

# Responsible Innovation: A Model for Holistic Design Pedagogy

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Current discourse around innovation has aroused global interest on the part of corporations, governments, and non-profit organizations in applying human-centered design methods to renovate or expand their offerings. While enriched product and service portfolios benefit those who partake in the marketplace, innovations undertaken for innovation's sake have been seen to undermine some social and environmental conditions for the general public. In this paper, we argue for a holistic view of responsible innovation that deals with the design, reification, and maintenance of positive, equitable, and meaningful futures desired by sustainable networks of human and non-human actors. We have organized a conceptual model of responsible innovation around clusters of topics, theories, methodologies, and modes of design action. This model offers designers a systemic perspective on the often-overlooked implications of innovative offerings. We explain how the responsible innovation model informs a new graduate design curriculum at the University of Illinois at Urbana-Champaign that offers four tracks of study. The model acts as a scaffold for students to construct research paths across topics and methods, thereby empowering them to outline their learning experiences and develop sustainable solutions. The holistic model also serves as a pedagogical tool to help faculty engage the opportunities and challenges of responsible innovation.

**Keywords:** *social responsibility; innovation; design futures; graduate design education*

## 1 Introduction

In order to actualize ethical research currently being conducted in the realm of innovation, design researchers at the University of Illinois at Urbana-Champaign recently organized a master's program around the concept of responsible innovation. Whereas innovation for innovation's sake has arguably become a cultural obsession, we asked, what would it mean to engage innovation with intentionality and purpose (Sax, 2018), and what might a program guided by a principle of responsibility look like? While we recognize the great value of the human-centered design approach, we propose that its methods and principles should be reevaluated and recalibrated to express and deliver solutions that produce responsible outcomes.

The issue of responsibility is an underdeveloped thread of prevailing discourses about innovation. For much of the 20<sup>th</sup> century, the definition of well-being was grounded in the availability of products and services that support human activities (Marcus, 2002). This implies a problematic democracy of consumption inasmuch as the resources needed to

bring those products and services to life are finite and unevenly distributed (Manzini, 2015). For example, while a majority of individuals may benefit from democratically-derived decisions, it is nevertheless the case that a large minority may still experience access barriers that prevent them from benefiting from products and services intended to support and constitute well-being.

In a domain of responsible innovation, the methods and processes that designers use should not only be innovative, interdisciplinary, and team-oriented, but also ethical and sustainable. The ability to deploy critical thinking throughout the design process enables researchers to identify gaps in knowledge on complex social issues. Design researchers can fill these gaps by analyzing primary and secondary research. Factors gathered through the process of analysis can guide researchers to make informed decisions that result in design solutions that are both innovative and ethical. In this manner, creative practices can yield responsible outcomes.

In this paper, we reflect on how designers can contribute to a domain of responsible innovation, by defining the topic and framing its relevance for a new graduate design program at the University of Illinois at Urbana-Champaign. Then we present a theoretical-conceptual model for developing and defining methodologies, followed by a discussion of pedagogical structure and conclusions.

## **2 Why responsible innovation?**

Whereas ‘innovation’ is typically expressed as a universal value, its impact is often measured in terms of social, economic, and/or political gains that actually serve to reinforce the status quo (Dourish, 2018; Irani, 2018; Jacobs, 2019; Wagner, Taylor, Zablitz, and Foo, 2014; Zehtabchi, 2018). As practitioners and researchers in non-design domains embrace processes, methods, and ‘designerly’ ways of doing that flow from design practice, design researchers in turn gain additional perspective on the scope and range of what design can accomplish. Responsible innovation requires a granular emphasis on the details of a design research process that seeks scalable design solutions for local, state, national, or global application. Ideally, such a process will yield designs that are not only effective but also flexible and enduring. Design researchers often ask what design can do (What Design Can Do, 2019). Defining a framework of responsible innovation offers new insights and tools for addressing complex social, cultural, and environmental challenges that play out in persistently problematic ways.

Our research in major and non-major design pedagogy shows that students from diverse disciplines are both eager and well-prepared to engage design theories and methods in the service of innovations that address the grand challenges of our time, including (but not limited to) climate change, systemic racism, polarized politics, and mental and emotional health and wellbeing. Students in many disciplines are hungry for an approach to innovation that prioritizes meaningful positive impact. Weekly studio logs kept by over 100 students in diverse majors enrolled in online and in-person general-education design courses at the University of Illinois, Urbana-Champaign (courses taught in the academic year 2018-2019 in the School of Art and Design and the College of Fine and Applied Arts, “Design Thinking” and “Design Beyond Boundaries”) reflect a consistent, self-motivated interest in these issues, yet little confidence that their major-area coursework is preparing them to enact meaningful change on these fronts. Conversely, when presented with design challenges that ask them to address such issues, the same students tend to make general, predictable, and

impractical gestures. But when guided in a design process that builds from their own concerns toward specific, actionable, human-centered design solutions, they gain enthusiasm and confidence in their capacity to collaborate to bring about meaningful positive social, cultural, and environmental outcomes. That this appetite for growth is evident in interdisciplinary, non-major courses as well as undergraduate courses for design majors indicates the opportunities for greater focus and impact that are possible in graduate study.

### **3 A definition of responsible innovation**

Innovation, by definition, is “the introduction of something new; a new idea, method, or device; novelty” (Webster, 2019). For example, the invention of the television was an innovation that moved the consumption of mass entertainment into the home; later, Netflix innovated on the manner in which people consume mass entertainment in their homes. Peter Murphy (2015) defines innovation as the social application of the power of creation and reflects on the necessary conditions in which innovation can emerge. It is not enough to have innovative ideas; these need to be supported by “creative time and creative spaces” (Murphy, 2015, p. 64). Richard Buchanan outlines four orders of design to describe the cultural, temporal, and disciplinary conditions that support creativity on university campuses. These include: 1) the graphic order, i.e. symbols of print; 2) the industrial order, i.e. products; 3) the interaction order, i.e. services, experiences, interfaces, and information; and 4) the systems order, which comprises business, organizations, education and government (Buchanan, 1992). These orders sketch a space for social, technological, and political innovation.

Responsible innovation is an umbrella term that encompasses concerns about social, technological, and political factors in innovation. We define responsible innovation as a domain of intentional action that deals with the design, reification, and maintenance of positive, equitable, and meaningful futures desired by sustainable networks of human and non-human actors. The boundaries of this domain are determined by topics of contemporary debate, such as sustainability, conservation, ethics, justice, equity, culture, and identity. This definition introduces a new dimension to a prevailing definition of innovation that emphasizes value generation. For example, Vijay Kumar defines innovation as “a viable offering that is new to a specific context and time, creating user and provider value” (Kumar, 2012, p.1). In this paradigm users find value in offerings that sustain their fundamental human needs, support the dynamics of their social groups, and maintain or improve their living conditions, while providers find value in user returns on their offerings.

In a market scenario, user and provider logics appear to be concurrent and mutually beneficial. However, a systemic consideration of how and why providers develop their offerings reveals some concerning ethical questions about innovation. In general terms, for-profit providers assess their innovation and product development success by measuring customer satisfaction, margins, revenue growth, return on investment (ROI), sales of new products, and number of patents (Wagner, Taylor, Zablit, and Foo, 2014). These metrics are focused on the fiduciary duty corporations have to their shareholders, who in turn are interested in short-term profits. Such corporations often justify their social duty by arguing that governments use their tax contributions for the general good, or by implementing social responsibility programs that are not necessarily related to the social and environmental impact of their market offerings.

Innovation also occurs on the part of governments and civil and non-profit organizations, as for example when they enact new laws, activate development and inclusion programs, or articulate initiatives that are achievable by the power of collectives that favor underrepresented groups. In these cases, the public good prevails over private interests, and the wider the innovation impact, the better. But the socially-conscious intentions of such innovations do not exclude them from moral scrutiny. Decisions on taxation, public infrastructure, access to justice, or acknowledgement of identity might ameliorate the living conditions of some sectors of the general public at the cost of others. For instance, civil sectors of the city of New York contested the use of public subsidies to entice Amazon's headquarters expansion because the new facilities would raise the cost of living in already gentrifying neighbourhoods. As U.S. congressional representative Alexandria Ocasio-Cortez, (D-NY) explained, "Today was the day a group of dedicated, everyday New Yorkers and their neighbors defeated Amazon's corporate greed, its worker exploitation, and the power of the richest man in the world" (Soper, 2019). In contrast, others embraced the initiative because it would bring tech jobs for highly trained individuals (Goodman, 2019).

In both for-profit and non-profit cases, the user-provider dyad falls short at describing just who is envisioning, designing, servicing and ultimately benefiting from innovative offerings. The binary model obfuscates the roles of stakeholders and shareholders and neglects the possibility that individual actors may be both the recipient and benefactor of a social cause. Therefore, when it comes to analyzing and implementing responsible innovation, *networks of participants* are a more appropriate unit of analysis than the user-provider dyad. In networks, people and organizations constitute nodes, whereas transactions of social, cultural and economic value constitute their interactions.

#### **4 A pedagogical approach to responsible innovation**

We believe it is essential to address ethical responsibility within spaces of innovation. While designers have greater and greater capacities to prototype solutions, they also have an increasing ethical responsibility to consider the impact of their activities, including the unintended consequences that can result from their design solutions. The model we introduce herein prompts students to ask, what is responsible design, and what constitutes a responsible designer? Horst Rittel and Melvin Webber argued for the designer's responsibility when they defined the notion of wicked problems in 1973. They articulated ten properties to describe "the social reality of designing" (Buchanan, 1992). The tenth property states, "the wicked problem solver has no right to be wrong—they are fully responsible for their actions" (Buchanan, 1992 citing Rittel and Webber, 1973). This is a clear argument for the designer's responsibility to think through a host of unintended consequences, from early prototypes through the final deliverable.

Graduate faculty noticed that applications to Illinois' graduate program in graphic design reflected increasing research interest in designing for meaningful change. Our new mission statement, which emerges from the research concerns of our faculty, supports students' growing interest and creates a space for collaborative research with faculty:

The University of Illinois at Urbana-Champaign offers an MFA in Graphic Design that focuses on interdisciplinary making, research, and practice in responsible innovation. This program prepares students to contribute to the field of design by entering into practice, academia, or both. Students can explore responsible futures through research

in traditional print media and emergent technologies including, but not limited to: data visualization, digital interaction, information design, systems thinking, and visual narrative. The degree offers four specialized tracks of study:

1. Sustainable & regenerative design
2. Urban sociology & critical race design
3. Visual and cultural studies
4. Applied research in responsible innovation and social impact (Student Proposed)

To assist students in using these tracks, we offer them our conceptual model for connecting topic, theory, and method within an overarching framework of responsible innovation. The model acts as a scaffold for students to learn to conduct and apply primary and secondary research in interdisciplinary collaborations, thereby empowering them to develop sustainable social and/or environmental solutions.

#### **4.1 Structural model of design for responsible innovation**

In order to visualize a process in which design can operate in a domain of responsible innovation, we have organized our conceptual/theoretical model around networked clusters of topics, theories, methods, and modes of design action. We developed the variables that appear in each cluster by aggregating the critical design frameworks that inform our research and that of our colleagues at the University of Illinois, Urbana-Champaign. In addition to our own respective research programs, we have drawn upon readings, conversations, and debate with a network design scholars and practitioners who are informed by a global and critical perspective on design and research practices, many of whom have participated in our visiting scholars program.

Because responsible innovation is a multidimensional subject that cannot be unpacked as a single linear narrative, the model consists of three bipartite networks of interconnected concepts arranged in four clusters (Figure 1). Each cluster describes a broad conceptual domain that contains several categories. Within clusters, the categories are disconnected, because they describe discrete and comprehensive subjects. Between clusters, however, the categories are tightly connected. In other words, categories in one cluster are associated with (or contribute to) the categories in other clusters, yet are discrete from the other categories in the same cluster.

The clusters are named *categories of awareness*, *topics of concern*, *modes of inquiry*, and *methods of design action*. The first and second clusters address issues and topics that can be used to distill spaces of inquiry for responsible innovation, while the third and fourth offer design methodologies that help to actualize critical thinking and making. It is important to note the variables presented in each cluster are non-exhaustive; users of this model may extend or replace them with variables from their own domain knowledges. In the remainder of this section we define each cluster and show the reader how to use the model.

# Responsible Innovation



Figure 1. Networked structure of design for responsible innovation.

The *categories of awareness* cluster, describes thematic classes of socio-environmental issues constituted by wicked problems. They motivate optimistic visions of futures characterized by fairness, equity, and sustainability. In order to understand these categories, it is necessary to problematize them with the help of methodological tools derived from the bodies of knowledge listed in the second cluster, *topics of concern*. These foundational aspects of the humanities, social sciences, and environmental sciences enable researchers and designers to formulate arguments about values, trust, justice, or identity.

There are no silver bullets to “solve” the wicked problems that arise within the *categories of awareness*. Rather, they can be tackled by devising systemic innovations. That is, a wicked problem can be disentangled by understanding its disposition within the web that emerges at the interface of *categories of awareness* with *topics of concern*. The relationships linking the *topics of concern* with the *categories of awareness* are usually one-to-many. Visualizing these relationships as a web reveals the networked condition in which wicked problems develop.

The *topics of concern* constantly call for the adoption of a responsible position in the innovation process. They bridge the *categories of awareness* with theories and methodologies pertaining to the variety of academic disciplines offered in the third cluster, *modes of inquiry*. Scholars, researchers and practitioners use these modes of inquiry to engage with cultural and social issues and build bodies of knowledge around topics of concern. The relationships between the second and third clusters are also one-to-many, for more than one mode of inquiry is applicable to any one topic of concern. These theories and methodologies can serve to frame the wicked problems nested inside *categories of awareness*. Again, it should be noted that this list is by no means exhaustive; expert researchers and practitioners can incorporate entries from their own domain knowledges as they apply the model.

Finally, the *methods of design action* cluster, offers design disciplines and methods that are informed by the *modes of inquiry*. The relationship between these two clusters is, once again, one-to-many. Thus, problematizing *categories of awareness* by using *modes of inquiry* can motivate design action and innovation. Practitioners following this model will find a solid theoretical framework for grounding their work in the domain of responsible innovation. While our objective is to deploy this model from a design standpoint, this cluster could certainly be replaced with methods from other disciplines. Furthermore, we do not claim that solutions from single disciplines solve complex social problems; on the contrary, it takes systemic and multidisciplinary solutions to instantiate responsible visions of the future.

The model is not a design method. Rather, it is a conceptual tool for devising courses of design research for responsible innovation. It could be read according to the syntax illustrated in Figure 2, which begins at the third cluster, modes of inquiry, and proceeds both to the left and to the right. One form that this reading could take: *modes of inquiry* serve to theorize *topics of concern*, which are in turn used to problematize *categories of awareness*. The same *modes of inquiry* inform the *methods of design action* that practitioners and researchers use to develop design solutions for responsible innovation.

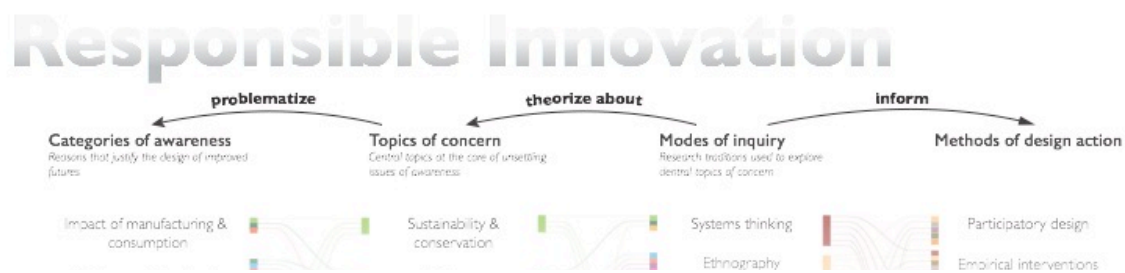


Figure 2. Syntax of the model of design for responsible innovation.

## 5 Structure/Pedagogical Framework

The four tracks of study, 1) sustainable & regenerative design, 2) urban sociology & critical race design, 3) visual & cultural studies, and 4) applied research in responsible innovation and social impact, emerged directly from faculty research interests. The fourth track is intended for students who are interested in working on individually-proposed topics that emerge from intellectual discovery. All of these tracks of study, and many more, can be accommodated by the *topics of concern*.

In order to demonstrate the efficacy of our model, we apply it to an existing research study led by Illinois M.F.A. candidate Eunmi Moon (Figure 3.) This study is an instance of the fourth track. In her project, *GuidingMe*, Moon developed long-term collaborations with individuals who have a visual disability and together they ran empathic experiences. From the analysis of such experiences Moon developed the Role-playing Living Lab (RpLL) method where users created experiences for makers in order to concentrate on the maker's experience of a real user's experience. The maker and the user work as a team, not only by role-playing but also by taking it a step further: the real user is empowered to develop and facilitate an experiential activity for the maker. Moon's mapping of the development of RpLL into our model reveals how she framed her modes of inquiry using ethnographic methods, pattern recognition from observations, and grounded theory. These modes of inquiry served Moon by helping her to theorize about her *topics of concern* (urban social practices; ethics,



morals, and values; honesty and trust). Moon studied users' trust in offerings designed by able bodied designers and the ethics of empathy in the context of fair urban practices. More specifically, the categories of awareness related to her research problem were the stigmatization of people with disabilities, the opacity of infrastructure accessibility, and the issues of social mobility in unequal societies. The modes of inquiry also served Moon to inform design specific methods for the collection of data, structure studies and conduct workshops using participatory design, empirical interventions, simulations and empathic design. Below, we offer further discussion of opportunities afforded by the four tracks of study.

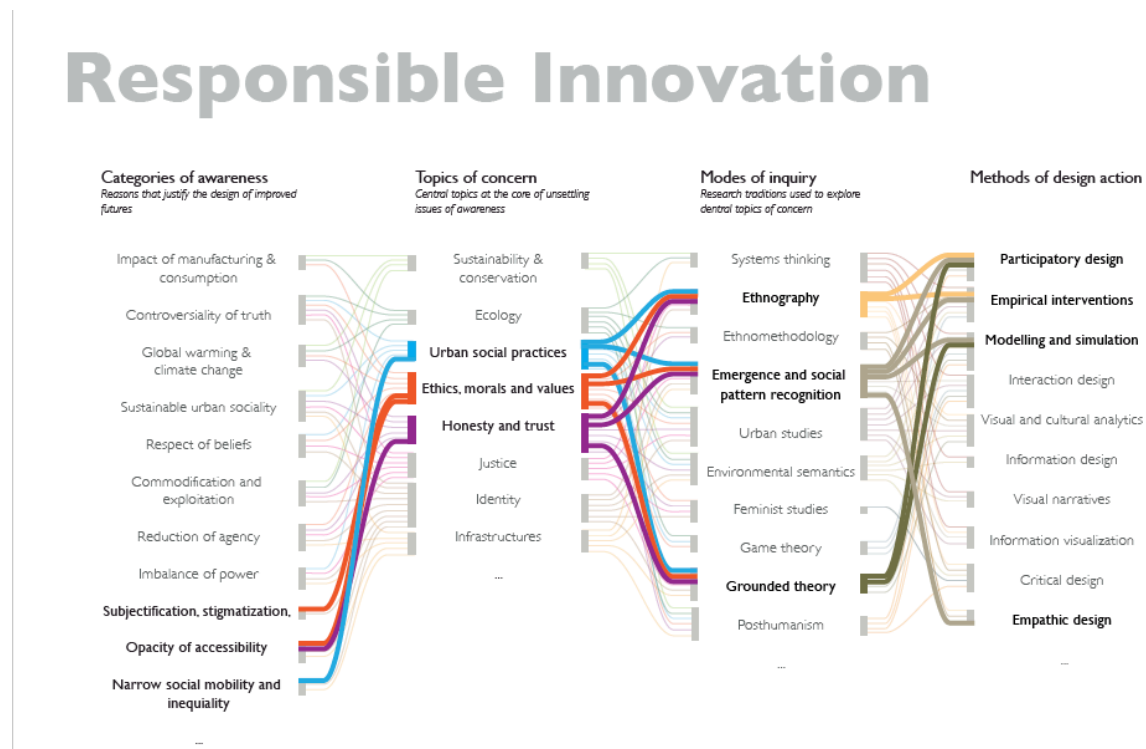


Figure 3. Illinois M.F.A. Candidate Eunmi Moon's methodology can be traced from her methods of design action to the categories of awareness that define her thesis project, GuidingMe.

### 5.1 Sustainable and regenerative design

Sustainable and regenerative design is focused on the production and consumption of material (Benson and Fine, 2010). Professor Eric Benson of the University of Illinois at Urbana-Champaign collaborated with Professor Peter Fine to define imperative components for sustainable and regenerative design. "A more holistic and deeply collaborative pedagogy that emphasizes creativity and innovation [is] the basis for inspired solutions that are centered within commerce, and a [redefined] craft that explores new materials and processes to confront issues of sustainability" (Benson and Fine, 2010). Benson collaborated with Yvette Perullo to co-found *Re-Nourish*, a non-profit organization, that provides design tools to minimize waste, advocate for awareness & action in environmental impact, and develop sustainable systems thinking in the communication design community (Benson and Perullo, 2017).

### 5.2 Urban sociology and critical race design

Urban Sociology and critical race design both speak to the constructed nature of gender, race, sexuality, and class (Forlano, 2017). Both frameworks help describe, explain and address the effect of oppressive procedures, plans, and processes upon the communities



that emerge from socially constructed identities (Murphy, 2015). By using these frameworks in an evidence-based design process, researchers are able to analyze the complex cultural issues surrounding these topics. One example of such research currently being conducted on our campus is *Racism Untaught*, a study that examines racialized designed artefacts, systems, and experiences through design research (Mercer and Moses, 2019). This project provides a creative space that supports learning environments in which students and educators can explore issues of race and racism, from the most obvious to the least visible. The visual rhetoric and individual encounters on a daily basis requires designers to be overtly aware of the dominant cultural constructed ideas and systems that influence design (Hum, 2015). It is imperative students engage in an interactive experience that provides context around community issues.

### **5.3 Visual and cultural studies**

Design is a visual medium whose agency depends on the cultures of perception in which it is deployed. While visibility is the dominant perceptual paradigm for graphic design, studies in visual culture need not restrict inquiry to issues of opticality. For example, the emergence of critical visual studies in the 1980s and early '90s showed that visibility offers a basis for problematizing perception across all the senses (Bal, 1993; Bryson, 1983; Jay, 1988; Silverman, 1996). Visual and cultural studies can trace the consequences of design interventions over time in order to reveal not only the intentional processes by which material cultures emerge but also the unintentional intersections that shape the social and economic structures we inhabit. Haptic and aural sensations contribute to this process. For example, the built environment reflects the purposeful efforts of architects, landscape architects, and policymakers as well as the vernacular manner in which popular multi-sensory media have shaped perception, expectation, and desire in urban and rural spaces (Briggs, 2018; Briggs, 2019). Designers organize social and economic structures in smart cities, as in the case of smart bicycles that are synced to traffic infrastructure. The interconnected bicycles convey signals through optic, aural, and haptic interfaces in order to organize schools of cyclists in a flocking pattern (Cespedes and Salamanca, 2018).

### **5.4 Applied research in responsible innovation and social impact**

The final track we recommend for potential study is a general category for exploring the space of responsible innovation. Topics of concern could arise from any of the previously mentioned tracks or from the researcher's particular concerns. Modes of inquiry could allow the researcher to develop a granular focus for design research that is also flexible, enduring, and scalable. Focus points in this track would be student-led and accommodate diverse interests.

## **6 Discussion/Conclusion**

Our framework affords a number of pedagogical and methodological benefits. In its holistic exposition of topical, theoretical, methodological, and modal clusters, it highlights design's capacity to function as a critical lens for interpretation and action. That is, whereas affirmative design perpetuates normative design practices, critical design questions the status quo and opens up new avenues of possibility (Dunne and Raby, n.d.). The structures we have outlined enable the exchange of knowledge and afford students a creative space for discovery in which they can develop an epistemological understanding of design and ethics (Murphy, 2015). The framework encourages students to examine the implications of a variety of methodological choices early in the process, rather than allow premature choices

of topic, method, or rationale to diminish their design opportunities. Embracing ethics within a framework of responsible innovation not only permeates the decisions designers make on behalf of users but also illuminates the scale, significance, and consequences of their solutions.

This work urges the need for holistic views and a spirit of inquiry from designers, where action is supported by systemic thinking, designers guide their design process with ethics, and are transformative with their ethical actions. Design can be both practical and critical. Practical actions and critical analysis can help designers understand and navigate complexities that lead to discovery of new knowledge (Murphy, 2015). Designers collaborate with key stakeholders developing design solutions for both human and non-human actors with meaningful positive, social, cultural, and environmental outcomes. A responsible process for innovation must be inclusive and diversify collaborators, providing a space to both analyze and act upon implicit knowledge, provide transparency in our understandings, and support the ability to be flexible within a system (Smallman, 2018).

The model is modular and therefore is adaptable and extends to many domains. Socially responsible innovations may require systemic actions from domains not covered in the model. A revised version of the model from an ecological perspective would add concepts and methods about the natural environment. The fourth cluster (*methods of design action*) is specific to the design domain but it could be replaced by methods and strategies for action from fields such as economics, social work, psychology, information science or education.

We have begun to use the model to advise students as they develop systemic solutions to complex social issues. Students have found it useful for reflecting on the social and environmental impact of the methods and processes they use in the design research process. In this manner, the development of responsible designs should be guided by ethics and result in systemic design solutions for both human and non-human actors.

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**Molly Catherine Briggs's** research examines the role of popular immersive media in perceiving and constructing the built environment. She holds a Ph.D. in Landscape Architecture from the University of Illinois, USA, and an M.F.A. in Printmaking from Northwestern University, USA.

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