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The Creative Thinking Field Book: Putting Creative Problem Solving into the Context of Research & Development

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A Project in
Creative Studies

by

W. Clayton Bunyard

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

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An Abstract of a Project
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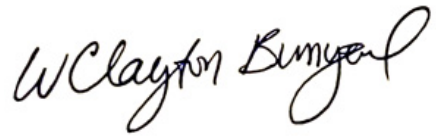
ABSTRACT OF PROJECT

The Creative Thinking Field Book: Putting Creative Problem Solving into the Context of Research & Development

This project focused on creating a supplemental resource guide for people who have recently completed a course on Creative Problem Solving (CPS). This resource guide was designed to go beyond the basic resources of a typical CPS course and provide additional detail and context to enable new students of CPS within my research and development (R&D) organization to more confidently practice deliberate creativity skills and tools in real-world settings. More specifically, this resource guide provides guidance and detailed considerations for how to select divergent and convergent thinking tools for typical R&D collaboration scenarios, as well as how to incorporate deliberate creativity tools into R&D processes such as scientific inquiry. A prototype assessment tool for determining whether CPS is the appropriate innovation method for a task was also developed. Key process and content insights developed during the project are presented in the context of how to foster practice of CPS within a large R&D organization.

Keywords: creative problem solving, research and development, creativity training, organizational creativity



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May 2, 2016
Date

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SECTION ONE: BACKGROUND TO THE PROJECT

Project Description and Purpose

The purpose of this project is to create a supplemental resource guide for people who have recently completed a course on Creative Problem Solving (CPS). The content of this resource book, referred herein as the *Creative Thinking Field Book*, is intended to go beyond the basic resources of a typical CPS course and provide additional detail and context to enable new students to more readily put the mindset, skillset, and toolset of deliberate creativity into real-world practice. More specifically, the version of the *Creative Thinking Field Book* developed in this project will be targeted for use with the research and development (R&D) functions at my company. One department within our organization's R&D function recently completed a CPS training program within the past two years. This three-day CPS training course covered the creative mindset, the basic skills (CPS) and tools through a combination of lecture and individual and group practice using real-world challenges. While the feedback from the training course participants was considerably positive, the questions posed during and after the course revealed a number of common pain points for the participants that need to be resolved to foster broader adoption and practice of the creativity skills and tools. The following three paragraphs describe the pain points that were prioritized for the focus of this *Creative Thinking Field Book*.

How do I incorporate these creativity skills and tools in the processes that I use every day?

R&D functions typically have a range of processes and frameworks they follow to carry out the research, development, and implementation activities required to produce

innovation. For example, a number of the participants in our CPS training course have physical science (chemistry, physics, biology) or engineering backgrounds and use frameworks common to those disciplines such as scientific inquiry (Robinson, 2004) and engineering design (Cropley, 2015). Additionally, as much of the innovation in our company is more incremental in nature, lean-thinking, a prominent continuous improvement management philosophy (Sanchez & Blanco, 2014) has a strong foundation in our R&D groups. Lean thinking has its own problem-solving frameworks and tools such as Plan-Do-Check-Act (Lander & Liker, 2007; “Plan, do, check, act,” n.d.) which are commonly used in R&D. Lastly, there are standard processes for submitting proposals for new R&D projects and managing innovation projects. Collectively, these processes and frameworks are a regular part of the daily lives of the R&D team members. The CPS skills and tools in the training were new to many of the participants and appeared to be generally perceived by many as an additional process to use, such as in a “brainstorming meeting”, rather than a set of creativity skills and tools that could be integrated within these existing processes and frameworks. If the people in our R&D groups understand how deliberate creativity can be incorporated into their existing processes and frameworks, then perception of the value and the practice of these skills and tools should increase.

How do I practically apply these methods and tools in typical group collaboration scenarios at work?

It was evident by the questions over the course of the different CPS training sessions that the participants were trying to reconcile the practice of particular divergent

and convergent tools in the training class with the realities of their day-to-day work. Representative questions in many of the sessions included

- When do you stop diverging?
- How do we practice divergence in a videoconference or teleconference? Post-it® notes wouldn't work.
- I'm not sure when I should use brainstorming versus brainwriting. When do I use SCAMPER?
- What if the people have not been trained with these tools? Do I have to teach them first?
- Do we always have to use dot voting? What other ways are there to converge? This does not feel very critical.
- How do I put together a meeting with these tools? I feel like I will always need a facilitator. It seems complex.

As with many other CPS courses, the training materials and content provide the basic description of the CPS model and associated tools. Covering questions such as these, which get into the practical nuances of how and when to apply particular tools, was only possible to a limited degree in the allotted time. Considering that the majority of the participants in training will not practice CPS on a regular basis following the training, the likelihood of them developing insights to these very practical questions through experience is low. However, if these individuals have a more practical understanding of when to apply basic creativity tools early on, then their adoption and practice of these creativity tools has a greater potential to increase.

How do I know CPS is the best approach for this situation?

As mentioned in a previous section, lean continuous improvement methods are an important part of R&D at my company and were pre-existing to the introduction of the CPS training. The introduction of CPS as an alternate framework for problem solving introduced some confusion for participants with regular exposure and practice to these lean methods. Seeing value in both approaches, it was not evident to these individuals on how to go about deciding whether lean problem-solving (LPS) methods or CPS should be used as the problem solving framework for particular situations. While Plsek (1997) has argued that this question is "silly" noting that "all of the approaches are correct at some time, and none of them is correct all of the time" (p. 244) and that the most appropriate approach might even be a blend of several methods, his perspective represents a much higher creative thinking skill level than the targeted audience of the field book. From a practical perspective, if individuals have clear guidelines for selecting among different innovation frameworks, particularly when they are first introduced to CPS, then they will have greater clarity and confidence in how and when to use CPS in their work.

Rationale for Selection

The impact of fostering creativity on the financial success of organizations is becoming increasingly clear (Forrester Consulting, 2014). With the goal of fostering creativity within our company, I gained organizational support for and led the implementation of the pilot evaluation of the CPS training as well as the broader rollout of the training to the rest of our R&D department. Considering the investment in this effort so far, and the potential for future CPS training initiatives, it is important for the company to see a return on its investment. And for the goal to be realized, participants

in the training program need to not only see the value of developing themselves towards the practice of deliberate creativity, but they also have to feel motivated and confident to try to put the mindset, skills and tools into practice. This *Creative Thinking Field Book* aims to foster that confidence by relating these new CPS practices to the context of our organization in a way that CPS training resources designed for general audiences cannot.

One of my primary motivations for entering the ICSC distance program was to better understand how to augment the scientific and technical innovation carried out within our R&D departments with deliberate creativity practices. Odumosu, Tsao, and Narayanamurti (2015) recently spoke to this topic in an opinion editorial calling for the integration of the social science of creativity into scientific research practices. This *Creative Thinking Field Book* represents a step towards creating the bridge to connect these disciplines in a practical, user-friendly way for individuals within those scientific disciplines and limited CPS experience.

SECTION TWO: PERTINENT LITERATURE

In preparation for my project work, I looked for resources that would provide new perspectives on how to address the pain points for adoption and practice of creative thinking skills. The majority of these resources fell into three major categories: frameworks and processes in R&D, workbooks and manuals on creative processes, and selection of innovation and change methods. The following section reviews the most impactful literature and resources in these categories.

Frameworks and Processes in R&D

To address the pain point of incorporating CPS within other frameworks, this project will focus on the commonly used Scientific Inquiry, Engineering Design Process and Lean Problem Solving (LPS). The general frameworks of Scientific Inquiry and the Engineering Design Process are practiced on a regular basis in our R&D department, but not in formalized way. The practice of these frameworks is left up to the particular scientists and project teams. However, to introduce CPS into these frameworks for my project, specific representations of the frameworks and descriptions of the steps must be chosen.

Scientific inquiry, while based on the scientific method, has been suggested by some scientists to be more reflective of how science is actually practiced (Reiff, Harwood, & Phillipson, 2002; Robinson, 2004). The scientific method has a linear structure and is designed well for answering a single question following an experiment (Mytko, 2008). It can be represented by the following six steps:

1) Ask a Question

2) Do Background Research

3) Construct a Hypothesis

4) Test the Hypothesis

5) Analyze and Draw Conclusions

6) Communicate Results (“Steps of the scientific method,” n.d.).

In comparison, scientific inquiry is more fluid, and often leads to even more questions along the way. It can been represented in a variety of other formats (“How science works: The flowchart,” n.d.) depending on the targeted audience, but the most simple and appropriate for use in this project is the “scientific inquiry wheel” (Reiff et al., 2002) shown in *Figure 1*. The authors note that it is not an inquiry cycle, which is why after each step it returns back to questioning. Roy, Kustra, and Borin (2003) also provided a helpful resource for framing inquiry questions during the project.

The engineering design process might look very similar to scientific inquiry when comparing the steps of the two frameworks but they each start with different intentions. Scientific inquiry starts with a question to be studied while the engineering design process starts with a problem that needs to be solved (“Comparing the engineering design process and the scientific method,” n.d.). After reviewing a number of different versions of the engineering design process intended for K-12 students, a version was created for this project by incorporating descriptions of steps from two different sources (“Engineering design process,” n.d.; Tufts Center for Engineering Education and Outreach, 2013) and is shown in *Figure 2*.

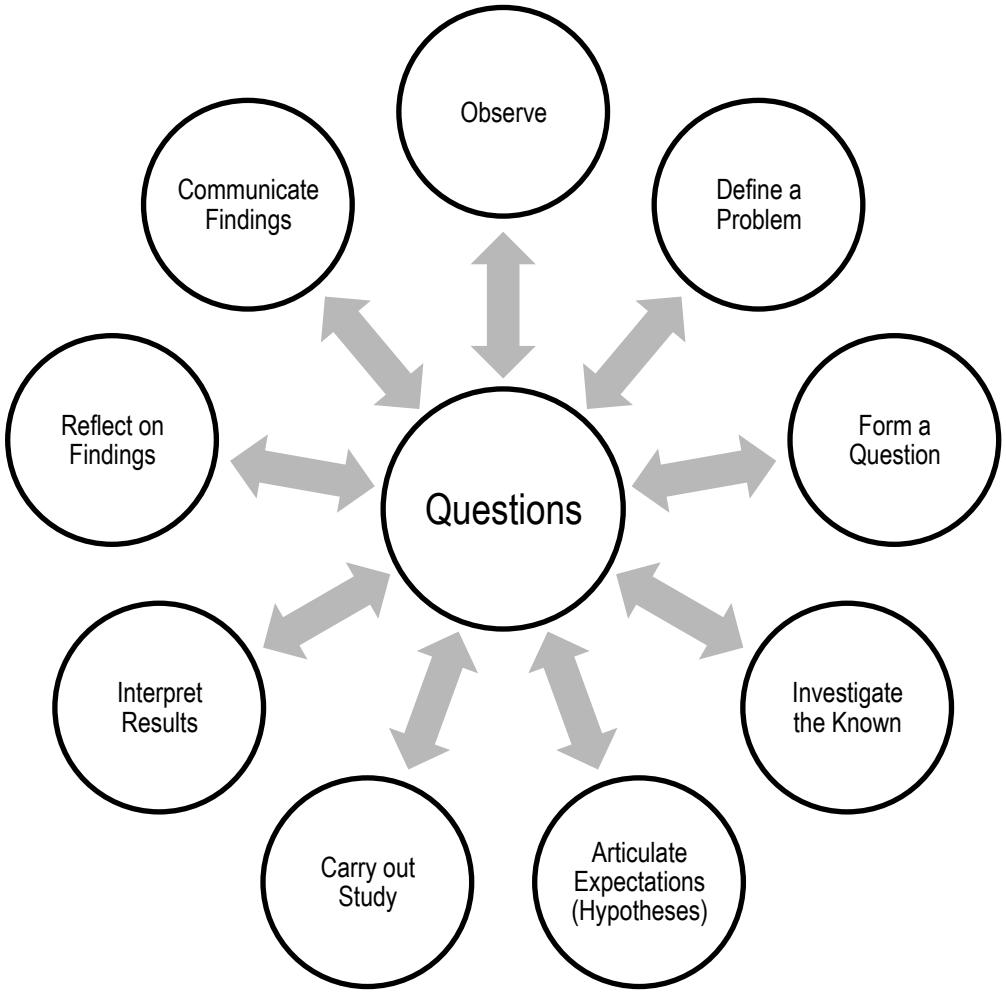

Figure 1. Scientific Inquiry Wheel. Illustration describing the steps of Scientific Inquiry based on Reiff et al. (2002).

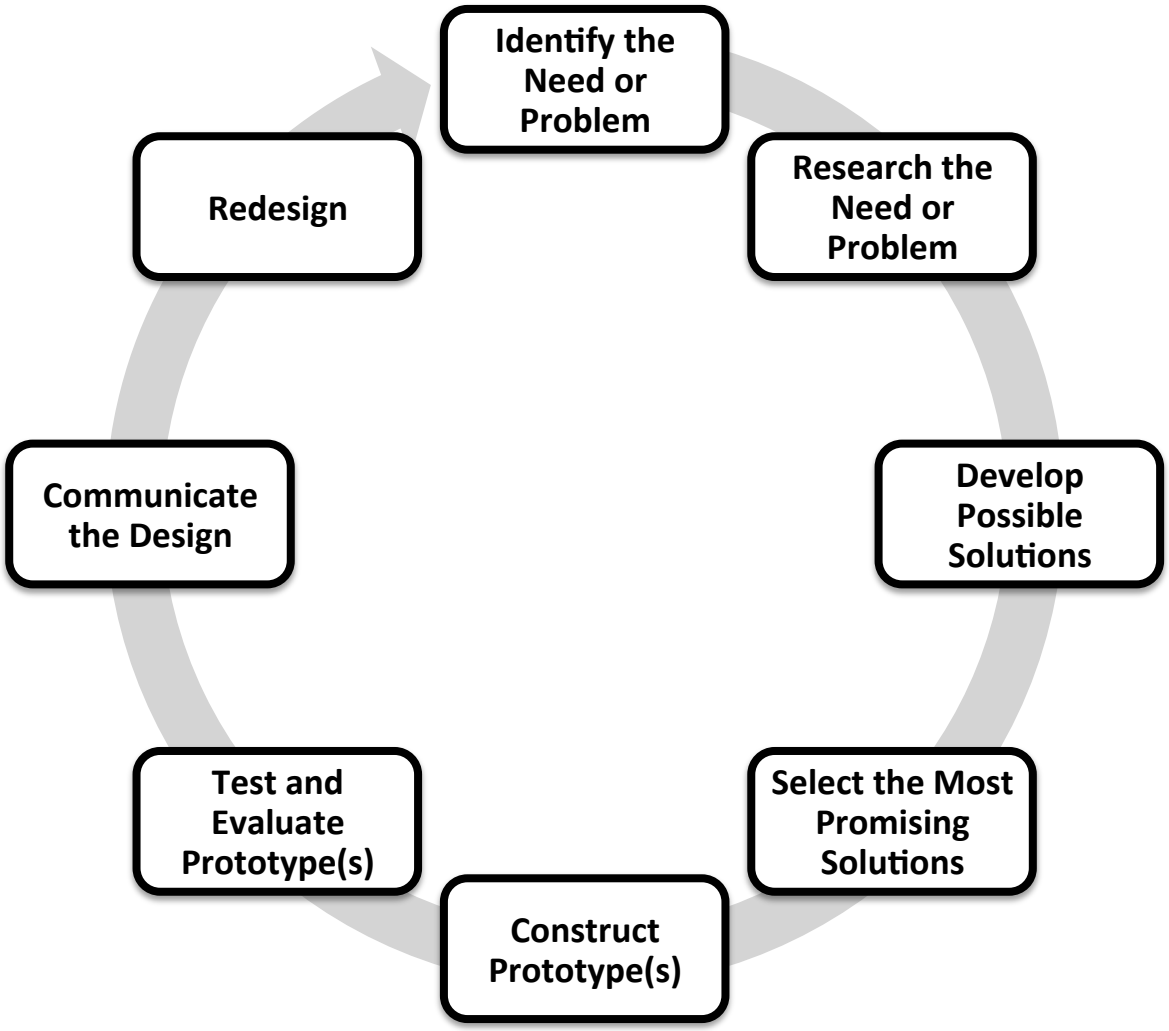

Figure 2. Engineering Design Process. The illustration is based on a combination of the Engineering Design Process descriptions in "Engineering design process," n.d. and Tufts Center for Engineering Education and Outreach (2013).

Howard, Culley and Dekoninck (2008) looked at integrating the engineering design process with the creative process to create a new “creative design process”. They made comparisons across 23 different engineering design process models as well as across 19 different creative process models, which included several versions of CPS. When generalizing the creative process models, they broke the steps of the different models into four separate phases: analysis, generation, evaluation and communication/implementation (Howard et al., 2008). While using different language, these stages are effectively equivalent to the Clarify, Ideate, Develop, and Implement stages of the FourSight model for CPS (Puccio, Miller, Thurber, & Schoen, 2012). However, Howard et al. (2008) limited the creative process to only the analysis, generation, and evaluation steps, as communication/implementation was considered to be a design step. When comparing across the processes for engineering design and creativity, they noted that

> psychologists have moved from thinking of the creative process as a cognitive process to a more activity-based one, more analogous to the design process. In doing this, many recent creative process models could, interestingly, be interpreted as extremely generic design process models. (Howard et al., 2008, p. 167)

Upon integrating the two processes, the creative process steps were mapped onto the different design activities. These relationships between engineering design and the creative process provided useful insight for the approach I will take to integrate the steps of the different frameworks with CPS for the *Creative Thinking Field Book*.

Survey of Workbooks and Manuals on Creative Processes

The manual used in the CPS training in our R&D department presents the foundational elements of what creativity is, the creative mindset, divergent/convergent thinking, a six-step CPS framework based on elements of the plain-language model for CPS (Vehar & Firestien, 2001) and the FourSight Model for CPS (Puccio et al., 2012), and associated divergent and convergent thinking tools. The manual does not elaborate upon the use of CPS or the tools. As the intention of the *Creative Thinking Field Book* is to provide sufficient detail to encourage practice of CPS model and tools in the context of an R&D setting, I conducted a brief survey of additional resources related to CPS, design thinking and facilitation to obtain a broader perspective on the presentation of the material.

Creativity Unbound by Miller, Vehar, Firestien, Thurber, and Nielsen (2011) is used in CRS 559, the introductory course to CPS at Buffalo State, and provides an overview of creativity, tools for diverging and converging, and the FourSight model for CPS. The tools and CPS model are described at a basic level and primarily focused on the purpose behind different tools and stages of thinking with step-by-step instructions. The *Creative Problem Solving Resource Guide* (Creative Education Foundation, 2015b) and *Creative Problem Solving Participant Workbook* (Creative Education Foundation, 2015a), which are provided to participants in the Creative Problem Solving Institute's introductory CPS class, cover the same basic content at a similar level of detail to *Creativity Unbound*.

Treffinger, Isaksen, and Stead-Dorval's (2006) *Creative Problem Solving: An Introduction* similarly covers the creative mindset, skillset and a basic toolset of CPS but

in a more detailed, narrative format. It discusses how to plan an approach for use of CPS and factors that contribute to successful application. It also makes use of a number of conceptual representations of the CPS stages and explanatory tables and figures to guide use of the process and tools. Contrasting *Creative Problem Solving* (Treffinger et al., 2006) with the resources in the previous paragraph, it has a greater level of detail to guide practice of CPS, and would perhaps be best suited for more dedicated students of CPS.

Isaksen and Treffinger's (1985) *Creative Problem Solving: The Basic Course* presents an earlier model of CPS in a narrative-based format with numerous workbook elements and process and tool templates. It expands into much greater detail on the application of the tools, and particularly with convergent thinking tools. At the end of the book, templates for a CPS run-though are provided along with a worked example using a general business scenario.

Isaksen, Dorval, & Treffinger's (2011) *Creative Approaches to Problem Solving: A Framework for Innovation and Change* has a textbook format, and presents similar materials to their earlier introduction of CPS (Treffinger et al., 2006). It expands further into chapters on the roles of context and content, the use of CPS as a change method, and how to customize its application for individual sessions and even large-scale initiatives.

Moving beyond CPS-focused materials, I reviewed resources related to design thinking. Liedtka & Ogilvie's (2011) *Designing for Growth: A Design Thinking Tool Kit for Managers* covers the philosophy, methodology and tools of design thinking with the goal of making it more accessible to managers. Liedtka, Ogilvie, and Brozenske’s

(2014) *The Designing for Growth Field Book: A Step-by-Step Project Guide* is a follow-up to this book intended to be a more practical, stand-alone guide. It has a more limited narrative description of the method and a greater focus on application. The authors saw the need for this field book based on their experiences working with their targeted audience of managers. Liedtka, Ogilvie, and Brozenske's (2014) level of description of the design thinking methodology and tools is comparable to that of *Creativity Unbound* (Miller et al., 2011).

The *Facilitator's Guide to Participatory Decision Making* (Kaner, 2014) is a resource guide for facilitators and presents concepts and tools which overlap with the previously mentioned CPS resources but come from a perspective of group decision making rather than CPS. While lengthy, Kaner's (2014) guide presents the material in a visual way with limited narrative text and generous use of conceptual graphics, checklists, and annotated process maps. The content is also focused on practical applications, walking through typical challenges a facilitator might run into in group scenarios, examples of behaviors to look for in participants, case studies, and reasoning for why and how to use particular tools.

The review of these resources provided greater clarity of the focus and presentation of the *Creative Thinking Field Book*. Resources designed for CPS courses similar to the two day course at my company (Creative Education Foundation, 2015b; Miller et al., 2011) share the same basic content focus and do not address the pain point of how to tailor CPS to typical work-related collaboration scenarios that this project is trying address. Looking at the CPS resources that provide much more elaboration on the CPS process, tools and application (Isaksen & Treffinger, 1985; Treffinger et al.,

2006), they cover a range of content that appears to be targeted to advancing CPS students to a facilitator level of skill without addressing the pain point of tailoring CPS to specific collaboration scenarios. While the layperson audience for this field book could make use of these resources, the degree of detail is likely too much for someone that wants a quick, practical reference and has not yet developed a serious interest in the study of CPS. Therefore the degree of elaboration will be an important consideration for engaging the reader at his or her current level of skill. With respect to presentation, the conceptual graphics, process diagrams, quick reference sheets, tool templates, case studies and worked examples used in several resources (Isaksen et al., 2011; Isaksen & Treffinger, 1985; Kaner, 2014; Liedtka & Ogilvie, 2011; Liedtka et al., 2014; Treffinger et al., 2006) suggests that I look for opportunities to incorporate these into content of the field book to maximize comprehension and practice of the material.

Selection of Innovation and Change Methods

As discussed previously in the background section, a Lean Problem Solving (LPS) method is commonly used in our R&D department and upon introduction of CPS, it created confusion for some participants on when to use which methodology. The LPS method used is based on the Plan-Do-Check-Act (PDCA) cycle ("Plan, do, check, act," n.d.) and is referred to internally as "simple problem solving." Both are used to identify new solutions to foster innovation, with LPS perceived as coming from a more analytical perspective and CPS coming from a creative perspective. This section will explore different aspects of this topic to inform the creation of guidelines for the layperson practitioner.

Isaksen et al. (2011) devoted a chapter to this general topic, framing CPS as one of many identified “change methods” that an organization can use to “make something better or different” to “create productive transformation” (p. 214). Change methods can vary in situational fit and flexibility of application. Several examples provided in addition to CPS included Kepner/Tregoe, Six Sigma, Total Quality Management, Lean manufacturing, Lateral Thinking and TRIZ (Isaksen et al., 2011). The authors further elaborated that

> knowing a method’s purpose and unique qualities will help you set appropriate expectations for its effectiveness. You will be in a better position to know when you are using the method in a way where you can be confident in its use, and when you might be stretching the method beyond its potential effectiveness. (Isaksen et al., 2011, p. 217)

Isaksen et al. (2011) suggested evaluating a task against four key characteristics on a low/medium/high scale to determine if CPS is an appropriate method. The characteristics, and the levels appropriate for CPS application were

- need for novelty (medium to high),
- level of complexity (medium-low to high),
- amount of ambiguity (medium-low to high), and
- openness of the task (medium to high).

Based on these considerations from Isaksen et al. (2011), I will need to be able to clearly define the purpose and qualities of LPS and CPS, understand where they each do and do not work well, and potentially provide some “rules of thumb” related to tasks to guide the layperson in selection of LPS versus CPS.

Cropley and Cropley (2012) and Cropley (2015) developed a model for innovation derived from a phased model of creative problem solving (preparation, activation, generation, illumination, verification) and expanded with the exploitation activities (communication, validation) required to transform the creative solutions into innovation. They argued entry into this expanded phased model for innovation by an organization is triggered by a desire for change (Cropley, 2015). Combining the work of Isaksen et al. (2011) with this phased model for innovation, it suggests that another factor for guiding a layperson in the decision between LPS and CPS, is incorporating the type of change or degree of innovation desired.

Considering that LPS is an incremental innovation-based change method and CPS is more uniquely suited for fostering radical change, a continuum proposed by Smith (1993) based on the Kirton Adaption-Innovation scale (1976) is a potential guide for delineating which change method is the most appropriate to apply to a situation. Smith (1993) proposed the following seven types of change ranging from incremental to radical:

- efficiency (doing things right)
- effectiveness (doing the right things)
- cutting (doing away with things)
- improving (doing things better)
- copying (doing things other people are doing)
- different (doing things no one else is doing)
- impossible (doing things that can’t be done) (p. 29-32).

Plsek (1997) advocated for the application of creativity tools and approaches in quality management where analytical change methods like LPS are the norm. He did not advocate for either analytical or creative methods as being preferable, but rather advocated for flexibility in thinking. For example, if one starts out with LPS as a method, it is important to recognize the signs of "stuck thinking" where the analytical methods fail to yield forward progress (Plsek, 1997). Plsek (1997) shared his experience that in this situation, "thinking harder rarely helps. Thinking differently is the only thing that helps" (p. 247). An over-reliance on rational thinking or scientific reasoning is an often-cited creativity block (Isaksen & Treffinger, 1985).

In addition to the sources referenced above, the following sources were not mentioned but influenced my thinking during the development of the project.

Kepner, C. H., & Tregoe, B. B. (1997). *The new rational manager: An updated edition for a new world*. Princeton, NJ: Princeton Research Press.

Radeka, K. (2013). *The mastery of innovation: A field guide to lean product development*. Boca Raton, FL: CRC Press.

Simonton, D. K. (2003). Scientific creativity as constrained stochastic behavior: The integration of product, person, and process perspectives. *Psychological Bulletin*, *129*(4), 475–494.

Treffinger, D. J. (2000). *Practice problems for creative problem solving* (3rd Ed.). Waco, TX: Prufrock Press.

SECTION THREE: PROCESS PLAN

Goals and Outcomes

The focus of this project will involve creating the prototype versions of chapters 3-5 of the *Creative Thinking Field Book*, the full contents of which are described in order below.

- Chapter 1. Foundations of Creative Thinking
- Chapter 2. Overview of the FourSight Model for Creative Thinking
- Chapter 3. Using Creative Thinking Tools at Work
- Chapter 4. Creative Thinking in other Processes
- Chapter 5. Choosing an Innovation Method

Project Timeline

The project timeline for write-up of the Master's Project as well as completion of the content of the *Creative Thinking Field Book* is described in Table 1. The overall plan involves first grounding myself in current and past resource guides and field books designed to teach or train creativity methods. Combining this review of our internal CPS training course materials and feedback, the outline for the *Creative Thinking Field Book* can be formed. From there, each chapter of the field book will be developed through the steps described in Table 1. The prototype field book will be shared with previous participants of our internal CPS training for feedback. The learning from the process of creating the field book will then be incorporated into the project write-up along with the final project presentation.

Table 1.

Key activities, milestones and timing for project completion.

Task	Estimated Hours	Start Date	End Date
Write Concept Paper	16	Jan 25	Feb 15
Detailed Outline of Field Book • Review CPS and creativity training resources and tool descriptions • Review internal CPS course materials and feedback	8	Feb 8	Feb 15
Chapter 4. Creative Thinking in Other Processes • Mapping of the TSM and FourSight models for CPS on the steps of innovation processes • Matching of tools with the innovation processes • Write narrative descriptions for each process • Create overlay graphics of FourSight model with innovation processes and creativity tools	40	Feb 16	Mar 4
Chapter 3. Using Creative Thinking Tools at Work • Research and develop divergent tools categorization and narrative • Research and develop convergent tools categorization and narrative • Create individual divergent and convergent tool descriptions • Create Example Scenarios	40	Mar 5	Mar 18
Complete write-up of project sections 1-3	30	Mar 10	Mar 14

Complete write-up of project sections 4-6	36	Apr 1	Apr 11
Chapter 5. Choosing an Innovation Method • Research change methods and task assessment • Develop Task Characteristics Worksheet • Develop Task Assessment Tool instructions • Develop Innovation Method Descriptions	30	Mar 19	Mar 27
Field Book Content Evaluation • Chapter 3 discussions with CPS class participants • Chapter 5 discussion with Lean Expert • Chapter 4-5 discussion with managers	4	Mar 21	Apr 8
Prepare Presentation	8	Apr 25	Apr 29
Give Final Presentation	2		May 2
Total Hours	214		

SECTION FOUR: OUTCOMES

Introduction

My goal for this project was to create prototypes for three chapters of the *Creative Thinking Field Book*, which has the purpose of serving as a post-training resource for participants in a CPS training course at my company. Each of these chapters was designed to address one of three pain points described in the first section of this project write-up. The three chapters developed during this project include

- Chapter 3. Using Creative Thinking Tools at Work
- Chapter 4. Creative Thinking in Other Processes
- Chapter 5. Choosing an Innovation Method

I developed the chapters to the extent I believed would be sufficient to get feedback from previous CPS training participants. Currently, the book contains limited graphics and elements for visual learners, which would be developed in a more final version after the content is set.

In the following sections, the CPS process is referred to in several ways, including the Thinking Skills Model (TSM) for CPS (Puccio, Mance, & Murdock, 2010) as well as the more simplified FourSight Model for CPS (Miller et al., 2011). Within our internal CPS training course, we made a conscious choice to avoid the use of the phrase “creative problem solving” as we did not want the participants to overly focus on the word “problem”, particularly as we had a number of commonly used internal problem solving methods. Rather, we wanted them to focus on creative thinking and found it useful to refer to the FourSight Model for CPS as the FourSight Model for Creative

Thinking. For consistency, within the *Creative Thinking Field Book*, I also used this same terminology.

Chapter 3. Using Creative Thinking Tools at Work

The pain point of "how do I practically apply these methods and tools in typical group collaboration scenarios at work?" was the primary focus of this chapter. To accomplish this, the chapter framed the divergent and convergent thinking tools from the internal CPS course in the context of the typical collaboration scenarios that participants would see at work. Our internal CPS training focused primarily on teaching the CPS process and tools in a synchronized in-person group collaboration scenario, but that scenario represents only one of the many ways in which people collaborate and contribute creatively where I work. Therefore, emphasis was placed in the field book on synchronous (everyone contributes at the same time) in-person and virtual collaboration, as well as asynchronous (everyone contributes on their own time) collaboration. The benefits of asynchronous collaboration were highlighted as well as the concerns relative to synchronous collaboration.

Divergent Thinking Tools

In this section, the divergent thinking tools were categorized by either a primary purpose of "capturing a divergent list of options" or "fostering breadth and novelty of options." The rational for breaking up the tools into these categories was to make divergent tool selection more straightforward for the novice CPS user. This would focus emphasis first on selection of a divergent tool which best fits with the collaboration scenario they are participating in before thinking about tools for augmenting the novelty and breadth of the divergence. Separating divergent from convergent thinking is a

significant behavior change being asked of the training participants, and making this behavior change easier for them could provide a noticeable shift in creative thinking within our organization. In the former category, which included tools like Brainstorming and Brainwriting, the tools were broken down into techniques that would fit with different synchronous and asynchronous collaboration scenarios. For example, “Brainwriting with a Template” might be used more easily in an in-person collaboration while “Brainwriting on a Spreadsheet” might be used more easily in a virtual setting with shared computer screens. In the latter category, which included tools such as Forced Connections and SCAMPER, scenarios where these type of tools would be most beneficial for use were briefly highlighted.

To assist the user in more mindful selection of tools for particular situations, an evaluation matrix reference tool was created which differentiates the tools by the two major categories of “capturing a divergent list of options” or “fostering breadth and novelty of options”, the CPS model stages/steps they best fit with, and an evaluation of their fit with “synchronous in-person”, “synchronous virtual” and “asynchronous” collaboration. The fit evaluation was based on a high, medium, low scale, with the meaning of each of the levels described in the table. To supplement the use of this evaluation matrix, each of the tools were separately described with respect to the benefits and considerations of their use for group collaboration. Several examples of these tool descriptions are provided in Figures 3, 4, and 5.

Convergent Thinking Tools

The rationale for the design of this section was to bring greater clarity to the purpose of different convergent thinking tools and when they are more effectively used.

The CPS training course primarily focused on the use of Hits (or Stars), Highlighting and POINt (Miller et al., 2011) with limited to no practice of other convergent thinking tools. The process of narrowing down the large number of options generated during divergence was considered either overwhelming, unstructured or confusing for a number of the participants in our internal CPS training. This section was intended to provide them a foundation for a process to think through convergence. This was accomplished by placing the convergent thinking tools into the categories of *Organizing*, *Evaluating*, *Prioritizing*, and *Developing* which have been previously described by Isaksen, Dorval, and Treffinger (2011). These categories represent the different types of convergent thinking that might need to be considered for use in different tasks.

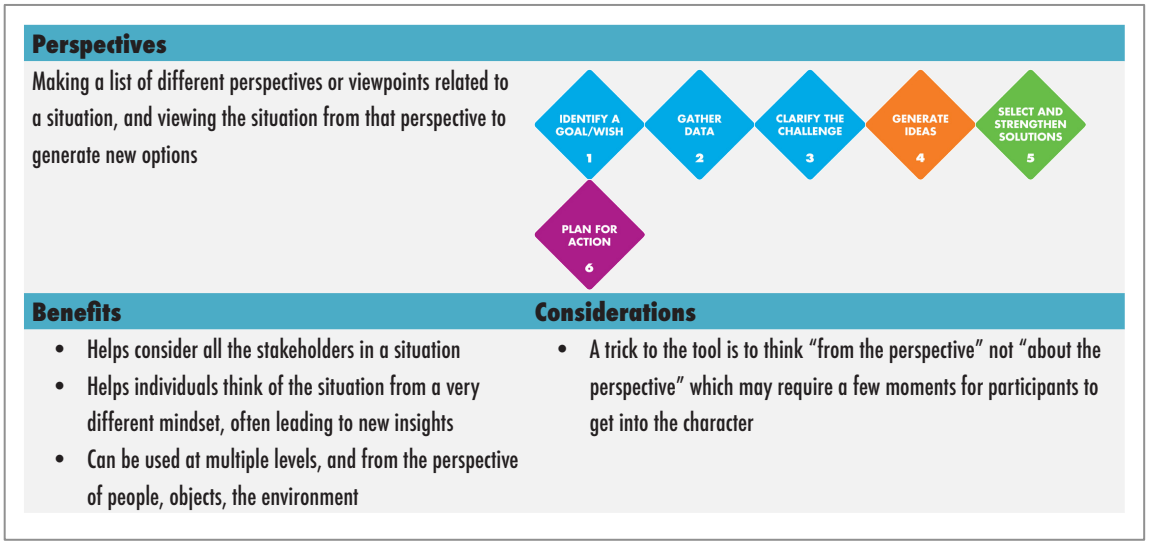

Figure 3. Description of the divergent thinking Perspectives tool including benefits and considerations for group collaboration.

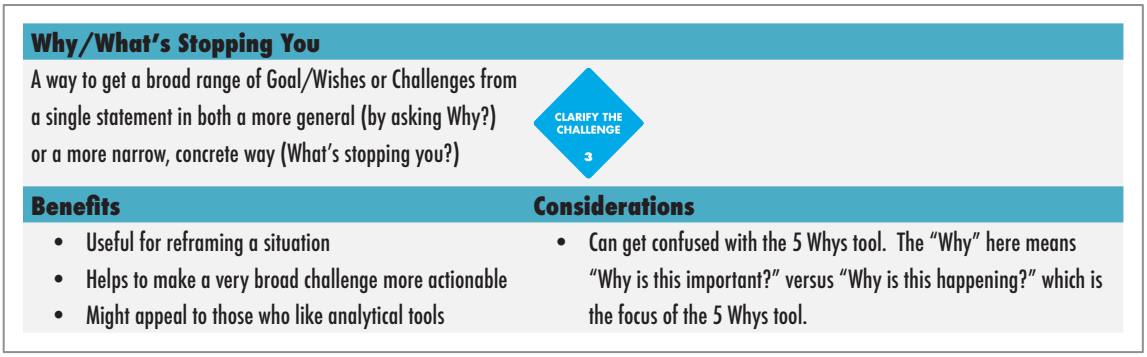

Figure 4. Description of the divergent thinking Why/What's Stopping You tool including benefits and considerations for group collaboration.

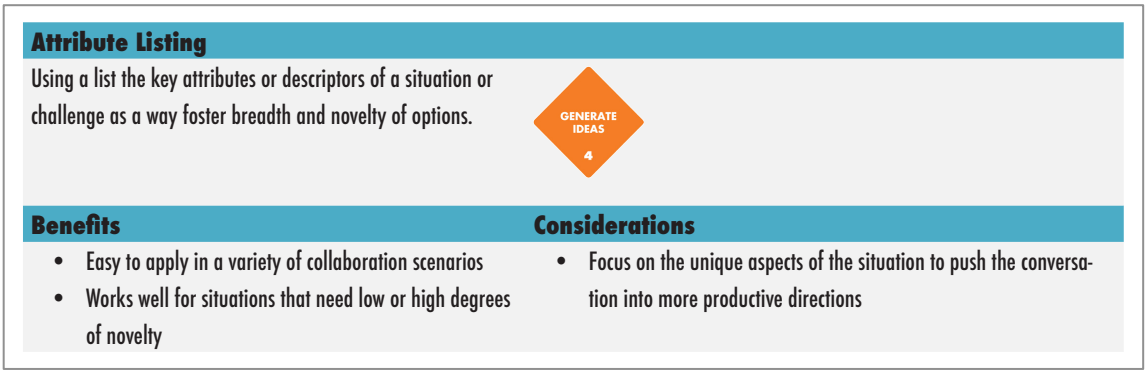

Figure 5. Description of the divergent thinking Attribute Listing tool including benefits and considerations for group collaboration.

Similar to the divergent thinking tools section, an evaluation matrix was created to group the different tools by the categories of convergent thinking, the number of options that they are designed to handle, the CPS stages/steps that they best work with, and an evaluation of their fit with "synchronous in-person", "synchronous virtual" and "asynchronous" collaboration. The evaluation was also based on a high, medium, low scale, with explanations of their meanings included along with the evaluation matrix. To supplement their use of this evaluation matrix and selection of particular tools, each of the tools were separately discussed with respect to the benefits and considerations of their use for group collaboration.

Example Scenarios Using Creativity Tools

Building upon the descriptions of the divergent and convergent thinking tools in the previous section of this chapter, here the focus is on illustrating the application of the tools in collaboration scenarios relevant to an R&D organization. The three examples shared in this section of the field book are based on meetings that I lead previously involving different combinations of synchronous and asynchronous collaboration scenarios and can be found in Table 2. The rationale was to help the reader put the use of the tools into the context of the types of collaboration scenarios experienced based on relevant content. For each of the example scenarios, a narrative description of the situation and creative thinking approach was provided along with a meeting plan outline. The meeting plan outline consisted of the stage/step of CPS, the type(s) of collaboration scenario(s), the specific divergent and convergent thinking tools used along with a brief rationale for their selection. An example of one of the meeting plan outlines can be found in *Figure 6*.

Table 2.

Creative Thinking Scenarios Using Divergent and Convergent Tools.

Creative Thinking Scenario	**Synchronous**		**Asynchronous**
	In-Person	**Virtual**	
Clarifying the Focus of a Project		✔	✔
Identifying Applications for a New Technology	✔		✔
Identifying New Approaches to Improve a Product	✔		✔

Stage	Scenario	Divergent/Convergent Tools/ Techniques		Rationale
	Asynchronous	Brainwriting via spreadsheet	Divergent Question List	Individuals could take their time to think through their thoughts, with the help of the divergent question list.
			Stars	Individuals could look at everyone's contributions and pick the most important and meaningful ones to them
	Synchronous, Virtual (Skype)	Mindmapping software	Highlighting	Allowed the group to discuss the themes and come to a mutual understanding of what the themes were
			Card Sort	Allowed the individuals to share what their top priorities were moving forward and come to a mutual agreement

Figure 6. Meeting plan description for the "Clarifying the Focus of a Project".

Chapter 4. Creative Thinking in Other Processes

The pain point of "how do I incorporate these creativity skills and tools in the processes and frameworks that I use every day?" was the primary focus of this chapter. The approach to address this pain point in the *Creative Thinking Field Book* was to map the stages/steps of CPS and selected divergent and convergent thinking tools onto the steps of several existing innovation frameworks practiced within our company to show how these existing frameworks might be augmented with creative thinking. Incorporating deliberate creativity into existing practices would likely represent the easiest entry point for many individuals to build their creativity skills, rather than expecting them to regularly practice CPS as a standalone framework. Three innovation frameworks were chosen for this prototype chapter including a model for Scientific Inquiry (Robinson, 2004), a Lean thinking problem solving method based on Plan-Do-

Check-Act (PDCA; Lander & Liker, 2007; “Plan, do, check, act,” n.d.), and the Engineering Design Process (“The engineering design process,” n.d.).

The same basic process and format was used for each of the three different innovation methods. Before writing the chapter, the steps of the three different innovation frameworks were mapped to the appropriate creative thinking skills of the Thinking Skills Model (Puccio et al., 2010) and then to the FourSight model for CPS (Puccio et al., 2012). A basic description of each innovation method was included for reference, with the assumption that the reader had some level of familiarity with the methods. For each step of an innovation framework, a brief description of how the step could be augmented from a creative thinking perspective was provided. In addition to these narrative descriptions, a graphic for each innovation framework was used to show how the FourSight model mapped onto the different steps along with the divergent and convergent thinking tools. The narrative was intended to help those that wanted more detail on how to incorporate creative thinking into the frameworks, with the graphics serving more as a quick reference. The graphic created for Scientific Inquiry is provided in *Figure 7*.

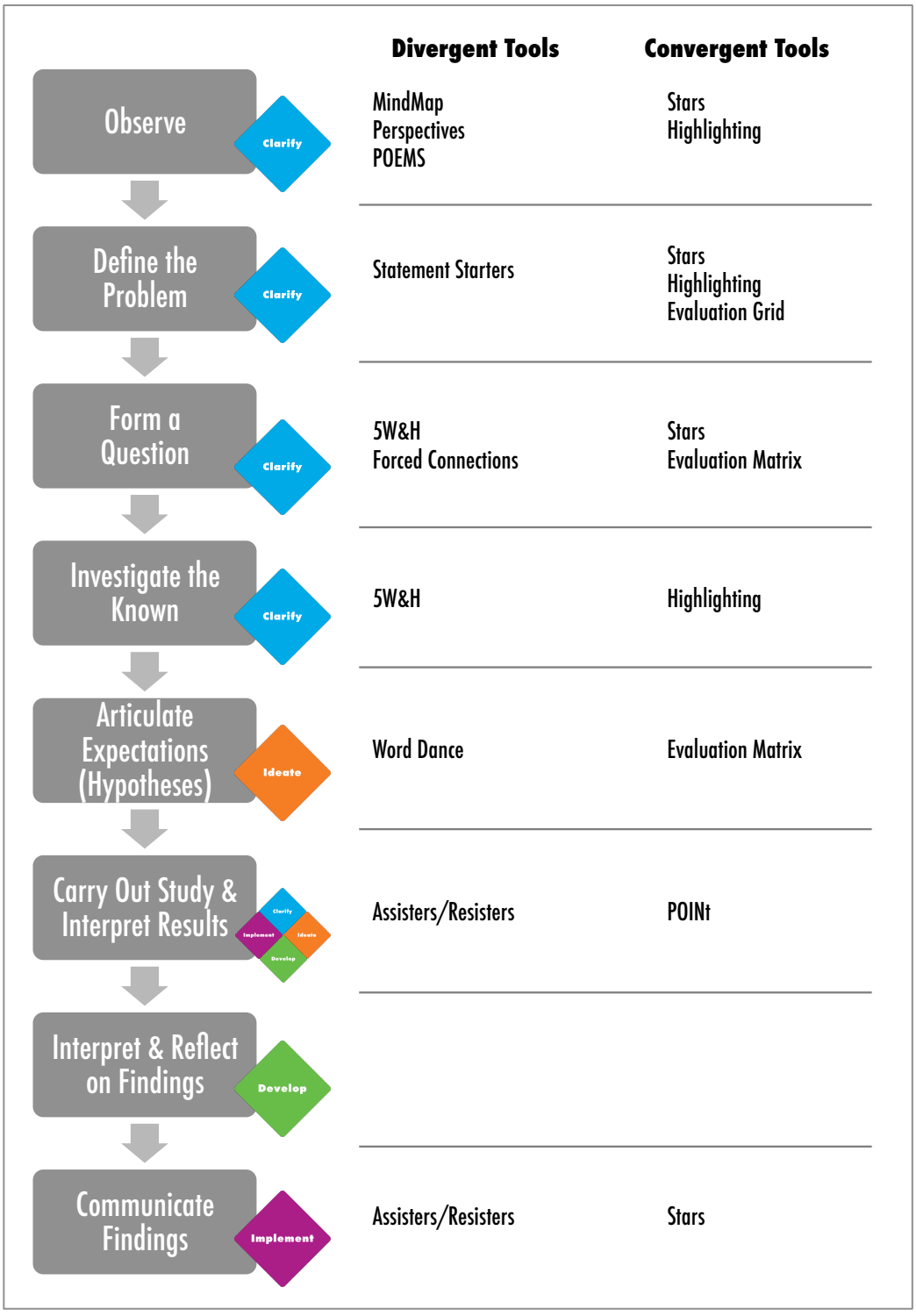

Figure 7. Overlay of the FourSight Model for Creative Thinking and associated tools on the steps of Scientific Inquiry.

Chapter 5. Choosing an Innovation Method

The pain point of “how do I know CPS is the best approach for this situation?” was the primary focus of this chapter in the *Creative Thinking Field Book*. The approach to address this pain point was creation of an assessment tool for guiding individuals in selection of an innovation method suitable for their situation. For the purpose of the tool development, CPS and two LPS methods, “Simple Problem Solving” and “Kaizen” were selected for this chapter. The Task Assessment Tool developed for this chapter has three main components, a) Task Assessment Tool Instructions, b) Task Characteristics Worksheet, and the c) Innovation Method Descriptions.

Task Characteristics Worksheet

The starting point for the development of the Task Characteristics Worksheet was the work of Isaksen, Dorval, and Treffinger (2011) in which they discussed CPS as a change method and provided guidance on the characteristics of tasks that best fit with the use of the CPS process. Their characteristics of “need for novelty”, “level of complexity,” “amount of ambiguity,” and “openness of task” were used as the foundation of the worksheet, as those characteristics seemed appropriate for a range of innovation methods (Isaksen et al., 2011, pp. 218–219). One additional characteristic was included to describe the “type of innovation” desired from use of the innovation method, which was adapted from the work of Smith (1993). These characteristics were built into a “Task Characteristics Worksheet” shown in *Figure 8*. Each of the task characteristics, with the exception of “type of innovation” are rated on a five-level likert scale ranging from low to high, with guidance provided in the description of the characteristics for

selection. For “type of innovation”, the types were adapted from Smith’s (1993) innovation continuum.

Innovation Method Descriptions

Basic descriptions were created for several innovation methods, including “Creative Thinking”, “Simple Problem Solving” and “Kaizen”. Internally, “Simple Problem Solving” and “Kaizen” are problem-solving methods both based on the PDCA cycle (“Plan, do, check, act,” n.d.). The former method is used with problems that typically can be addressed within a few hours, and the latter is used with problems involving more complex situations and requiring several days to address. The method descriptions included three key parts, a) a one-sentence description of the innovation method intended to capture its unique purpose, b) considerations for use of the method, and c) the range of task characteristics which best match with the innovation method. The innovation method description for Creative Thinking (FourSight) is shown in *Figure 9*.

Task Assessment Tool Instructions

The Task Assessment Tool Instructions made use of both the Innovation Method Descriptions and the Task Characteristics Worksheet to provide guidance to the user on how to think through matching up an innovation method with the task that they want to accomplish. The Task Assessment Tool Instructions are provided in *Figure 10*.

Task Characteristics Worksheet

Do you need creative thinking? Different tasks may require different types of creativity. Answer the questions below for your task to guide selection of an innovation method that fits best with your needs.

TYPE OF INNOVATION	Which of the following best describes the type of change that you want to bring about upon completion of the task?				
	Doing things right	Doing the right things	Doing things better	Doing things differently	Doing impossible things
NEED FOR NOVELTY	To what extent are you seeking something new, or something that might be a surprising departure from today (higher novelty)? Or are you seeking options that are more familiar, easy to implement, or considered safe (lower novelty)?				
	Low	Moderately-Low	Moderate	Moderately-High	High
LEVEL OF COMPLEXITY	To what extent is the task simple and distinct, or complex and made up of many different or interrelated parts? Lower complexity – few elements or layers to the situation, solution pathways might be already known or simple. Higher Complexity – many elements or layers within the situation, possibly interconnected. Solution pathways are unknown, undetermined, or highly complex.				
	Low	Moderately-Low	Moderate	Moderately-High	High
AMOUNT OF AMBIGUITY	To what extent is the task "messy," ill-defined, or lacking in structure? Lower ambiguity – the task is well-defined and structured in what needs to be accomplished Higher ambiguity – what needs to be accomplished is fuzzy, or the need is unclear. It feels like you need to work through the mess to get a clearer picture of what the end result needs to look like.				
	Low	Moderately-Low	Moderate	Moderately-High	High
OPENNESS OF THE TASK	To what extent does the task provide the room to generate a wide-range of possibilities? Lower openness – there is little to no room for generating new alternatives, the nature of the most appropriate options are already self-evident, or pre-conceived. Higher openness – you are free to move in almost any direction, nothing is pointing you in a particular direction yet.				
	Low	Moderately-Low	Moderate	Moderately-High	High

Assessment adapted from Isaksen, Dorval, and Treffinger (2011).

Figure 8. Task Characteristics Worksheet from Chapter 5 of the *Creative Thinking Field Book*.

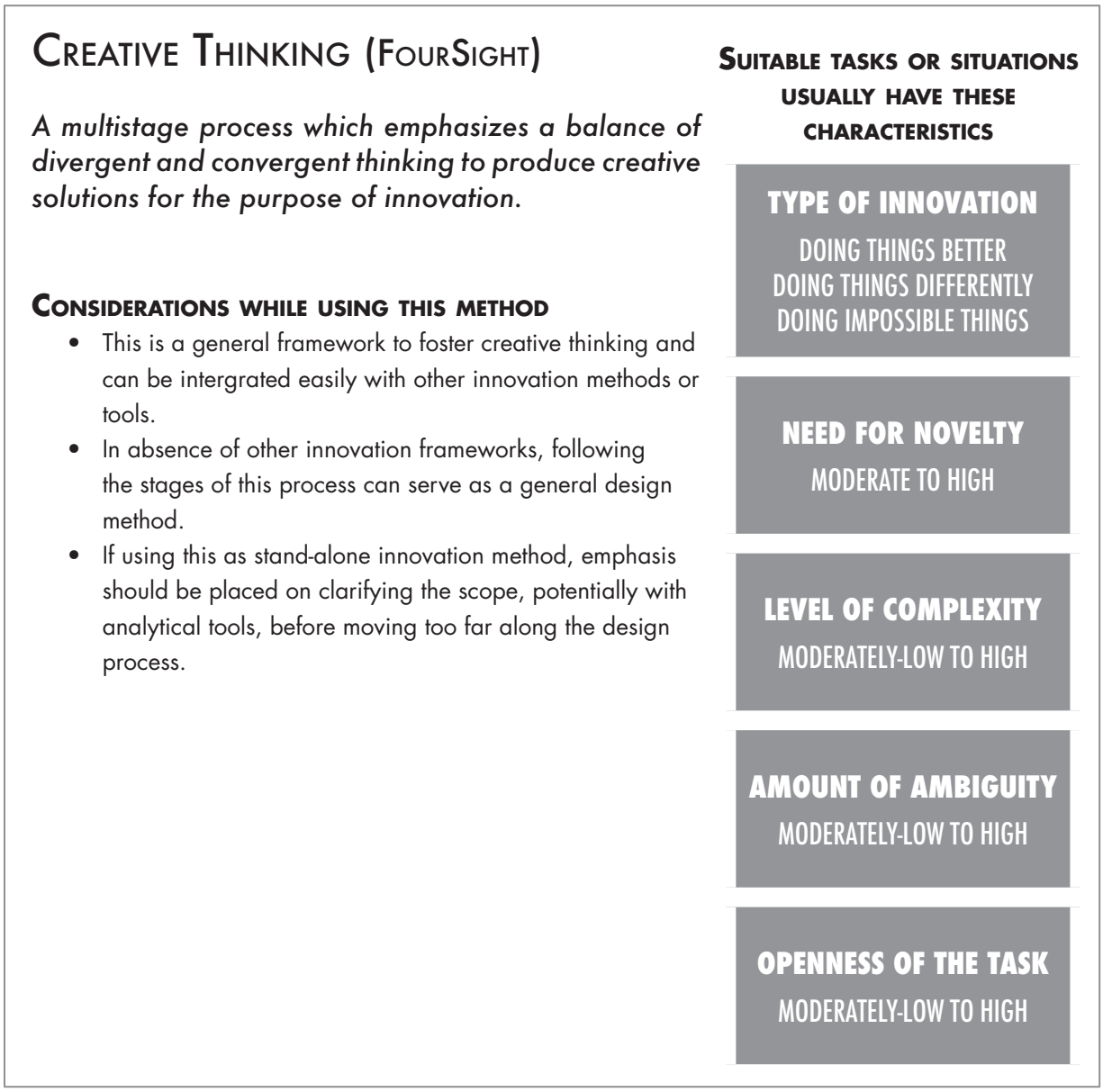

Figure 9. Innovation method description for Creative Thinking (FourSight).

5.1 Task Assessment Tool

The following steps provide some general guidance for selecting an innovation method. There is no right or wrong answer, the focus should be on what seems to fit the best. A number of methods might be appropriate for what you want to accomplish, and focus here it to help match method(s) with your task.

1. Write a few sentence description of the task you would like to complete. It should describe the future outcome you would like to accomplish. Note: Diverging on Goal/ Wish statements can help you frame that outcome.
2. Keeping this task description in mind, use the Task Characteristics Worksheet to assess what you currently know about it.
3. Based on your answers, rank the importance of the different characteristics. You can use the *Card Sort* tool to do this.

Rank	Task Characteristic
	Type of Innovation Desired
	Need for Novelty
	Level of Complexity
	Amount of Ambiguity
	Openness of Task

4. Read the innovation method descriptions; find the approaches which seem to match based on your desired outcome and your ratings from the Task Characteristics Worksheet. Also use the your rankings of the task characteristics (Step 3) to guide your selection. It's possible that your task will not perfectly match with a particular method against all the characteristics, but it should with at least a few, and particularly your most highly-ranked task characteristics.
5. Think about the potential benefits/challenges of using about the innovation method(s) that seem most appropriate, and then select the innovation method you believe has the best fit for your task. Some things to consider when choosing among methods.
    a. To what extent are you familiar with the innovation method, or do you have access to experts who know how to use the method?
    b. If multiple methods fit well with your task, and you are working with a group, which of the innovation methods is the group most familiar with?
    c. To what extent is a particular innovation method expected to be used for your particular type of task? (e.g. you are expected to provide an A3 document for your project)

Figure 10. Task Assessment Tool Instructions.

SECTION FIVE: KEY LEARNINGS

My intention for this project was to create a resource for people who are new to CPS that will help foster their practice and adoption of creative thinking skills in the way they work. Along the way I gained insights relevant to my own development as a creativity practitioner as well as for the content developed for the audience of the *Creative Thinking Field Book*. These insights are shared in the following process and content learning sections, respectively.

Process Learning

Adopting the Perspective of Consciously Unskilled

Along the process of developing the content for this project, I became more aware of the extent to which I am either consciously unskilled, consciously skilled, or unconsciously skilled in different aspects of CPS (Puccio et al., 2010). The target audience for this project are consciously unskilled individuals in CPS, having just recently completed the CPS training. The *Creative Thinking Field Book* is intended to help move them along the path towards becoming consciously skilled and avoid backsliding to becoming unconsciously unskilled. As I was developing material for the field book, I frequently caught myself getting into levels of nuance or aspects of CPS that would be less relevant to the targeted audience. I constantly had to remind myself to think back to the time when I first learned CPS to make sure my perspective was grounded. As a result, I had to rework two chapters to bring the content to what I felt was the appropriate level of detail and description for the audience.

One example of how this manifested was in the development of the content for Chapter 5. To create that chapter I had to map the steps of the different innovation

methods to the TSM for CPS (Puccio et al., 2010). The steps of these innovation frameworks did not map exactly to the TSM, with some steps not relating at all or others encompassing a number of different creative thinking skills. It was easy to get wrapped up in that analysis. If the focus of the project was on creating an academically rigorous connection of the TSM to these innovation methods, that would have been appropriate. However, the focus of Chapter 5 was to help novice CPS practitioners understand how to incorporate more creative thinking into the frameworks they practice. The validity of how I matched the CPS thinking skills with the steps of the frameworks is not relevant to the audience. Instead, my focus needed to be on matching the stages/steps of CPS and the divergent/convergent thinking tools that would be most useful to the user within a particular innovation framework step. Of course, the stages/steps of the CPS model should have a strong element of face validity for the user, but whether the CPS stage is technically more consistent with Ideate or Develop is less relevant. This perspective shifted my thinking as I developed the chapter and helped me to remove a level of nuance that would have likely lost the reader along the way. Considering that we cannot forget what we already know, there is no substitute for getting feedback from the target audience to verify if I accomplished that goal.

Adapting My Writing Style and Presentation of the Material

Having a background of mostly science and technical writing, my writing style has traditionally been more formal or academic in nature. While writing the narrative aspects of the field book, I found it difficult to adapt my writing style to a more casual tone. Additionally, I have less experience writing materials with a more instructional focus. These concerns represent another area where feedback can help me determine

how I need to adapt my writing and presentation of the different materials for the target audience.

Strengthening My Own Understanding of CPS

Revisiting the use of divergent and convergent thinking tools and attempting to frame their use for someone with limited CPS experience has evolved how I currently think and go about selecting tools. I have already noticed that my thinking process has changed during creativity coaching discussions and my ability to articulate the reasoning behind the selection of tools has improved. This is particularly true for the convergent thinking tools, which has been more difficult for me to explain to others in the past.

Similarly, developing the Task Assessment Tool for Chapter 5 has helped me to better articulate why certain innovation methods might be more appropriate for one situation than others. Previously, I did not have a defined framework for critically thinking and selecting amongst methods other than a general understanding of their purpose. Now, I more consciously think through the characteristics of the task in the assessment of which innovation methods to use.

Content Learning

The learning gained during the project with respect to content is most easily described in the context of the specific chapters developed in the *Creative Thinking Field Book*.

Practical Use of Divergent and Convergent Thinking Tools

To understand the effectiveness of Chapter 3 for addressing the targeted pain point, I shared the chapter with two people that had taken the internal CPS training

class last year and set up time to discuss their perspectives of the content. The discussion revealed what worked about the material for them as well as aspects that were unclear or missing. Some of that feedback has been captured in Table 3. Based on this limited feedback, the content of Chapter 3 appeared to accomplish the primary goal, with opportunities for further elaboration on the topics for clarity and usability. I found the concept of "beginner versus advanced tools" to be a helpful way of framing the tools. Also, the notion of a troubleshooting guide represents another practical perspective for giving someone the confidence to try something new.

Table 3.

Feedback on Chapter 3 from participants of the internal CPS course.

Topic	What worked	Areas to strengthen
General comments	• "You can tell it was developed to make it more practical to use"	• Indicators of when you can/should stop diverging. • There were not many tools for Identify Goal/Wish. That step was not covered in class and it would be nice to have more details on that step. • Build out how to go about defining evaluation criteria more explicitly.
Categorization of the divergent and convergent thinking tools	• Splitting the brainstorming and brainwriting tools into the different techniques made it easier to understand when to use them. • Dividing the divergent and convergent tools into the categories helped make it more clear how they should be used.	• More detail on how to use internally available virtual collaboration tools and apply use of CPS with those collaboration tools. • Can you show combinations of the two divergent tool categories and discuss which ones might work and not work well together? • Can you further break down the tools into beginner versus more advanced toolsets? Highlight ones to try first.
Tool	• Level of detail within the	• More detail on the definition

Descriptions	tool descriptions seemed appropriate and was helpful.	of small versus large groups in the tool descriptions. • Are there other variations of Stars that can be used? It's a frustrating tool to use.
Other content		• How to go about selecting resource group members. • How to know when to diverge or converge, when to stop diverging, and when you might need to go back to a previous step in the process. • Talk more about critical versus creative thinking
Example Scenarios	• "The examples were relevant, I could easily identify with them." • The rationale for tool selection made sense and was useful.	• How to apply the thinking here in more conversation settings? • Can there be a troubleshooting guide to address typical challenges?

Incorporating Creative Thinking into Other Processes

I shared the content of Chapters 4 and 5 with two managers who both participated in the CPS training during previous years and who also had team members participate in the training. Overall, they felt that the approach of incorporating creative thinking into existing ways of working would be the most impactful and practical way of fostering creativity versus teaching CPS as a standalone method. They wanted to see other processes treated similarly to demonstrate how they could be enhanced from a creative thinking perspective. This conclusion then begged the question of what extent people formally followed the steps of thinking as described by the Engineering Design Process or Scientific Inquiry. In practice, these innovation frameworks are not formal processes where everyone must follow the same exact steps. The principles of these frameworks are captured in our R&D project documentation, however the execution of

these principles is not prescriptive. Thus, the applicability of the content within these chapters will need to be investigated in more detail with a wider audience as the practice of these frameworks might vary considerably based on individual background, experience and type of work.

Based on this feedback, the mapping of the CPS steps/stages and tools generally appeared to be of value. It was not clear from the feedback if the level of detail in narrative was sufficient or not. While creating the content for the different innovation methods, it was more challenging to describe how to incorporate the tools within Scientific Inquiry versus the Engineering Design Process. Creative thinking tools have a more natural fit with the Engineering Design Process in practice and the concept of incorporating creativity tools into Scientific Inquiry is more foreign. For Scientific Inquiry, I felt that more detail was needed to make the practical connection to creative thinking. This would likely represent an area where individuals would need to practice integrating the creativity tools into the processes first to allow for stronger feedback. In my own reflection of Chapter 4 the application of the creative mindset and basic principles of creative thinking within these processes needs to be elaborated in more detail.

Choosing an Innovation Method

Prior to sharing the *Creative Thinking Field Book* with the two managers, I had an internal Lean expert with training in CPS review Chapter 5. Feedback from the Lean expert was used to improve the Innovation Method Descriptions before seeking feedback from the two managers. While discussing the Task Assessment Tool with the Lean expert, it became very apparent that something was missing from the overall

approach, which was placing the assessment in the context of how other parts of the R&D community scope and run innovation projects. The R&D department in which I reside has a great degree of flexibility in how we work. However, the R&D functions within the business units do not have that same flexibility due to the requirements of product development and commercialization. The Lean experts working with the business units prefer scoping an innovation project from a more analytical or critical mindset to clearly define the current state. Based on how CPS has been taught internally so far, it could be perceived as conflicting with that critical thinking discipline, as the tools taught for clarifying emphasize divergence versus critical thinking. Of course, critical thinking tools can be incorporated into the clarification stage of CPS; however, that calls into question the original premise put forward for the design of this chapter. Does there really need to be an "either/or" decision when thinking about LPS versus CPS or is it a "yes, and"? To this point, the Lean expert found the basic CPS tools helpful for augmenting the scoping process for innovation projects as well as their other Lean innovation processes. If blending approaches works and is preferred with the Lean experts, then it is less clear how to address the pain point of when to choose CPS as a method. Is that the real problem that needs to be solved? Reflecting back to Plsek's (1997) perspective that a blend of analytical and creative approaches might be the most effective approach, it seems that emphasizing a need to choose between analytic versus creative methods may not be the best approach.

Putting Creative Thinking into a Research & Development Context

The discussions related to Chapters 4 and 5 of the *Creative Thinking Field Book* helped to crystallize my thinking about how creative thinking should be approached

within my organization, and particularly how it should be taught. The flexibility of CPS as a framework for creative thinking and innovation makes it a powerful approach, but that same flexibility can also lead to confusion for the novice practitioner, particularly when they attempt to practice it within a complex organizational structure. CPS, as taught in in our internal training course, can be thought about at several different levels:

1) Practice of the basic principles of creative thinking such as divergent/convergent thinking and awareness of FourSight preferences (Puccio et al., 2012) can foster creativity in how people work individually as well as together.
2) The creative thinking skills represented by the stages of the FourSight model for creative thinking and the tools that work with them can be applied to augment creative thinking in the existing ways people work.
3) The FourSight model for CPS can be used as a general process for developing new solutions for problems facing R&D which are typically addressed in formal innovation projects.

The basic principles of creative thinking were understood by many who took the internal CPS training, with several principles resonating strongly with the participants. The other levels of thinking about CPS have caused the most challenges and confusion.

Our R&D functions have numerous innovation processes and problem solving methods for product and process development in addition to the ones described in Chapter 4. Based on the feedback so far on Chapters 4 and 5, use of the creative thinking skills and tools to strengthen the ways in which we use practice these processes and methods might be the most promising path for improving creative thinking in R&D. Reflecting back on how our internal CPS training was structured, the

training likely did not reinforce this perspective but rather reinforced the perception of CPS as a standalone innovation process. For example, the stages/steps of the FourSight model were taught in an end-to-end progression on both an individual and group level with a minimal emphasis on how the creative thinking skills and tools could be practiced individually (beyond assessing the situation) or integrated in other innovation activities, methods or processes. Considering feedback over the years of the training class, I would surmise that the perception of the FourSight model for CPS as an innovation process is relatively common. This is not surprising looking back on the work of Howard et al. (2008), where they viewed CPS as a generalized design process. Design processes, like the Engineering Design Process, represent the general structure of typical R&D projects. When presenting CPS to an R&D audience, a different approach might be needed to avoid confusion and provide greater clarity of what CPS is and what its relationship can be with their R&D practices. Putting all of this together, it suggests that the training format for our internal CPS program needs to be changed to refocus the framing and in-class practice of the CPS model so that the emphasis is more clearly placed on the creative thinking skills and tools and secondarily on its use a general innovation process.

SECTION SIX: CONCLUSION

I began the journey at Buffalo State with the goal of understanding how creative thinking can foster faster, more impactful innovation in the R&D function at my company. I learned early on in the graduate program that providing individuals in the R&D organization a foundational understanding of creative thinking and enabling them to practice it deliberately is critical to success, assuming the organizational environment supports it. Resources such as the *Creative Thinking Field Book* can provide a mechanism to support continued development and practice of deliberate creativity skills. What I have come to appreciate more thoroughly in working on this project is the extent to which there needs to be a more deliberate initial focus on how the new creative thinking skills are expected to be practiced within the organization. This intention should then guide the development of the content of the CPS training so that it naturally reinforces its adoption and practice within a specific R&D organization. A one-size-fits-all CPS training may not be the most successful approach, particularly in complex organizations with established innovation processes.

Next Steps

In the immediate future, Chapter 3 of the *Creative Thinking Field Book* will be developed further based on the current feedback to create a next stage prototype for broader feedback. At the first opportunity it will be piloted as a resource for an internal CPS training. The content of Chapter 4 will be further expanded to include additional innovation methods and processes used at our company. To support those who have already completed the internal CPS training, workshops will be developed to share the content of Chapters 3 and 4. Chapter 5 will be removed and reframed as a tool to

select among more formalized innovation processes such as Biomimicry (Baumeister, Tocke, Dwyer, Ritter, & Benyus, 2013), TRIZ (Fey & Rivin, 2005), and other methods that require significant time and resource investments.

Collaborating with our CPS training vendor, we will look into reframing how CPS is taught and place a greater emphasis in the class on reflecting on how the creativity skills and tools can be incorporated into a pre-existing type of work, both individually and in groups. While teaching CPS as an overarching creative process has value, the presentation of it will need to be changed to avoid confusion on its role in supporting innovation in our R&D organization.

Lastly, I will look further into designing additional resources for a general R&D audience on the practice of CPS concepts, skills, and tools in their day-to-day work. This might take the form of a short course at CPSI or a more elaborate version of the *Creative Thinking Field Guide* designed for an audience external to my organization.

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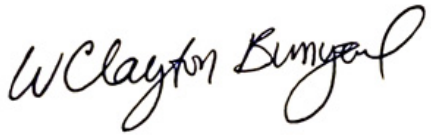

W. Clayton Bunyard

May 2, 2016

Date