

# **SYSTEMS & DESIGN THINKING: A CONCEPTUAL FRAMEWORK FOR THEIR INTEGRATION**

**John Pourdehnad, PhD, University of Pennsylvania**

**Erica R. Wexler, MSOD, University of Pennsylvania**

**Dennis V. Wilson, University of Pennsylvania**

## **Abstract**

This paper explores the relationship between Systems and Design Thinking. It specifically looks into the role of Design in Systems Thinking and how looking at the world through a systems lens influences Design. Our intention is to show the critical concepts developed in the Systems and Design Thinking fields, their underlying assumptions, and the ways in which they can be integrated as a cohesive conceptual framework.

While there are many important distinctions that must be considered to understand the similarities and differences of these concepts, gaining a complete understanding of these factors is more than can be covered in this paper. Nevertheless, the most critical classifying variable used to distinguish these concepts will be discussed in order to make their integration possible.

This variable, the recognition of purposeful behavior, will be used to develop a conceptual vision for how a combined approach can be used to research, plan, design and manage social systems...Systems in which people play the principle role.

**Keywords:** Analysis, Design Thinking, Integrative Thinking, Problem Solving, Synthesis, Systems Thinking

## **Relevance to Design Practice**

How well we deal with emergent problematic conditions depends on the quality of the approaches we use and try to implement. These approaches depend more on our philosophy and "world view" than on science and technology. Design practices will benefit from consciously integrating the System's world view into its methodology.

## **Introduction: Context, Systems World View and Design Thinking Defined**

World views integrate experience and influence the way we frame and approach problems. A world view (also known as a mindset, mental model, or paradigm) controls what questions we ask and what answers we consider legitimate. The demand to change the prevailing world view of any situation arises when we are unable to fit the facts, assumed problems or observations into the existing paradigm. Any of these anomalies can create a dilemma. Russell L. Ackoff (1981) defined a dilemma as "a problem, which

## **Systems & Design Thinking: A Conceptual Framework for Their Integration**

cannot be solved within the current world view." A set of dilemmas generates new approaches to thinking about them. The anomalies are worked on and studied, and some are eventually addressed as a new and different paradigm emerges. Ackoff went on to note that a change in paradigm is underway in our society and has been set in motion by a set of dilemmas.

This sentiment has recently been echoed by many systems and design thinkers faced with the complexity of today's business challenges. During the Creative Industries Convention 2010, designers identified the growing interest in developing new business models that can help them work in different ways. While it was acknowledged that there is some fear in the pending paradigm shift, it is becoming clear to designers that change toward a collaborative way of approaching problems is imperative.

The need for change in paradigm is further emphasized by the use of Einstein's famous quote that says: "Problems cannot be solved by the same level of thinking that created them." Much of the confusion we encounter in problem solving today results from misconceptions about the nature of change in social systems and their environments. Moreover, it has become evident that traditional organizational forms, planning methodologies and response strategies are inadequate for addressing complex problems. This is especially true when applied to emerging conditions having an increased rate of change, increased complexity and increased uncertainty. This inadequacy, in large part, stems from the nature of the traditional paradigm which relies on existing knowledge -- knowledge gained by studying traditional approaches.

Gareth Morgan (2006) posits that metaphors play an important role in understanding organizations and management. The use of metaphor implies a way of thinking and a way of seeing that pervade how we understand our world generally. The resulting mindsets that develop are the products of historical circumstances. Currently, most of the metaphors used to describe organizations and their complex problems are derived from the "machine" age and the mechanistic world view.

The world views that we develop and the metaphors that we use to describe what we see directly influence the underlying assumptions we make about the situation we are looking at, and therefore, the approach we take. Since our understanding of organizations is informed by looking at organizations through multiple metaphors or images, it is important to approach problems from more than one framework.

This paper, among other things, will explore two of the possible frameworks that are used to approach problems: a Systems Thinking approach and a Design Thinking approach. Systems Thinkers look to formulate and subsequently dissolve complex problems from a systemic world view, while Design Thinkers approach the same complex problems from a variety of perspectives. Consciously selecting a conceptual model that combines the differing Systems and Design approaches to problem resolution will increase the probability of successful and sustainable implementation.

### **Systems Thinking World View**

"Systems thinking" or the "systems view of the world" is evolving as an alternative to the old paradigms. (Flood and Jackson, 1991). Mattesich (1982) writes that "systems

## Systems & Design Thinking: A Conceptual Framework for Their Integration

thinking is first and foremost a point of view and a methodology arising out of this view point." It is a lens through which you can look at the world and that lens determines what you see. Also, it often determines what you do about what you see.

Systems thinking as a mindset evolved from General Systems Theory, with the work of Austrian biologist Karl Ludwig von Bertalanffy in 1937. Systems Thinking has been adapted by many circles since WWII. In its current manifestation, it is used to provide a different perspective to understand the world (including organizations) and our conception of its nature.

Systems thinking **replaces** reductionism (the belief that everything can be reduced to individual parts), cause and effect (environment free theory of explanation), and determinism (fatalism) **with** expansionism (the system can always be a sub-system of some larger system), producer-product (environment-full theory of explanation) and indeterminism (probabilistic thinking). Additionally, it replaces analysis (gain knowledge the system by understanding its parts) with synthesis (explaining the role of the system in the larger system of which it is a part). Analysis is useful for revealing *how* a system works but synthesis reveals *why* a system works the way it does. (Ackoff, 1999)

Many methodologies are derived from the systems thinking world view including interactive planning, soft systems thinking, systems dynamics, and the viable model to name a few. Regardless of methodology, the essence of systems thinking is encapsulated in the concept of systemic wholeness, which is grasped by looking at the whole instead of the parts. As a result, when an organization is considered a system, it implies an interconnected complex of functionally related components. Failing to consider the systemic properties as derived from the interaction of the parts leads to sub-optimization of the performance of the whole.

One of the consequences of Systems Thinking is the willingness to sacrifice the performance of the part for the performance of the whole. This is in opposition to maximizing the performance of any one given part at the risk of sub-optimizing the performance of the whole. With systems thinking, managers and designers must learn how the parts of their organization interact, not how they perform independently. Otherwise, unintended consequences may emerge as changes made within one part of the system may adversely affect other parts of the system not initially considered. Often, these new problems are much worse than those addressed initially. It is for this reason that Ackoff (1999) suggests many performance-improvement initiative fail and actually throw fuel on the fires they seek to extinguish.

### Design Thinking Defined

In recent years and independent of the systems thinking movement, there has been a great interest in "Design Thinking." But design in management is not something new. Design philosophy in management has its roots in Egyptian and Mesopotamian bureaucracies. Even Taylorism was considered a new design philosophy in the early 20th century! However, it is important to note that design thinking does not adhere to a specific worldview. This is a significant difference from systems thinking.

## Systems & Design Thinking: A Conceptual Framework for Their Integration

Currently, there are many contrasting and even widely divergent concepts of the design process and what makes someone a designer. Additionally, there are many organizations that are cited as examples of companies promoting a Design Thinking culture (e.g., P&G). What does this mean?

Buckminster Fuller, in his introduction to a book written by Victor Papanek (1971) says that design for him can mean either a mental conception or a physical pattern. The essence of design for him is the notion of a pattern of events organized into discrete and interacting elements. For him, "the opposite of design is chaos." The ubiquity of the design process and the variety of criteria used in its actualization is described by Papanek, who on "what is design" writes:

"All men are designers. All that we do, almost all the time, is design, for design is basic to all human activity. The planning and patterning of any act towards a desired, foreseeable end constitutes the design process. Any attempt to separate design, to make it a thing-by-itself, works counter to the inherent value of design as the primary underlying matrix of life. . . . Design is the conscious effort to impose meaningful order."

To illustrate, however, that the general design function does have some structure, Papanek further asserts that the general design function must incorporate considerations of: Methods (tools, processes); Use (does it work?); Need (real vs. evanescent requirements); Telesis (reflection of the times and conditions surrounding the project); Association (psychological connections with aspects of the project); and Aesthetics (shaping colors, textures, etc. into pleasing forms).

According to Nigel Cross (2006), designers have specific abilities to "produce novel unexpected solutions, tolerate uncertainty, work with incomplete information, apply imagination and forethought to practical problems and use drawings and other modeling media as means of problem solving." He further argues that designers must be able to resolve ill-defined problems, adopt solution-focusing strategies, employ abductive/productive/appositional thinking and use non-verbal, graphic and spatial modeling media."

Architects are examples of designers who operate from this mode of thinking. Bryan Lawson (2004) has conducted research which shows that when the same problem is given to architects and Ph.D.s, architects develop the best solution in no time. Boland and Collopy (2004) experienced more or less the same thing. When working with architects they noticed that these "design thinkers" do not adhere to the traditional model of decision making/problem solving. Instead of developing options and evaluating the alternative options, they design the best option from the start!

The term *Design Thinking*, as recently defined by one of its proponents, is now generally referred to as applying a designer's sensibility and methods to problem solving, NO MATTER WHAT THE PROBLEM IS. Tim Brown (2009) explains that it is not a substitute for professional design or the art and craft of designing, but rather "a methodology for innovation and enablement." There are many who argue that Design Thinking is the third culture (area) in education besides science and humanities (arts). (Nigel Cross, 2006) It seems that lately some in the management sciences think that there is a lot to be learned from the way that designers think (including the abductive

## Systems & Design Thinking: A Conceptual Framework for Their Integration

logic) and the way they "know" that could help us with innovative solutions (compared to the role of research in science).

Jonathan Baron (2008) says that "thinking is important to all of us in our daily lives. The way we think affects the way we plan our lives, the personal goals we choose, and the decisions we make." We've already mentioned how at one end of spectrum you have analytical thinkers who hone and refine their existing models even as they get less and less valid. At the other extreme are intuitive thinkers who say it's all gut and deny they are using any logic at all. Einstein stated that "The workings of intuition transcend those of the intellect, and as is well known, innovation is often a triumph of intuition over logic." (Holton, 1997)

Charles Sanders Peirce (Hawthorne, 1958) was most interested in the origin of new ideas. It was this interest in new ideas that ultimately led him to argue that no new ideas could ever be proven via the application of Deductive or Inductive reasoning and that it required what he called a "logical leap of the mind." He further argued that when new data exists, and that data does not neatly fit into a currently understood model, the first activity to be performed by the mind is to wonder. Wondering, as opposed to observing, is the key to Abductive reasoning. It is the act of creatively thinking about what can be done with the data in order to orient it to the environment that sets Abductive reasoning apart from Deductive or Intuitive reasoning. Since the data is new, there is no method of reliably determining the appropriate method of dealing with the data; therefore, a practitioner must rely on, as stated earlier, a "logical leap of the mind" to make sense of the new data.

In a recent interview, Roger Martin (2009) was asked "What do you mean by the term *design thinking*?" He responded that "design thinkers are willing to use all three kinds of logic to understand their world." We infer this to mean that he was referring to deductive, inductive and abductive thinking. Martin says that Design Thinking is the only mode of thought that will allow an organization to move knowledge through the Knowledge Funnel, the path taken when an organization travels from mystery to a heuristic of its business environment, and finally to a reliable algorithm for its behavior within that environment. Further, Martin says that it is the interplay between these two extremes of the exploration of a mystery and the exploitation of an algorithm where Design Thinking emerges.

Martin to greater extent explains that neither Analytic nor Intuitive Thinking alone is enough to sustain competitive advantage since each, while providing tremendous strength, also create scenarios of systemic weakness if applied in isolation. He also makes clear that the goal of abductive reasoning is not to declare a conclusion to be true or false. Instead, it is to posit what could **possibly** be true. And so it is theorized that design thinkers are using abductive logic but failing to make it explicit to themselves or anyone else. It is this mode of thinking that allows a designer to seek out new ways of doing things, challenge old ways of doing things and infer what might be possible. It is the careful, balanced application of the reliable lessons of the past and the logically valid leaps of what might be in the future.

## **Systems & Design Thinking: A Conceptual Framework for Their Integration**

The design thinker bridges these two worlds, and works to make the abductive logic which design thinkers use more explicit so that it can be shared and refined. Fred Collopy (2009) recently wrote in *Fast Company*:

So if thinking is at the center of the activity that we want to encourage, it is not the kind of thinking that doctors and lawyers, professors and business people already do. It is not a feet up, data spread across the desk to be absorbed kind of thinking. It is a pencil in hand, scribbling on the board sort of thinking.

And while that may be obvious to those close to the process already, we are afraid it is not what folks conjure up when they first hear the phrase *design thinking*. From this perspective, then, it is ultimately the Design Thinker's responsibility to know which method to apply and when. However, it has been pointed out by many current practitioners, including Roger Martin, that there is little or no formal training provided in our institutions for executives or management in the creative design process.

The appeal of Design Thinking lies in its human-centered heuristics and growing track record of success. Numerous examples of these successes can be cited, such as IDEO (a design company in California that has designed many successful products). As more is written about the application of design thinking in the business world, what is becoming clearer is that it is most commonly applied to product-oriented problems despite its clear value to the design of innovative services, systems and processes. While successful applications do exist in this area, they are less commonly highlighted.

Language matters. We cannot help thinking that we are selling our ideas short given the momentum behind the current choice of language. And, we wonder, how much designing and/or thinking has actually gone into DESIGN THINKING? While the strengths of taking a design approach are seen in the successful outcomes, the term *design thinking* is becoming so common that this approach is facing the risk of becoming yet another meaningless fashionable term without true business value.

### **The Role that Design Plays in Systems Thinking**

Design in Systems Thinking is not the same as design in Design Thinking. We acknowledge that there are many divergent views on design within the systems process; however, there is agreement upon a number of underlying principles that systems thinkers take when planning toward a desired future. While a full explanation of these principles goes beyond the scope of this paper, systems thinkers, generally, aim to do something today to improve the system tomorrow.

In systems thinking, design (based on Aristotelian/Singerian teleological imagery) is a core concept that is characterized as "a creative act which attempts to estimate how alternative sets of behavior patterns would serve specified sets of goals." In the Systems community, Design became the preferred approach to problem solving and planning for a variety of reasons: the belief in the synthetic mode of thought; the belief that the future is subject to creation (design being the creative process); the belief that you need to dissolve problems (and not solve) through redesign of the system; etc.

## **Systems & Design Thinking: A Conceptual Framework for Their Integration**

Van Gigh (1978) and Warfield (1983) argue that "design" is to the systems approach as "continuous improvement" is to the scientific approach. They point out that design is a process, which requires the ability to question prior or existing assumptions regarding the ultimate state to be achieved. We think this raises a question as to who the designer is and whether he or she is a specific breed with superior cognitive capabilities.

To understand the role of Design in Systems Thinking, it is helpful to look at Ackoff's (1981) view on planning. Ackoff describes four orientations to planning: Reactivism, Inactivism, Preactivism and Interactivism. *Reactivists* are those planners who embrace the past. *Inactivists* are those planners who are generally satisfied with the way things are in the present and seek to avoid making mistakes within the current system; they seek to avoid errors of *commission*. *Preactivist* planners are unsatisfied with the past as well as the current environment and seek change. The Preactivist planner seeks to understand all aspects of the future that may affect the success of the phenomenon they are planning for; they seek to avoid errors of *omission*. Professional planners forecast the future and organizational officers set objectives based on the planners' predictions. Finally, *Interactive* planners believe the future is subject to creation. They believe the best means of revealing a desirable future is by enabling the stakeholders to do it themselves.

Not surprisingly, the Ackoffian systems thinker embraces the *Interactive Planning* perspective. The Interactive Planner believes our failures are *often due* to misguided assumptions made when planning for how our future *ought* to be. They believe knowledge of the past does not enable the ability to solve complex problems and they seek to avoid both errors of commission as well as omission.

Given Papenak's (1979) view that "design is basic to all human activity" and Ackoff's view that the future is subject to creation, Interactive Planning is Design. It is Interactive Design...more specifically, it is the execution of Design Thinking with a Systems worldview.

### **On Designing, With and Without the Systems World View**

Bausch (2002) says that:

Design literacy is the crying need of our age. To accomplish its goals, system design cannot be a top-down operation nor can it be expert driven. It must actively involve the stakeholders of the design in shaping a shared vision that represents their ideas, aspirations, values and ideals.

Taking this view, a Social Systems Designer, one who plans, redesigns, manages and organizes Social Systems, embraces a Systems world view when designing the future of a given Social System. And given this, it is the role of the stakeholders in the design process that separates the Systems Thinkers approach to design from that of the Design Thinker.

We believe we have identified the core differences in the Systems Thinking and Design Thinking approaches to problem resolution:

## Systems & Design Thinking: A Conceptual Framework for Their Integration

- Systems Thinking methodologies arose from the consideration of social systems. **The stakeholders are the designers.**
- Design Thinking methodologies arose from the consideration of products and artifacts. The problems are ultimately resolved by people identified as a **designer by trade. The stakeholders are observed and studied by the design team (cf Deep Dive approach as practiced by IDEO)**

An integrated approach to problem resolution requires design thinkers to expand their understanding of good systems design principles with a purposeful consideration of the social systems they are working within. During the Creative Industries Convention 2010, Andrea Goetze (2010) noted that today's design industry can no longer take a structured development approach, where a single creative genius locks himself in a room for three years before emerging with a solution. Instead, she explained that designers must find a way to change their role from one of the sole expert to one of a service provider or facilitator. Goetze also commented that designers will need to become more flexible and open to input from others and put the product in the middle of the process instead of the design practitioner. It is important to involve more people who collaborate together, including the users of the product, because only this way will they have ownership and make the implementation easier.

These comments show that design thinkers are moving away from First Generation of Design, where the act of designing is the prerogative of a certain talented group called "designers." (Olsen, 1982) The First Generation Design Methods rely heavily on professionalism, in the sense that the professional is viewed as the holder of knowledge that is critical to design, and inaccessible to the user of the design. The professional creates a design and, because of his expertise and sense of responsibility, is under no obligation to go further. This approach is the one typically taken in the past in the design of operating systems. It is frequently described as an "over the wall" approach. In this approach the designer develops an operating system design on paper, and supplies all the documentation and blueprints to a contractor who converts the paper design to a physical system. This mode of supplying is, figuratively, to throw the design over the wall that separates the professional design organization from the contractor or user.

Designers today more often operate from the Second Generation of Design. As Goetze (2010) noted, they recognize the need for collaboration among designers and external perspectives to guide them. Deep Dive methodology, as practiced by IDEO, for example, has made it standard practice for designers to gain input from many different stakeholders, including the end user. The design team observes and interacts within the larger system environment (in order to immerse themselves in the situation) before going back to the design table to piece the data together and design a solution. There is no question that such ethnographic and anthropological studies have added tremendous value to the solutions that are generated. This is where Design Thinking today seems to incorporate some aspects of Systems Thinking.

There is still risk with this approach, however. Even though there are many perspectives involved in parts of the design process, they are observed and give feedback in parts. The stakeholders give input based solely from their individual experiences and never see how it fits into the whole system. It is still, therefore, the role of the designer to

## Systems & Design Thinking: A Conceptual Framework for Their Integration

piece it all together. They need to get into the heads of the stakeholders and attempt to interpret what they think. Because neither the organization nor the end user has been involved in the entirety of the design process, there is a need to elicit their buy-in. There is also the risk that a key stakeholder group will be missed. We caution that there are often unintended consequences when interdependent pieces of the larger system have not been consciously considered in the context of the whole system.

As mentioned previously, Tim Brown's (2009) defines Design Thinking as "an approach that uses the designer's sensibility and methods for problem solving to meet people's needs in a technologically feasible and commercially viable way. In other words, design thinking is human-centered innovation." It is in the use of the "designer's sensibility...to meet people's needs" where the Design Thinker strays from the System Thinkers worldview.

Even Brown (2008) worries about this risk when he says:

One of the principles of design thinking is that it requires empathy for users to inspire ideas. Normally we think about getting that from ethnographic style research. Diving deep into the lives of a relatively small number of people, understanding the environment they live in, their social networks, seeing things first hand. We have lots of evidence that this works, but I sometimes wonder if we aren't also missing something. The problem with looking deeply at a few people is that you miss the opportunity for insights that might come by connecting more broadly across cultures.

This reliance on professionalism is strewn throughout the Design culture. Take for instance a recent blog post by Designer Kevin McCullagh (2010):

Let's agree that all of humanity are designers, and that design is one of the things that separates us from the apes. As Jonathan Ive put it: 'Design is not important. Good design is important.' First, when we talk of designers, we usually mean professional designers, who have reached an accepted level of competence. They have survived a Darwinian selection process (there are far more graduates than jobs) and have clocked up well over 10,000 hours of practice on projects. We should remember that designers learn by doing, not by learning and practicing a theory, designing involves a lot more tacit knowledge than in other areas of business. It's therefore hard to believe that senior managers can change their thinking habits of a lifetime after a workshop or two working with designers. And, to be frank, to suggest as much devalues what designers do.

Additionally, a key factor in creating good design that really does make a difference is great designers. These talented individuals are few and far between and provide critical competitive advantage. Let's forget about design thinking as a magic process, and focus on how designers and managers should best work together to deliver great quality outputs.

The Systems Thinking world view offers a method of doing just that. We propose that by taking this approach, Design Thinkers can move into a Third Generation of Design, which builds in a purposeful consideration of Systems Thinking principles. It therefore addresses many of the challenges of trying to get into the heads of others. A successful design is not one which is imposed on or provided to the organization from a

## Systems & Design Thinking: A Conceptual Framework for Their Integration

source external to the system. The best way to ensure that the design will serve the purpose of the organization is to include the stakeholders in the formulation of the design. Hence, the success of a design is directly related to the level of stakeholder participation in the development of the design.

In the Third Generation of Design, the **stakeholders are the designers**. They are not external sources of input. Instead, they are the concept generators and concept implementers (Barabba, 1995). An underlying principle of interactive planning is that people must be allowed to plan for themselves (Jackson, 2003). In fact, to reach objectivity in social systems, the process must involve the interaction of groups of individuals with diverse values. It becomes the role of the design facilitator to therefore create an environment where these differing views are honored within the context of the larger system. Creating a shared vision of the future can also be described as finding “common ground”, a place where participants are able to get past the current situation and make decisions based on what is good for the system. (Weisbord, 2003) In fact, designing creative solutions becomes much more straightforward if the practitioner is able to address the conflicts that arise due to differing stakeholder values, beliefs and world views. (Jackson, 2003)

By empowering all stakeholders from the beginning, it is possible to tap the creative energy of every participant so that innovative ideas emerge from the collective of the differing perspectives. This concept was described as “authentic engagement” in one of the seven laws of Dialogic Design. Laouris’ **Law of Requisite Action**, another of the Dialogic Design Laws, asserts that “action plans that are not founded on authentic engagement of the stakeholders in the dialogue and deliberation are unethical and are bound to fail.” (Christakis, 2006)

One thing that design practitioners using a systems approach bring to the table is ability to help an organization take ownership of the ideas that emerge through the design process. This is a critical consideration for today’s designers. It is much more likely that the ideas generated will be implemented and maintained if the stakeholders involved were the one who came up with the solutions in the first place. When people within an organization have had input throughout a change process and believe they have influenced the direction things are going in, the resistance to new ideas dissipates. (Rehm, 1999)

It is important for designers to be able to help an organization and the participants uncover the underlying assumptions they are making about the problem they think needs to be solved. Often cultural assumptions and traditions contribute to the problem they are working on. (Shuman, 2006) Cultural assumptions include those specific to leadership, both formal and informal. This can have a direct affect on how effectively they approach the assumed problem. A designer applying Systems Thinking principles can help participants recognize the assumptions the organization and the individual participants hold. In this way a designer can provide them with the means to develop a new framework and shared world view.

## **Systems & Design Thinking: A Conceptual Framework for Their Integration**

### **Case Study: An Integrated Approach to Problem Resolution in Action**

In 2009 Johns Hopkins Hospital was anticipating their 2011 relocation to new multibillion dollar quarters. Relocation projects, especially ones as large-scale as a hospital, always come with planning challenges, which in turn come with different strategies to reach a plan.

The hospital administration had a choice. They could simply move their current operating procedures to the new location with a basic plan for relocation procedures. They could bring in "design thinking" folks to look at the needs of the different units, gather some ethnographic data, and then lay out a plan with recommendations for the relocation. Instead, Johns Hopkins took a different approach. They looked at the move as an opportunity to redesign their current situation into a more desired future. The hospital would upgrade its system as they upgraded its physical environment. Their change would be systemic and not purely geographic.

Championed by a number of VPs, Johns Hopkins formed design teams comprised of the hospital's stakeholders. They defined stakeholders to mean anyone who could either impact or be impacted by the decisions made in the design teams. This included not only administration and management, but representatives from all of the hospital's units, including, for example, doctors, nurses, technicians, customer services representatives, and custodial staff. Most importantly, the design teams included the end users: the patients.

Before starting with the redesign of the subsystems, the design teams were given a short course on systems thinking. The orientation created a shared understanding of how the hospital operated as a system.

During the initial design meetings, information and data was also shared from research that had been conducted prior to the design meetings. This research had been done across different hospitals with the goal of finding out how patients thought about and described the care they received. The trends showed that there was more to a hospital stay than the level of care that was received. Patients who had successful procedures with a high quality of medical care, in some instances, stated they would never return to that hospital again. Examples of some of the reasons provided included: poor treatment by diagnosticians; multiple room switches; unsanitary bathroom conditions; and long waits for transportation for tests. It had nothing to do with the quality of the medical care provided by the doctors. It had everything to do with how they perceived their experience with the hospital (experience was defined as a systemic property of the hospital system that is derived from the interaction of the essential components of the hospital system).

There were significant implications from these early steps in the design process; they gave people who often never communicated before a common language and common point of reflection. It also took the risk of blame and finger pointing off of the Johns Hopkins staff and redirected the focus to patterns that were happening in the larger environment of hospital care in general. From that point, even though there were initially people with different experiences and frameworks at the table, there was a shared understanding that any design created and implemented must meet two systems thinking criteria:

## Systems & Design Thinking: A Conceptual Framework for Their Integration

- Identification and consideration of the *essential parts* of the system
- Whatever the design, it would be decided by the amount of improvement to the system as a *whole*, not just to individual parts or units

Once these criteria had been agreed upon, the group was charged with the next question:

*If John Hopkins is a **system**, what does the hospital do to support the PATIENT EXPERIENCE versus simply considering PATIENT CARE?*

As doctors, janitors, technicians, and other hospital staff interacted with patients, the interdependence of their contribution to the hospital as a whole began to emerge. This led to what can only be described as an “A-HA!” moment. The participants realized that two essential components of the hospital were traditionally overlooked, yet had a great impact on the patient experience. Those two units were **Patient Transportation** (responsible for moving patients from one part of a hospital to another) and **Environmental Services** (responsible for cleaning services throughout the hospital).

Realizing that these two units are the essential components of the system had a significant implication for the new design. The additional awareness that they directly impacted both the hospital experience *and* the bottom line produced exciting designs. But most importantly, all of these considerations resulted in a new approach to recruitment, training, and compensation for employees within these departments.

Within Patient Transportation, an innovative and effective design resulted by measuring how long it took to move patients between various locations in the hospital in a manner that was pleasant and timely. Additionally, this consideration helped the design team to determine where to place the wheel chairs in a logistically optimum place in the new buildings. This will result in their ability to move patients quickly (e.g. diagnostics will no longer stay idle waiting for patients). Furthermore, the design team was able to improve the internal communication system. This will eliminate the additional work and time lost by the nurses trying to contact patient transporters (information regarding patient’s discharge by the attending physician will be shared with the patient transportation services).

The same types of new designs occurred with the Environmental Services design team. One solution improved the “bed turnaround” time (similar to plane turnaround in the aviation industry, hospitals don’t generate funds unless there is a patient in the bed). However, this improvement also means that patients won’t be left waiting in the hall for a room at the new facility. What also emerged from this design team was a new awareness that the Environmental Services unit does more than simply change over the rooms. They also impact the overall quality of care in the hospital, specifically as it relates to infectious diseases. This was an epiphany for everyone.

## **Systems & Design Thinking: A Conceptual Framework for Their Integration**

The approach Johns Hopkins took shows the instrumental role that taking a systemic world view plays in design. It also highlights how important the design is to any consideration of the system. By starting with an overview of systems thinking principles, everyone was operating from a shared mindset. By sharing trends collected from the larger health care environment they operated within, Johns Hopkins was able to develop a shared context of the current situation. In any design process involving systems thinking, such opportunities are designed based on the organization's specific situation and tied to the purpose of the design process.

Moreover, by bringing everyone to the design meetings together, stakeholders who rarely had a voice were heard, and throughout the design process they expressed that this was the first time they felt valued. There was a level power dynamic for the first time, which was a monumental shift from the traditional hierarchy of respect with surgeons and doctors at the top of the ladder. The perception of the employees in those two units changed. Johns Hopkins had achieved its goal of a system redesign with the ownership of those most impacted.

If Johns Hopkins had simply brought in designers to look at the problem, interview various stakeholders, and design recommendations based on the compiled feedback, they would not have achieved such a rich redesign of their system. They definitely would have missed the opportunity for the interdepartmental perceptions of each other's value to change. There is a high probability they would have missed the impact of the two essential parts identified in this process. The system would have likely been redesigned based on the wrong assumptions of where improvement was needed. It was only by having everyone in the same room, under the same shared context of hospital trends in the larger environment, using the same systems language, throughout the *entire process*, that the resulting design had the input and ownership of the entire system

## **CONCLUSION**

In today's business world Design Thinking and Systems Thinking are being considered disjointedly. Specifically, the role of "design" in either approach is not transparent. For all of us the challenge remains how the "DESIGN THINKING" community can learn from the "SYSTEMS THINKING" community and vice versa.

We believe that SYSTEMS THINKING should be intentionally integrated with DESIGN THINKING to enhance the chances of creating the RIGHT designs! We have shown that Systems Thinking can help the designer to better understand the world around them. As an example, in systems thinking design is considered the methodology for planning because there is a belief that the future is subject to creation and design is the creative process for this purpose. Furthermore, SYSTEMS principles can inform the designers to achieve more SUSTAINABLE designs.

Design can be greatly enhanced if it improves the performance of the system as a whole (even if you are redesigning the part). Design Thinking can also be enhanced by purposefully considering the principle of unintended consequences, etc. Yet the most

## Systems & Design Thinking: A Conceptual Framework for Their Integration

valuable principle that Systems Thinking can add to Design Thinking is the need to bring the whole system to the discussion from the beginning, not just in parts. The stakeholders within the system must plan for themselves. If problem formulation is the first step in design process, taking a systems mindset can help with "framing and especially with re-framing" the problems.

We have proposed that the two approaches complement each other and each incorporates components of the other *implicitly*. We believe it is possible – and necessary - to create an approach that *explicitly* incorporates the strengths of each, thereby addressing their gaps and increasing the chance of creating sustainable solutions to the wicked problems facing organizations and society today.

### REFERENCES

- Ackoff R.L. (1999). *Re-Creating the corporation: a design of organizations for the 21st Century*. Oxford: Oxford University Press.
- Ackoff, R.L. (1981, February). The Art and Science of Mess Management. *Interfaces II*. 11 (1), 20-26.
- Ackoff, R.L. (1981). *Creating the corporate future*. New York: John Wiley and Sons.
- Ackoff, R.L. & Emery, F.E. (1972). *On purposeful systems*. Chicago: Aldine-Atherton.
- Barabba, V.P. (1995). *Meeting of the minds*. Cambridge, MA: Harvard Business School Press.
- Baron, J. (2008). *Thinking and deciding*. (Chinese translation of 4th edition.) Cambridge University Press (errata). (Original work published 1988, 1994, 2000)
- Bausch. K.C. (2002, June). Roots and branches: a brief, picaresque, personal history of systems theory. *Wiley InterScience*, 19(Syst.Res. pp 417-28). Retrieved September 2009, from [www.interscience.wiley.com](http://www.interscience.wiley.com).
- Boland, R. & Collopy, F. (2004) *Managing as design*. Stanford, CA: Stanford University Press.
- Brown, T. (2008, June). Design thinking. *Harvard Business Review Paperback Series*, pp 1-10.
- Brown, T. (2009). *Change by design*. New York: Harper Collins.
- Checkland, Peter.(1981). *Systems thinking, systems practice*. New York: John Wiley & Sons.
- Christakis, A. & Baush, K. (2006). *How people harness their collective wisdom and power to construct the future in co-laboratories of democracy*. North Carolina: Information Age Publishing, Inc.
- Churchman, C. West. (1968). *The systems approach*. New York: Dell Publishing.
- Collopy, F. *Thinking about design thinking*. Fast Company blog. Retrieved July 9, 2009, from <http://www.fastcompany.com/blog/fred-collopy/manage-designing/thinking-about-design-thinking>

## Systems & Design Thinking: A Conceptual Framework for Their Integration

- Cross, N. (2006). *Designerly ways of knowing*. London: Springer-Verlag.
- Flood, R. & Jackson, M. (1991). *Creative problem solving*. New York: John Wiley & Sons.
- Flowers, J. (1993). The power of chaos: A conversation with Margaret J. Wheatley. *Healthcare Forum Journal*, (Sept/Oct), 48-55.
- Follet, M.P., (1940). The psychology of control. In Metcalf, H.C. & Urwick, L. (Eds). *Dynamic administration: The collected papers of Mary Parker Follet* (pp. 183-209). New York and London: Harper & Brothers Publishers.
- Goetze, A. (2010). Creative Industries Convention 2010 Interview. Retrieved May 20, 2010 from <http://www.vimeo.com/9402566>.
- Hawthorne, C. & Weiss, P. (Ed. Vols 1-6) and Burks, A.W. (vols. 7-8). (1931-1958)  
*Collected Papers*. 8 Vols. Cambridge, MA: Harvard UP..
- Holton, G. (1997). *Albert Einstein: Historical and cultural perspectives*. New York: Dover Publications.
- Jackson, M.C. (2003). *Systems thinking: Creative holism for managers*. University of Hull, UK: John Wiley & Sons.
- Johnson, L. (1997). *From mechanistic to social systemic thinking: A digest of a talk by Russell L. Ackoff*. Innovations in Management Series. Cambridge, MA: Pegasus Communications.
- Mattesich, Richard. (1982, November). The systems approach: Its variety of aspects. *Journal of the American Society for Information Science*, 33(6).
- McCullagh, K. (2010), Design thinking everywhere and nowhere: Reflections on the big re-think. Core 77 Design Magazine and Resource, Retrieved, March 29, 2010, from <http://is.gd/csz4Z>.
- Morgan, G. (2006). *Images of organization*. Thousand Oaks: Sage Publications.
- Olsen, Shirley A. (Ed.). (1982). *Group planning and problem-solving methods in engineering management*. New York: Wiley Interscience.
- Papanek, Victor. (1971). *Design for the real world*. New York: Pantheon Books.
- Papanek, Victor. (1983). *Design for human scale*. New York: Van Nostrand.
- Rehm, Robert. (1999). *People in charge: creating self managing workplaces*. Gloucestershire, UK: Hawthorn Press.
- Shuman, S (Ed.) (2006). *Creating a culture of collaboration: The International Association of Facilitators handbook*. San Francisco, CA: Jossey-Bass.
- Weisbord, M. (2004). *Productive workplaces revisited*. San Francisco, CA: Jossey-Bass.