Research Proposal Toolkit

Design tools for developing multi-stakeholder research proposals

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Research Proposal Toolkit
Design tools for developing multi-stakeholder research proposals

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Abstract

KEYWORDS: DESIGN CANVASES, DESIGN THINKING, PARTICIPATORY DESIGN, MULTI-STAKEHOLDER ENGAGEMENT

Researchers seeking funding often feel overwhelmed by the extensive criteria and the increasing competition for funding. Often research proposals are rejected immediately for failure to comply with defined criteria. To address this issue, I used a participatory design approach to develop a Research Proposal Toolkit to better align proposal elements with grant criteria. The toolkit described in this paper contains design tools and methods that help multi-disciplinary research teams visualize the various components of a grant proposal in order to quickly evaluate and strengthen the elements to use in the development of a full proposal. The process of designing and testing these tools highlighted the role design can play in many areas of the research process. Designers can serve as facilitators in bringing groups of diverse stakeholders together to use design tools to address complex problems, such as those being addressed in many proposed research studies. Including a participatory design approach in the methodology to engage participants across diverse groups in a study offers a proven approach not often presented in research proposals. And finally, the inclusion of information designers on a research team ensures the capacity to create effective artifacts for presenting data analysis to interested audiences.
Acknowledgments

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Introduction

At universities across the United States, cuts in federal research funding are threatening the progress of academic research. As the competition for declining funding heats up, academic researchers must find ways to develop comprehensive research proposals that stand out. Researchers seeking funding often feel overwhelmed by the extensive criteria they need to address across various funding agencies. Many spend countless hours developing proposals that are often rejected immediately for failure to comply with requested criteria.

For this thesis I developed a Research Proposal Toolkit to better align proposal elements with grant criteria when developing research proposals. I collaborated with researchers and funding professionals, using a participatory design approach to iteratively co-create versions of the toolkit. The Research Proposal Toolkit described in this paper contains design tools and methods that help multi-disciplinary research teams visualize the various components of a grant proposal in order to quickly evaluate and strengthen the elements of their proposal.
The process of designing and testing these tools highlighted the role design can play in many areas of the research process.

1. The participatory design process used to create the toolkit highlighted the role that designers can play as facilitators of the design process for generating a product. In this case, the Research Proposal Toolkit.

2. It also highlighted the role that designers can play as facilitators in bringing groups of diverse stakeholders together to use design tools to address complex problems, such as those being addressed in many proposed research studies (Fig 1).

3. Literature on research proposal evaluation criteria notes that many funding agencies are looking for proposals that demonstrate novel ways to approach complex issues, often requiring the participation of participants or patients. Including a participatory design approach in the methodology to engage participants across diverse groups in a study offers a proven approach not often presented in research proposals.

4. And finally, research proposals and successful research studies must consider the dissemination and communication of research findings throughout the research process to both expert and non-expert audiences. The inclusion of information designers on a research team ensures the capacity to create effective artifacts for presenting data analysis to interested audiences.

This paper explores the similarities in evaluation criteria defined by most federal funding agencies. These main criteria determined the elements the toolkit needed to address to be effective in helping researchers develop comprehensive proposals. The toolkit is a work in progress that draws from the design tools and methods featured in this paper that are used to bring groups of diverse stakeholders together to address complex problems. The tools in the kit that have undergone the most iterations have proven to be useful for research teams in developing proposals. The newer tools that have been introduced based on researcher feedback require additional testing and iterations to hone their effectiveness.
How Research Proposals Are Evaluated

A decline in research funding has created increased competition for research grants. At universities across the United States, cuts in federal research funding are threatening the progress of academic research (Hume, Giladi, and Chung 2015). In the 1960s and ‘70s the federal government’s share of research spending topped 70%. In 2004 its share declined to 61% and more recently fell to 44% in 2015. Budget cuts, sequestration, and inflationary losses have been cited as reasons for a decrease in funding (Collins, Reizes, and Dempsey 2016). This decline of federal funding is a familiar story to academic researchers who are faced with increased competition for government grants.

In the ultra-competitive landscape of research funding, researchers must find ways to make their proposals stand out above the rest and demonstrate the potential impact of their research in order to increase their chances of securing research funding (Hume, Giladi, and Chung 2015). Research development offices sustain their efforts by encouraging new researchers and established researchers to apply for grant support from diverse funding opportunities. Foundation Center maintains a comprehensive database on United States grant makers and their grants. Foundation Center’s on-line service, GrantSpace, provides resources for grant applicants. The most asked question on GrantSpace is how to write a grant proposal.
For new and established researchers, the prospect of learning a plethora of rules from different funding agencies can seem daunting. The grant proposal process does not have to be as daunting if researchers understand that most research grants have essentially the same goals and evaluate proposals based on similar criteria (Falk-Krzesinski and Tobin 2015). Most funding organizations require researchers to submit a formal grant proposal that includes a research protocol outlining the need for the project, detailing the methods for how experiments will be performed and data will be analyzed, and describing expected results and potential impact (Hume, Giladi, and Chung 2015; Chung and Shauver 2008, 2008; Kotsis and Chung 2010). Grant proposal must demonstrate a high likelihood that the research will produce meaningful results (Hume, Giladi, and Chung 2015). Federal funding agencies, state agencies, local groups, and private philanthropic organizations evaluate research grant proposals to determine which projects fit within their mission and will provide a return on their financial investment (Falk-Krzesinski and Tobin 2015).

Organizations use different terms to describe their review criteria, with the majority of the criteria falling into one or more of four main areas—impact, feasibility, expertise, and budget (Hume, Giladi, and Chung 2015; NIH 2016; Agarwal 2006; Jagadeesh, Balakumar, and Inamdar 2013; Falk-Krzesinski and Tobin 2015). An overview of what elements make up the four main areas of impact, feasibility, expertise, and funding will allow us to see where design tools can play a role in streamlining the process of developing more fundable research proposals.

Impact Evaluation Criteria

Elements that make up the impact section of a grant proposal include the research topic, the research questions, objectives, relevance, and existing research review (Jagadeesh, Balakumar, and Inamdar 2013). The research topic is the foundation of the research project. All other elements of the study should relate back to the research topic in a clearly evident way. Therefore the research topic should not be too narrow or too broad (Jagadeesh, Balakumar, and Inamdar 2013). It should be
novel and relevant to society at large (Tracy 2010), and address scientific questions that have not yet been answered. Those answers should advance knowledge in a local context but have significance beyond a given setting (Proctor et al. 2012). A lack of societal significance or personal meaning conveys an impression that the study will be pursued with less rigor and less attention to research design and data collection (Miles, Huberman, and Saldaña 2014). When considering writing a research grant proposal, an investigator will most likely already have an idea of the question they would like to study. However, the idea needs to be fully articulated into a formal research question that will be central to the entire grant. To formulate a novel question, an extensive literature review should be conducted and summarized to demonstrate a comprehensive understanding of the field and avoid duplicating studies that have already been published (Chung and Shauver 2008). Research questions can be broken down into more precise objectives that lead to relevant methods for achieving the objectives and definition of key terms. Objectives should describe the goals of a study, rather than describe the steps. The objectives should cover the entire breadth of the project.

Feasibility Evaluation Criteria

Feasibility of a research proposal is determined by the researcher or research teams ability to access the data and resources needed to conduct the research within a specific timeframe (Patten 2017). New researchers often struggle to demonstrate their capacity to conduct proposed research and proposed methods. If a proposed study is very complex, it is even more important to provide evidence of capacity and feasibility (Proctor et al. 2012). Funding agencies look for overall strategies, methodologies, and analysis that are well reasoned and appropriate to meet the objectives of the study. Strategies should ensure robust and unbiased approaches appropriate to the work proposed. Potential problems, alternative strategies, and benchmarks for success should be presented. Projects in the early stages of development should demonstrate how they would establish feasibility and manage risky aspects of the project. The proposal should present adequate plans to address relevant biological variables, such as sex,
for studies in human subjects. Projects that involve human subjects must address the protection of human subjects from research risks. Inclusion or exclusion criteria of individuals, including children on the basis of sex/gender, race, and ethnicity must be justified in terms of the scientific goals and research strategy proposed. The environment or setting, including institutional support, equipment, and other physical resources should be outlined in terms of its relevance to the project’s success (NIH 2016).

An evaluation plan that includes an outline of how the study will measure success is often required in larger grant proposals to demonstrate feasibility of a project and provide information as to how a project can be improved during development and implementation (Office of the Vice President for Research at Brown University 2018). The Office of the Vice President for Research at Brown University offers suggestions for elements that should be included in two different types of evaluation plans – formative and summative. A formative evaluation begins during project development and continues through implementation to assess initial and ongoing project activities. This type of evaluation plan allows for new and sometimes unanticipated insights into improving the outcomes of the project. It requires review by the principal investigator, the steering or governance committee, and either an internal or external evaluator, depending on grant requirements.

A summative evaluation takes place after the completion of the project to assess the quality and success in reaching a project’s stated goals. Summative evaluation presents the information collected for project activities and outcomes for review by a panel that includes the principal investigator, the steering or governance committee, either an internal or external evaluator, and the program director of the funding agency. Both types of evaluation plans should outline the participants directly involved in the project and the investors, partners, collaborators and research team.

The relevant items developed in the evaluation process should also be outlined. The evaluation process can be broken down into a series of steps, from preparation to implementation and interpretation. A co-creative design thinking approach, described in more detail in the next section,
can help to develop a conceptual model of the project and identify key evaluation points. Participation of key stakeholders in the creation of the evaluation plan creates a shared understanding of the project’s structure and expected outcomes, and highlights the project’s most important elements. Including information designers on the research team ensures the capacity to create effective artifacts for presenting data analysis to interested audiences.

**Expertise Evaluation Criteria**

Feasibility of a proposed study is dependent on expertise. It includes being able to demonstrate the research team’s capacity to conduct a study, access to the people needed to gather required data, and resources that provide critical access (Patten 2017). Proposals that convey a research team’s experience with the proposed study’s setting, treatment, and methods help convey capacity and feasibility to successfully complete the proposed research (Proctor et al. 2012; Stiffman 2009). Proposals should demonstrate the experience and training of all researchers, including on-going accomplishments that have advanced the proposed study’s field of research. Collaborative projects should present complementary and integrated expertise and demonstrate how the proposed leadership approach, governance, and organizational structure are appropriate for the project (NIH 2016). Clearly outlining the stakeholders, including researchers, collaborators and populations of study helps to demonstrate the capacity and feasibility of a research study.

In the following section, Multi-Stakeholder Design, I discuss the role co-creative design thinking approaches are playing in multi-stakeholder engagement for addressing complex issues. The literature referenced in the next section offers language that can be included in research proposals to present stakeholder engagement methods. Highlighting co-creative design thinking approaches serves as demonstration of utilizing novel theoretical concepts and methodologies to challenge and shift current research practice paradigms, which has been noted by funding agencies as an evaluation criteria that can strengthen a research proposal (NIH 2016).
The inclusion of design researchers and information designers on research teams demonstrates a capacity for effectively engaging diverse stakeholders in a research process. Unique partnerships and expertise that may not be duplicated elsewhere and a strategy for engaging stakeholders across diverse groups of practice make a research proposal stand out from the competition.

Funding Evaluation Criteria

The funding portion of a research proposal is often comprised of outlining a detailed budget for the proposed study. The proposed budget takes into account the expenses and income for all the activities, resources, and people outlined in the study proposal. The Minnesota Council on Foundations outlines elements that make up a proposal budget in their guide to successful grant proposals (Davis 2005). Expenses are often divided into three sections – personnel expenses, direct project expenses, and administrative or overhead expenses. Personnel expenses include the costs incurred for people who will work on the project. Direct Project Expenses are non-personnel expenses that would not be incurred outside of the project, including travel costs, printing, space or equipment rental, supplies, insurance, or meeting expenses such as food. A budget should be well thought out and accurately reflect all of the costs the project will incur. A comprehensive outline of all costs can be used to complete research proposals for various funding agencies. Some funders don’t cover administrative expenses. Some require a flat percentage of your direct expenses. Others request an itemization of all expenses. Project income is split into two sections – earned income and contributed income. The project’s products or services generate earned income. Other funding opportunities are considered contributed income and can be in the form of cash or in-kind. In-kind contributions are gifts of goods or services instead of cash. They can include donated space, materials or time. The budget for a proposed study must be realistic in terms of estimated requirements for equipment, supplies, and personnel. The cost of the proposed project should not be greater than any possible benefit to be derived from its completion.
Common Reasons Proposals Are Rejected

Research proposals must give equal attention to the overall quality of all elements and completeness to optimize chances of funding (Hume, Giladi, and Chung 2015). For example, an NIH grant will be returned if the margin justification is incorrect. In one study of grants submitted to the NIH, 20% of proposals had formatting errors for which the instructions were clearly spelled out (Chung and Shauver 2008). A listing of common deficiencies that are identified in the grant review process can yield valuable insights into the process of developing proposals and lead to a stronger application (Agarwal 2006). The list on the next page (Fig 3) adapted from ‘Proposals that Work’ outlines the most common reasons for proposal (Locke, Spirduso, and Silverman 2007). The illustration above (Fig 2) summarizes the most common challenges funding agencies and researchers face with funding or developing research proposals. In the next section we will look at the role design plays in the process of engaging multiple-stakeholders to develop stronger research proposals.
**Common Reasons Proposals Are Rejected**

- Submission deadline was missed!
- Proposal topic did not align with the mission of the funding agency to which it was submitted.
- Proposal topic was not a current priority for the funding agency to which it was submitted.
- Required content, format, and/or length guidelines were not followed exactly.
- The proposed question, design, and method were traditional, offering no novel or innovative advances to the field.
- The proposal was too vague in describing one or more elements of the study.
- The proposal did not comprehensively describe one or more elements of the study.
- The review of the literature indicated the research/s did not have sufficient expertise in the area of focus.
- The proposed study appeared to be beyond the capacity of the authors in terms of training, experience, and available resources.
- The proposed method of study did not align to the objectives of the research.
- The budget was unrealistic in terms of estimated requirements for equipment, supplies, and personnel.
- The cost of the proposed project appeared to be greater than any possible benefit to be derived from its completion.
- The proposal presented a highly partisan position on the area of study.
- The quality of writing was poor.
- The problem scope and solution scope did not match.
- The proposal contained many mechanical defects that reflected carelessness and inattention to detail.
Multi-Stakeholder Design

A decline in research funding has created increased competition for research grants. At universities across the United States, cuts in federal research funding are threatening the progress of academic research (Hume, Giladi, and Chung 2015). In the 1960s and ‘70s the federal government’s share of research spending topped 70%. In 2004 its share declined to 61% and more recently fell to 44% in 2015. Budget cuts, sequestration, and inflationary losses have been cited as reasons for a decrease in funding (Collins, Reizes, and Dempsey 2016). This decline of federal funding is a familiar story to academic researchers who are faced with increased competition for government grants.

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In developing the research proposal toolkit, I employed a co-creative process to iterate and test variations of the tools with researchers to determine which layout designs, content and formats best meet their needs. This section describes co-creative design and highlights its use in a multi-stakeholder process for addressing complex issues. The content on the following pages not only serves to describe methods and tools that informed the process that was used to create the Research Proposal Toolkit, but also serves as an argument for integrating a co-creative framework into the research design of a proposed study. In addition, it offers an argument for including design researchers and information designers on multi-disciplinary research teams to increase a proposed study’s likelihood of successful outcomes.

Wicked Problems

Wicked problems are difficult or impossible to solve because of incomplete, contradictory and changing requirements that are often difficult to recognize. Moreover, because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems (Rittel and Webber 1973).

In this context, the term wicked is not used in the sense of evil, but refers to a problem that is highly resistant to resolution (Australian Public Service Commission 2007). Urban planners, H. W. J. Rittel and M. M. Webber, first used the term wicked problems in 1973 to describe a range of societal issues that cannot be defined or solved with traditional linear and analytical methods. Rittel and Webber contrasted these types of complex societal problems with ‘tame’ problems, which can be defined and have identifiable solutions. The typical approach to solving a tame problem can be described with a linear process of identifying the problem, brainstorming solutions, selecting best option, and applying the selected solution to the problem. A simple example of a tame problem is a recipe for a dish that serves 5 people, but the need to serve 20 people. Multiplying the ingredients and changing the logistics solves this tame problem.
Wicked problems, in contrast, have no known algorithms to solve them. Examples of wicked problems include economic development, strategic planning, organizational change, curing cancer, or eliminating world hunger. Approaching wicked problems is an iterative learning process between problem and solution. Since a linear process cannot be followed to understand or formulate solutions for complex issues of this nature, creativity is needed to design new approaches. However, an individual stakeholder, regardless of intellect or creativity, cannot fully comprehend or solve problems of this scope on their own (L. Sanders and Stappers 2012). An interdisciplinary team approach that effectively engages stakeholders from diverse groups of practice is required. This approach merges multiple perspectives into a more comprehensive understanding of an issue to identify innovative solutions (Nijstad and De Dreu 2002). Diverse teams bring people with different styles of thinking, decision-making, and reasoning together (Sanders and Stappers 2012). Ideal teams will bring all of these styles together to generate innovation solutions. It has been argued that without the collaboration of creative teams there can be no true innovation (Sawyer 2017).

Creative teams addressing wicked problems should balance the prevalence of left-brain, logical, sequential-type thinking of lawyers, accountants and engineers with right-brain, holistic, intuitive and non-linear thinking of artists, inventors, and entertainers (Pink 2006). Effective teams will utilize Henry Mintzberg’s three strategies for decision making (Mintzberg and Westley 2001), and take into account Charles Pierce’s three modes of reasoning (Peirce, Houser, and Kloesel 1992).

Henry Mintzberg (2001) distinguishes the diversity in decision-making into three strategies, each with its own strengths and weaknesses – thinking first, seeing first, and doing first. Thinking first is a left-brain strategy that works for tame problems, which are well defined and have reliable data and identifiable solutions. Wicked problems, which often involve missing, uncertain or conflicting information, cannot be addressed with a thinking first strategy. Seeing and doing first strategies shift us toward our right brain and offer more creative approaches to addressing wicked problems. Seeing first involves creating visuals, such as sketches, and
Design-Led

User-Centered Design
- Usability Testing
- Human Factors + Ergonomics
- Contextual Inquiry

Participatory Design
- Lead-User Innovation
- Applied Ethnography

Research-Led

Critical Design
- Cultural Probes

Generative Design Research
- Generative Tools

Participatory Mindset
“users” seen as partners (active co-creators)

Expert-Mindset
“users” seen as subjects (reactive informers)

“Scandinavian” Methods

suggests that seeing drives decision-making as much as thinking. A seeing first strategy works best when many elements need to be combined to imagine possible futures and create innovative solutions that can be committed to, as in new-product development. Doing first strategies could include creating, testing and iterating on prototypes. Doing first works best when things need to be worked out with limited experience or understanding.

Charles Sanders Peirce wrote expansively throughout his fifty-year career on the three modes of reasoning – deduction, induction, and abduction. Each mode of reasoning has a different method for forming conclusions. Deductive reasoning can be described as a logical manner of forming a conclusion. Deductive reasoning is sometimes referred to as top-down thinking or moving from the general to the specific (Evans, Newstead, and Byrne 1993). For example a grocery store has determined that people buy candy as an impulse buy. Therefore, if they put candy near the cash register, people will buy more candy. The scientific method is an example of inductive reasoning, which develops a hypothesis about something and then tests the hypothesis enough times to develop a trusted conclusion. Abduction and induction are similar in that both seek a theory (Sebeok and Umiker-Sebeok 1979). However, abduction seeks lots of possible explanations without the need to prove there is only one right answer (Sanders and Stappers 2012).

A combination of seeing and doing first strategies and abductive reasoning are often used in co-creative design thinking frameworks to connect left and right brain thinkers participating in multi-stakeholder problem-solving activities. Design thinking has evolved as an umbrella term used to encompass multi-disciplinary, human-centered projects that involve research and rapid ideation (Szczepanska 2017). Design thinking uses Peirce’s abductive reasoning to actively look for new data points, challenge accepted explanations, and infer possible new futures (Martin 2009). Design thinking can be used to describe a category of activities, tools, and thinking styles used for engaging diverse groups of people to draw on their innate creativity to collaboratively generate innovative ideas for addressing complex problems. A look at the evolution of design research helps to illustrate where co-creative design thinking approaches are playing a critical role in multi-stakeholder
**Fig 5**

**Expert Mindset:** DESIGN FOR – Traditional research approaches see ‘users’ as subjects to study and design for

**Expert Mindset Example:** Outside research consultants are hired to study ‘users’ (i.e. workforce, clusters, etc)

**Designers use the report to create materials (i.e. website, printed documents) as a way to share findings

**Stakeholders present designer’s concept of the report

---

**Participatory Mindset:** DESIGN WITH – Co-design includes the people we are serving as participants throughout the entire process

**Co-design brings the expertise of the community to the research and decision-making process

**Boundary objects are used to synthesize knowledge and form a story that everyone connects to

**A co-designed process allows the community to build a story that they are a part of, believe in and can act upon**
engagement for addressing wicked problems. The map (Fig 4) illustrates this evolution of design research approaches and methods. Originally published in the landmark book on co-design, Convivial Design Toolbox: Generative Research for the Front End of Design (2012), Liz Sanders’ map defines and describes design research in two intersecting dimensions – approach (top and bottom) and mindset (left and right sides). Shown at the bottom and taking up most of the map are approaches to design research that have come from a research-led perspective driven by psychologists, anthropologists, sociologists, and engineers. Shown at the top of the map are the approaches that come from a design-led perspective. Design-led approaches have a shorter history than research-led approaches, having come into view more recently.

Sanders presents opposing mindsets found in design research today on the left and right sides of the map. Toward the left side of the map are approaches characterized by an expert mindset. Design researchers on this side of the map consider themselves to be experts who study ‘users’, ‘subjects’, ‘consumers’, etc. Design researchers on the right side of the map have a participatory mindset. They value people as co-creators who are integral to the design process.

The pink bubble, representing user-centered design, is the largest and most developed area on the map. In this area research-led approaches are conducted with an expert mindset. Sanders notes that the large bubbles of activity within this area, human factors/ergonomics, applied ethnography, and usability testing come from the applied social and behavioral sciences and engineering. Sanders describes the orange participatory design bubble on the right side of the map as an approach that attempts to involve the people previously referred to as ‘users’ throughout the design development process as much as possible. A key characteristic of participatory design approaches is the use of physical artifacts to streamline idea generation and synthesis throughout the design process. Sanders attributes the origin of many of these methods to the research-led Scandinavian tradition of co-operative design, which democratized workers voices in the workplace (bottom right of the map).

The visualization on the left (Fig 5) shows the contrast between an expert mindset and a participatory mindset. In a traditional user-centered design approach, stakeholders engage researchers to study subjects (users).
Researchers combine their expert knowledge from theories with new knowledge developed through observing and interviewing the users. This knowledge is often passed to the designer in the form of a report. Designers use the report to create materials (i.e. website, printed documents) as a way to share findings from the report in creative ways. Stakeholders present the designer’s concept of the report to users, who often fail to see where their input contributed to the final form. In contrast, the co-creative design process integrates the people who will eventually be served by the design process into the design process. As ‘experts of their own experience’, the participants contribute knowledge, generate ideas, and develop concepts (Sleeswijk et al. 2005). Researchers and designers participate in the process and provide tools for ideation and creative expression. This collaboration of stakeholders in generating a shared understanding and artifacts can be referred to as a co-creative approach.

Co-Creativity

Co-creation refers to any act of collective creativity, which often occurs when an idea is borrowed from one domain and applied to another (Sanders and Stappers 2012). Co-creative tools use associations, ambiguity, incompleteness (Sanders and Stappers 2012), bisociation (Koestler 1989), and metaphor (Schön 1993) to stimulate creative thinking and generate new ideas. According to Sanders, ambiguity and incompleteness can be used to stimulate creative thinking because people will draw on their own experience and imagination to fill in what is not shown or said. People are driven to make meaning and therefore project their needs onto ambiguous stimuli. Sanders refers to ideas as the basic building blocks of creativity. Ideas can be represented by words or pictures or can be thought of as clouds of associations. Priming is a method used to activate nearby clouds of associations when one cloud is triggered through remembering an idea. These clouds of associations are different for each individual depending on their own personal experience of thinking about an idea before. Understanding priming can help design researchers select and prepare tasks and materials to use in preparation for creative sessions. Bisociation is a term coined by Arthur Koestler (1989) to describe
a ‘process that brings together and combines previously unrelated ideas’. Metaphor is a type of bisociation that generates new ideas and solutions (Schön 1993).

Ideas and thoughts stored in memory make up four distinguishable levels of knowledge – explicit, observable, tacit, and latent (Sanders and Stappers 2012). Explicit knowledge can be shared easily in a document or stated in words. Observable knowledge is developed through watching how things occur or how people behave. Sanders depicts these levels of knowledge as an iceberg (Fig #) with the harder to access levels of tacit and latent knowledge underwater. The experiences a person has are tacit knowledge. When experiences are documented they become explicit knowledge. Latent knowledge is hidden until we draw on our past experiences to form knowledge that we haven’t experienced yet.

Co-creative techniques rely on the creative process to uncover latent and tacit knowledge and often result in the making of an artifact. Artifacts created collectively help to align the ideas of individuals from different communities of practice (Star and Griesemer 1989). Elements that make up individual creativity are used to design effective tools and techniques for artifact creation in a co-creative process. There are numerous design methods, tools, and techniques used to research complex problems, develop innovative ideas and design effective solutions (Martin and Harrington 2012). We are going to take a look at how co-creative design methods, tools, and techniques address the need for co-creative multi-stakeholder engagement for addressing complex problems, often the topic of proposed research studies.
Co-creative Design Approaches

Co-creative design approaches being used today include participatory design, action research, experience design, and service design, among others. There are many overlaps between the different approaches. In developing the Research Proposal Toolkit, I employed an action research approach, which used an iterative sequence to actively develop and explore improvements to the tools in collaboration with practitioners (Avi-son et al. 1999). Collaborative iterations served to both improve the tools and understand the context in which they will be used. Action research is a form of participatory research. It provides a theoretical basis for ‘getting out of the lab’ and benefits from a co-creative approach. The business community has embraced elements of action research.

In Running Lean (2012), Ash Maurya details his customer-centric approach to rapid iteration for developing startup business plans (Maurya 2010). Maurya references Customer Development and Lean Startup as influencers in the development of his approach. Customer Development is a term coined in Four Steps to the Epiphany by Steve Blank. This term refers to ‘getting out of the building’ and engaging customers directly, which draws directly from action research’s concept of ‘getting out of the lab and engaging with practitioners (Blank 2013). Lean Startup is a book and trademarked phrase of Eric Reis that promotes the concept of using smaller, faster iterations for testing a vision (Ries 2011). All three approaches mentioned above provide design-thinking tools in the form of canvases or worksheets to engage participants in ideation and creative expression.

Experience design and service design are approaches that go beyond design of physical products to consider the moments of engagement between people and brands. Experience design focuses on the process and act of designing experiences an individual has with a brand or product. Service design focuses on the process and act of designing services. Experience design and service design use many of the same design tools and
techniques to achieve their goals. A service or experience designer might be involved in designing the entire scope of a service or experience from beginning to end, or just a moment in a service or experience. To effectively design an entire service, experience or moment, it is essential to understand the environments, systems, people, and tools that support and influence the service and/or experience. Experience and service design are focused on purpose versus approach or method, and therefore can be embrace either an expert or participatory mindset. To-date, service design in particular has adopted many participatory design tools, techniques and methods as seen in the alignment diagrams explored in the next section.

Co-creative Methods, Tools, and Techniques

Design Toolkits

The term toolkit can be applied to many forms of information and content. Toolkits are generally thought of as a container that keeps tools for working in construction in one place. Having the tools in a single place that can be easily carried around is a convenience. Design toolkits are collections of design tools and methods that make various processes and activities easier to carry out. For example, a designer’s toolkit for stakeholder engagement would contain the tools and methods a facilitator most frequently uses when bringing groups of diverse people together for ideation activities.
Generative Toolkits

In *Convivial Design Toolbox: Generative Research for the Front End of Design*, the authors refer to co-creative design as generative design and outline methods used for product development. They propose the use of visually driven toolkits and participatory mindsets to ensure that ‘all stakeholders have a voice in what the future holds for them’ (Sanders and Stappers 2012). The book introduces a range of design tools and techniques, organized by what people say, what people do, and what people make. The authors define a tool as ‘a physical thing that is used as a means to an end,’ often described by its form. They define a technique as ‘the way in which a tool is employed’ or used. The co-creative design techniques described in the book often result in the creation of an artifact made by participants. By actively engaging in the act of design, the participants are forced to consider all aspects of a problem. They are required to choose an idea for a solution (even if only temporarily).

The Make Toolkits highlighted in the book are used to encourage participants to engage in associative, bisociative, and creative thinking. The authors argue that these toolkits are enable participants to imagine the future based on deeper interpretations of their past experiences. They note the rapid evolution and adoption of co-creative design thinking methods to address complex social issues, highlighting universal issues such as improving healthcare, public transportation, and education. Many of the concepts and information in this book influenced my process and thinking during the creation of the Research Proposal Toolkit.

Fig 6. The image on the previous page is from Lonnie Petersheim’s design blog. Petersheim attended a workshop lead by Liz Sanders. Sanders brought in tools used to create a shared understanding between a small group. The group created a mural with pictures, words, and shapes. Then they discussed and told stories about what the mural meant to them. These prototypes are generative and used for research to find opportunity, meaning, and problems.

https://designlonnie.wordpress.com/
Fig 7

Individuals

VALUE

Organizations
Alignment Diagrams

Many of the participatory design tools, techniques and methods mentioned in Convivial Design can be found in service design frameworks for stakeholder engagement. Service design methods were initially developed for businesses or large organizations. However, the diagrams and tools described below can be used in participatory design processes that strive to include all stakeholders to address a variety of complex problems in addition to developing a product like the Research Proposal Toolkit. These diagrams also serve as examples that are useful for aligning knowledge across research teams to streamline the research proposal development process. In Searching for the Center of Design, Jess McMullin proposes what he calls value-centered design (Fig 7); a process focused on the intersection of an organization’s goals and individuals needs (McMullin 2003). In business, the intersection of an organization’s goals and an individual’s needs are called touchpoints. Each instance where a consumer can interact with an organization or brand is considered a touchpoint.

In relation to research design we can look at touchpoints for a patient-centered healthcare study. The touchpoints include instances when researchers from different labs come together as a team and where a research study interacts with research participants or partnering organizations. These points of intersection can cross several departments within an institution or organization. However, most research studies are not set up to identify these interdependencies between units, especially when each one may seem to be functioning well on its own. From an individual’s point-of-view, the experience with a research study’s process or methodology can often seem fragmented with inconsistent interactions they are left to navigate on their own. Visualizations are valuable tools for breaking down the silos between departments and between an organization and individual. An all-encompassing view of an individual’s experience in tandem with an organization’s process or a research study’s
methodology allows all stakeholders involved in a project to grasp the interdependent relationships at once. The research team is able to see the experience from the participant’s perspective and stakeholders are able to see where they play a role. A visual diagram can highlight ‘pain points’ or areas of friction in a process where an individual experiences frustration. Uncovering areas of frustration can reveal opportunities for streamlining an individual’s experience and increasing value for both the individual and the team or organization. Effective visualizations inform strategy and move teams toward alignment and shared purpose. In order to visualize the interactions between an organization and an individual, business strategists use a variety of alignment diagrams. We will take a look at those diagrams through the lens of a multi-discipline research teams looking to develop a methodology for a patient or participant-centered research study.

Alignment diagrams are tools that are currently used in customer experience management, service design, and user experience design. Anyone who is involved in the end-to-end planning, design, and development of products and services can use alignment diagrams to gain a holistic view of the ecosystem in which their products or services are situated. For our purposes, anyone who is involved in the end-to-end planning, design, and development of multi-disciplinary research studies can use alignment diagrams to gain a holistic view of the ecosystem in which their studies are situated. Designers, product managers, brand managers, marketing specialists, strategists, entrepreneurs, business owners and leaders of community, government, and non-profit organizations are examples of people who can benefit from using alignment diagrams for business. Policymakers, institutional leadership, senior and junior investigators, research staff, and research administrators are examples of stakeholders who can benefit from using alignment diagrams for research.
James Kalbach and Paul Kahn first proposed the term alignment diagrams in an article written for the ‘Parsons Journal For Information Mapping’ in 2011 titled ‘Locating Value with Alignment Diagrams (Kalbach and Kahn 2011).’ The authors proposed the term alignment diagrams to ‘describe the class of maps and diagrams that visualize touchpoints in a business process’ (Kalbach and Kahn 2011). This in-depth article was the starting point for James Kalbach’s book Mapping Experiences: A Complete Guide to Creating Value through Journeys, Blueprints, and Diagrams. According to Kalbach, alignment diagrams have two parts. On one side, they illustrate aspects of the individual’s experience – a depiction of aggregate behavior across archetypal users. On the other, alignment diagrams reflect an organization’s offerings and processes. The points of interaction between the two are the means of value exchange (Kalbach 2016).

Examples of alignment diagrams include service blueprints, customer journey maps, experience maps, mental models, spatial maps, and ecosystem models. In many examples, the customer actions are usually indicated at the top and the business processes at the bottom. In the middle there is a ‘line of interaction’ displaying touchpoints where there is an exchange of value between the organization and the individual. Terminology for the different types of diagrams is inconsistent. What one person refers to as a customer journey map, someone else might call a service blueprint or an experience map. Regardless of what the diagram is being called, the typical purpose of using these types of alignment diagrams is to map an individual’s experiences with an organization’s process. This process can build empathy by shifting an organization’s view from inside out to outside in. It helps teams to find a common big picture and breaks silos between departments, sectors, and fields of practice. Bringing focus to an organization, initiative, or problem reveals opportunities for improvement and innovation (Kalbach 2016).
Fig 8

Early service blueprint example from Harvard Business Review.


Fig 9

Blueprint for Overnight Hotel Stay

Service Blueprints

Service design can be traced back to an article written in 1984 that showed a simple flow diagram (Fig 8) of a discount broker’s services. The diagram includes possible fail points where the service has the potential for issues or complete breakdown. Current approaches (Fig 9) utilize separate rows of information and color-coding for easier readability. It borrows from swim lane diagrams found in business process modeling. Similar to a theater show, this chronological arrangement highlights the separation of front stage interactions experienced by the individual and backstage processes invisible to the audience. The backstage processes are not seen by the audience, but are essential to supporting the front stage experience and providing the services. Over time, service-blueprinting techniques have evolved to include elements such as more than one individual audience, their emotive states, and various aspects of the emotional context of an experience.

The five key layers of a service blueprint are physical evidence, customer actions, onstage touchpoints, line of visibility, backstage actions, and support processes. The physical evidence layer displays the expression of the touchpoints that customers interact with through physical devices, electronic software, and face-to-face interactions. Customer actions are the main steps an individual takes to engage with an organization’s service. Onstage touchpoints are the actions of the organization, which are visible to the individual. The line of visibility is a division that separates onstage touchpoints with backstage actions. Backstage actions are an organization’s processes that directly impact the individual’s experience but are not visible to them. Support processes are internal processes that indirectly impact the customer experience. The interaction between these layers provides a systems view of the overall service experience from both the organization and individual’s perspectives.
Fig 10

The Customer Journey Canvas

**PRE-SERVICE PERIOD**

**Advertisement / Public Relations**
How is the service proposition communicated by the service provider?

**Social Media**
Which pre-service information can people access through social media?

**Word-of-Mouth**
What do friends, colleagues and family actually communicate about the service and/or service provider?

**SERVICE PERIOD**

**Service Journey**
Which touchpoints do customers experience during the service period? Are there any critical incidents, i.e. touchpoints customers experience?
Customer Journey Mapping

Although the exact origin of the term customer journey map is unclear, the general concept of interrelationships between touchpoints seems to have evolved from Jan Carlzon’s concept of special touchpoints called moments of truth (Carlzon 1987). These types of touchpoints are critical, emotionally charged interactions that can make or break an individual’s relationship with an organization.

As a type of diagram, customer journey maps are very similar, particularly in chronological structure, to service blueprints, however there are some key differences. In general customer journey maps contain fewer process details, but more information about the individual’s experience. Service blueprints, on the other hand, contain fewer experience details, but more information about the processes that deliver the service. A simplified explanation of the difference between the two types of diagrams is to say that customer journey maps are more experience-centric and service blueprints are more process-centric. Customer journey maps are often used to gain a better understanding of customer loyalty and opportunities for improving existing customers’ experiences. They help answer questions about engaging customers and providing value that creates repeat customers.

The customer journey canvas (Fig 10) is a variation of a customer journey map, created by Marc Stickdorn and Jakob Schneider, which can be useful for getting input from the entire team. Similar to the service blueprint, the basic format of the customer journey map displays the front and backstage aspects of an individual’s experience. It aligns how an organization will manage the customer relationship prior to, during, and after a service encounter.
Another type of diagram related to the CJM is the Customer Lifecycle Map, which reflects an overall relationship between a customer and organization rather than a specific journey within that lifecycle as shown in a CJM. The image above (Fig 11) offers a generalized interpretation of the approximate relationship of customer lifecycles, CJMs, and service blueprints. Customer lifecycles explore the overall relationship to a brand. Customer journey maps explore a specific engagement. Service blueprints generally analyze particular types of service encounters.
Experience Maps

Today’s systems are multifaceted. They are comprised of increasing levels of complexity. Organizations that think in terms of ecosystems will have a competitive advantage (Kalbach 2016). By looking beyond just their offerings to the broader context of human activity, organizations can find connections between people, places, and things within a given domain. These revelations aid in the design of comprehensive systems that create value for both the organization and their audience. Unlike the customer journey map that focuses on individual experiences with a product or service, experience maps highlight the interactions people have with many products and services from various organizations in a multitude of situations. An organization may not even appear in the experience map as in the example on the following page for growing food in Chicago (Fig 12). Organizations that examine this broader context can better understand how varied experiences shape their audience’s lives and therefore influence their relationship with an individual organization. Experience maps evaluate how an organization’s offerings fit into an individual’s broader experience versus looking at it from specific timeline around a particular event. They illustrate an individual’s point of view of the overall domain. Related types of diagrams, like jobs maps and workflow diagrams can help to spotlight various areas within the experience map.

Research methodologies are often described in terms of steps in a work plan that involve various interactions between research team members, partnering organizations, and study participants. Due to the linear format of a proposed study’s work plan, customer journey maps or experience maps could prove to be a useful tool for identifying potential challenges and opportunities for innovation.
GROWING FOOD IN THE CITY
User experience map

DISCOVERY
- Context for discovery
  - Past or present experiences with nature and/or cooking
  - “I simply love the growing aspect of it”
  - Just a recreational activity

TRIAL
- Initial contact with urban agriculture
  - Wants to explore and discover areas of interest
- First experience of growing food
  - Enjoys the connection with nature
  - First production is a success
  - Job opportunities, retirement, communities and networks motivate them to want to learn more

LEARNING
- “Bring some academic experience”
  - Trigger
  - Success
  - Can’t see potential
  - Don’t have the skills or knowledge
  - Initial failure...
Sharing and teaching is a matter of social good. Teaching people enhances the sense of community ownership.

**Education**

- Learn techniques to growing food in the city
- Belongs to a community
- Has the skills
- Has the knowledge

**Production & Sharing**

- Defining personal objectives
- Active participation in a community or organization
- Networking with communities and organizations
- Continuous learning is a way of connecting with other people

**Insecure**

- Can’t communicate
- Has no time to do it
- Lack of resources

**Empathetic**

- I want to educate people by using not only my knowledge, but also my experience.

**Engaged**

- Want to spread the word

**Passionate**

- Sometime community gardeners face rejection from local residents

**Motivated**

- Not enough gardens for people who want to be gardening

**Frustrated**

- Frustrated with bureaucracy
- Lack of time
- Things don’t work the way he/she expects

**Tired**

- Looses interest
- Lack of support (financial and social)
Mental Model Diagrams

Mental models are described as an individual’s interpretation of real, hypothetical, or imaginary situations. People’s beliefs, assumptions, and past experiences inform their prediction of how a system should function, but not necessarily how it actually works. An individual’s understanding of an organization’s systems will most often differ from the organization’s understanding of how their offerings actually work. The goal of mental model diagrams is to discover aspects of how an individual thinks that may not be about the organization’s system at all, but can have everything to do with how the individual achieves her intended goal. This is particularly useful when engaging participants in a research study.

In 2008, Indi Young published a formal method for visualizing mental models in her book Mental Models (Young 2008). Mental model diagrams (Fig 13) utilize a hierarchical structure, taking a bottom up approach of an individual’s experience based on real observations. In Daniel Eizans’ example published in Mapping Experiences (Kalbach 2016) the top half of the diagram uses levels of information to reveal thoughts, reactions, and guiding principles across a set of people. The boxes with green background in the diagram form towers, which are organized by affinity. The towers form clusters of affinity called mental spaces. Below the dark line are the products and services or existing systems relevant to the thought process within a tower. The content in the boxes and towers reflect an individual’s internal voice.

Creating a mental model diagram can be incredibly time consuming, taking weeks or months to complete or can be modified to create diagrams within just a few days. The result is a diagram of a mental model that reflects the vocabulary, thought processes, and biases from surveys of individuals.
Design Canvases

Design canvases are blank diagrams on paper that allow stakeholders to workshop various alternatives quickly by hand. Like alignment diagrams, they can be used to identify and highlight the intersections where value can be found for all stakeholders. Completed canvases can serve as alignment diagrams, but the exploratory function of a blank canvas denotes its categorization as a tool (Kalbach 2016; Sanders and Stappers 2012). Canvases are often used as discursive templates, encouraging novel methods for communicating. The use of canvases allows diverse stakeholders to ‘notice new things, make fresh distinctions, see new connections, and have novel experiences’ (Tsoukas and Chia 2002). The medium of a canvas was popularized by the Business Model Canvas (Alex Osterwalder and Pigneur 2010). Alexander Osterwalder initially proposed The Business Model Canvas (Fig 14) for generating new or documenting existing business models. Since the release of The Business Model Canvas in 2008, many designers have adapted the concept to create canvases to address specific needs across various sectors. The Value Proposition Canvas (Alexander Osterwalder et al. 2014) (Fig 14) and additional tools are used to help define the customer need and value offered.

The visual nature of design canvases, such as the Lean Startup Canvas (Fig 15) or the Platform Design Canvas (Fig 16) prioritize speed and adaptability embraced by action research and provide context at-a-glance, which is more conducive to group work and collaboration than a written business plan. Drawing from context mapping approaches, these canvases can be used with all stakeholders related to the situation being explored to gather tacit knowledge about the use of a product or experience of a service (Sleeswijk et al. 2005).
Lean Startup Canvas

Fig 15. Ash Mayura adapted the Business Model Canvas to create the Lean Canvas specifically target for the needs of startup and entrepreneurial business models.
The Platform Design Canvas

Fig 16. In 2013, Simone Cicero, created the Platform Design Canvas (below) to model emerging, multi-sided, ecosystem based, platform models. A similar toolkit and set of canvases has been developed by Matthias Walter and his team at InnovationToolkit.
Gamestorming

David Gray, founder of the visual-thinking company XPLANE, conducts workshops for educators, corporations, and the public on creativity, innovation, and business transformation. In his book *Gamestorming: a playbook for innovators, rulebreakers, and changemakers*, Gray presents games as an exploratory space for multi-stakeholders (players) to creatively collaborate on innovating solutions (Gray, Brown, and Macanufo 2010). Many of the games described in Gamestorming can be found in other lists of design-thinking methods. Gray frames them in the context of game play. Instead of calling them design methods, he calls them design games. His definition of a game space is when the ‘rules of ordinary life are temporarily suspended and replaced with the rules of the game.’ In effect, a game creates an alternative world. When players enter a game space, they must agree to abide by the rules of the space. Players must enter willingly. It’s not a game if people are forced into playing. The agreement by all players to temporarily suspend reality creates a safe place ‘where the players can engage in behavior that might be risky, uncomfortable, or even rude in their normal lives.’ When the players agree to a set of rules they enter a shared world. Without that agreement, the game would not be possible.
Fig 17 based on illustration in Gamestorming: a playbook for innovators, rulebreakers, and changemakers, Gray, David. 2010
Games have rules that players agree to, which define the way the world within the game space operates. They also have boundaries in space and time. Players enter the game space at the beginning of the game and leave at the end. The game space can be activated or paused, for example for lunch or bathroom breaks, by agreement of the players. Often games have spatial boundaries outside of which the rules do not apply. Imagine, for example, a baseball game. Spectators could not insert themselves between the player on the field without spoiling the game.

Many games utilize physical artifacts; objects that hold information about the game, either intrinsically or based on their position. The ball and the bases in baseball are such objects. When the player passes all the bases and touches home plate a point is scored. That’s information. Artifacts can be used to track progress and to maintain a picture of the game’s current state. A digital scoreboard keeps track of the score. The scoreboard is another kind of information artifact.

Gray states that every game is a world that evolves in five phases (Fig 17).

1. Imagine the world
2. Create the world
3. Open the world
4. Explore the world
5. Close the world

Gray considers the first two phases as the game design, and the remaining three phases as the play. Once a game is designed it can be played an infinite number of times. So, for a previously designed game there will be only three phases:

1. Open the world
2. Explore the world
3. Close the world
Figure based on illustration in Gamestorming: a playbook for innovators, rulebreakers, and changemakers, Gray, David. 2010
The game design model as proposed by Gray is shown in Fig 18. A rectangle with triangles on both ends pointing out. On the left hand side is point A, also called the initial state or what we know now. On the right side is point B, or the target state. The goal of the game is to get from point A to point B. When designing a game, Gray suggests to start with the end in mind. Start with the goal of the game. What should be accomplished by the end of the game? What does success look like? That’s the outcome of the game, point B, the target state. A tangible goal gives participants something meaningful to aim toward and provides a sense of accomplishment when they are done. And when they are finished, they can look to something they co-created.

Gray describes the stages of game play in three acts. The first act ‘opens the world by setting the stage, introducing the players, and developing the themes, ideas, and information that will populate the game world.’ In the second act, players explore and experiment with outputs from act one. In the third act, conclusions are formed, decisions are made, and a plan for the actions that will serve as the inputs for the next event are made. The next event could be another game or a different activity.

OPENING

According to Gray, the first act opens people’s minds to new possibilities. It is about getting the people in the room and the information and ideas flowing. The goal for this act is to produce as many ideas as possible. The concept is that the more ideas generated, the more players will have to work with in the next stage. Gray states that the opening is ‘not a time for critical thinking or skepticism; it’s the time for blue-sky thinking, brainstorming, energy, and optimism.’ The keyword for opening is ‘divergent’ as first coined by the psychologist J.P. Guilford in 1956 (Royce 1968). The goal is to have the broadest possible array of perspectives. To generate as many and as diverse a set of ideas as possible.
OPENING (Divergent)  EXPLORING (Emergent)  CLOSING (Convergent)

Fig 19 based on illustration in Gamestorming: a playbook for innovators, rulebreakers, and changemakers, Gray, David. 2010
EXPLORING

Once the energy and the ideas are flowing, it’s time to explore and experiment. In this phase players look for patterns and analogies. The aim is to try to see old things in new ways. The keyword for exploring is ‘emergent.’ The goal is to create the conditions that will allow ‘unexpected, surprising, and delightful things to emerge.’

CLOSING

The final act, according to Gray, is the time to move toward conclusions, making decisions, actions, and next steps. This is the time be critical or realistic. Every opportunity can’t be pursued. So, this is the time to identify which are most promising and where to invest time and energy. The keyword for the closing act is ‘convergent,’ also coined by Guilford. The aim is to ‘narrow the field in order to select the most promising things for whatever comes next.’

Opening, exploring, and closing are the core principles for designing games (Fig 19). Games can be played once or in a series, where the outcomes of one game create the inputs for the next. With larger groups it often makes sense to pursue multiple goals. Gray describes a key concept in game design called break out/report back, where a larger group ‘diverges by breaking out into smaller subgroups, plays a game or two, and converges by reporting back the outcome of their efforts to the larger group.’ This is effective for keeping groups small and dynamic, and increases the variety of ideas. The Research Proposal Toolkit can be utilized with various game design patterns.
Most funding agencies evaluate research grant proposals to reach the same goals. Understanding this can help us to understand how the review criteria across funding agencies and organizations are aligned into four main areas – Impact, Expertise, Feasibility, and Funding. Separating the review criteria into identifiable sections helps research administrators, research development offices, and researcher teams break down review criteria from almost any funding opportunity. The Research Proposal Toolkit draws on this to deliver a framework and design tools with the goal of helping researchers better align their proposal elements with defined criteria. The paper canvases in the toolkit are used to help researchers visualize the various components of a grant proposal to quickly see what elements they have and reveal what they are missing. The visual nature of design canvases prioritizes speed and adaptability and provides context at-a-glance. Drawing from design-thinking approaches, these canvases can be used with all stakeholders related to the situation being explored to gather tacit knowledge (Sleeswijk et al. 2005). They provide storage for information artifacts in the form of sticky or handwritten notes.
Writing by Hand

A benefit of using paper canvases is the act of writing notes by hand. According to a study performed at the Indiana University, writing by hand releases creativity not easily accessed in any other way. Magnetic resonance imaging has shown that writing by hand increases neural activity in certain sections of the brain, similar to meditation (James and Engelhardt 2012). The act of writing by hand is creative. A University of Washington study showed that children writing by hand produced more words more quickly than via a keyboard and also expressed more ideas (Berninger et al. 2006). The low-tech paper canvases in the toolkit remove the distractions of digitally connected devices like smart phones, tablets, or computers. And, because they are paper, there is no ‘delete’ button that allows people to quickly erase ideas. The canvases create opportunities for iterating quickly without throwing away or deleting early ideas, which might prove to be the best ones.

Process

In developing the Research Proposal Toolkit, I employed a co-creative process of facilitated workshops to iterate and test variations of the paper canvases with researchers and funding professionals to determine which layout designs, content, and formats best meet their needs. I conducted this iterative process as Program Director of The Rhode Island College and University Research Collaborative (The Collaborative) over the course of 6 months with a series of in-person workshops and informal interviews with 25 participants. The aim of the workshops and interviews was to gain a deep understanding of each stakeholders needs and goals to co-create tools that reduce frustration and time to develop comprehensive research proposals.
The Role of the Facilitator

Design-thinking workshops often require a facilitator to lead participants through design games, methods, and techniques. The Research Proposal Toolkit is a collection of design tool that are best implemented in a workshop setting with a facilitator experienced in design research. Facilitation is described as ‘a technique by which one person makes things easier for others (Kitson, Harvey, and McCormack 1998).’ The facilitator of design-thinking workshops could be a design researcher by training or a team member that has experience in facilitation. The purpose of facilitation can be to provide help and support for achieving a specific goal or to enable individuals and teams to analyze, reflect, and change their attitudes, behavior, and accepted ways of doing things (Harvey et al. 2002). Some facilitator roles are more concerned with ‘doing for others,’ other facilitator roles are more focused on enabling others to learn by their own processes (Harvey et al. 2002). Design-thinking facilitators more often represent the ‘enabling’ type role. This type of facilitation is more likely to be developmental in nature, ‘seeking to explore and release the inherent potential of individuals (Kitson, Harvey, and McCormack 1998).’ There is no single right way to design a workshop. Every research team has its own dynamic. Some teams move slowly through concepts, and some are more dynamic. Experienced facilitators strive to achieve the right balance between creativity, reflection, thinking, energy, and decision-making when facilitating a design-thinking workshop (Gray, Brown, and Macanufo 2010). The illustration on the following pages shows the role design can play in the research process (Fig 21).
Where can design play a role in research?

Designers can act as facilitators in bringing groups of diverse research stakeholders together to use design tools to formulate proposals to meet criteria and address complex problems being addressed in many proposed research studies.

A co-creative research design approach engages participants across diverse groups. Including designers on a research team offers unique partnerships and expertise that make a proposal stand out.
Where can design play a role in the research process?

A co-creative research design approach engages groups in innovative ways. Including information designers on a research team offers unique partnerships and expertise that make a proposal stand out. Including information designers on a research team ensures the capacity to create effective artifacts for presenting data analysis to interested audiences throughout the research process.
Vision Statement
What is the gap that has been identified by existing research? Define larger context and local impact in terms of human needs and societal benefit.

Objectives
State 2-4 objectives in active terms focused on outcomes vs. process (ex. use ‘to identify’, ‘to recommend’ vs. ‘to run’, ‘to conduct’)

Research Team Members
Team includes members from diverse disciplines.*
1 2 3 4 5
Team includes data visualization and information designer.
1 2 3 4 5
Team has access to people the project will impact.*
1 2 3 4 5
Team has access to people who can influence project’s success.*
1 2 3 4 5

Accessible Stakeholders
Partners / Collaborators / Practitioners / Community of Need

Impact
Proposed project relates to funder’s interests.*
1 2 3 4 5
Existing research in topic area is concisely summarized.*
1 2 3 4 5
Objectives are stated in terms of outcomes (not process).*
1 2 3 4 5
Human needs and societal benefits are clearly stated.*
1 2 3 4 5
**FEASIBILITY**

- Project can be completed in required timeframe.*
  
  | 1 | 2 | 3 | 4 | 5 |
- Team has access to essential data or can make our own.*
  
  | 1 | 2 | 3 | 4 | 5 |
- Team has secured required approvals (IRB, consent, supervisor).*
  
  | 1 | 2 | 3 | 4 | 5 |
- Success metrics and evaluation process are outlined clearly.*
  
  | 1 | 2 | 3 | 4 | 5 |

**BUDGET**

- Budget provides sufficient resources to carry out project.*
  
  | 1 | 2 | 3 | 4 | 5 |
- Budget costs are not duplicated between direct and indirect costs.*
  
  | 1 | 2 | 3 | 4 | 5 |
- Budget costs are realistically estimated in all categories.*
  
  | 1 | 2 | 3 | 4 | 5 |
- Budget items are clearly related to project objectives.*
  
  | 1 | 2 | 3 | 4 | 5 |

**Workplan + Timeline**

How long will it take to complete? What are the steps involved?

**Accessible Data + Resources**

What is needed for success of project? Which are accessible?

**Funding**

How much do you need to make the project successful?

**Other Funding Opportunities**

Do you agree with these statements? 1 = Not at all  5 = Totally agree

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Designed by Maeve Donohue  |  cocreativetools.com
Research Proposal Dashboard Canvas

The first tool I developed in the kit was the Research Proposal Dashboard (Fig 22). This is the central canvas in the Research Proposal Toolkit. It is the most developed of the tools in the kit because it has undergone the most rounds of iterations and testing with researchers. The concept for the Research Proposal Dashboard is to give researchers a birds-eye view of the important elements needed to meet the criteria of many funding agencies. The four main areas that comprise research proposal evaluation criteria are separated into four quadrants on a single 11” x 17” piece of paper. Having the four quadrants on the same page allows researchers to quickly jot down the elements of a proposal they may already have. This is useful for visually presenting gaps in areas that need addressing to strengthen a proposal. The quadrants may be filled out in any order. However, the arrangement of quadrants on the canvas prioritizes placement by patterns of use by workshop participants and the importance of the quadrant elements to funding agencies. The names and arrangement of the quadrants changed throughout the course of testing the canvas. Although, impact has always received prioritized placement in the upper left hand corner based on the importance of the elements in that quadrant to funding agencies. For English speaking people (and languages with similar reading patterns), the left side of the page is heavily favored when scanning pages (Afsari, Ossandón, and König 2016).

SCORING

The central target circle of the canvas contains scorable statements to rate the strength of the current state of a proposal. Creating various iterations of the Research Proposal Dashboard throughout the research proposal development process allows researchers to view progress in strengthening a research proposal. The goal of using the Research Proposal Dashboard with team members is to achieve the highest score possible to prevent spending time developing a proposal that has a low likelihood of being funded due to missing key criteria. A high score indicates a team has the essential elements to create a comprehensive proposal.
The scoring mechanism is made up of 16 key statements, 4 in each quadrant, that can be scored on a scale of 1 to 5 to determine if each quadrant is adequately meeting all the key criteria evaluated by funding agencies and organizations. Scores for each statement relate to how much the researcher agrees with the statement, 1 representing ‘does not agree at all’ and 5 representing ‘completely agree’.

IMPACT QUADRANT

The Impact Section of the Research Proposal Dashboard provides space for a vision statement, two to four objectives and four scorable questions below:

• Proposed project aligns with funder’s interests.
• Existing research in topic area is concisely summarized.
• Objectives are stated in terms of outcomes (not process).
• Human needs and societal benefit are clearly stated.

FEASIBILITY QUADRANT

On the top right hand side of the Research Proposal Dashboard is the Feasibility section. This section provides space to note how long the proposed study will take and the steps involved. It includes space to note data and resources that are needed and accessible to ensure the success of the project. The scoring statements are below:

• Project can be completed in required timeline.
• Team has access to essential data or can make our own.
• Team has secured required approvals (IRB, consent, supervisor).
• Success metrics and evaluation process are outlined clearly.
EXPERTISE QUADRANT

The lower left hand corner of the Research Proposal Dashboard is the Expertise section. This area is to note the team members and additional stakeholders that will contribute to the success of the proposed study. The scoring statements for this section are:

• Team includes members from diverse disciplines.
• Team includes data visualization or information designer.
• Team has access to people the project will impact.
• Team has access to people who can influence the project’s success.

FUNDING QUADRANT

The funding section provides space to note how much funding is needed to complete the project and how much is available. It provides a section for noting additional funding opportunities. The scoring statements for this section are listed below:

• Budget provides sufficient resources to carry out project.
• Budget costs are not duplicated between direct and indirect costs.
• Budget costs are realistically estimated in all categories.
• Budget items are clearly related to project objectives.

GETTING STARTED

The research proposal development process begins with an idea for answering a question through research. Often the idea comes from a gap a researcher has identified. Sometimes the spark for a research proposal comes in the form of a Request For Proposal (RFP). Some researchers start the proposal development process with resources from previous studies. Others will be new to research and need to develop a team and identify resources from scratch. The Research Proposal Dashboard gives new researchers an overview of what they need to pull together to develop a comprehensive research proposal. It provides experienced researchers with a quick mechanism for viewing what resources they already have and which areas need to be strengthened.
Game Design Patterns

Research Proposal Toolkit workshops can utilize several different game design patterns depending on the team and level of resources already gathered. The goal of the Research Proposal Toolkit is to achieve the highest possible score. So the main game design of the Research Proposal Toolkit is to move research teams from point A, the initial state, which consists of noting the elements of the proposal they currently have, to point B, which is a high-scoring canvas with the strongest set of elements they can gather to develop a proposal.

The opening stage in using the toolkit is to quickly fill out the first version of the Research Proposal Dashboard. Each team member can participate in adding information to the canvas using sticky notes or writing by hand. In this stage the team should note as many resources and ideas that relate to evaluation criteria that they currently have access to or need access to. The exploration stage for this canvas consists of evaluating current resources for missed opportunities identifying gaps that need to be filled and generating ideas for content that could fill the gaps. The closing stage for the main game is to prioritize and select information to fill the gaps and achieve a high score. There are a variety of game design patterns that can emerge within the explore section of the main design.
As shown in the diagram below, the conclusion of this first game pattern could prompt a series of parallel games to ideate solutions for filling the gaps in information for each of the quadrants. The closure from those games would generate the input for a final game of filling out the Research Proposal Dashboard and rescoring the proposal elements.

1. Quickly fill out the Research Dashboard Canvas as fully as possible with the proposal elements you currently have. Score the canvas. Determine where the gaps are.
2-5. Use identified gaps to generate ideas for filling the gaps and select content for each quadrant.
6. Use outcomes to complete the Research Dashboard Canvas. Re-score and compare to original score. If it is higher, the goal was achieved. If it’s high enough to use the elements to craft a comprehensive research proposal, it’s a WIN!

Another possible game design pattern is to explore each quadrant separately and return to iterating the Research Proposal Dashboard after each quadrant game phase.
Once the researchers can view what they have or don’t have via a quick iteration of the Research Proposal Dashboard, they can begin to focus on the areas in any order that suits their needs. However, through the iterative process of co-designing the toolkit, I have learned that regardless of how complete a canvas is when research teams begin this process, it is a useful exercise to start with the impact quadrant before addressing the other three quadrants, as seen in the game design in visualization above.

The steps below are represented in the game design pattern above.

1. Quickly fill out the Research Dashboard Canvas as fully as possible with the proposal elements you currently have. Score the canvas. Determine where the gaps are and close by identifying specific needs in the Impact quadrant.
2. Define your vision statement and objectives
3. Summarize existing research to define need for proposed study
4. Determine how well your vision statement aligns with funding agency’s mission statement.
5. Close with each game by selecting elements to add back to Research Dashboard Canvas
6. Take outcomes from game 5 to create inputs for exploring Feasibility, Expertise, and Funding quadrants.
7. Align work plan steps to vision statement and objectives.
8. Use objectives to determine team members, partners, and participants needed for proposed study.
9. Align budget numbers to workplan, team members, and objectives.
10. Use outcomes to complete the Research Dashboard Canvas. Re-score and compare to original score. If it is higher, the goal was achieved. If it’s high enough to use the elements to craft a comprehensive research proposal, it’s a WIN!
Supporting Canvases

The Research Proposal Dashboard has been noted by researchers who participated in the workshops as the most useful and innovative of the tools in the toolkit. The additional canvases in the kit have all been developed in response to calls for supporting games to ideate content to strengthen the gaps presented when filling out the Research Proposal Dashboard. The tools in the kit that have undergone the most iterations have proven to be useful for research teams in developing proposals. The newer tools that have been introduced based on researcher feedback still require additional testing and iterations to hone their effectiveness.

Additional canvases in the toolkit that assist in developing information for the Impact quadrant of the Research Proposal Dashboard are the Grant Vision Canvas (Fig 24), Literature Review Canvas (Fig 26), and the Funding Opportunities Canvas (Fig 27). The Grant Vision Canvas supports the development of the Vision Statement and Objectives. The Literature Review Canvas helps to organize and rate sources to support the need for additional research proposed in your study. The Funding Opportunities Canvas helps to aggregate and rate the alignment of the proposed study with potential funding agencies mission statements and funding allowances.
**Grant Vision Canvas**

**Objectives**
State 2-4 objectives in active terms focused on outcomes vs. process (ex. use ‘to identify’, ‘to recommend’ vs. ‘to run’, ‘to conduct’)

**Global Context**
What is the broader societal issue?

**Larger Context**
What is the problem in terms of human needs?

**Local Impact**
How does it directly impact local communities in need?

Vision Statement
Describing your research in terms of societal benefits and human needs?
Vision Statement

Describe your research in terms of societal benefits and human needs?

What will happen if it's not resolved?

What will happen if it's not resolved?

What will happen if it's not resolved?
Grant Vision Canvas

The goal of the Grant Vision Canvas is to help research teams define their vision statement and objectives in terms of positive impact. When reviewing research topics via the Grant Vision Canvas, teams were often surprised by how they began to view their approach to a problem in a new way. Often, in defining a vision statement, researchers learned new insights about the potential impact of their proposed study. Addressing the impact area via the Grant Vision Canvas helped researchers to determine if the scope of their project was being described too broadly or too narrowly. It assisted in framing the proposed solutions in terms of positive impact versus defining the solution as a lack of something.

The Grant Vision Canvas prompts users to define the problem in terms of the broader societal issue, general human needs, and impact on the local community of need. Workshop participants noted this canvas as the most useful and innovative canvas in the toolkit, after the main Research Proposal Dashboard. They noted that workshopping with it helped them to think about the overall impact in novel ways and relate the other elements of the research proposal back to a central and overarching theme described by the vision statement.

A strength of this canvas, as noted by researchers, was how it helped them to state a problem and the proposed solutions in the same terms of scope. For example, describing the issue of Russia influencing the presidential election when the study being proposed is increasing training for elementary school science teachers was a stretch. An argument can be made that increasing scientific understanding from an early age could help to combat the ‘fake news’ dilemma. However, researchers agreed that describing the problem in more local terms would resonate more directly with a funding agency’s mission. Proposal reviewers have noted that describing both the problem and solution in the same relative terms shows that a research team is knowledgeable about the specific area of focus and that the proposed solution is feasible and relevant to the community.
of interest being addressed (Locke, Spirduso, and Silverman 2007). The canvas prompts researchers to locate an issue within a larger context and then describe the issue in as local a context as possible. For example, if the purpose of the research is to educate people in Rhode Island about opioid addiction, a researcher should describe the epidemic in terms relative to Rhode Island and not the United States as a whole. Describing an issue in a local context makes it easier to draw a line from the proposed research to a funding organization’s mission and determine if the proposed study is the right fit for a particular funding agency. However, too narrow a focus is also a problem when describing an issue.

Some researchers noted that they were being too narrow and focused in the description of their problem. They made assumptions about the level of expertise of the grant reviewers in their specific topic area. For example, discussing the impact of a proposed study in neo-natal abstinence syndrome without relating it to the larger opioid epidemic to give grant reviewers a point of reference. Working through the Grant Vision Canvas helped them to frame their proposed solution in a broader context that would make more sense to the reader before going into more specific detail about the granular nature of the solution they were proposing. Researchers also noted that locating an issue within a larger context helped them to identify additional funding opportunities with funding agencies that had stated missions and goals in the broader topic area.

Describing the issue not only in factual or scientific terms but also in human terms, as prompted via the canvas, helped some research teams better identify not only study participants but also partners and collaborators who could serve to strengthen the expertise section of the proposal. Human terms relates to how the situation affects the people involved, usually the victims of the situation, and creates an emotional connection to the problem. Stating both the factual and human terms helped to identify the data needs or existing resources that would increase the likelihood of a proposed study’s success. Providing data in these terms created an op-
portunity for experienced researchers to cite their individual contributions to the larger field. It also provided an opportunity to highlight preliminary work conducted to engage potential study participants and inform the feasibility of the plan.

During the workshops researchers were instructed to note what the absence of a solution looks like in order to delineate between the problem statements on the left side of the canvas and the solution statement in the form of a vision statement in the top middle circle. One workshop participant noted that the ‘dystopian rainbow,’ (Fig #) which shows the current state of the problem on the left side and the potential future state of the problem on the right side to be helpful. He found the contrast of the rainbow content, which had a more negative framing, with the positive framing of the Vision Statement helped to avoid describing the problem as an absence of the proposed solution. He noted that drawing a line back to the positive vision statement from all the elements of the research proposal would create a more relatable narrative for proposal reviewers.

**Funding Opportunities Canvas**

Once the Vision Statement has been clearly defined, the next step is to compare it to the funding organization’s mission to ensure that the proposed study aligns with the organization’s goals. One of the biggest reasons for proposals being rejected is because the proposed study does not fit within the funding agencies goals. The Funding Opportunities Canvas offers a central place to aggregate and score alignment of funding opportunities. Workshop participants noted that although the canvas is not novel or innovative in its design format, the function of comparing the project’s vision statement with various funding agencies’ mission statements on a single page is a novel and useful concept.
### Funding Opportunities Canvas

**Your Vision Statement**

<table>
<thead>
<tr>
<th>Funding Organization/Agency</th>
<th>Mission Statement for organization or specific program</th>
<th>How does your vision align with their mission?</th>
<th>Items in your budget funder doesn’t cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
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<tr>
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<td>1 2 3 4 5</td>
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<tr>
<td></td>
<td></td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

**Literature Review Canvas**

**Research Topic:**

- Ex. On a scale of 1 to 7 (1 being ‘Not at all’ and 7 being ‘Very’) how would you rate these statements...

**Sources**

- List source citation information. Then prioritize sources by ratings...

**Rating**

**Summary**

**How will you rate sources related to objectives?**

- Ex. To determine scope of the issue in human needs; To determine gaps in research...

*Additional worksheets contain more detailed information.*
Literature Review Canvas

Most requests for proposals require a proposed study to demonstrate how the study will contribute to advancing the field of research. While extensive literature reviews are not often a requirement of research proposals, a summary of the current state of research should be included in a research proposal to support the need for new research. A common reason for rejecting research proposals is that the literature review indicated the research/s did not have sufficient expertise in the area of focus (Locke, Spirduso, and Silverman 2007). The Literature Review Canvas can be used to aggregate, summarize, and rate sources. Experienced researchers dismissed the literature review canvas as less innovative because they use other tools or methods that provide a similar or better value. Researchers noted that existing spreadsheet formats could provide the same value or their own process of organizing information was more useful to them. Some researchers had developed an interactive platform that stores and rates peer-reviewed literature. New researchers expressed the value of the literature review canvas in terms that it helped them understand the value of conducting a literature review and provided a visual way of thinking about the value of sources they were citing in their research process.

Feasibility + Budget Canvas

Feedback from researchers and funding professionals noted that the scoring criteria for the feasibility and funding quadrants on the Research Proposal Dashboard were useful for determining if they had all of the pieces they need for a comprehensive research proposal. However, feedback on the supporting canvas for this section (Fig 28) shows that more work is required to offer a novel and innovative approach to compiling the information needed for developing the work plan steps, necessary resources, and budget costs. The supporting canvas for developing content for the feasibility section also supports content development for the budget section of the canvas. Similar to the feedback on the Literature Review Canvas, they noted that existing tools as possibly more useful in organizing this data. Areas they noted could be improved included adding a feature for
Feasibility + Budget Canvas

Your Vision Statement

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Workplan Steps</th>
<th>Resources</th>
<th>How will you evaluate success?</th>
</tr>
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<tbody>
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<tr>
<th>Resource Accessibility</th>
<th>Time</th>
<th>Cost</th>
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<td>1</td>
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<td>5</td>
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<td>5</td>
</tr>
</tbody>
</table>

Date:
Version:

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Grant Expertise Canvas

Who am I?
Here I am: leader, researcher, mentor, partner, etc.

Why do I care about this project?

Power Grid

INTEREST

INTEREST

INTEREST

Fig 28

Fig 29
mapping challenges to objectives and work plan steps. They also noted that a simple evaluation box at the top of the canvas was not sufficient to outline the evaluation plan of a proposed study and map the evaluation metrics back to project objectives and steps. New researchers also noted that this canvas did not help them streamline their thinking or organize their materials. Based on this feedback, future iterations and workshops with researchers is needed to develop a deeper understanding of the needs of researchers in relation to their pains when developing the content for the feasibility and budget elements of a research proposal. Drawing on the alignment diagrams used for service blueprinting, customer journey mapping, and experience mapping could prove useful in this context. However, more testing would need to be done to say that for sure.

Grant Expertise Canvas

Workshop participants positively reacted to expertise scoring statement on the Research Proposal Dashboard for including information designers and data visualization experts on a team. They believed doing so demonstrates creates a unique partnership and expertise that most other applicants would not have. They also commented on the value ‘design-thinking experts’ can add for engaging stakeholders across diverse groups of practice make a research proposal stand out from the competition. However, they voiced a concern of not knowing how to find or evaluate designers with the correct skillset to include on their teams. Some stated that in their experience they had always sought out designers after the research had been completed to ‘make their findings pretty.’

The Grant Expertise Canvas (Fig 29) is the newest canvas in the toolkit. I drafted the canvas quickly one morning before a workshop to test some concepts for better understanding the needs and goals of team members, potential partners, and potential participants. However, most researchers were confused about how to use the Grant Expertise Canvas and we did not dedicate much time to testing its usefulness during the workshop. Most researchers noted that it was often sufficient for them to include C.Vs with their proposals to demonstrate the experience and previous work of team members.
Fig 30. A model for the stakeholder engagement process I developed while working at The Rhode Island College and University Research Collaborative.
A Little History

Before I go into the case study outlining my use of the Research Proposal Toolkit to develop a research proposal with a team, I will outline the events that led to me focusing on this topic and my role as a facilitator of stakeholder engagement workshops and research proposal reviewer.

In 2011 I was a designer for an early telemedicine start-up team out of the MIT Media Lab (recently acquired by FitBit in 2017). Working with this team was my first introduction to participating in and facilitating hackathons and other stakeholder engagement processes that brought diverse groups of people from all around the globe to address complex healthcare issues.

In 2012, I became the executive director of a medical-technology (med-tech) networking group that was funded to enhance connectivity and collaboration in the med-tech sector in Rhode Island. At the time, I was also board member for Rhode Island’s economic development agency and an economic development committee member for a statewide planning process. Based on the economic development work I was doing in Rhode Island and various collaborative technology projects I was working
on at with different groups in MIT Media Lab, I received a grant from the Rhode Island Foundation to develop a centralized database tool that could connect non-profit, member organizations in Rhode Island. All of these projects I was working on involved participating in or facilitating multi-disciplinary stakeholder engagement workshops using design tools and methods to brainstorm ways to innovate progress.

In 2013, I began consulting as an information designer for the Rhode Island College and University Research Collaborative (The Collaborative), a small not-for-profit organization with a Program Director and a few interns. In 2017 I moved into the role of Program Director. Our mission at The Collaborative was to develop a statewide platform to provide policymakers in Rhode Island with academic research to support their policy decision-making process. Since 2013, the work I did at The Collaborative engaged over 700 scholars across all 11 colleges and universities in Rhode Island on more than 50 research projects and community initiatives to inform policymakers in areas such as arts and culture, education, energy, engineering, healthcare, infrastructure, manufacturing, regional competitiveness, and workforce. Through The Collaborative I provided research translation, data visualization, stakeholder engagement workshops, research team development, and research funding development services for academic researchers, industry practitioners, and government staff in Rhode Island. We also leveraged support from college presidents, state leadership, and the research community to build a critical mass of partnerships that funded academic research produced in Rhode Island. Our research cycle began with an annual meeting of a panel of policy leaders from the Governor’s Office, House of Representatives, Senate and the Rhode Island Foundation to develop a list of research questions based on the policy leaders pressing issues. These questions were then proposed to The Collaborative’s network of researchers through a ‘kick-off’ event.
The kick-off events were design-thinking workshops that brought diverse groups of stakeholders from academia, industry, non-profit and government together (Fig 30). During kick-off events, tables were set up with signs noting the table’s theme (healthcare, infrastructure, education, etc.). Participants were encouraged to join a table that matched their interests. Worksheets were provided at each table to explore available data and research and to ideate on new research that could inform solutions to the challenges posed. Facilitators led each table through the activities designed to generate feasible ideas for research proposals. Participants shared ideas and networked to find team members to submit research proposals for topics they were interested in researching. Research proposals with cross-institutional, multi-disciplinary research teams were given higher priority in the selection process. We applied the design game concept of break out/report back, because of the large attendance from 25 to over more than one hundred participants at each event.

After the kick-off event research teams were invited to submit research proposals. I reviewed the proposals along with the previous Program Director and with policy leaders. Each year 9-12 teams were selected to receive funding for their proposed studies. Some proposals clearly aligned with the questions we posed and the mission of providing policymakers with research to inform policy decisions. Others were submitted by junior research faculty or faculty that had little to no experience developing research proposals. The process of engaging researchers in design-thinking workshops, and reviewing, funding, and rejecting research proposals led me to develop a toolkit that would help academic researchers better align proposal elements with defined criteria.
Building a Strong Proposal
Case Study – ORI Grant Proposal

In March 2017, Stacey Springs, MS, PhD approached me to develop a research proposal for a request for proposal from the Office of Research Integrity (ORI). Dr. Springs is an AHRQ K12 Scholar in Comparative Effectiveness/Patient-Centered Outcomes Research in the Center for Evidence Synthesis in Health at Brown University. She is also a Research Fellow in Global Health and Social Medicine and Fellow in Bioethics at Harvard Medical School. Her research leverages a complement of methodologies (e.g. health care policy analysis, health economics and evidence synthesis) to improve health outcomes in critically ill newborns and investigates the role of interdisciplinary, collaborative care teams within health systems to promote patient-engagement and evidence-based decision making. Dr. Springs recent work includes community engaged research for inclusive health policy agenda setting and implementation.

Dr. Springs and I had worked together on various research projects over the past year. I provided narrative translation and data visualization for Dr. Spring’s academic research projects. Dr. Springs recognizes the value of design thinking, visual design, and data visualization for clarifying complex scientific information for non-expert audiences. She asked me to
be part of a research team for a proposed study building off of our recent work visualizing evidence mapping processes and outcomes for the Rhode Island State Arts and Health Plan. Dr. Springs had a preliminary draft of a research proposal that needed several iterations before submitting to ORI. We decided to utilize the Research Proposal Toolkit as we collaboratively developed the proposal.

Our first step was to look at what resources and information we currently had to fill out the Research Proposal Dashboard and score the current state of our research proposal. We already knew what team members were available to work on this study, leaving it open to adding more if we discovered that we needed more throughout the proposal process. We already had a list of resources available through the Brown University AHRQ K12 lab. The expertise of each current team member was easily outlined using our current resumes and previous work. The funding available for this research would come specifically from this grant, but we hope to use the elements from this grant proposal to pursue other funding opportunities in the same topic area. We had some understanding of the local impact and larger context but needed to do a deeper dive into understanding the reach of the proposed study and an exploration of how our combined expertise creates a novel approach and advances the field of research integrity and evidence based policy science.

Our first pass at the Research Proposal Dashboard resulted in a low score in the impact, feasibility, and funding sections. We had a lot of information to formulate a vision statement but it was not clearly articulated. We needed a deeper dive into our research topic and question to illustrate the landscape of where our proposed study fit into the global and local context of the field of research integrity. The feasibility and budget sections received low scores primarily because we had not yet outlined the steps each of us would contribute and the costs associated with the work that needed to be done. The expertise section of the canvas received high scores because we already had established our team and letters of commitment from other stakeholders who would be collaborating on the project.
Through working on the initial iteration of the Research Proposal Dashboard I uncovered an issue with the phrasing of certain scoring statements on the Research Proposal Dashboard. The first question scorable statement in the Impact quadrant read – ‘Proposed research projects relates to funders interest.’ We were not able to score our agreement with this statement because we had not yet clearly articulated our vision statement. We would have been better able to determine an appropriate score if the statement read – ‘We are confident that the proposed research project aligns with funder’s mission.’ In that instance we would have been able to answer a low score of 2 or 3. While we did believe that our research aligned with the mission stated in the RFP and the organization’s mission, we were not able to formulate it into an alignment score because we did not have a vision statement that summarized the mission of the proposed study. Instead of a concise vision statement, we had several paragraphs that required readers to decide where the emphasis and impact of our proposed research lay. The second scoring statement reads ‘Existing research in topic area is concisely summarized.’ I determined that a more effective scoring statement would read ‘Existing research in topic reveals a gap to be filled.’ This would address the need for the proposed research study.

A deeper dive into the impact section using the Grant Vision Canvas allowed us to view the vision statement in terms of individual team member contributions. This helped us to see each other’s roles in the study and develop a vision statement that was collectively generated. This exploration also helped to more clearly define the roles and contributions needed to develop the work plan steps, timeline, and budget. An exploration of the context helped us to reframe the main vision statement in positive terms. This led us to understand that we had been focusing heavily on the research misconduct but put less emphasis on the positive impact of protecting patients and advancing the field of research integrity. Referring back to this statement throughout the document provided opportunities to remind proposal reviewers of the positive impact of our proposed study.
We noted that the objectives for our first draft of our research proposal were stated in terms of process instead of active terms focused on outcomes. A quick rephrasing of our aims clarified the objectives and made it easier to relate work steps back to desired outcomes.

The RFP did not require an evaluation plan so we did not include one, but we noted that in the next proposal we submitted we would like to include one as part of our methodology to highlight the need for embedding evaluation metrics into our co-creative approach to synthesize and evaluate each step. The collected evaluation plan metrics can serve as a report back to the funding agency to highlight impacts and challenges encountered along the way. Including this in the proposal and in the research process will help us to secure additional funding for continued studies in this area. Including the evaluation plan will also help us to determine the costs associated with evaluation efforts to include in the budget.

While developing the methodology outline we needed to look at our team of researchers as well as the collaborators and participants in the study to make sure that all of the objectives and steps were relevant to creating impact for each participating group. We were able to clearly outline the costs for each service and individual’s time using a basic table in a word document instead of using the Feasibility + Budget Canvas in the toolkit. Dr. Springs contributed a section for stakeholder engagement process in the original draft that included a framework for identifying stakeholders in patient-centered outcomes research developed by Thomas Concannon (Concannon et al. 2012). I found this to be an extremely useful framework for outlining stakeholders in our research proposal and plan to explore incorporating this concept into the design of the supporting canvas for the expertise quadrant. Concannon’s framework proved to be more useful than the Grant Expertise Canvas. The toolkit’s Expertise Canvas could prove useful for developing a deeper understanding of the individual stakeholders needs and motivations. However, the effort to fill out an individual canvas for each of the stakeholder categories seemed to be too much effort. In the end we chose to prioritize other considerations over filling out the Expertise Canvases and did not use them in developing this research proposal.
Our final iteration of the Research Proposal Dashboard showed a marked improvement in our score from when we began the process to the end. We still fell short of a perfect score in some areas, but were able to significantly improve our impact score to a place where we feel confident submitting the proposal.

Similar to the feedback received during the workshops with researchers using the Research Proposal Toolkit, we found the Research Proposal Dashboard and Grant Vision Canvas to be very useful as an at-a-glance overview of where we were at in the proposal development process. We are able to quickly see where our weaknesses were and collaboratively determine how to prioritize next steps. We will be able to use the baseline proposal elements to develop additional research proposals for other funding agencies. The Grant Vision Canvas was particularly useful in breaking down and outlining a narrative for the impact and contribution our proposed study can offer to our field of focus. Also similar to the feedback received during the workshops with researchers, we found a definite need for supporting canvases for the feasibility, expertise, and funding quadrants. However, the current canvases need more design consideration and future co-creative iterations before they can offer a novel and innovative approach to those important areas of a research proposal.

This process definitely helped us to develop the baseline pieces and narrative needed to generate more proposals in a quick manner as we seek additional funding. It will also help us to evaluate our success during the research phase and establish clear lines from our goals to funding agencies goals. We were able to clearly outline our contribution and identify other areas where our contribution can have impact. The scoring mechanism of the Research Proposal Dashboard help us to track our progress and strengthen our proposal.
Conclusion

The complex problems addressed by research proposals require the creativity of multiple stakeholders to merge diverse perspectives into possible solutions that clearly demonstrate a novel and potential impact of a proposed study. Including design researchers and information designers on multi-disciplinary research teams increases the creative diversity needed to solve complex problems and increase a proposed study’s likelihood of successful outcomes. The inclusion of information designers on a research team also ensures the capacity to create effective artifacts for presenting data analysis to interested audiences. Applying a co-creative approach to the methodology of a proposed study that includes multiple team members, participants, and collaborating partners offers a proven approach to stakeholder engagement that is not often included in academic research proposals. A co-creative design thinking approach also helps team members develop a conceptual model of the project and identify key evaluation points. Participation of key stakeholders in the creation of the evaluation plan creates a shared understanding of the project’s structure and expected outcomes, and highlights the project’s most important elements. Based on my own experience, feedback from researchers I have worked
with since 2013, and empirical studies, there is a clear need for a framework that can help streamline the research proposal development process that produces proposals with an increased chance of receiving funding. Researchers are often overwhelmed by the seemingly daunting task of keeping track of all the evaluation criteria as they develop their proposals. The Grant Proposal Canvas and Grant Vision Canvas have proven to be effective tools in helping researchers develop and track the progress of research proposals in development. However support canvases, including the Literature Review Canvas, Budget + Feasibility Canvas, and Experience Canvas require future iterations to provide novel and innovative approaches to those important areas of a research proposal. Many participants in workshops conducted during this thesis process and in my professional experience to-date, note that the in-person opportunities for ideating with other individuals from different groups of practice is one of the most valuable parts of participating in design thinking activities.

While more work needs to be done on the supporting canvases, researcher feedback to-date has shown that using the Research Proposal Toolkit for multi-stakeholder research studies promotes collaboration and strengthens research proposals, which can increase a proposal’s chance for receiving funding. The next step in the development of the Research Proposal Toolkit is to create a guide for facilitators to utilize the toolkit in their own workshops. The guide would include recommendations for recruiting research stakeholders to workshops, workshop materials list, tips for facilitating the workshop and capturing the important conversations, and considerations for the physical location where the workshop will be held.
References


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