organizations outside the traditional university frameworks, disciplines and their specialist derivatives continue to be the principal way of organizing scientific work, and it is foreseeable that traditional disciplinary approaches will continue to coexist with inter-, multi-, and transdisciplinary ones for the foreseeable future (Weingart, 2010).

In terms of DT, disciplinary capabilities and expertise are important drivers in creating new products, services, and business models. Without deep specialization, cutting edge technology, the newest business practices, and a deep understanding of the human factor cannot be brought together to create truly novel solutions (Clark & Smith, 2008; Boland & Collopy, 2004). This amounts to a very strong argument for continuing to support deep disciplinary learning in the future. What does seem to be happening, however, is that new areas of deep specialization are created through the onset of the knowledge economy through finding common and crossing grounds between existing disciplines, and these do need to be taken into account in a flexible manner. That said, there seems to be no real evidence that new modes of knowledge production are replacing old ones (Weingart, 2010).

## **Dimension 2: Removing constraints to use capabilities**

One of the wicked problems in higher education is that the build-up of capabilities is often automatically assumed to resolve the problem of applying them. In a somewhat convenient way, educational institutions make the ultimate disclaimer: We teach you skills, but how you apply them is your business. This sidesteps the inconvenience of learning institutions having to be up to date and needing to know what is truly relevant and coherent in the real world. This could also be seen as the result of the current establishment renewing the existing frames of mind and not engaging in a rethink of how things are done. That noted, societal values are constantly shifting and there is no status quo, nor can there be. Evidently there is some truth in the observation that “we do not know what jobs will be out there” in the next twenty years or so and also in the fact that the educational structures often cannot (and some say should not)

keep up with the world's transformations. Also, the idea that there is universal, basic, and archetypal knowledge that needs to be taught holds true only part of the time.

Linked to this is a time dimension: Do we teach the world of today (to solve the problems that exist retroactively) or do we teach how to create a future (to change things proactively for a better arrangement)? Much of the capability toolkit and approaches used seemingly deal with finding out what users want and know today. In other words, while the desire is to address the future, the taught practices are of the present. Even more critically, we equip the students with skills and competences to execute tasks but not necessarily the needed toolkit to remove the significant constraints that exist in society that inhibit the wider and novel use of capabilities.

To understand the relationship between disciplinary capabilities and socially constructed constraints, it is useful to fall back on the work of Amartya Sen (1985, 2000) who initially outlined his approach to understand the relationship between capabilities and constraints in the late seventies, based on a broad ethical vision of capabilities as instruments for achieving human participation, well-being, and freedom. From the viewpoint of his capability approach, it is not the possession of a skill that produces well-being but what a person actually succeeds in doing in the personal and external circumstances of that time and place.

The use of capabilities is delimited by constraints, which effectively limit the choices that can be made. These constraints are socially constructed and relate to issues like religion, family, and social class, which mold the idea of a “good life” and “how we do things around here.” Personal characteristics—like sex, age, skills, and intelligence—influence how a person can turn his or her skills into real options. Additionally, social characteristics—such as non-formal social practices, hierarchies, and norms—along with more formal public policies also influence the options and environmental characteristics—like physical location, space, and infrastructure—have an evident impact (Sen, 2000). As an example, religious upbringing often creates lock-ins in terms of diet choices. It is the socially constructed constraints that act as inhibitors in many personal development issues, reducing the freedoms that exist allowing us to act in ways that can enhance wider well-being. It is also the focal point of social control and assimilatory pressure.

As such, no absolute value judgment can be made as to the positive or negative effects of these constraints; it could be presumed that both would be present in any given time and place. But they do set the boundaries of acceptable action within a social sphere and thus effectively limit the application of a set of capabilities. That being said, while certain personal characteristics (like a person's sex) cannot easily be altered, it is possible to alter the constraints that these attributes impose. Sen (2000) argues that real freedoms (and thus opportunities to create the new) are linked to the ability to remove constraints.

This is the link to the DT discourse that aims to explicitly create changes and the future. The importance of the thinking of Sen to DT is in explicitly addressing the abilities of future professionals to remove

constraints as a dimension in itself. Identifying the constraints, making sense of them, and dealing with them proactively tends to be a difficult task, and its required multidisciplinary approaches (as constraints, contrary to capabilities) are cross-cutting in their nature. There is thus a very strong link between the Senian view of constraints and the DT idea of multiple distinct disciplines, or multidisciplinary, as an approach to overcoming wide challenges.

### **Dimension 3: Building collaboration**

It can be noted from the previous two dimensions that one moved from individual capabilities to social constraints and the other from mono- to multidisciplinary. What really powers DT, however, is the idea of human collaborative work. Lone innovators have been replaced by collaboration across functions, organizations, and cultures. Teams observe from multiple angles, engage in sense-making, and user-centric and design-driven innovation, while building a deep and empathetic understanding of the human factor. They test the products, services, and business models through visualizations, prototypes, and user engagement and arrive at solutions that solve real problems and create meaningful innovation. The third dimension of DT is linked to collaborative work that is arguably driven by interdisciplinarity, where deep expertise starts to merge into common approaches and the distinct disciplines start to fade. Understanding the dynamic and shifting foundation of the third dimension benefits from three key ideas put forward by Gilles Deleuze (1995) and Félix Guattari (1987, 1994): concepts, becoming, and collisions with affect.

#### **Building new concepts through collaboration**

According to Deleuze, concepts are the means by which we move beyond experience so as to be able to think in new ways. Philosophy, in turn, is the art of inventing or creating concepts, or putting concepts to work in new ways. Concepts must be creative, active, and exploratory, rather than just being descriptive, reductionist (simplifying), or representative; in addition, they cannot be separated from the context of their production (Deleuze & Guattari, 1987, 1994).

In DT, the development of new products, services, and business models is done purposefully, through collaborative methods, to initially build new concepts of products, services, and businesses that may then later on be refined into things that become more tangible offerings. It is not irrelevant how one goes about the initial phases of thinking about these new initiatives, as the world is full of services that no one uses, products that are not desired, and businesses that fail. In order for us to understand the front end of development in the DT context, we need to think of concepts as thinking tools that allow us to move beyond user experience to create the new.

Over time, anticipatory creation starts to shape the future and the world, becoming a normal part of life—this means that sense-based perceptions no longer ground the creation of new concepts. This is how we create the positive power to transform our ways of thinking. In practice, building on our experiences means that that we need the individual experience and the collective collaboration that transforms past experience into a future concept. A wider experience set makes it potentially possible to create a concept

that is more robust, more relevant, and addresses issues that are significant. This is why the creation of concepts needs ID teams.

### **The world as becoming**

In building concepts, we need to consider the context: We often talk about the world of today as being in a state of constant flux and change. We do, however, somehow assume that if we were able to decipher what individuals really want and do (say through DT), we could understand their being and use this knowledge to create useful and valuable products and services. This static view is inherently flawed and only serves to try to simplify something that cannot be simplified. Again, we need to visit Deleuze and Guattari (1994). It is argued that we need to think of the world as “becoming” instead of “being” in the DT context, to capture the full richness of the potential that concepts have to work in new ways. Since the world is in a constant state of movement, one way or the other, it makes sense to try to understand things from the process view of going and coming, of always being in the process of becoming. This reframing could also inform the way in which we use DT to create insights. This departs from the Platonic idea that grants privileges to static being, originality, and essence, with a world behind the appearances (O’Sullivan & Zepke, 2008).

Human beings are not stable, rational individuals who remain essentially the same while experiencing changes, and they need to be seen as constantly changing organisms that are subject to random influences from language, other organisms and organizations, societies, and the like. Designed outcomes (such as products) may be momentarily stable in terms of their attributes but in fact the target audiences see them in extremely different ways. Consider the example of fashion—in three months the season changes and new products (outcomes) are produced. In services, the dynamic nature of the outcome is even more apparent: Each and every touchpoint and delivery is different from the previous one and the next one.

The designing of processes (e.g., creating, delivering, and reviewing them) is also dynamic in its nature, due to the fact that the outcomes vary from one moment to another. Evidently the capabilities are also shifting due to the fact that we must learn how to vary our outcomes. The management of the outcomes and processes is also inherently dynamic as it must meet the real world on an everyday basis. The capability to manage changing things also needs to be dynamic by definition.

As a result, nothing in DT supports the idea of static being: every aspect points clearly to the (dynamic and) becoming nature of the individuals and of the world. When we create concepts, they are, by definition, dynamic and becoming in their nature, and in order to be coherent in our educational delivery and inputs, we need to think of education as a process of becoming. This is essentially in line with the constructivist view of pedagogy (Rockmore, 1995), in the sense that learners build up their own

learning—evidently as a dynamic internalized process wherein teachers curate material and contexts and facilitate the learning process.

### **Collision with affect**

When things come into contact and collide, something (else) always happens. This is also true of collaborative work that aims to create new concepts. People, ideas, and experiences meet and collide in some form. But what happens in this collision? How do we qualify the output, outcome, or product of this specific encounter? In this we turn to the Deleuzian idea of affect, as a physical and temporal modification of experience resulting from these contacts or collisions. Affect as a variation or change can be a known product of an encounter, specific in its dimensions (say an object of art), or it can just as well be an indefinite experience (such as a sunset) (Deleuze & Guattari, 1994; Parr, 2005). An encounter of bodies produces change or variation—a difference. It can be argued that it is only through a collision that this change or variation happens. Inert bodies do not change, but are suspended in a void until something external acts on them.

The disciplinary meeting of capabilities is thus mediated by the Senian constraints and Deleuzian ID collaboration to produce new concepts with affect. This collaboration needs to be learned so that the collisions do not end up being destructive. It also means that one needs to master the ways in which these collisions take place (ideational or physical, tangible or intangible, visible or invisible, or tacit or explicit).

For DT (and evidently for interdisciplinarity, the key issue is that bringing concepts into play with each other causes an affect: Something changes, and we call that change the affect. It is not only an experiential force; it can and does become a material thing (as in a piece of art or in a product/service we use)—on both levels it impacts on systems of knowledge and power. When we isolate the idea of affect from the bodies that collide, we can also try to understand the active or reactive nature of the collision. It helps us to make sense of the multidimensionality of each encounter.

The nature of the contact and collision also leads us to understand the context in which it happens. The socially constructed context is extremely important for the efforts of DT to build up the concepts. The key issue is related to the social constraints that impact on the new. If the affect of a collision is negatively active or reactive towards the new, it may mean that the constraints that exist are not torn down but are reinforced or even built up to become more challenging. If, however, we have a positively active affect upon the novelty, we may find that surmounting the existing constraints is much simpler.

### **Dimension 4: Diffusing the ideas**

Hierarchies, ordered lineage, and the tracing of antecedents are often organized around an arborescent (treelike) schema, whereby we can map out ordinal and even nominal relationships. This is fine for simple



things but does not really support the current thinking on seemingly random and unrelated events that collide with deterministic drives to produce surprising and unforeseen results. As an example, there is still no way to understand what will be the main trends in the next few years in fashion or what unforeseen natural events change life forever. We are able to recreate the causalities afterwards (though even then, only tenuously), by joining the dots as we saw them in the past.

In order to model a way of thinking about DT, the future, and education, we turn to the image of a rhizome. The Deleuzo-Guattarian (1987) model of a rhizome, describes the concurrent connections of the most similar and farthest away ideas, objects, people, and places. These apparently random and non-hierarchical connections and collisions map the processes of affect in networked, relational, and transversal thought, without being fixed to a construction of a linear and rigid structure.

The image of a rhizome offers a perspective on how learning and ideas can be diffused within the DT context. The static tree of knowledge is outdated and is not able to describe the ongoing dynamic configurations that emerge in social media, the arts, or in the start-up world, to name but a few contexts. In terms of higher education, learning in this kind of continuously shifting environment can only be done through immersion into an environment that is like the structure of a rhizome. In practice, this means learning-by-doing, learning-by-being-involved, learning-by-acting, and learning-by-living. In a parallel fashion, research through action is an engagement of a similar nature.

This kind of immersion has to be planned somewhat, as the very nature of the rhizomatic structure does not necessarily clarify what the relationships are and how they operate. As the rhizomatic structure is everywhere, networked, and “underground”, it is also at times invisible and not readily understandable. Operating in the rhizomatic structure is clearly a mapping exercise, where you draw the map as you go along. The map has a becoming nature, though it cannot be reused to make another trip, as the terrain will have changed by then. It can, however, be used to chart “how we got here.” This may be valuable in a reflective reframing exercise. It may also be useful for gaining an understanding of some generic steps to take when making sense of the process.

## **Conclusions**

This paper started by calling for a foundational base for learning in the area of DT. Through arguing that collaborative work, as a single common denominator within multiple understandings, is the central foundational element of DT, a starting point for theorizing was established. In terms of learning in higher education, collaborative work poses a problem for educators: Are we skilling people for instrumental tasks or are we enabling them to remove constraints that then create the freedom for individuals to develop their own paths? The socially built constraints have a major impact on the creation of human well-being today

and they will in the future, either positively or negatively, and thus it is argued that education that does not explicitly address this issue will not create the best possible value for participants in the future.

Engaging in DT is motivated by the desire to create new products, services, and businesses and thus human-friendly solutions that can enhance well-being. We aim to create new concepts that join experiences together and over time add value through addressing real needs and creating meaningful innovations. In this way, DT is firmly grounded on the idea of becoming, understood as the continuous process of living, learning, and change, instead of static being. The future-creation orientation is thus an element that needs to be configured into the learning processes and outcomes of design thinkers. The idea that there is never a static moment of being implies that learning never ends; it is constructed on a continuous basis. The idea of a constant process of making a difference is linked to this continuity; we can never really say “it is done,” as the difference created through becoming is not quantifiable as an absolute difference between two points but occurs within itself. Education itself becomes a continuous, future-driven activity, undermining the current batch-driven methods of delivering degrees.

The collaborative creation of new concepts implies dealing with active or reactive affects that the meeting and collision of things create. Understanding that collaboration itself influences the way in which the concepts are able to deal with the socially constructed constraints that inhabit the context of the concept can have a major bearing on the concept itself. Learning in the area of DT requires an understanding of how the collisions happen in the teams, how both active and reactive affects are built up, and how one can understand and manage (to the extent possible) the social constraints that exist in the context.

Finally, this paper asked what the ways and methods of spreading DT competence and practice are. The rhizome is an alternative perspective on how learning can be diffused within the DT context. The tree of knowledge is an outdated, even static structure, one that does not support continuous learning and becoming, nor does it enable the free-form joining of collaborative works from very distinct parties in an ID way. The rhizome is potentially everywhere, networked and underground, ready to emerge when opportunities call.

In other words, DT is a very human-built, heterodox construction, structured around the imperfection of human doing and becoming. To educate people in this implies that we must reconcile imperfection, experiences, and life itself in our educational approaches.

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