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A Case for Reimagining Reflection-in-Action and Co-evolution

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Abstract

This paper discusses core aspects of "Reflection-in-Action" found in the work of Schon and others suggesting that fundamentally an individual designer draws upon their previous pattern of experience and knowledge responding to complexity in a spontaneous tacit way. It is argued this has some limitations. Moreover, it is argued the nature of the limitations may be owed to the fact designers may limit the field of issues and indeed the dynamic interplay of the relationships both among and within issues and indeed contexts. Afterward, the paper draws upon the ideas of co-evolution found within Maher and Poon (1996) and Dorst & Cross (2001) suggesting the way the co-evolution model is often interpreted may also be somewhat limiting, as designers appear to "Muddle Through" a design problem co-evolving the problem and solution. Given these limitations, a reimagining of these models is presented. This paper supports the case that forestalling solution development in order to focus on developing a well-considered and comprehensively mapped Problem space first holds immense value for the creative design thinking process.

Keywords: design thinking; reflection-in-action; situatedness; co-evolution

Over a number of years literature in relation to design thinking and design thinking processes has been drawing upon the twin ideas *reflection-in-action* as in Schon (1983) and *Co-evolution of problem-solution*, as in Maher and Poon (1996) and Dorst and Cross (2001). It may be argued these core design thinking frameworks have been traveling tangent to each other. These models suggest that both perspectives have a close correlation with the occurrence of design creativity. Moreover, over the years these parallel models of how designers proceed through the design process have been empirically tested within various design Domains. While the core underlying principles resonating within both models of the design process have been tested and critically reviewed, limitations remain nonetheless.

The commonality rests in the fact that both models capture the idea that designers adapt and reshape the design problems and the design solutions. What is more they embrace the nexus between a problem space and a solution space. They fluctuate between solution development and changing how they perceive the problem and then back to solution development. This is done “on the fly”. It may be argued that this “on the fly” or “Muddle Through” approach to design, while workable, may not model how we may draw upon divergent perspectives, and indeed divergent contexts.

As the world gets increasingly complex bringing with it increasingly complex problems, the models found in the *reflection-in-action* model as in Schon 1983 and *Co-evolution of problem-solution*, model as in Maher and Poon (1996) and Dorst and Cross (2001) may no longer be sufficient. We may ask is there a model that advances the old models while remaining true to their core ideas and concepts.

In the subsequent sections this paper will discuss various aspects of the *reflection-in-action* model within the work of Schon highlighting some of the limitations and gaps. As the *Co-evolution of problem-solution*, model advanced our thinking beyond the *reflection-in-action* model the paper will turn its attention to various aspects of that model highlighting some of the limitations and gaps. Following on from that discussion a new fledging model is proposed. This model seeks to reimagine the two models in a new way. The model put forward endeavors to allow divergent perspectives, and indeed divergent contexts to help shape and detail a problem space prior to solution development. It is argued this serves to assist in the subsequent development of more, divergent, creative, and well considered solutions. In addition, a mapping tool is suggested that will allow a person to work through the new model.

Given the above discussion it make sense to now turn our attention to the “reflective/situated designer” and its associated implications for the design process.

On The Situated / Reflective Designer

A review of the often cited earlier work of Schon and the subsequent work of others [see: Schon (1983); Schon (1987); Schon (1992); Schon & Wiggins (1992); Gero & Kannengiesser (2008)] discusses the notion of the “reflective practitioner”. Principally the discussions embrace the idea of what has come to be called “Reflection-in-Action”. Fundamentally, as discussed in Schon (1983) an individual designer draws upon their previous pattern of experience and knowledge responding to complexity in a spontaneous way. More often than not this is tacit in nature. Designers often reframe the problem and propose a solution by Seeing – moving – Seeing again. At the core of Schon's two books (1983, 1987) he advances the position that these aspects of problem solving and indeed design are fundamental and important aspects in relation to how professionals use their knowledge. This form of knowledge, which Schon calls "knowing-in-action," is a form of practical knowledge that professionals hold about their professional work that cannot be

formally articulated. In a real sense, for Schon, professional knowledge is developed via action. Moreover, it is articulated within actions of the designer as they evolve their design solutions. The concept "reflection-in-action" refers to the active processes by which new knowing-in-action is developed.

If "reflection-in-action" informs how experience essentially guides a designer's solution development process, it then stands to reason that the problem solution relationship relies upon the interplay between what the designer "knows" [previous pattern of experience] and the design problem, along with the problem's associated issues. Thus suggesting the existence of an evolving problem solution interplay. In Schon's terms, the designer's action of seeing – moving – seeing evolves a design solution. They may use theory, but they have no direct interest in it. It may be argued Schon's approach separates practice from its analysis through theory. Thus principally defining what is problematic in terms of *problem formulation*. This is very much a version of problem solving using a variant of the scientific method. Essentially this may be considered a self-limiting positivist / reductionist approach. Indeed it may be argued, as in the work Clandinin and Connelly (1988), in essence Schon's conception of the practical contributes to the reductionism, and unquestionably to a bounded technical rationality. However, this is the very view that he argues against. The reflection that Schon calls to our attention is in the action, and *not* in preliminary or subsequent thinking about the action.

While Schon is not making the claim that reflection-in-action is a frequent event, he does argue that it is a process outside of our control: it is not the sort of thing one can switch on or off or indeed plan. This being the case it may be that relying on this process as one's fundamental design process is limiting. Moreover, when reviewing the work of Gero & Kannengiesser (2008) they argue the design process proceeds via a "reflective conversation with the materials of a design situation" in the development of a material solution. Moreover these solutions evolve through representations in the external world. These representations typically include iconic and symbolic representations of the design object, such as the drawings. The representations, the objects, and their associated relationships of a design proposal are constructed and reconstructed by the designer. It is important to note they are built up and constructed inside the designer based on their *personal* previous pattern of experience. It is argued here this has significant implications in that all aspects of the design depend on the unique experience of the individual designer and therefore may be conceived of as being limited.

When drawing upon Connelly and Clandinin (1986) and Clandinin and Connelly (1988), they highlight that both terms reflection-in-action and reflection-on-action "separates thinking during practice from thinking after or before" (Connelly and Clandinin 1986 p. 294), basically they are expressing concern that Schon's approach still separates practice from its analysis through theory, and that it defines what is problematic in terms of *problem formulation*. Fundamentally, it may be argued heavily relying on "reflection-in-action" may cause a problem with problem formulation.

If we pause to explore the nature of the limitations above, it may be owed to the fact the designers self-limit the field of issues and indeed the dynamic interplay of the relationships both among and within issues. Further, this limitation occurs both within and outside their individual domain of knowledge. Being situated/bounded within their own internal "design world" the designer evolves the design via dialogue with the external media [typically drawing and sketching] with the expectation of emergent design solutions and a changing "design situation". To illustrate this when referring to Figure 1 below, the planar Design Domain/Field represents possible knowledge or design issues which may be brought to bear on a design problem, and each little circle represents an individual "bit" of knowledge, the larger circle serves to represent the bounded field of knowledge of an individual designer. In addition this boundary represents their bounded rationality.

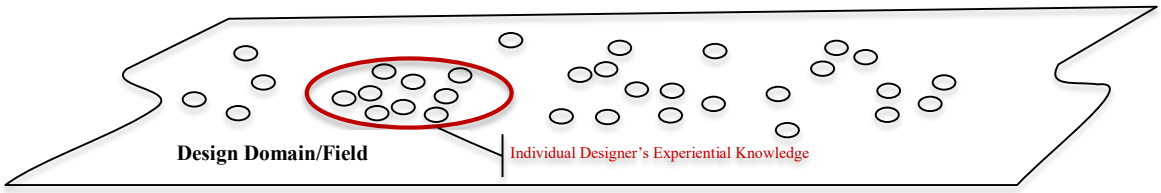

Figure 1: The Situated / Reflective Designer

As a simple example we will carry through this paper relates to the design of a coffee cup. In taking Schon's perspective, a designer will draw upon their experiential knowledge and begin to design the coffee cup being mindful of things like the aesthetics, materiality, form, color etc…. Thus evolving the design in their own way based on their reflections while they are "designing" and drawing the cup. Fundamentally, the discussions here have parallels with the work of Kopecka et.al. (2012) when they discuss "Designerly Ways of Muddling Through" a design problem. Fundamentally, their paper compares and contrasts Design Thinking processes and what they call "Incrementalism". They discuss how disjointed incrementalism and design facilitate change. However, it may be argued more often than not there is an exceedingly heavy focus on using a solution development design processes at the expense of including larger dynamically interrelated issues not typically found or considered within the design domain/field. Essentially this is a form of clustered "Disjointed Incrementalisms" that fails to consider the interplay between larger contextual issues outside a given domain of knowledge. Some simple examples they touch on relate to design in the relationship to environment, and design and relationship to policy decisions. These larger contexts are not realistically considered when a designer moves through their design process. In point of fact referencing Albrecht (1997), they draw our attention to a big picture issue/context touched on in 1971 by Charles Eames, a well-known American designer, who made the following remarks:

"We wanted a more efficient technology and we got pesticides in the soil. We wanted cars and television sets and appliances and each of us thought he was the only one wanting that. Our dreams have come true at the expense of Lake Michigan. That doesn't mean that the

dreams were all wrong. It means that there was an error somewhere in the wish and we have to fix it." (Albrecht, 1997, p.16)

Given the above, it was the products that designers have developed which impacted our environment in a negative way. Today, statements expressing the desire to fix this big picture/larger context issue are commonplace, and part of political agendas. The world and design problems within it are becoming increasingly complex. Further, the dynamically interrelated issues are also becoming increasingly complex. Consequently, as our problems are becoming increasingly complex it is important to consider the interplay between larger contextual issues outside any given domain of knowledge. The complexity of design problems can be quite extreme owed to a designers increasing need to cross various domains of knowledge and contexts.

In this modern age designers need to develop a capacity for, and strategy in, bringing to their design processes larger contextual issues. They should form part of our design development agendas, as well at the problem formulation phase, early in the design process. However, as discussed earlier designers often are bounded by and draw upon their limited experiential knowledge and personal rationality (context). Drawing upon Newell and Simon, (1972) the concept of bounded rationality holds that people are bounded and rational in their decision making. The boundaries lie in the limits of people's [in our case a designer's] analytical ability and the limits of knowledge. These limits notwithstanding, given the above, in a real sense it may be considered the designer *Co-evolves the problem space and solution space* based on their limited experiential knowledge. This begs the question how may we model/diagram a designerly process which may consider the interplay between larger complex contextual issues outside a given domain of knowledge. Given this notion of co-evolution it makes sense to turn our attention to literature surrounding co-evolution.

On Co-evolution

Given the above, when turning our attention to notions of co-evolution we may draw upon the seminal work of Maher and Poon (1996) and Dorst & Cross (2001). While much of the work of Schon discusses ideas of co-evolution, the work of Maher and Poon (1996) model the design process in a different way from the work of Schon. They are of the view Design is a process that develops or formulates a problem and ideas for a solution. Likewise, this happens in parallel to each other. Furthermore, the act of developing a solution is seen as inseparable from problem space development. In turning are attention to Figure 2 below Maher and Poon (1996) illustrate a dynamic interplay between an evolving Problem-Space and an evolving Solution-Space. Fundamentally, they see the design process moving from P(t) - initial problem space to developing an initial solution in the solution space with a focus and a check for fitness. Subsequently, the initial solution informs a new problem space in turn giving rise to P(t + 1) - partial structuring of problem space. Successively, this newly evolved problems space with its new parameters allows the designer to evolve a new solution until one fits and satisfies the reshaped problem space.

The discussion above is seen as a core process for co-evolution in design, and predominantly so when the solution does not address any key requirement/requirements. By changing or adapting the requirements and intentions, a satisfactory problem and solution pair could subsequently be produced via this design process model.

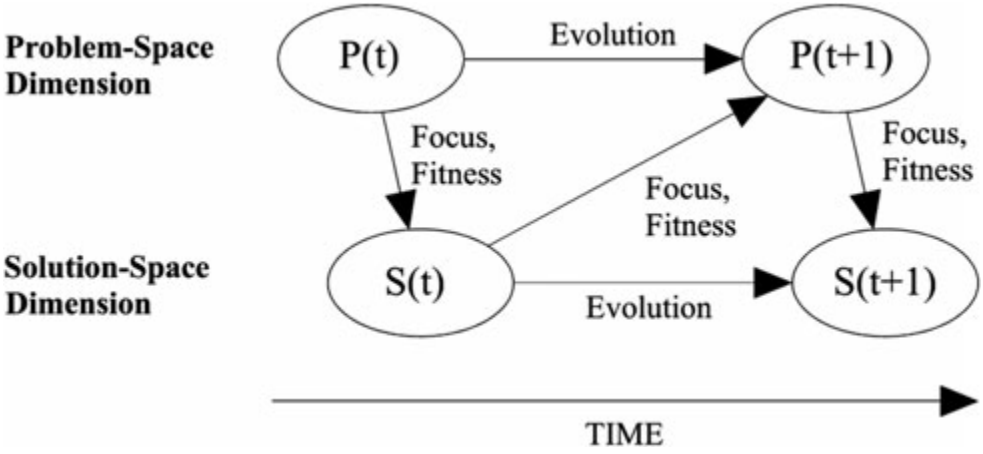

Figure 2: The coevolution model based on Maher and Poon (1996)

In advancing the work of Maher and Poon (1996) the work of Dorst & Cross (2001) proposed a refined version that serves to further illustrate the creative process taken more from a behavioral perspective. By using a protocol analysis methodology involving nine industrial designers, their model, as illustrated in Figure 3 below, indicates designers start from a design problem space P(t), subsequently developing a partially structured problem P(t +1). In turn this partially structured problem is then used to develop a partially structured solution space S(t+1) emerging from an initial solution S(t). As suggested in Maher and Tang (2003), this process is repeated throughout the design process. Furthermore, it should be noted the transition between design problem and solution occurs continually as cyclical iterations until a satisfactory solution emerges.

Within their experiments Dorst & Cross, (2001) observed the designers started by exploring the PS, and find, discover, or recognise a partial structure (P(t + 1)). To illustrate this when referring to Figure 3 below, the planar Design Domain/Field represents possible knowledge or design issues which may be brought to bear on a design problem, and each little circle, triangles, and diamonds represents an individual “bit” of knowledge which may be utilized in the design process. The partial structure (P(t + 1)) was subsequently used to provide the designer with a partial structuring of the SS – Solution space (S(t + 1)). Next, the designer considers the implications of the partial structure within the SS, using it to generate a few initial ideas for the form of a design concept, and so extend and develop the partial structuring (S(t + 2)). Some of this development of the partial structuring may be derived from references to earlier design projects. It should be noted this is not unlike how the designers discussed in Schon’s work draw upon their previous pattern of experience to evolve their designs. As a result, they transfer the developed partial solution structure back into the PS (P(t + 2)), and again consider implications and extend the structuring of the PS.

Moreover, while not being explicit there is an implicit opportunity for the designers to draw upon information from other domains of knowledge and other contexts. In returning to the coffee cup example, as the designer evolves the problem space, they may have noted a new context. Let us say the new context relates to having coffee while on a camping trip and there is little room in the backpack for a large cup. The designer may begin to design a collapsible or shrinkable coffee cup. While their goal is to create a matching problem–solution pair they are also enlarging their understanding of both the problem space and the solution space [triangles and diamonds serve to represent new information enlarging the context and understanding of both the problems space and solution space]. Dorst and Cross further argue that this coevolution process is vital to support the highest level of creative design (Cross & Cross, 1998; Dorst & Cross, 2001).

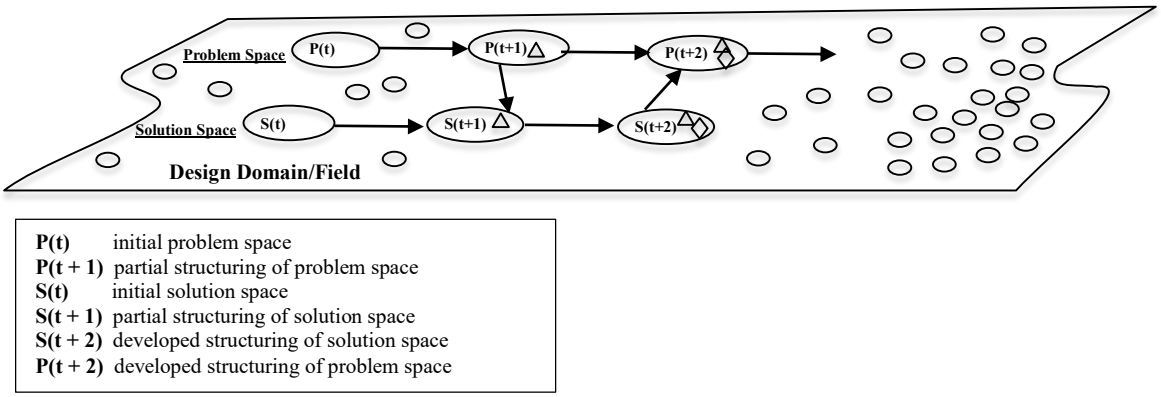

Figure 3: The Designer Co-evolving Problem-Solution Space

Notwithstanding the work of Yu et.al. (2015) that lends empirical support to the ideas of co-evolution and aspects of the ideas found in the various works of Schon, it should be noted that much of the literature surrounding both predominantly shows how designers operated mostly within their domains of knowledge in what may be considered very narrow contexts. This is true irrespective of the exemplars, be they from the domain of industrial design, as in Dorst &Cross (2001), or in Architecture as in Schon & Wiggins (1992) and Gero & Kannengiesser (2008). It may be argued in a real sense they remain committed to, and indeed mired in, their domain of knowledge, previous pattern of experience, and arguably limited context development. This begs the question how may we model the core ideas found both within the *"Reflection-in-Action"* literature and the *"Co-evolution"* literature. Moreover how may we do this in a new way that while being true to their core principles, allows for an enlargement of the design context by drawing upon other domains of knowledge, broadening the problem context, and draw upon additional dynamically interrelated issues typically thought to be outside the domain of Design. This notion of drawing upon a wider field of knowledge is discussed in the work of Wang & Ilhan (2009). At first blush the discussions found in the well-considered work of Wang & Ilhan (2009) appears to parallel the discussions here. However, the clear focus resonating through their paper related to aspects of "defining" a design profession and indeed whether design professions have and use discrete bodies of knowledge. Moreover, they are of the view the

problem in defining a design profession does not rest in isolating the content of what it knows, but rather in discerning what it does with any general knowledge (read wider body of knowledge) that assists in what they call creative acts, which serve to assist in a sociological process of defining itself to the larger culture. This notwithstanding, a core idea represented in their work is that "all knowledge" is contingently relevant for design practice. It is this aspect that has resonance here. Indeed the thematic issues touched upon in our subsequent discussions relate to the process of using the diverse knowledge bases drawn from diverse domains. It is in this sense this paper may be seen as supporting this idea raised in Wang & Ilhan (2009). We are not discussing the bounding of design domain specific knowledge, but the process of using and integrating, both design specific and non-design specific knowledge. In the subsequent section a preliminary model is proposed which reimagines Reflection-in-Action, Situatedness, and Co-Evolution.

Reimagining Reflection-in-Action, Situatedness, and Co-Evolution

If we are to reimagine and remodel how we may conceptualise, Reflection-in-Action, Situatedness, and Co-Evolution, it is argued we need to add another dimension to the diagrams typically found within the respective literature, and indeed as illustrated above. Firstly, it is noted most of the diagrams are basically two dimensional and planar in their representations. In a sense they are not unlike playing a game of chess which is a complex strategic game played on a planar surface where players move/positon and group their pieces in the plane. As indicated earlier the existing models focus on the designer drawing upon information flows within their domains of knowledge.

In both Figure 1, Figure 2, and Figure 3 above each planar Domain/Field predominantly relates to designers drawing upon various aspects of the design problem space typically found within that space or from the experiential knowledge of the designer. It is argued that other domains of knowledge may be represented in this manner as well, where we need only change the title on the planar surface. Returning to our chess metaphor, what if we were to add a third dimension to the game of chess with a series of clear chess boards spaced above the main base chess board. All at once the "game" becomes significantly more difficult and yet would bring to the game an opportunity for many new, rich, and diverse strategies to develop. Drawing inspiration from this metaphor, we may imagine the "base" plane of our model to be the Solution space as illustrated in Figure 4 below. After all, while it is not always the case, generally in the field of design the end/base objective is to have a creative "well considered" workable solution represented. As it is the Problem space that informs the Solution space, floating above the Solution space plane would be the Problem Space plane labeled Design Domain/Field as illustrated in Figure 4 below. Given the work of Wang & Ilhan (2009), one may ask should this plane be labeled the Design Domain/Field, as they argue, rightly so, that "all knowledge" is contingently relevant for design practice. It is argued the rationale for labeling this plane in this way clearly relates to a Design emphasis or raison d'être for design by offering a space for drawing together the knowledge and indeed

map the relationships between both design specific and non-design knowledge [note the interconnections indicated the Design Domain/Field plane in Figure 4 below]. Subsequently, stacked and spaced above the Problem Space would be the many other Domains/Fields of knowledge a designer or design team may draw upon.

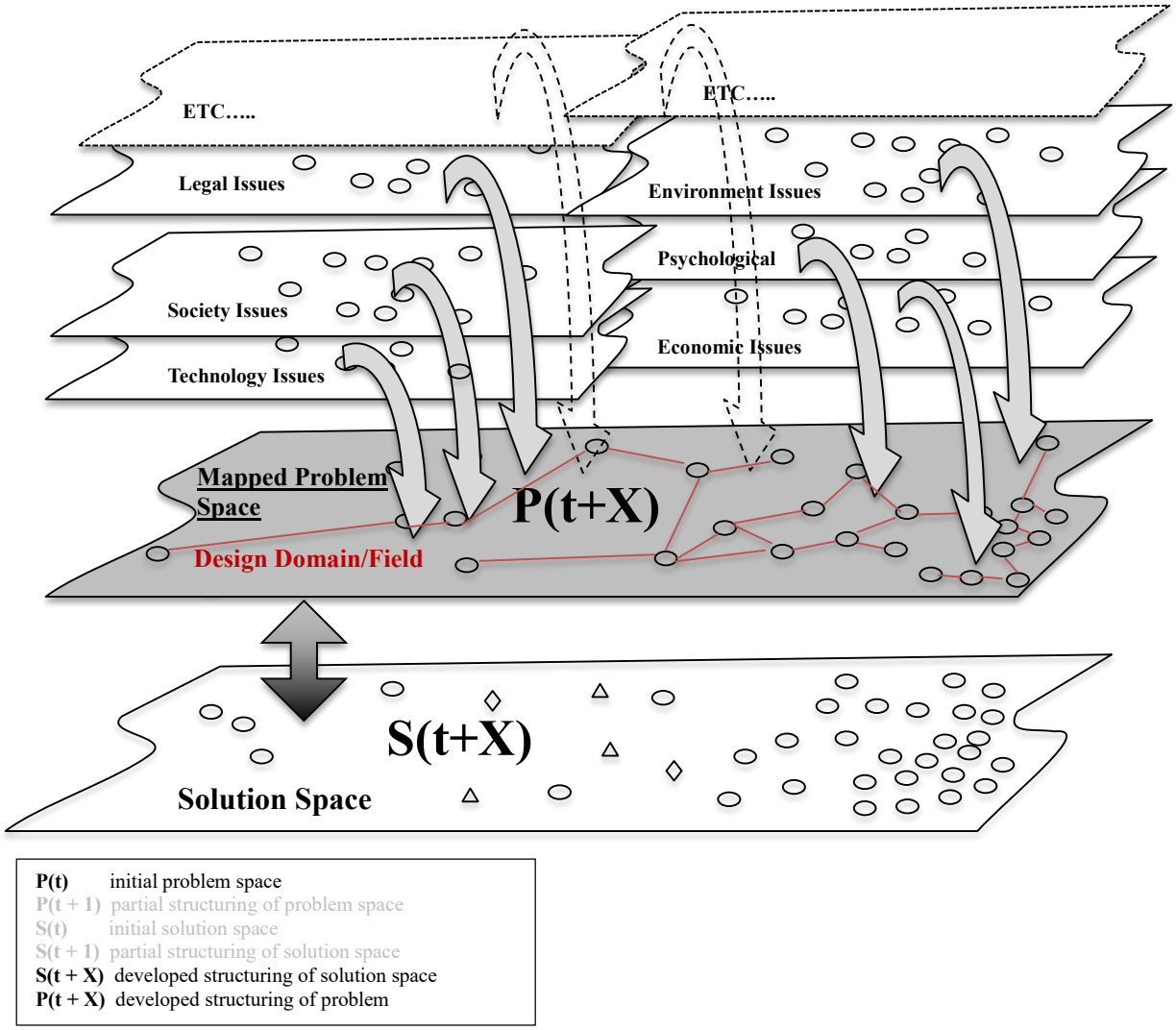

Figure 4: The Designer Co-evolving Problem-Solution Space

Given the structure outlined above let us now turn our attention to interpretation of the model. Firstly, a point of differentiation in this model, as opposed to the earlier ones, rests in the fact that it is recommended solution development is forestalled until later in the process. This is an important aspect as suggested in the work of Kokotovich (2002). It is argued that while moving between the problem space and solution space [represented by the double headed arrow] is important, it is recommended this activity be forestalled until a more fully developed problem space has emerged. This provides the opportunity for alternate interpretations, divergent contexts, and divergent issues to be drawn from other domains. Moreover, this allows for the opportunity for the emergence of divergent and well considered solution development. Consequently, it should be noted in Figure 4 above it is recommended

that as part of the process P(t + 1) partial structuring of problem space; S(t) initial solution space; S(t + 1) partial structuring of solution space are forestalled, and should be saved for the latter part of the process, once a more fully developed problem space is evident [note: these parts are in light gray above]. In support of this position, as highlighted in Kokotovich (2002), it is important to both separate ideas from the embodiment of ideas, and forestall the embodiment development. Moreover, as discussed in Kokotovich (2008) forestalling the embodiment of ideas in favor of problem analysis and a detailed exploration and mapping of the problem space in the early phases of the design process results in solutions that are both more creative and indeed more practical. Moreover, it is argued that when a broader range of design issues, divergent contexts are dynamically interrelated and ***mapped*** [as highlighted in figure 4 above], more creative and indeed practical solutions emerge.

Turning our attention back to Figure 4 above, it should be noted the two lower planes are also labeled Problem Space P(t+X) and Solution Space S(t+X). The supporting rationale for this is that once a larger and more fully developed problem space is evident, a larger and more fully developed solution space is possible with multiple opportunities presenting themselves. Consequently this model may be seen as less limiting than both the co-evolution model and the "Reflection-in-Action" model, where incremental solution development emerges based on incremental co-evolved problem development, and a limited previous pattern of experience that limits problem development. It is argued a more holistic understanding of the complex dynamic interrelated issues and context found in the problem space will emerge from this model.

Let us now turn our attention to the relationship between the various planes, represented in Figure 4 above. As in Figure 3, each little circle represents an individual "bit" of knowledge which may be utilised in the design process, irrespective of which domain of knowledge it came from. Each plane represents a different knowledge domain and indeed different contexts with associated issues which may be drawn upon and mapped into the problem space ***prior*** to solution development. Over time additional domains of knowledge may be layered on top of all the other knowledge domains. In revisiting our coffee cup example, if we draw down issues from other domains and begin to relate them to the initial coffee cup we may reconceptualise our understanding of the problem by examining issues such as environmental sustainability. When considering and mapping issues of Washing, Disposal, Reuse, clean drinking water, and the various environments of use, these are inevitably interrelated to many other issues drawn from both design specific and non-design knowledge. Given this we may begin to think about the problems less as designing a specific "cup" and explore the ideas relating to the safe consumption of liquid foods. Consequently, we may question do we really need to continue exploring ideas directly related to previous ideas or artifacts related to notions of "Cupness".

While the discussion above focused on the conceptualization of the Design problem space being above the solution space, it is not difficult to see how this design process problem-solving process model could be used with other domains of knowledge being the core focus.

In this model all one needs to do is alter the domain name of the problem space which rests above the solution space. For example, one could label the domain name above the solution space as a social/societal problem space or problem domain. Consequently, one could still keep the design domain field plane but just move it above the societal plane. In this way issues and contexts from the design domain of knowledge could be drawn upon and brought into framing and mapping a societal problem space. Equally, this would hold true if one were to rearrange the planes and have the environmental/sustainability plane forming the problem space with other domains of knowledge floating above it. Again in this way it is argued this design process problem-solving process model would have value for other domains. As advocated in Kopecka et.al. (2012) policymakers or politicians could gain value in developing a capacity using a design thinking methodology. It is not difficult to see how the model proposed here would assist them in this endeavor.

At first glance this reimagining may appear to run contrary to the ideas found within the Reflection-in-Action, Situatedness, and Co-Evolution. A closer analysis reveals the core elements remain, however, they are forestalled and operate between the lower two planes, *after* a more fully developed Problem space has emerged. Additionally, notions of evolving Situatedness remain and are indeed shaped throughout the new process model.

The move to Mapping

Given the new model described and illustrated above the question arises; how would a designer, or for that matter a non-designer, move forward their design process? Our suggestion would be to use Non-hierarchical mind-mapping as advocated in the work of Kokotovich (2008). In this empirical study strong evidence is presented. It builds the case that forestalling the embodiment of ideas in favor of focusing attention on developing a detailed problem analysis phase in the early part of the Design process is of immense benefit. The following findings of the study are listed below:

- The greater the number of quality design issues a designer develops, the greater the opportunity for the clear articulation of complex dynamic interrelationships between design issues in need of resolution. This has implications for the design process in that a detailed analysis and subsequent understanding of a design problem space offers greater opportunities for creative and considered design solutions.
- When using Non-hierarchical mind-mapping in problem formulation more highly rated proposals, which are determined as being creative, clearly reasoned, and validated tend to emerge.
- When a designer is capable of developing and clearly articulating design issues in need of resolution in the problem formulation stage, this is linked to their capacity to develop creative and well-considered design proposals/solutions.
- If a greater number of clearly articulated themes/issues are raised, in the early stages of the design process [problem formulation stage], the greater the probability the final design proposal will be determined as being creative.

- When designers are able to raise, consider and clearly articulate complex dynamic interrelationships between design issues, in the early stage of the design process [problem formulation stage], they are better prepared to present a highly regarded reasoned analysis of their final design proposal.

While an initial reaction to this reimagined model may appear contrary to typical design thinking, a closer analysis reveals it is not. As suggested in the work of Schon and other design literature, graphical languages become second nature to designers. Consequently, owing to the graphical nature of using non-hierarchical mind maps, the designer can comprehend the nature and structure of the problem/problems, more readily developing a holistic approach in solving design problems.

Moreover, it is argued using non-hierarchical mind maps with notations relating to the linkages reveals meaning in the often complex embedded relationships in the design problems diagrammed, thereby allowing the designer to see both the 'big picture' and the minute details. Consequently, more detailed and subtler relationships may be mapped over time. Therefore, the designer has the opportunity to make creative connections between disparate seemingly unconnected domains of knowledge. This is consistent with the intent of this reimagined model.

Conclusions

It should be noted while the discussion above does not argue the models of Reflection-in-Action and Co-evolution do not have value and utility, most decidedly they do. However, this paper sought to put forward a reimagined alternative which simultaneously encompasses the core aspects of those models while reimagining and moving forward a new model.

In order to highlight the differences between the three models discussed above in a simplistic manner, let us imagine a very simplistic design task of "designing a bouquet of flowers". Conceptually, when using the Reflection-in-Action model, one can imagine a designer being situated in or sitting in a field of flowers. As the designer is operating in the moment or being situated, they would draw upon what is immediately known to them, and pick only the flowers around them, as they are unaware of alternatives beyond their immediate reach and experiences. Alternatively, when adopting the co-evolution model, the designer can be conceived of as initially drawing upon what is immediately surrounding them, then skipping through the field evolving their design solution as they evolve both the problem space and the solution space. In the co-evolution model as the new experiences and knowledge come to hand both the problems and solution evolve together. In contrast the reimagined model suggested in this paper argues that prior to developing "the bouquet of flowers", one should rise above the field and map possible relationships and opportunities which may inform the design of the "the bouquet". Indeed, it may be further argued if the designer rises high enough they may be able to map and include possibilities, issues from contexts and domains beyond the immediate field and draw from another field as well.

While the Non-hierarchal mind-mapping tool suggested for use in the new model proposed had been empirically explored, the overall model has yet to be more fully developed. It is understood this is very much an untried model and the development and testing of this new model needs much work. A long journey begins with a first few steps. What has been put forward here as a discussion paper are those first few steps. The development of the model needs to be assessed first on criteria that range from trials within the design domain, then other domains may be trialed. It is not difficult to see how this may be both theoretically and empirically tested. The next step is to develop and test the core ideas/issues embedded in this basic model.

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