Design thinking to focus in achieving value in complex environments

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Abstract

The paper addresses the trend towards complex environments and ways to provide solutions that satisfy stakeholder value in such environments. The paper draws on observations of the trends now found in emerging methods in industry such as agile methods. The aim of the paper is to draw on these observations to develop a framework for methodologies to design systems in complex environments. The paper thus more poses a question rather than answer. It is how to address the emerging challenge of providing solutions in the increasingly complex environment. It particularly focuses on whether design thinking is that answer and if so how to apply it in practice. It describes design thinking and its differences from existing development methods. It particularly sees design thinking as a socially oriented process whose goal is to capture the values of stakeholders in any proposed solutions.

A second goal of the paper is to bring theory and practice together. The paper examines the practices emerging in industry in an attempt to ensure that any framework has a practical foundation and can be used to construct design processes. The paper then provides a framework for research questions that need to be addressed. It particularly focuses on the idea of business blocks to create conceptual models to be used in in conjunction with design thinking to create acceptable solutions.

Keywords: Collaboration, Complex systems, Design Thinking, Business Building Blocks

1. Introduction

This paper proposes a research framework to identify design methodologies for the emerging complex environments. The goal is to create ways to design systems that satisfy a variety of emerging stakeholder needs in such environments. The focus is on ways to foster agility needed to respond to change. Its focus is not on new designs but on ways to pout existing design assets to create new methodologies. The paper proposes design thinking as a way to

address complexity, using its social emphasis to capture stakeholder values in creating solutions.

Trends in Environment

The emerging environment is characterized by the emergent meta organization (Gulati, 2013), which are prone to unexpected, large-scale, seemingly uncontrollable behaviors. Meta organizations are seen as networks of firms that organize themselves to satisfy continually changing industry needs. Terms such as wicked systems (Head, 2013) are increasingly used to define the emerging environment as is the description of information systems as complex adaptive systems. The question addressed in this paper is what methodologies will emerge to address wicked problems and the research needed to identify the more effective methods. The paper argues that information system development needs a new approach to address increasing complexity. Information systems need to be designed more as complex adaptive systems rather than systems that realize prespecified goals through a reductionist approach. This evolution in design can be seen as natural from a trend that began with automating existing processes (often through structured systems analysis), through supporting well defined ways of new technologies (such as web based online sales) to the now emerging environment where there is a need to create systems that deal with unanticipated events. Some other criteria that emerge here are:

The focus should not be just IT but should focus on a holistic solution,
Satisfy a large number of stakeholders,
Not focus on the major stakeholder

Complexity

The paper focuses on design methods for the increasingly complex environments. The term complexity is now increasingly used to describe the emerging environment. Complexity is not seen here in its mathematical sense in its relevance to information systems (Merali, 2006). Complexity primarily arises from changes in social behavior and values; this particularly requires satisfying multiple goals, emergence of new problems and the need to continually reorganize to address these problems. Complex systems evolve from bottom-up rather than top-down, calling for rearrangement of responsibilities, and restructuring of relationships. One characteristic of this emergence is the emphasis on those methods that focus on the characteristics of the business environment and ways to address problems in the environment.

Trends in development methodologies

System development methodologies have emerged over many years. The predominant design approach has been an analytical approach characterized by what is often known as the waterfall cycle. In the waterfall method the product is delivered at the end of the project. Thus in the early 70s data base design addressed issues of data duplication through the emergence of relational systems. Then structured systems analysis and design became the driving force especially to address the issue of project overruns. The data flow diagrams that characterized these methods focused on precise definitions of workflows in organizations. The combination of design methods and process workflows became a strong combination to address issues of the time. The subsequent trend to object modeling then further cemented to combination of process and data into a unified concept. All of these assumed that requirements can be precisely specified.

Precise requirements specification is increasingly difficult to develop in the increasingly changing environment. Systems are now more dynamic, continually change and adapt to their environment and to other systems. In the waterfall method that characterizes development processes we define and deliver the whole system. In this case all the decisions and trade-offs are made at the beginning. In the agile alternative the system is developed as a set of releases starting with the minimal viable product (MVP). Here there is minimal change to set a direction and generate some early value. Then as we learn from each release we develop the next release. In agile development this happens throughout the process. A version of service is introduced; we learn from it and then make additional trade-off given a new set of choices to be made. This calls for new methodologies with increasing emphasis on what are called agile methods.

2. Agile Development in Practice

The focus on any implementation is on encouraging collaboration between all stakeholders involved in a system. A common way is to use post-it notes to paste comment on building blocks on a board. A board with post-it notes as shown in Figure 1 is commonly known as a canvas. The emphasis here is on experimentation through bringing the tacit knowledge of stakeholders to jointly propose mutually acceptable solutions. Face to face discussions often involve rearranging postit notes to create solutions. Methods used to do this are typically postit notes on visible boards where stakeholders can post and discuss ideas as they emerge. This is consistent with the complex adaptive systems. In summary the emphasis is on holistic approaches, including stories arise from different perspectives. In this case post-it notes can represent different domains.
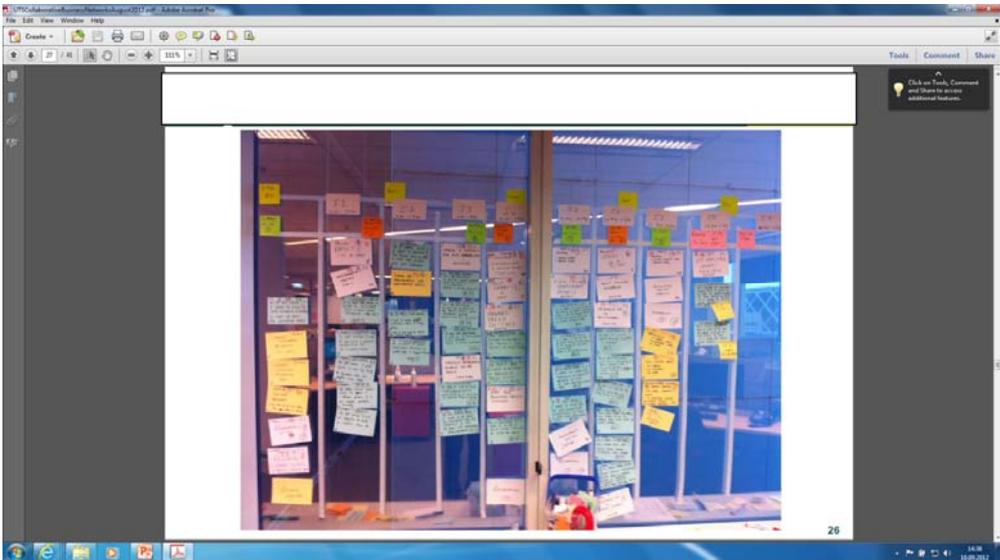

Figure 1 – A board with post-it notes as a canvas

Currently the processes in most environments are ad-hoc with stories emerging based on stakeholder's experiences and not in any formal way. The result can be that not all possibilities are examined given the lack of a framework on which questions can be based. Martin's design thinking provides a way to introduce these in a formal way.

Longer Terms - Government Industry

The method used in Figure is one where participants brainstorm in synchronous environments to post ideas as they emerge. In longer term relationships between forms in an organization it is not possible to sustain a continuous board or space for the posing of stories. Alternate processes are needed. One example is shown in Figure 2. It describes an innovation cycle found appropriate for innovation within a private public relationship.
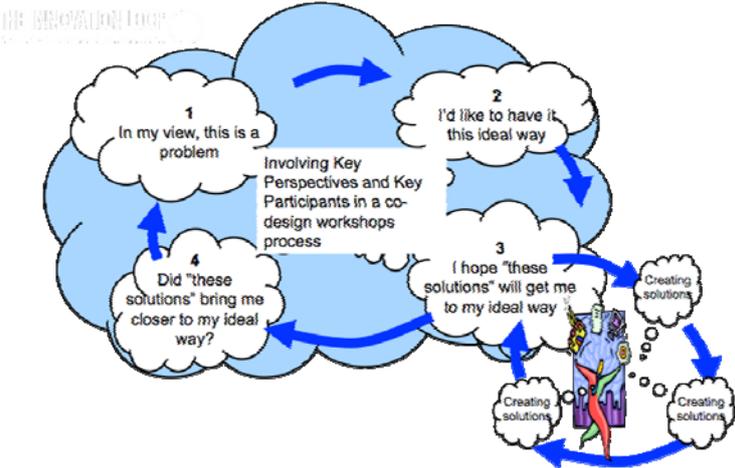

Figure 2 – Innovation Cycle (from Forsgren, 2014).

The process shown in Figure 2 is not the only one supporting design thinking in organizations. A similar report (Courage, 2013) describes CITRIX a cloud company adopting a design thinking culture. It stresses the importance of engagement across the enterprise and extending it across distance in global organizations. This itself raises research questions on ways to implement agile methodologies across distance.

Collaborative Teams

In a study conducted by AAIA in Australia to identifying innovative companies two leading companies identified were Atlassian and Google working with their Australian clients. The common characteristic of their processes was the emphasis of collaborative teams, working in collaborative environments primarily focusing on generating and analyzing ideas. In the case of Atlassian there were teams working in different geographic areas, namely, Vietnam, San Francisco and Sydney. (NOTE: A paper on this is being developed and there should be a reference at the time of the conference).

Summarizing the Practice

Emerging practices have number major characteristics, namely:

• There is continuous evolution and process and requirements emerge. Each step requires further ideas. Each new release calls for new ideas, possible new experimentation.

- Design is by stakeholders working together and multi-disciplinary in nature.
- New ideas emerge during the process from stakeholder inputs.
- Not all decisions are made at the start – they are continuous and evolving.
- There is a need to continually innovate to create better processes and products.

These characteristics are consistent with those found in design thinking, where we can use heuristics to facilitate the generation of ideas. These may arise as users discuss what they have learned from earlier steps and make suggestions on what to do at the next step. Design thinking addresses two important differences between solutions in complex environments and traditional methods are:

- The merging complex systems place greater emphasis on values perceived by stakeholders with explicit measures taking secondary importance to price. People may be prepared to pay more at a restaurant because they like the atmosphere.
- There is more emphasis on business model innovation rather than re-engineering.
- Design methods and solutions are interdisciplinary in nature and satisfy a number of stakeholders.

This is consistent with design thinking, as illustrated by the bold components in Figure 3. It emphasizes visualization as is the case with perspectives in design thinking and experimentation in testing and learning. The perspectives and heuristics are also consistent with the ideation and other steps in the process shown in Figure 3. What we now need are the concepts to develop the model of any proposed system.

3. Matching the Trends to Methodologies

The business and social environment is the platform for research in information systems. This is in no way new; in the course of science as for example in medicine methods focus on the characteristics of the human body and ways to improve its performance. The human body is the research platform here. There is the emphasis on bridging the gap between practice and theory – for example smoking can cause cancer; the research then focuses on ways to eliminate smoking or treat its after effects. Again research addresses the gap between theory and practice. Research has usually followed to perfect the methods, with alternatives such as action research and more recently design science.

The same argument can be made to propose the work and social environment as the target body of knowledge for Information Systems. Consistent with this we draw on observations of trends in practice and propose design thinking as an emerging methodology that can address problems in complex systems. The methods proposed are combinations of existing design methods in innovative ways. Our focus is on design thinking, agility and business building blocks.

4. Design Thinking – what is it?

Design thinking is here seen as providing the way to create solutions in complex environments. Complexity is in most cases the result of changing social behavior and vales. There is thus a match as design thinking is fundamentally a social process. Design thinking has been defined earlier; its principles are shown in Figure 3. The major idea (Beckman,

2007) is that design thinking when compared to other methods focuses on a detailed analysis of existing systems. It goes beyond system interfaces and interoperability and looks into the details of system operation. It begins with what some people define as a divergence by capturing detail through observations and points of view of stakeholders as shown in bottom left quadrant in Figure 3. These are captured as stories, which indicate stakeholder values. These stories are then combined to create innovative solutions that meet stakeholder values. Ultimately they converge to solutions through an ideation process where stakeholders collaborate to create solutions that realize value for them.

Design thinking as suggested by Martin (2009) includes guidelines and suggestions for communication by encouraging visualizations and metaphors that foster communication between interdisciplinary groups. Metaphors are used here to guide solution formation as for example (Yoo, 2013) where the emphasis is on knowledge flows, social structures or business activities. Metaphors should be general to support an interdisciplinary environment. The solutions are then put into practice and tested.
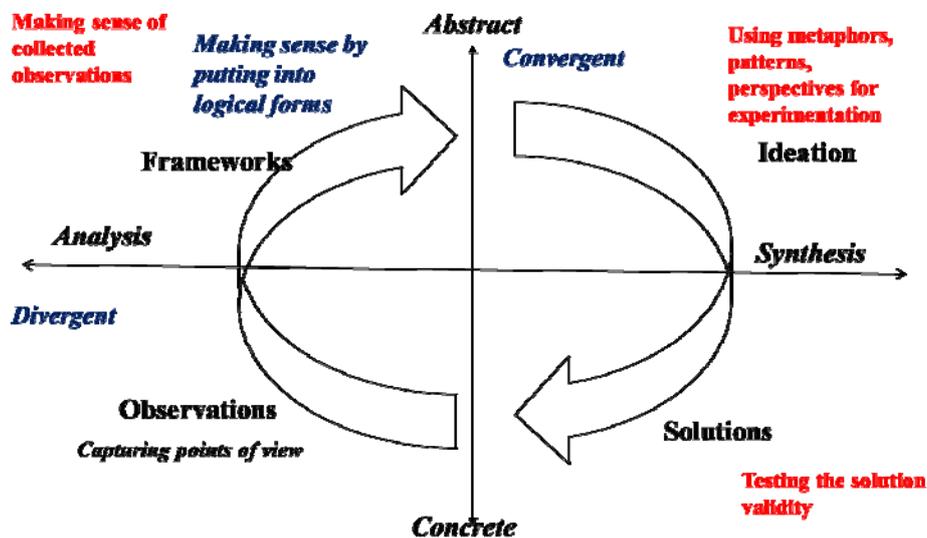

Figure 3 – Design Thinking – The Basic Principle

Compared to system thinking, design thinking focuses on in depth relationships to identify solutions that may not be apparent when looking at interfaces between systems. The differences of design thinking from system thinking are illustrated in Figure 4. Here on the left a new system results in new interfaces between existing systems. In design thinking the existing systems are examined in detail (divergence) and parts may be recombined to create new systems. The divergence is through stories captured in complex environments and solutions created by recombining them in innovative ways.
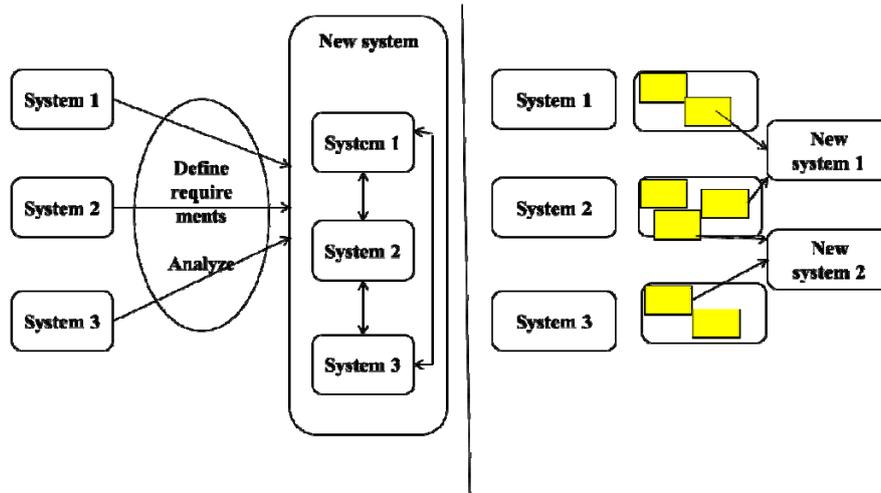
Figure 4 – Difference from system thinking

Design thinking also emphasises collaboration and interdisciplinary solutions by ideation through perspectives and metaphors. Describe how this can address challenges. Table 1 indicates the advantages provided through design thinking to look at the detail of operations that address the challenges such as removing silo cultures, forming relationships, smart services, supply chains or process innovation. Important characteristics of design thinking are that:

- All stakeholders are involved at each stage, and

- Design thinking is a continuous process, not just one off. Often a design process is followed to release a new system we learn from it and then continue with the next release.

- Visualization is deemed important as a communication tool in generating alternative solutions.

The heuristics here are unspecified and need to match the problem at hand. This is the equivalent of notes posted on post-it boards but now a formal way can be introduced through suggestions of the heuristics used to reveal the mystery. These can be metaphors, questions to ask or perspectives and models such as business building blocks as models. One example of using perspectives as an approach (Yoo, et.al.) focused on knowledge, social structure, organization and business process in a government setting.

Tools and Processes

An important part of designing thinking process is the canvas and presentations or visualizations to foster experimentation and collaboration. All the information collected is presented on a canvas. The canvas is a presentation of the current state of thinking about the problem, people's points of view, suggested solutions and comments on these. The important factor is that to reach a holistic solution requires collaboration and a continuous evolution on the canvas on the current state of thought.

The most popular process that combines agility and innovation is the Stanford process shown in Figure 5. It stresses a collaborative approach to design (Hung, 2013) that places considerable importance on engaging people to work directly to resolve problems in their context. Its goal is to encourage research experimentation both in technical support as well as business models. It goes beyond open systems methodologies as it emphasizes collaboration of multi-functional teams and support for such collaboration. The major emphasis here is to start by defining stakeholder values, their points of view and use this to create solutions that satisfy all stakeholders.
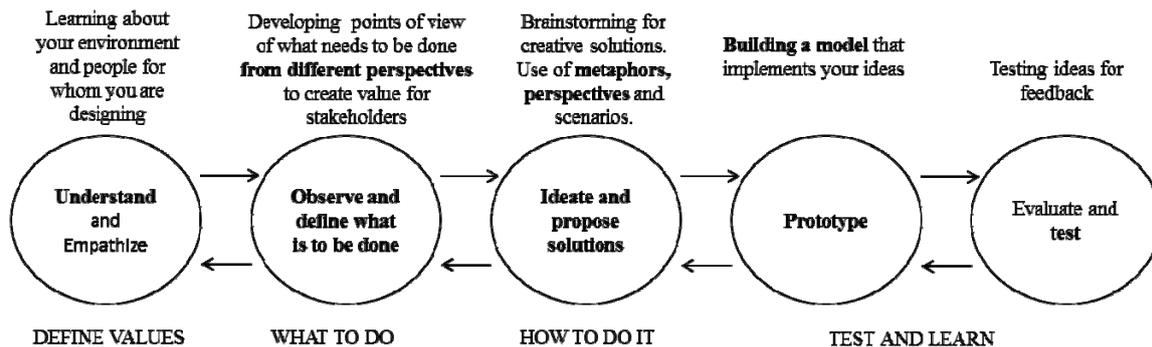

Figure 5 – Activities in Design Thinking

This particularly provides ways and techniques to be used to elicit detailed information about existing systems and stakeholder values and points of view.

5. Research Questions

The paper sees design thinking as an emerging practice in information systems design. The research is on ways to combine design thinking with other design assets that encourage agility and experimentation in the information systems design domain (Hawryszkiewycz, 2014). There have been a number of successful implementations but it is not clear what criteria are to be used to identify whether design thinking is appropriate for a particular problem and how to use it. There are still many unanswered questions on how to get the best outcomes from design thinking. Does it matter if the issue is one of a high level issue – for example business strategy – or one of more implementation such a creating a new service. Is it better if the activities are all face to face or is innovation across distance possible? Does this depend on the type of issue under design? Is it to be top-down or bottom-up in nature.

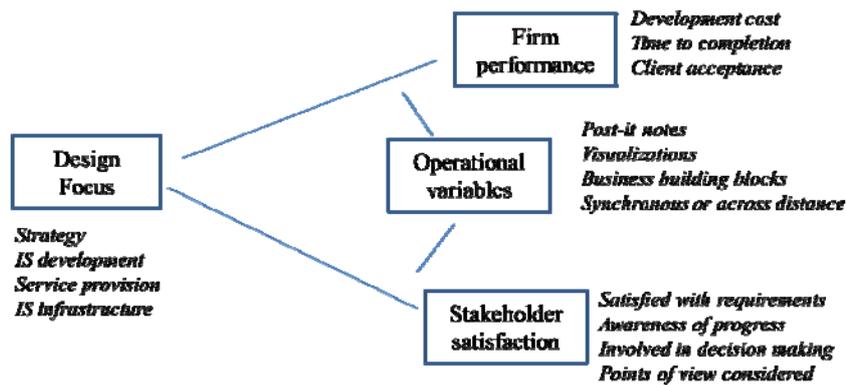Figure 6 shows a framework for identifying research questions.

Figure 6 – A Framework for Research questions

The research framework has two components – implementation methods and tools.

Tools - Business Building Blocks as a Visualization

Our research has focused on combining design thinking with building blocks. Their important goal is the collection and management of stories in a large business which can become virtually impossible unless there is an organized way of doing so. Communication becomes difficult without some facilitation for organizing stories and seeing relationships between them. One emerging idea here has been business building blocks (Osterwalder, 2010). Here stories are collected in different building and put together into solutions. Thus even in canvases like the postit notes in Figure 4 different postit note colors identify stories that belong to a particular building block. This paper suggests an innovation where building blocks are used with design thinking. It adds a question - does the idea of building blocks provide a basis for a more organized approach to design thinking? Different methods are used to identify building blocks – either by the location on the board or by different colors used for each building block.   The important requirement of an implementation is a canvas, or design space, to record discussions, ideas and people's comments on them. The research method can then be design science.

One research question here is how to choose building blocks. Should one just focus on using a standard set or is customization needed? Secondly is one business building block canvas enough or do we organize the building blocks by function or level as for example in Figure 7.
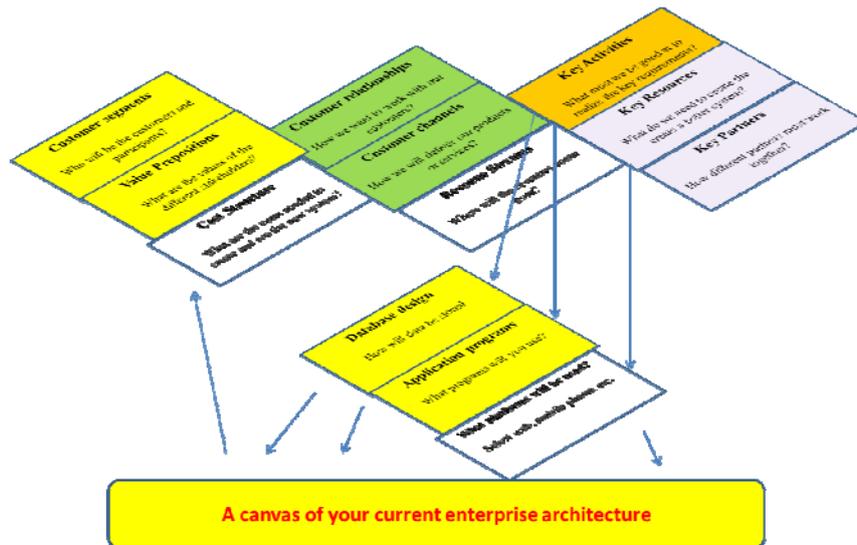
Figure 7 – Extending beyond the business model

How are building blocks used in complex environments? One possibility is that emergence is modeled through new stories in building blocks. These have to be traced to changes in the system implementation. Do building blocks provide a conceptual model? How to choose building blocks?

Implementation methods

Research on implementation focuses on how the idea of design thinking is introduced into organization and how is it implemented. The measures here become stakeholder satisfaction, and firm performance.

Then there are the details of the implementation. There are a lot of questions here. Is it to be synchronous or non-synchronous? How difficult is it to implement across distance? What visualizations are needed to facilitate ideation??

What is the research method?

Herterich and others (2014) summarize the main differences between design thinking as:

• Design thinking provides methods for design whereas design science does not, and

• Design science focuses on predefined goals whereas in design thinking requirements emerge

The claim here is that design thinking has a better approach to application to service design, where the propensity is for services to emerge. It can of course be argued that the design science and design thinking are at opposite ends of the research-practice spectrum; the former focuses on research the latter on practice.

6. Summary and future work

The paper addressed ways to create design methodologies for the emerging complex environment. The focus is on ways to combine existing methods together in innovative ways that address complexity. It used observations of current industry practice to identify a framework and proposed that design thinking integrated into agile development processes provides a framework. It further suggested that design thinking combined with building blocks to develop business models in emerging complex environments.

One important extension is to organize building blocks for large scale problems. Often more than one canvas is needed in the increasingly complex environment characterized by a larger meta organization (Gulati, 2013) where each firm must interact with other firms in that meta organization. The paper proposed that design thinking can address such environments and outlined a research strategy to identify ways to use design thinking and whether it provides advantages in design methodologies. It particularly focused on whether using business building blocks provides such advantages.

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