COMPUTER-AIDED DESIGN & APPLICATIONS, 2017
VOL. 14, NO. S1, 14–23
https://doi.org/10.1080/16864360.2017.1308076

Cultivating a shared vision with interdisciplinary teams

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ABSTRACT
This paper discusses the rapidly changing field of design and why interdisciplinary partnerships are necessary for solving complex challenges. Specific techniques relating to systems thinking and the creative design process will be introduced. Methodologies in this paper expand and amplify the creative design process, while being inclusive of all members of diverse teams to increase throughput that includes various points of view. Also presented are specific tools to expand the capacity of collaborative groups as they work in harmony towards a shared vision. As creative problem solving teams work together it is important for leadership to relate to diverse perspectives, including creative and scientific disciplines within the team to expand the collective outlook within any group. These leadership tools ultimately enhance the collaborative culture within any organization, which increases productivity leading to more innovative and successful product solutions.

KEYWORDS
Systems thinking; future of design; interdisciplinary teams; shared vision

1. Introduction

Within the field of industrial design, the traditional design process is largely practiced in corporations and taught at universities. When creative designers are given a product brief at the start of a project there is initial research, design development, prototype iteration, and a final design proposal. Engineers will oversee functionality and manufacturing leading up to production. These teams focus on the sub-systems that relate directly to the product. For example, when designing an automobile, the overall aesthetics are a priority for industrial designers, in addition to sub-systems like doors, lighting, seating, and storage. Engineers address the performance of sub-systems relating to braking, steering, and suspension. In both cases the systems being addressed relate directly to the product, and do not concern the environment that the product will be operating within. This traditional design process is flawed because it does not incorporate the surrounding conditions that influence functionality within the transportation system, and therefore these automotive designs developed in isolation produce a partial solution that creates other problems.

In recent years many complications have evolved relative to cars and mobility. The main mode of transportation within the United States is dominated by individual car ownership and an immense infrastructure, both of which are extremely expensive. The financial implications of owning a vehicle greatly add up when considering the total costs including payments, maintenance, gas, insurance, and parking. As more cars are operating on roads and highways we are becoming increasingly aware of the serious defects within this system. Construction, congestion, parking, noise pollution, and air pollution are just a few issues that most drivers and passengers deal with on a daily basis. The average speed in an urban area is 25 miles per hour (mph) while automotive manufacturers are producing cars that are capable of going 200 mph. Approximately 90% of the time there is only one person in a moving vehicle. Cars may be parked 90%-95% of the time and parking in densely populated areas are becoming increasingly harder to find [6]. These challenges are expected to intensify in the future with the anticipated increase in population.

Because industrial designers and engineers focus mostly on aspects specific to the vehicle they do not have detailed knowledge about where the materials come from that are used in manufactured products. Aspects of the product lifecycle management systems are incorporated within various phases of the design process, but it is not a complete picture. The materials economy is described as a system that includes extraction, production, distribution, consumption, and disposal [3]. In addition, problems can become increasingly complicated when we consider other factors that include people, government, corporations, and the associated true costs or triple bottom line [8].

When viewing the larger picture adjustments can be made to shift to a holistic design process that includes

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the environment products operate within, manufacturing process, materials economy, and various forces that should be influencing product design. This broadened perspective heightens our awareness and we begin to question the definition of excellence in design. Should the focus remain solely on the product to generate profits at the cost of our natural world? If vehicle designs are winning awards at automotive shows and recognized within publications yet they do not function well within the current infrastructure, are they still good designs? What responsibilities do we have as designers and engineers relative to this bigger perspective?

Discovery of these complex problems makes us wonder how to generate and implement innovative design solutions. When questions like this are looked at closely it becomes clear that the traditional design process needs to be transformed. Within this paper I elaborate on various ways to drastically improve the design process that incorporates the ability to generate information relative to a broader perspective. Two such approaches are the integration of systems thinking methodologies and the inclusion of interdisciplinary teams into the design process.

Approaches involving systems thinking are critical in elevating our awareness of product structures and systems in a holistic way. Without this insight we will continue to create fragmentary design solutions that generate more problems. Additionally, collaborative, interdisciplinary and trans-disciplinary teams that are working towards a shared vision are essential to creating innovative design solutions. Diverse groups of people from different backgrounds and disciplines generate more ideas. Diversified teams are more likely to produce holistic and lasting solutions to the various challenges of our time.

Several examples are incorporated into this introduction and within this paper that relate to automotive and transportation design. These examples should not limit the readers vision for what knowledge can be gained by reading this paper. The application of systems thinking, the importance of cultivating interdisciplinary teams, and the vision for the future of design has broad application. So if cars are not of great interest to you, read on. The comprehensive knowledge presented within this paper can be applied to any product, process, or service. This paper offers valuable insights that are intriguing to a diverse spectrum of individuals and teams.

2. Systems thinking methodologies

There are many different systems thinking models that relate to specialized disciplines. A system thinking approach relative to graphic communication design refers more directly to the process of creating logos, signs, websites, and visuals that have a consistent identity or look. Systems thinking to engineers involves various systems within a product or machine that must all work together so it functions properly. Architects look at the many systems within a building to confirm they all work together. Some systems thinking approaches relate to the working environments and work flows [9]. Other approaches deal with the throughput of an organization and managing inflows and outflows of resources [5]. All of these approaches are very applicable for specific disciplines, however they are not always so helpful when applied to the product development process.

Since no other approach exists I developed a detailed systems thinking methodology [7] that directly relates to the making of products and services. (Fig. 1) Within this model there are four areas of focus that include; 1) the current situation, 2) timelines, 3) forces that influence the product, and 4) the holistic systems. By applying these various areas to different aspects of the product we get a matrix of areas to explore. This strategic approach can be applied to; a) the product, b) the people that use the product or service, c) the experience of using the product, d) the environment the product operates within, and e) any other area worthy of exploring.

It is important to understand the benefits of researching each area of focus. Looking at the current situation as it relates to the product can be much like benchmarking or a product analysis study. This research is concentrated on products, services, or design concepts. Depending on the product, designers may want to explore the current situation as it relates to conditions, circumstances, or ratings. In depth information about current products gives us enough information to *react*, which is good but it is not very effective by itself.

Creating timelines can be very helpful in giving the designer the ability to anticipate what may happen next. There are a variety of ways to create product-linked timetables. They can be used to reveal the history of a specific product, type of product, segment, brand, technology, or form vocabulary. There are numerous options for generating historical data, which are highly beneficial when they connect with the product. For instance, in addition to developing a timeline of electric vehicles it is also advantageous to hone in on the development of battery technology or the implementation of charging stations. Chronological knowledge relating to the product can prepare us for what is next when we study how this information appears through time. This enables us to *anticipate* what may come next, but still there is more to explore.

Forces that relate to the product cause us to dig deeper. In the case of automobiles and mobility, relevant external forces include government regulations, safety guidelines,

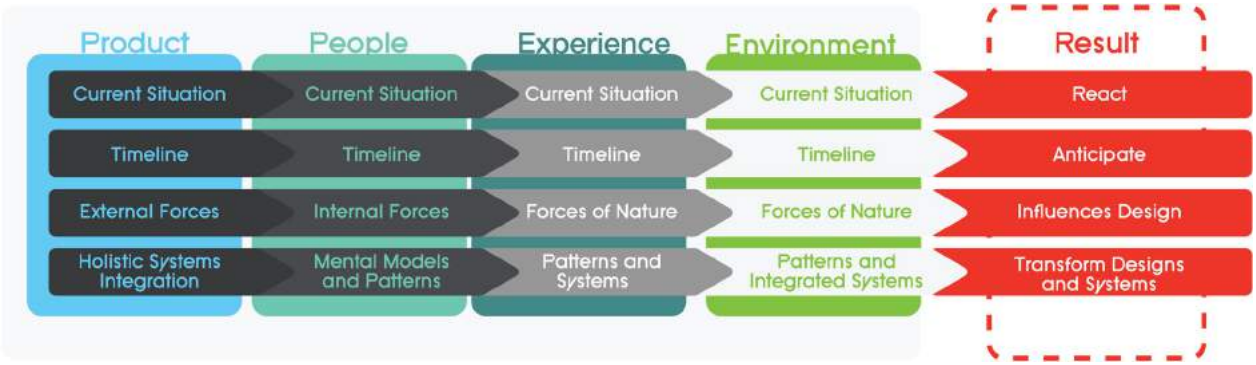

Figure 1. Systems Thinking: This illustrates a systems thinking methodology that can be directly applied to the product design development process. Areas of focus (in the left column) intersect with aspects relating to the product (listed across the top row) create a matrix of areas that, when researched in depth, give us a more holistic perspective of what we are designing.

or corporate profits. These external forces are powerful influencers of design and are often outside the scope of what a designer traditionally addresses**.** If designers are more aware of these regulating forces they may find ways to change them. Having this knowledge can also assist in creating a better product that aligns with these forces, and this can have a significant *impact on design*.

It is vital to explore environmental systems that relate to a product as a whole. When we are dealing with transportation systems we have many different options to choose from. Planes, automobiles, trains, bikes, or motorcycles all operate within different systems that ideally connect and work harmoniously as mixed modes of mobility. Also, the scale of these various systems is vastly different. Elaborate transportation systems can go from one side of the country to the other. Airplanes fly from one country to another and biking networks can be specific to a region. Understanding the environment as a whole requires us to experience and observe from a critical perspective. When we do this, aspects, challenges, and flaws within the system will be revealed as development opportunities. Knowing the environment gives designers the ability to *transform* the system and develop innovative products that integrate into new or improved structures.

3. Approaching systems

When exploring beyond the boundaries of the traditional design process we see a bigger picture that can be overwhelming and we do not know where to start. Often even accomplished professionals get confused and frustrated. When we see the product development process from a broader perspective there are infinite areas to explore. How can we possibly make a contribution with so many choices? At these moments we need to pause. When dealing with massive systems, or systems of any scale, it is very difficult to work across multiple platforms. It is best to focus on a particular range that is most interesting or will have the greatest impact. Then go deep in that direction exploring the available spectrum of possibilities.

When concentrating on a specific area of choice we are better able to manage feelings of being overpowered by the vastness of systems. Also, when we focus on a narrower field, other related areas of the system can be affected. Figure 2 shows an example of holistic transportation systems, and in this case the designer or team selected electrification as the focal point. Through developing new approaches, products, and systems relating to electrification other areas of the transportation system are influenced. Technology, connectivity, environmental costs, energy, infrastructure, and vehicle autonomy can evolve as a result.

Within academia and industry systems thinking approaches are often thought of as being discipline specific and have different meaning in various fields. Fragmented rational hinders our ability to see obstacles in an integrated way. Through this limited point of view, we create solutions, services, and products that have serious imperfections within the context of the bigger picture. The systems thinking methodologies described in this section crosses disciplines and should be integrated into the educational experience and work environment across many disparate fields. The complexity and scale of current wicked problems demand a holistic inquiry from diverse perspectives. This will likely heighten our awareness into the depths of social consciousness and design issues. The integration of systems thinking is something all leaders must take note of.

4. The hairball, the cube, and trans-disciplinary teams

It is clear that systems thinking approaches must be unified into the design development process in order

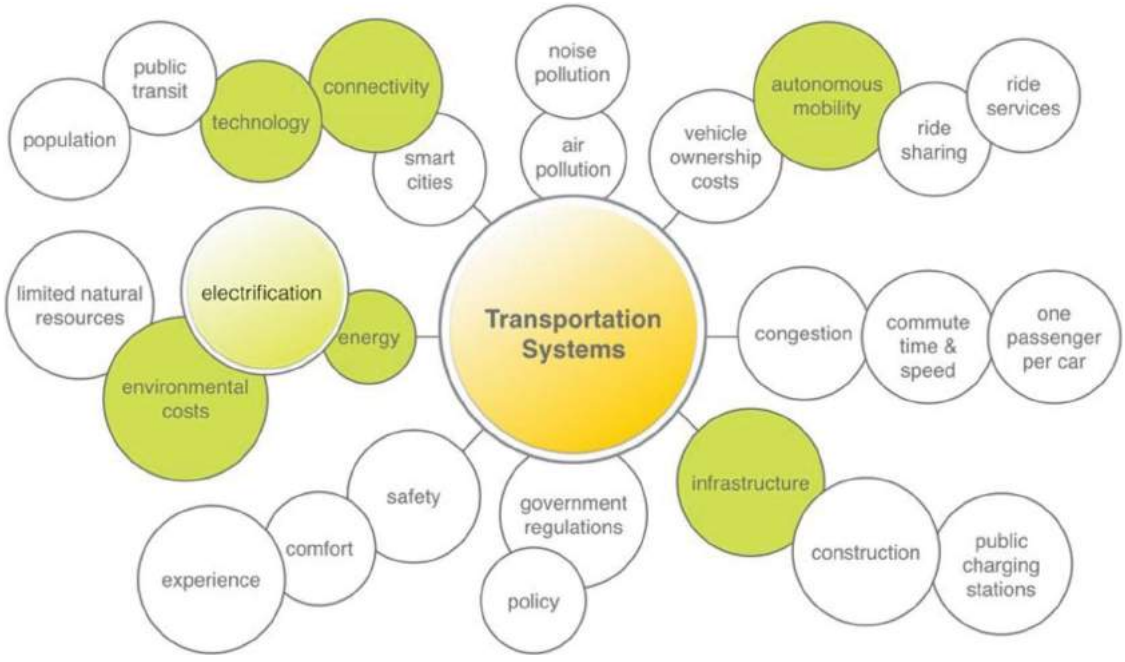

Figure 2. How to Think in Systems: A holistic view of the transportation system can seem immense. When looking at this bigger picture often designers become overwhelmed. However, focusing on one specific area influences other areas of the system. In this example, development in the area of electrification affects related areas such as environmental costs and energy.

to advance the best solutions. Based on the ambiguity, scale, and complexity of challenges designers and leaders are facing, it is also evident that cross-disciplinary teams are essential for creating innovative results. However, the integration of these two key elements into new ways of working can be a daunting task hindered by our traditional ways of working.

There are countless team building publications that encourage cooperation between diversified groups. I discussing the integration of creative designers and mechanical engineers with Wayne Cherry after he retired as Vice President of Design at General Motors (GM), the idea of the hairball and the cube emerged. In reality people, communities, nations and cultures are not so cleanly divided into the two distinct areas I am about to describe, but this analogy of the hairball and the cube can be used to make a simple but potent point. Over the years this concept has evolved to represent two fundamentally different groups of people with unique ways of thinking.

'Hairballs' are those who tend to be more creative and intuitive in their approach to problem solving. They thrive on chaos and disorder, and are likely to engage in a design process that generates numerous distinctive ideas through divergent thinking and eventually narrow down solutions to the best idea or ideas. 'Cubes' refer to people who tend to be more scientific in their thought processes. These are rational individuals that research facts and statistics to get to a single solution as fast as possible. They thrive on order and logic, and are convergent thinkers. In reality individuals are not solely in one camp or the other, but are likely to have an emphasis in one or the other. Different ways of thinking influence our approach to problem solving.

The importance of hairballs, cubes, and the differences in people leads us back the big question; How do interdisciplinary teams learn to work together to solve the complex challenges of our time? Within Figure 3 we begin to get a glimpse to the answer. Between the hairball and the cube is the bridge of communication, and this is where true collaboration happens. This bridge represents the idea that we have to somehow come outside of ourselves to reach a common ground with someone else from the other side who is willing to meet us half way. It takes a great deal of trust to come together in that common space and have authentic conversations. Trust is an elusive element in many collaborative partnerships because it takes time to build. It changes and grows, and yet once it is broken it can be difficult to mend. Another important ingredient in building relationships is respect, which can evolve through simple exchanges giving us insight into the unique qualities of others. Trust and respect are not possible if we are not looking for it or not open to it. Turning a blind eye to someone's potential contribution can have devastating effects on any team. When we recognize the importance of what others have to contribute we acknowledge the importance of the bridge of communication and what it represents. Through this idea, powerful teams with diverse backgrounds can come

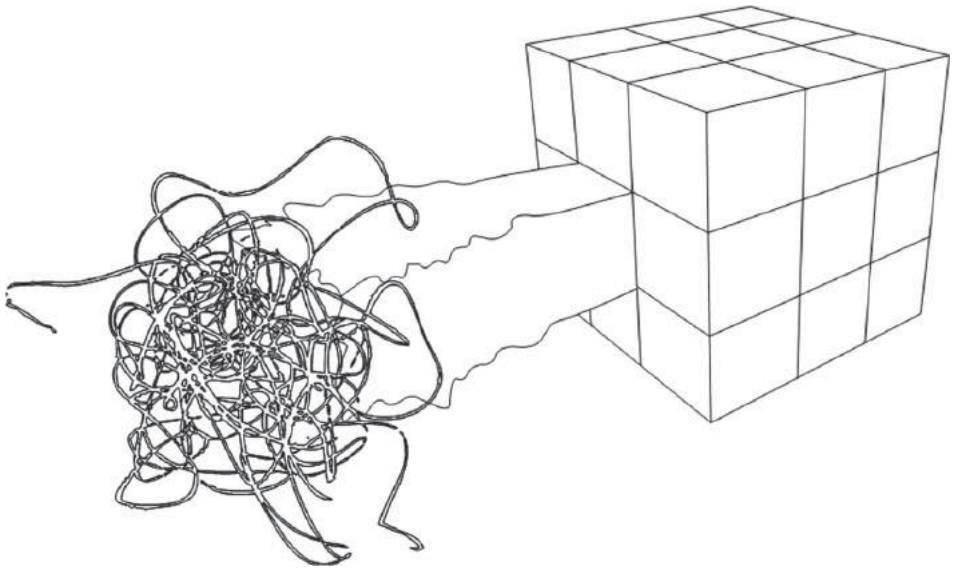

Figure 3. The Hairball and the Cube: The hairball represents people or groups of people who tend to be more creative and the cube represents those who are more scientific. What is important about this image is the bridge of communication between the hairball and the cube, where true collaboration takes place.

together as a cohesive unit to develop innovative solutions that are more likely to have transformative effects.

When diverse teams come together to solve problems one of the most important factors in successful collaboration is having a shared vision. A shared vision is a force in people that creates a common caring within a group [9]. When goals and teams are created by topic and are less discipline specific, self-organizing teams can form made up of individuals who have a shared passion inspired by common interests. When these teams join forces to work on a topic they are compassionate and this is somewhat contagious. It grows to acquire support from more people.

Individuals who work on teams with a shared vision are connected by common aspirations. Teams structured in this way are more likely to foster risk taking and experimentation. When working within a united team like this, members experience the power of mutual trust and respect. They experience the potential that is associated with connecting to something bigger than themselves. Eventually this manifests into the desire to be engaged in an important undertaking that is uplifting and intrinsic to the team. Overarching goals become more important than individual identity. When this is achieved work becomes part of the larger purpose and a shared commitment.

5. The cube

Advancements in science and technology have made great contributions to society, especially in the areas of transportation, medicine, agriculture, communication, and energy. With this growth we have the perception that we are moving forward with better tools and information. Many believe that science and technology will develop solutions to some of the problems we face today, including the warming of the planet, the decimation of the environment, mass extinction of species, and the depletion of natural resources. It is anticipated that the technical disciplines will develop solutions to regional challenges as well, including the likely increases in population and urban density, which could make many current challenges worse in the future.

Scientific knowledge allows for the development of advanced technologies, which opens up the opportunity to observe how this manifests in the world. These observations generate more scientific knowledge that hastens the growth of more technology. The rate of technological advancement is accelerating, while influencing design and the creative design process. Some of these influencers include 3D printing, synthetic biology, generative design practices, and artificially intelligent systems. In the future this growth is expected to continue to quicken.

However, looking at this cycle through the lens of the scientific community only gives us a limited point of view. A narrow scope of investigation with one perspective is an obstruction to developing solutions to the challenges we are facing. Many of these concerns have developed because of the implementation of technological advancements that progressed without thoughtful considerations to the broader impact. Other viewpoints could expand the content of inquiry beyond the quantitative date to include qualitative information.

Within academia and industry there is great momentum in creating collaborative groups that include different disciplines and viewpoints. There are many trends moving in this direction as we tear down territorial silos and create interdisciplinary settings where diverse teams can thrive. This arrangement is more likely to lead to successful product development processes and innovative results. Different perspectives are needed to solve complex challenges. Collectively, diverse outlooks generate more ideas that contribute to better solutions.

Our rational minds are very important and give us the ability to function efficiently and manoeuvre in the world. Logical thinking is part of us for many good reasons. However, the conscious mind can block our vision from seeing oneness. Finding a harmonious balance between our creative mind and our analytical mentality is key.

6. The hairball

Industrial designers and creative individuals embrace acts of visual creative expression. They are uniquely poised to express this amongst themselves and to the world in various forms including creating, writing, looking, translating, and making meaning. Creatives must have the ability to see and pay attention to intrinsic detail. Being this conduit for creative expression is about learning to pay attention and communicating what is going on. It involves seeing and finding meaning.

The creative person sees things up close as if looking through binoculars or a microscope. One of their responsibilities is to present clearly a viewpoint, a perspective, or a line of vision. Their job is to see people, situations, and things as they really are, and to do this they must know who they are in the most compassionate possible sense. Only then can they see things for what they really are. Often it is harder by far to see situations with a sense of kind-hearted detachment. This compassionate separation gives us clarity in our ability to see, observe and translate.

In moments when we are able to see a system with transparent clarity, we see that we are a part of a whole. It is possible to have this knowing. We do not see situations and circumstances with a layer of all the images, judgments, and random chaos that it may represent. It is actually quite the opposite. We see things as they are, which reveals issues that are opportunities to make things better.

One possible way to authentically observe is to try gently going back to what is really there to be seen with a kind of reverence. To be engrossed by something outside of ourselves is a powerful antidote for the rational mind and world. If we do not learn to do this, I think we will keep getting things wrong. In order to be a conduit of creative expression and connectedness, we must see things from a holistic perspective and learn to be reverent. This practice leads us to ask critical questions; Why are we creating? Why are we here?

We could think of reverence as awe, as a presence within, or as broad-mindedness to the world. The alternative is being numb, machine like, or shut down. Think of those times when you have read poetry that moved you or you stood before a work of art that is presented in such a way that you have a fleeting sense of being startled by its beauty and insight. In moments like this everything seems to fit together through a sense of synchronicity, or at least to have meaning. This is the goal of creatives and educators, to help others have this sense of wonder, to see things anew. To introduce things and ideas that catches us off guard and helps us see things from a broader perspective. It presents an openness where we can see in everything the essences of wholeness, a sign that this essence is implicit in all of us and in all living and non-living things. We see things as an outward and visible sign of inward, invisible grace.

7. The future of design

Challenges we face today and in the near future are changing the landscape of the design professions. Drastic shifts are on the horizon and leaders must deal with this by creating opportunities for teams to generate productive and satisfying work. The challenges of our time are not susceptible to quick fixes, nor can they be worked out with managers giving disciplinary instructions and orders. Leaders overseeing adaptable transdisciplinary teams must be exceptional listeners and encourage two-way conversations. They must support freeform experimentation so these teams can develop and implement their unique ideas created with thoughtful intelligence. This reforming of the design process is one of the ways contributors on diversified teams will find fulfilment in their work through extraordinary significant performance.

A fundamental shift in how adaptable teams think and act is needed to create meaningful lasting solutions. These developments are creating new opportunities within the various emerging facets of the design disciplines both in the creative and technical realms. As a result, the role of the designer is expanding at a very rapid pace. Leaders who know transformation is happening can embrace this new future with clarity and confidence. Understanding a vision for the future of design is critical in staying ahead of this progressive growth.

Below is a vision for the future of design that was created by analysing accumulated notes from various design

related lectures, conferences and conversations. Through studying these notes and through further research, main themes emerged as synthesized domains of design. (Fig. 4) As various categories materialized and through additional research seven realms remained, which are; 1) education, 2) technology, 3) society, 4) design, 5) policy, 6) environment, and 7) extensions. It is difficult to claim one as more critical or to put them into a hierarchical order of importance. They are all equally influential and work together as a cohesive system.

Within each domain there exists subcategories. This dissection of each area into smaller chunks reveals the depth of design in a snapshot. The category divisions in Figure 4 are areas that reoccurred in research and therefore most relevant as possible catalysts for transformation. This division can continue on in many different layers, giving us a glimpse of the complexity of design and indicators of where it is going in the future.

Although all the domains within the Future of Design Ring are equally important there are three that need to be elaborated on since they relate to the content of this paper. These three areas are education, technology, and extensions.

The future of design truly lies within the hands of a younger generation. Today these are the children who are drawing with crayons and playing on computers. They are comfortable with technology at an early age and are therefore not the same type of student that is in college now. Because advancements in technology continue to change so drastically, students that were in college five-years ago are very different than current students. Today a quality education in any of the design fields must be organic in nature enabling various learning paths to evolve. Current and future students will prefer to tailor their educational experience to align with their individual interests. This is especially important since so many new sub-domains are appearing that are generating career paths that never existed before, such as an App Developer or a User Experience Analyst. A Technical Artist is yet another title that did not exist in the past five years. This individual has a varied background including art, design, mathematics, and science.

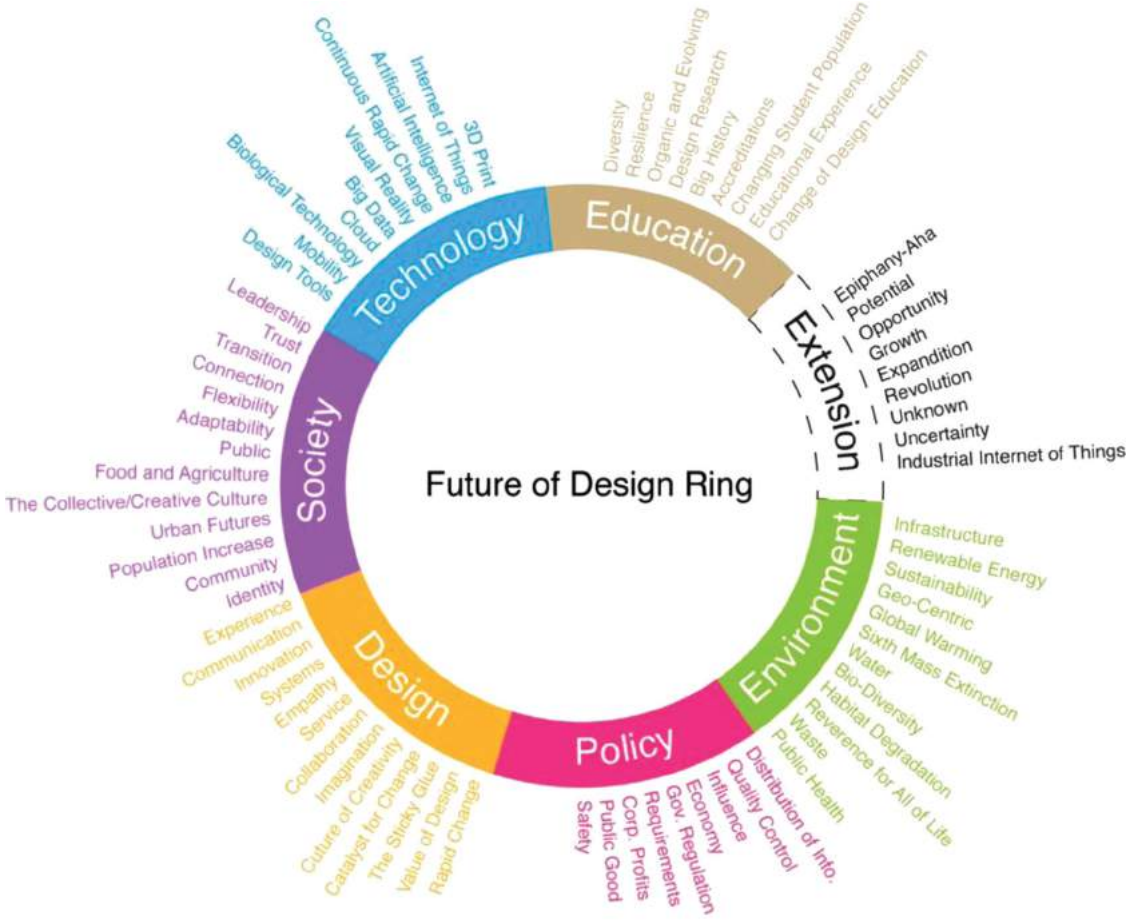

Figure 4. The Future of Design Ring: Various domains of design were developed for the 'Future of Design Ring' based on research and activities within the fields of design. Subcategories were also developed. The domain titled Extensions references the unknown events that can have a powerful influence on the future of design.

When considering higher education in design it is important to maintain and cultivate a curriculum that is adaptive to the fast paced changes happening in the field. Numerous forces are quickening the evolution of design, which is rapidly growing in complexity. Education must include systems thinking methodologies so we learn to see and think holistically. Because the design field is rapidly changing it is likely that advancements will accelerate in the future, therefore it is important that students learn to be adaptive. Additionally, students must learn how to work across various disciplines in transdisciplinary teams. A model that supports this would drastically transform traditional educational institutions.

Today there is an overwhelming emphasis on the sciences in education and industry within the United States. The Science, Technology, Engineering, and Math (STEM) initiatives put great importance on this technical perspective. This continues to widen the gap between science and the creative human experience, pushing art and design fields to the outer edges of our culture. When in reality, the two are best positioned as equal partners.

Contemporary scientists, including Rachel Carson [1] and Edward O. Wilson [10], revealed the connectivity humans have with nature and how our acts of destroying nature affect us. Science can give us facts and statistics, but it cannot inform us on meaning, purpose, and responsibility. Carson and Wilson are scientists that have crossed that threshold to share an important holistic outlook. Ed Catmull is the president of Pixar Animation Studios and Walt Disney Animation Studios, who is also a computer scientist contributing to many important developments in computer graphics. In his book titled *Creativity, Inc., Overcoming the Unseen Forces that Stand in the Way of True Inspiration* [2], he writes extensively about leading diverse teams of technically and creatively skilled people.

> *"A characteristic of creative people is that they imagine making the impossible possible. That imagining-dreaming, noodling, audaciously rejecting what is (for the moment) true-is the way we discover what is new or important. Steve [Jobs] understood the value of science and law, but he also understood that complex systems respond in nonlinear, unpredictable ways. And that creativity, at its best, surprises us all."*

Within the Future of Design Ring, the domain of Extensions refers to the unpredictable things that happen and influence design. Innovative breakthroughs, crisis, shifts in leadership, or a sudden epiphany can cause unanticipated change. For example, autonomous vehicles could be the source of a massive deviation from individual car ownership to car sharing systems. The Hyperloop could ultimately eliminate air travel across land and flights will only be necessary when traveling overseas. A colossal change in weather patterns could require us to rethink how we use energy. We often cling to what is known or what makes us feel comfortable, but in reality there is a great deal of uncertainty. For these reasons the domain of Extensions has been included in the Future of Design Ring. It represents categories that are unknown and yet have exceptional potential for initiating transformative change.

8. Systems thinking and design complexity

When applying the concept of systems thinking to the various domains of design we discover unlimited research opportunities by making simple connections. For example, when we connect Systems with the Internet of Things we get a potential research question as demonstrated in Figure 5. Is there a systems thinking model that can be generated from the Internet of Things? There are numerous relationships that can be made within this structure. If we make a link between Sustainability and Corporate Profits, we could consider a different question. How do we generate corporate profits through sustainable systems? When we explore the sub-domains of Mobility, Collaboration and all the different topics within the domain of Policy (government regulations, economy, public good, or safety) we get a plethora of questions to explore.

The number of research questions that could be generated from the Future of Design Ring goes on. This is one of the reasons why the design fields are emerging with facets of specialties and subspecialties that did not exist in the recent past. Some of these practices include social justice, sustainability, entrepreneurialism, and the maker movement. Because of the speedy advancements in technologies that influence the design professions the acceleration of change is anticipated.

9. The modern tree of science and creativity

In *The Book of Trees, Visualizing Branches of Knowledge*, Manuel Lima [4] references an illustration called the Tree of Science from 1663, which shows the main branches of a tree with labels representing sixteen domains of science. In this same illustration there are eighteen labelled roots divided into nine divine attributes and nine logical principles. The divine attributes include such things as wisdom, will, virtue, and truth. These are the more visceral qualities to humanity. It is interesting that the branches of science are dominant and drive our society today, while the roots of divine attributes take a back seat. Visual and creative activities are pushed to the fringes of our culture, while corporate, science, and technology initiatives thrive.

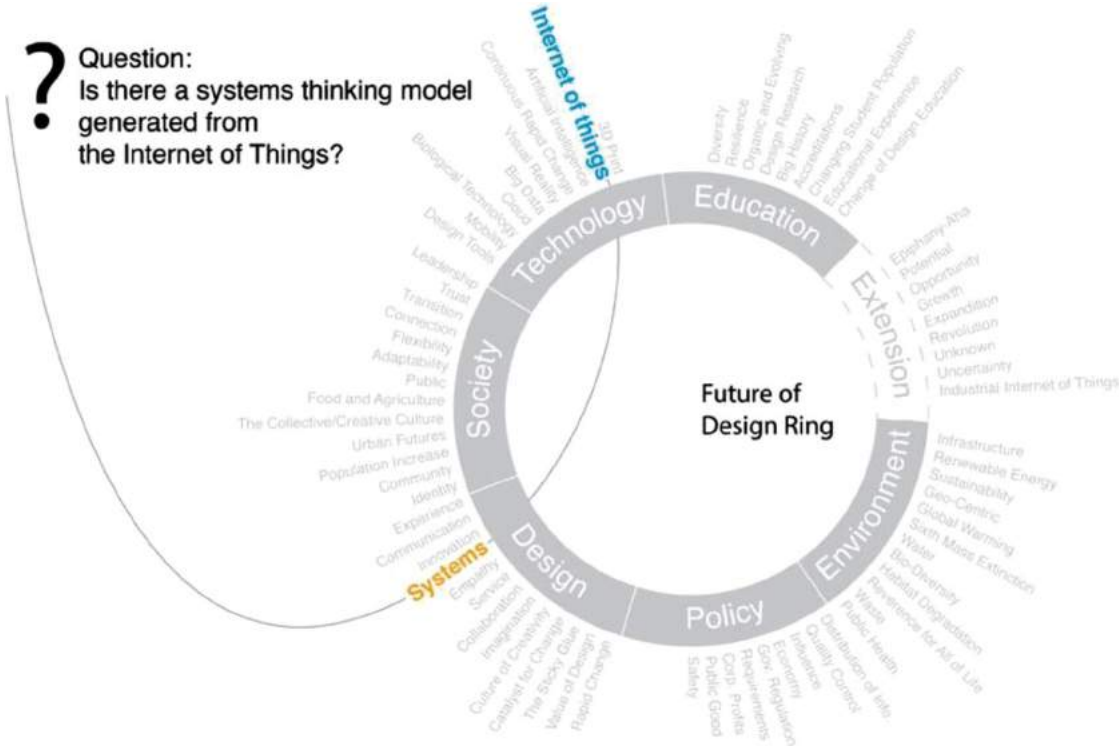

Figure 5. Systems Thinking and the Future of Design: When applying systems thinking to the future of design ring we get an infinite number of questions relating to design, which underscores the rapidly growing and complex field of design.

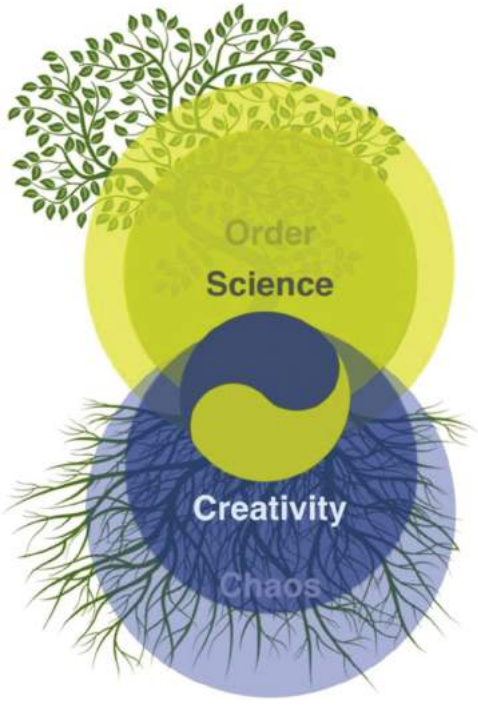

Figure 6. The Modern Tree of Science and Creativity: The balance between the scientific and creativity is critical to our ability to see in a holistic manner. This collective knowledge and intuition is a conventional wisdom that is all too often forgotten.

If we truly believe that diversity and mixed perspectives are imperative in generating solutions to the challenges of our time, then we must openly consider balance within our culture and initiate change. One way to begin this shift is by reforming the design process to include diverse perspectives that produce holistic solutions. When we rethink our approach to challenges and mix into the equation such things as meaning, purpose, and creativity we will get a different result.

As an evolution to the aforementioned Tree of Science I have developed The Modern Tree of Science and Creativity. (Fig. 6) Within the branches of science, we see order, which speaks to the technological minded contributors as mentioned earlier in this paper. This is imbedded in our culture and overshadows other aspects of humanity. The roots of creativity that are holding up the tree incorporate the chaotic and reference creatives. The visceral and visual aspects are grounded here. The balance between science and creativity is critical to our ability to see in a holistic manner. This collective knowledge and intuition is a conventional wisdom that is all too often forgotten.

10. Conclusion

Academic and corporate institutions can no longer neglect to implement learning strategies that are specific

to successful collaborative experiences. This includes fostering connections between various disciplines, incorporating embedded integrated systems thinking approaches and methodologies with practical applications, and creating a balanced space for creative and scientific perspectives within trans-disciplinary teams. This new model of learning is vital in fostering an integrated culture with multiple perspectives and increasing our ability to collectively work together toward a shared vision. Strong visionary leaders with this advanced foresight can act as a catalyst for constructive transformation by fostering these initiatives. This can be achieved through tending to both the branches (science) and roots (creativity) for an authentic holistic viewpoint.

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