

From Deep Space to Blue Sky:  
Using Science Fiction To Inspire Decision Makers And To  
Help Facilitate Innovation.

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By  
**Elysia Celeste Wells**  
Savannah, Georgia  
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## Table of Content

List of Figures.....	1
List of Tables.....	4
Abstract.....	7
Chapter 1: Introduction.....	8
Science fiction.....	8
Science Fiction as a Design Tool.....	8
Why Science Fiction?.....	9
What is Science Fiction?.....	12
Statements and Questions.....	15
Science Fiction Can Be a Tool.....	15
Problem Statement.....	15
Opportunity Statement.....	17
Thesis Statement and Questions.....	21
Thesis Statement.....	21
Research Questions.....	22
Chapter 2: Literature Review.....	25
Introduction.....	25
Pre-existing literature.....	25
Scenarios.....	27
What is Scenario Planning?.....	28
The Advantages of Scenarios.....	33
How Does Science Fiction Fit with Scenarios?.....	36
The History of the Genre.....	37
Understanding Science Fiction.....	37
<i>The Elephant in the Room: Science Fiction on Television</i> .....	39
Different Perspectives.....	42
Arthur C. Clarke.....	42

Innovation.....	44
Culture.....	46
Summery.....	48
Chapter 3: Methodology.....	49
Introduction.....	49
Elements Needed .....	49
Surveys and Interviews.....	50
Email and Phone Interviews.....	50
Surveys .....	52
Online Science Fiction: Amazon and Condor .....	54
Amazon.com Analysis.....	54
Condor .....	56
Science Fiction Short Stories.....	58
Astounding and Analog.....	58
How the Data Was Collected.....	64
Research Limitations.....	66
Chapter 4: Research Analysis.....	67
Introduction.....	67
Puzzle Pieces.....	67
Do Designers and Science Fiction Writers or Creators Think Similarly?.....	68
Interviews with Published Science Fiction Authors .....	72
Finding Authors Willing to be Interviewed.....	72
Authors' Backgrounds.....	72
What Influences Their Stories or Novels? .....	76
Answers to Survey Questions.....	81
Responses to Questions:.....	82
Some of the Respondents Looked at Current Technology:.....	83
Conclusion.....	89
Cultural Survey.....	89

Awareness of Science Fiction.....	91
Online Analysis.....	94
Amazon.com.....	94
Books, Films or Something Else? .....	100
The Number of Results.....	103
Condor.....	104
What Types of Searches Were Done? .....	104
Japanese and Chinese Data Set.....	112
Published Science Fiction Stories.....	117
<i>Astounding</i> Data Categories .....	117
Science fiction Idea to Actualizations .....	121
Discussion .....	128
The Data Sets Did Not Match .....	128
The Data Tapers Off After 10 Years.....	129
Explanation of the Patterns .....	129
Summary.....	131
Chapter 5 Design and Artifact.....	132
Framework .....	132
Introduction .....	132
Concept Exploration.....	133
Lessons Not Learned from Science Fiction.....	137
Activity Cards.....	159
Potential Applications for Factors .....	159
Activity Introduction.....	161
Instructions .....	162
Global Foreshadows (Mix Card).....	166
Scenarios "Build a Short Scenario" (Activity Card).....	170
Testing the Cards.....	172
The First Group.....	172

The Second Group .....	175
Summary .....	176
Conclusion .....	176
Chapter 6: Conclusion and Future Research .....	177
Conclusion .....	177
Expanding on the Research .....	178
Expansion of the Cross Cultural Research .....	179
Glossary .....	181
Bibliography .....	183
Appendix A .....	189
Surveys .....	189
Protocol For Designers and Design Related Fields .....	189
Protocol For The Mult-Cultural Survey .....	200
Interviews .....	203
Sample First Email .....	203
Informed consent .....	204
Protocol For Published Science Fiction Authors .....	205
Appendix B .....	208
Artifact Instruction Sheet .....	208
Instructions .....	208
Supplementary material: Factors .....	209
Appendix C .....	210
Foreshadows .....	210
How to read the reference code .....	221
Reference .....	221
Appendix D .....	227
The Finalized Cards .....	227
About the Author .....	241

## LIST OF FIGURES

Figure 1: Tablet Computers.....	11
Figure 2: Data Pads From Science Fiction .....	11
Figure 3: Kolb's "Learning Loop" .....	33
Figure 4: The Trial-and-error cycle.....	46
Figure 5: Authors Index.....	51
Figure 6: Author Michael Bishop's Home Page .....	51
Figure 7: A Stars Pattern Versus a Galaxy Pattern .....	56
Figure 8: An Example of a Thin Galaxy Found Using the Web Collector .....	57
Figure 9: Astounding and Analog Tables of Content.....	59
Figure 10: Percent of <i>Analog</i> Issues That Came From Each Month.....	62
Figure 11: Percent of <i>Astounding</i> Issues That Came From Each Month.....	62
Figure 12: The Raw Data From Astounding and Analog.....	64
Figure 13: The "References Codes".....	65
Figure 14: Fields of the People Who Took Part in the Surveys.....	70
Figure 15: Designers and Related Fields Survey.....	71
Figure 16: Science Fiction Creators Survey .....	71
Figure 17: Fields and Education Level of Interviewees .....	73
Figure 18: Home Country of the Respondents .....	90

Figure 19: Countries the Survey Participants Comes From.....	91
Figure 20: Results from the International Survey.....	92
Figure 21: Countries of Origin for Science fiction Products .....	95
Figure 22: CD Cover for a Nigerian Band Entitled: "Science Fiction" .....	97
Figure 23: Mult-national CDs Sold on Amazon.fr.....	97
Figure 24: Origin Countries of Products .....	99
Figure 25: Predominate Languages.....	99
Figure 26: Types of Products .....	101
Figure 27: A Network.....	104
Figure 28:An Example of a Thin Network and a Thick Network.....	107
Figure 29: Swahili Translations for Science Fiction, Future and Technology or "Sayansi ya Kubuniwa," "baadaye" and "teknolojia" .....	108
Figure 30: Arabic Translations for Science Fiction and Technology.....	109
Figure 31: Arabic Translations for Science Fiction and Future .....	109
Figure 32: Japanese Translations for Science Fiction and Technology .....	113
Figure 33: Chinese Translations for Science Fiction and Future.....	114
Figure 34: Russian Translations for Science Fiction and Future .....	115
Figure 35: French translations for Science Fiction and Technology.....	115
Figure 36: Croatian Translations for Science Fiction and Future.....	116

Figure 37: Hindi Translations for Science Fiction and Technology .....	116
Figure 38: <i>Astounding</i> and <i>Analog</i> Covers Ranging from the 1940s to 2010.....	118
Figure 39: <i>Analog</i> Data Subdivided into Seven Categories.....	120
Figure 40: <i>Astounding</i> Data Subdivided into Seven Categories .....	120
Figure 41: Science Fiction Technology Was Compared to a News Article .....	122
Figure 42: <i>Analog</i> Foreshadowed to Actual Technology or Cultural Change .....	123
Figure 43: <i>Astounding</i> Foreshadowed to Actual Technology or Cultural Change .....	125
Figure 44: <i>Analog</i> , <i>Astounding</i> and Combined .....	127
Figure 45: The Trial-And-Error Cycle.....	134
Figure 46: Kolb's Learning Loop.....	134
Figure 47: The Trial-and-error cycle with in Kolb's "learning loop" .....	134
Figure 48: Adapting the Cycle for Science Fiction.....	137
Figure 49: Matching the Cards to the Cycle.....	160
Figure 50: Layout.....	162
Figure 51: Testing the Cards .....	173
Figure 52: The Second Group Testing the Cards.....	175

## LIST OF TABLES

Table 1: Looking at Current Technology.....	83
Table 2: Science Fiction Creators Looking at the Human Element.....	84
Table 3: Focused on the End User.....	85
Table 4: Process for Both Groups.....	87
Table 5: Can You Learn From Science Fiction?.....	88
Table 6: Number of Results for Translated "Science Fiction".....	103
Table 7: Chart of Translations.....	106
Table 8: Country Codes That Appear in the Arabic Language Data Set.....	111
Table 9: Country Codes That Appear in the Croatian Language Data Set.....	112
Table 10: Factors Developed From the Foreshadows.....	139
Table 11: Clarke's Three Laws.....	140
Table 12: Attribute List.....	141
Table 13: Is There A Need For It?.....	143
Table 14: Is There Some Other Technology.....	145
Table 15: Is Society Changing.....	146
Table 16: Does It Require a Change of Life Style.....	147
Table 17: Who Would Use It.....	148

Table 18: Is It Practical .....	149
Table 19: Is the Technology Affordable .....	150
Table 20: Will It Likely Be Affordable?.....	151
Table 21: Does The technology Have Multiple Uses.....	152
Table 22: Is The Technology Rapidly Improving.....	153
Table 23: Does It Require A Dramatic Shift?.....	154
Table 24: Is it perceived as an improvement.....	155
Table 25: Could Future Uses Be Added .....	156
Table 26: Is It More Complex?.....	157
Table 27: Is It More Harmful .....	158
Table 28: Trend Went In The Opposite Direction .....	159
Table 30: Basic Instructions .....	163
Table 31: Factors.....	163
Table 32: Foreshadow "Has Happened" .....	164
Table 33: Foreshadow "Might Happen" .....	164
Table 34: Foreshadow "Might Happen" Mix Card .....	165
Table 35: Foreshadow "Has Happened" Mix Card .....	165
Table 36: Global Foreshadows .....	166
Table 37: Compare .....	167

Table 38: Re-Design Factors.....	168
Table 39: Re-Design .....	168
Table 40: Factors Mix Cards.....	169
Table 41: Scenarios "Build a Long Scenario" .....	169
Table 42: Scenarios "Build a Short Scenario" .....	170
Table 43: Sci-Fi Scenario "Build A Scenario" .....	171

## **ABSTRACT**

*From Deep Space to Blue Sky:  
Using Science Fiction To Inspire Decision Makers And To Help Facilitate Innovation.*

By Elysia Celeste Wells

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**Abstract:** Science fiction was examined to create a tool to help decision makers better prepare for the future. Qualitative and quantitative methods were used together to get a wider picture of science fiction. The history of science fiction was explored to provide a context for the study. Science fiction creators' methodologies were examined and compared to those of designers to find similarities in thinking processes and as a possible explanation for why science fiction has been successful at foreseeing new technologies. Science fiction literature was examined for patterns and themes to determine if there were consistent patterns in which science fiction technology or “foreshadows” became actualized technology present in today's world. Surveys and network analysis helped determine if the end product could be marketed to a worldwide audience. The end product was a set of cards inspired by pre-existing design tools that enable the user to utilize science fiction to help prepare for the future.

**Keywords:** science fiction, foreshadow, scenario planning,

## CHAPTER 1: INTRODUCTION

### Science fiction

#### Science Fiction as a Design Tool

'What if': This question plays a critical role in research, planning, strategy, and storytelling. This two-word question drives innovation. This question leads exploration and it helps the questioner to navigate around obstacles. Science fiction asks 'what if'. It is literature that centers on plausibility. It creates a narrative around this question, and features stories that look at possible outcomes and side effects. It frames plausible changes and potential futures in a way that are understandable. This gives science fiction a unique ability to help designers, scientists and many more to look at challenges and opportunities in a vivid and tangible way.

The reason science fiction has this potential is because the genre has featured countless ideas that later resemble technology or consumer goods that become popular. This ability of science fiction to foreshadow possible futures creates an opportunity for design managers, investors or entrepreneurs to use the genre as a way of avoiding risk or developing business strategy. These insights could be gained from a close examination of science fiction works and the technology that sits within the stories. Science fiction also has a vast number of stories covering a large subject area; this vast array of material

gives science fiction an edge over traditional scenario planning in which only a limited amount of scenarios are created and which are typically created in private.<sup>1</sup>

Opportunities exist to utilize this literature of possibilities because science fiction requires a strict reliance on logical progression once a technology or scientific breakthrough has been postulated. Science fiction is linked with scientific knowledge and therefore features ideas that are often plausible (Rabkin 1983, 9).

### **Why Science Fiction?**

Thousands, if not millions, of science fiction stories have been written, filmed, recorded or drawn. As the term “science fiction” implies, many creations that fall within the genre look at future possibilities based on questions of ‘what if?’ The genre has long been characterized by its ability to foreshadow future societies and has featured futuristic technology. It is natural that a genre that talks about the future would occasionally have elements that come to pass, and it is not surprising that some of the technology described in past science fiction stories has closely resembled items that are current consumer

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<sup>1</sup> This statement is based on the authors review of the works of Kees van der Heijden, author of *The Art of Strategic Conversation*, (van der Heijden 1996) Perter Schwartz, the author of *The Art of the Long View*(Schwartz 1991) and the book *The Shell Global Scenarios to 2025: The Future Business Environment: Trends, Trade-offs and Choices* (Royal Dutch Petroleum 2005).

goods. Arthur C. Clarke explained that science fiction is not only necessary to train one's imagination to look into the future but is also needed to successfully imagine future possibilities:

A critical-reading science fiction is essential training for anyone wishing to look more than ten years ahead. The facts of the future can hardly be imagined ab initio by those who are unfamiliar with the fantasies of the past. (Clarke 1999, 6)

However, turning science fiction technology into consumer goods does not always happen by accident; there is indeed some amount of causation. Many designers, engineers and inventors of consumer goods were inspired by something they read or were exposed to that appeared in a science fiction television show or literature. For example, the 1960s science fiction show *Star Trek* had an object that resembled a cellular phone (Startrek.com 2012).<sup>2</sup> This object was cited as inspiration by individuals who worked on early models of cellular phones (Jones 2005). With that said, to suggest that all of their ideas were stolen from a science fiction story discredits the inventiveness, intuitiveness and creativity of designers, engineers and inventors. It is also implausible that these creative bodies have all read science fiction stories that featured technology they would make, invent or make available to the mass market. Just from the sheer

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<sup>2</sup> *Star Trek* is a science fiction franchise that started as a television show that aired weekly in the United States (Startrek.com 2012).

amount of science fiction stories alone, it can safely be assumed that many of the stories which include technology or cultural shifts were left largely unnoticed from the time they were written to the time items, or events they had written about, resembled the real world. The scientists often mention what or who inspired them, but their "creative inspiration" is often not the first time a science fiction story mentioned something similar to what is developed (Jones 2005). For instance, many science fiction short stories written before the 1960s had objects whose description closely matched modern smart phones, and these stories are not cited by the creators of the early cellular phones (Leinster 1943, 49).<sup>3</sup> This further shows that the science fiction and technology relationship is highly unlikely to always be a case of cause and effect.



Figure 1: Tablet Computers (Amazon 2012) (Amazon.com 2012), (Bell 2012).<sup>4</sup>



Figure 2: Data Pads From Science Fiction (Behr and Beimler 1998), (Kubrick and Clarke 1968)

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<sup>3</sup> This example is from a short story that was found in *Astounding Science Fiction*. In "Adapter," written by Murray Leinster and published in the 1940s, the character carries a small phone with him and specifically he turned it off when he did not want to be bothered (Leinster 1946, 50).

<sup>4</sup> Images of new products were found and then compared to images taken from science fiction television programs or movies. This was done to demonstrate their similarity.

Once causation is ruled out, the question then centers around why some pieces of science fiction stories, such as technological elements, are accurate to what actually has happened. The goal then becomes to decode how the creators of science fiction stories have come to depict things, including cultural shifts, technology, events, and so forth, that later come to fruition.

### **What is Science Fiction?**

Before the mechanisms around science fiction's ability to foreshadow can be discussed, a working definition of science fiction must be outlined. The genre itself is greatly varied, and what science fiction is exactly depends on who you ask. Also, what is or is not science fiction has not always been agreed upon. Typically included within the definition of the genre is its focus around "What If?" *The Cambridge Companion to Science Fiction* simply begins its explanation of the genre by saying that "[t]he discourse of [science fiction] is about our relationship to the world and the Universe" (James and Mendlesohn 2003, 9). Many of the science fiction authors interviewed for this thesis also described it similarly. Gareth Powell, an author interviewed for this thesis, described it as "a tool for exploring what it will mean to be human in an increasingly strange and baffling future[...]" (Powell pers. comm.). Author Dr. Michael S. Brotherton, who was also

interviewed for his thesis, defined science fiction as a story that conforms to the known rules of science. For "hard science fiction," these would be the known rules of biological science, physics, medicine, and scientific fields that rely heavily on quantitative data; for "soft science fiction," the stories rely on those fields that use qualitative data such as anthropology, sociology and psychology (Brotherton pers. comm). All of the authors framed science fiction in the realm of broad possibilities.

However, this broad, encompassing description is not practical; this thesis focuses on science fiction of the future. While the science fiction written before the twentieth century tended to be set in the author's present day, such as Mary Shelly's *Frankenstein* and most of H. G. Wells' works, the focus starting at the beginning of the twentieth century changed to the future (Kelly et al. 2009, 15). In 1948, *Astounding* editor John W. Campbell "called for [science fiction] to be 'an effort to predict the future on the basis of known facts'" (Johnson-Smith 2005, 2). This is reasonable to use because the science fiction that has been examined for this thesis has been set in the future, near and far, and primarily comes from *Analog Science Fiction and Fact*. Smith (2005), the author of the book *American Science Fiction TV: Star Trek, Stargate, and Beyond*, describes it similarly:

Science fiction is 'often' but not 'always' concerned with technological advances, and this approach is essentially rooted in the technological preoccupations and prejudices of the twentieth and early twenty-first centuries. (Johnson-Smith 2005)

The focus of this thesis is on future technology and culture shifts featured in science fiction, and for the purposes of this thesis, science fiction must be defined in terms of when it is set. Building from Dr. Brotherton's and Jan Smith's descriptions, for this thesis, works of science fiction are built on some rules or principles of known science, and the stories are set in the author's future.

## Statements and Questions

### **Science Fiction Can Be a Tool**

The science fiction genre is centered on plausibility. This gives this literary genre a unique ability to help designers, scientists and many more to look at challenges and opportunities, and these groups have used science fiction as a tool; however, science fiction has not been used as a tool for Design Management, investors, or for entrepreneurs, at least not in a significant way.

Because science fiction has featured many ideas that later resemble technology or consumer goods that become popular, this creates an opportunity for design managers, investors or entrepreneurs to use the genre as a way of avoiding risk or developing business strategy based on insights gained from a close examination of science fiction works and the technology that sits within the stories.

### **Problem Statement**

Predicting the future has always been a goal of the human psyche. The survival of pre-historic humans depended upon their ability to make predictions as to where the herd would be next year or where and when ripe fruits or grains could be found. As they settled, they needed to know which crops would grow effectively within given climate

conditions, as well as when to expect to plant them for an optimal future harvest. Different future-predicting methods have been used throughout history, such as phases of the moon or observations of wild animal behaviors. Some were based on trial and error, some were based on observations. An example of this is the ancient Chinese; they used bones to try to see people's fates, whereas Europeans used astrology to try to foresee the future. However, most of these methods were not formulaic, relying mainly on supernatural theories as opposed to logical systems as we know them.

Even though our society has radically changed in the last few hundred years, there is still a fundamental desire and a need to be prepared for the future. In the twentieth century, different tools such as projections, trend forecasts, and other analytical tools were developed using various methods and attempting to include at least some form of logic (Normann 2001, 211-212). The problem is that these existing tools require extensive investments of time and resources and only have limited success rates. These tools also tend to be very narrow in scope rather than having a wide range of topics that they can cover (Normann 2001, 211-212, Ralston and Wilson 2006, 36-37). Based on the analysis of pre-existing technologies and illogical methods of future predicting, there is still ample need to create a new, logical predictive method that is inexpensive and efficient.

## Opportunity Statement

Billions of dollars each year are spent on technological development, and it is often unclear which technology will become an innovation and which one will fail (Economist.com 2012). Both forecasting and scenario planning address this problem by showing future possibilities and sorting out the ones that are the most likely.

Scenario planning develops stories of 'what if's' for five to 30 years from when they are created. Since they are targeted for their clients, they are biased and, because of this, are potentially limited in scope (Garvin and Levesque 2006, 9). For example, a scenario being created for a software company might take into account factors that are currently affecting the company, such as amount of users or cost of development.<sup>5</sup> The addition of science fiction can greatly enhance the reach of scenarios. Science fiction has a wide scope. The stories look at numerous subjects and a wide array of time periods instead of specific factors. Science fiction addresses human issues that are a result of new technology, cultural shifts and the problems of development, paired with the public's natural apprehension to change. Currently, when developing new technology, social and

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<sup>5</sup> While it would be possible for scenario planners to create a vast number of scenarios, it would not be practical to do so. Van der Heijden writes "at least two scenarios are needed to reflect uncertainty. more than four has proven to be counterproductive and organizationally impractical"(van der Heijden 1996). He self limits the number of scenarios to keep workshops manageable and understandable.

ethical concerns are often difficult or costly to address. It is not always feasible to look at how this technology will affect society or how society will use this new product. Some of the impact of a change or technology would be addressed in the created scenarios, but it would be greatly limited because scenario planners typically are limited to only three or four scenarios. Using science fiction as a technological model circumvents this because the writers consider the problems as part of the story line.

### *Hypothesis*

It would be short-sighted to imply that science fiction reliably predicts our technological future, that it is the driving force behind technological innovation or that some inventions only took place because they first appeared in science fiction. It is more reasonable and accurate to state that science fiction often is a precursor to consumer goods, and because science fiction is so vast, it has had the opportunity to explore many futures.

This thesis will make a case that science fiction writers and designers are not dissimilar in how they look at future technology. Designers and writers share the same 'discovery' process. Science fiction illustrates visions of the future from the writer's perspective. Some of these visions become realities, while others fail to make it past the

ideation phase. This process also happens in design; some ideas never make it off paper. The objects or ideas that become a part of our world are those that are centered on future users and address the needs and requirements of those users. This is very similar to the way that designers work. When they are designing products or services, they also address needs and requirements of future users.

### *Similar Thinking Processes*

Science fiction visionaries and designers have the same or similar thinking processes, but the designer has more limitations than science fiction writers, who do not have to figure out every detail or worry about marketability, feasibility, reliability, or cost but can conjecture about the possibilities. For example, a science fiction writer can say: "You punch 'Sally Hancock's 'phone and the screen blinks and sputters and you're hooked up with the logic in her house and if somebody answers you got a vision-phone connection" (Leinster 1946, 139). The writer does not have to explain the details of how the "vision-phone" connection works, just what it does, nor does the author have to explain what a "logic" is or how it works; again, he just talks about what it is capable of doing. The developers of Skype, on the other hand, had to develop the programming for the

computer, and they could only do this after the internet had become common and after computers were sophisticated enough to handle their program.

Writers, like designers, often come from a background based in technology, science, a creative field or have family members who are more technologically, scientifically or creatively inclined. They also have sufficient imagination to overcome the limitations of the current world without the restriction of dealing with current technology. As Clarke wrote, "The greatest problem it sees is finding a single person who combines sound scientific knowledge—or at least the feel for science—with a really flexible imagination"(Clarke 1999, 6).

### *What Is Different?*

What separates designers and writers is that writers do not have the same limitations as designers. Designers have to make their ideas feasible, affordable and appealing, where writers are free to imagine and "create" things that may take anywhere from 20 to 200 years to come to fruition. Science fiction creators are not restrained by current technological limitations. A designer may have to abandon a project because we simply do not currently have the means, either technological or monetary, to create their vision, whereas writers can spend time to further consider where an innovation could

possibly lead. In addition to this, writers, like designers, consider a wide array of possibilities and future potentials, but unlike designers writers will spend the majority of their time thinking and considering future possibilities. A designer might spend a few weeks considering what might be, while a writer may spend the majority of their working life developing ideas about potential futures. It is this lack of limitation that has enabled science fiction writers to consistently foreshadow the future where scientists and designers have fallen short (Clarke 1999, 6). Over the last half century, tens of thousands of stories have explored possibilities of the future. There are few things that can happen that have not been described somewhere, in books or magazines.

## Thesis Statement and Questions

### **Thesis Statement**

Science fiction is an untapped resource for business and design decision makers. Science fiction can be used because it consists of scenarios and forecasts of future societies, either far into the future or within the near future, and explores potential technology. Science fiction can be used to illuminate the importance of blue-sky thinking to those who are funding, working with or managing design. It can be used as a tool to

identify plausible technological and potential paths society may take, which can shed light on either opportunities or potential risks.

My objective is to use science fiction as a tool for decision makers, designers, businesses and anyone else with a stake in future technology. The goal of this thesis is to develop a method through which business people, entrepreneurs and managers can utilize works of science fiction to identify plausible technological futures and help them to make strategic decisions.

## **Research Questions**

- Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology?

This is key to the main hypothesis: whether science fiction writers and designers often share a similar way of looking at humanity's problems.

- Are there factors or patterns within science fiction that can be used as a foreshadowing tool to indicate emerging or potential technology which might become a reality?

By examining science fiction stories and comparing them to existing, or current, technology, patterns will or will not emerge. If patterns are found, they can be used to

forecast the future. These could be indicators about how current science fiction writing portrays future events that have relevance in our lives.

- Is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context?

This question is a bi-products of the author's observation. During the course of doing research the author encountered few references to global science fiction. The author observed that most of the science fiction authors, H. G. Wells, Ray Bradbury, Isaac Asimov and so forth that were focused on came from the English speaking Western world and science fiction was addressed as a genre of the western world (Rabkin 1983). *The Cambridge Companion to Science Fiction* almost exclusively focuses on American science fiction (James and Mendlesohn 2003). Jules Verne is one of the few non-English speaking authors to be named in many of the books reviewed for this research (James and Mendlesohn 2003, Kelly et al. 2009, 10, Clarke 1999). Does this mean that science fiction is a genre that is found primarily in the English speaking West?<sup>6</sup> If science fiction is culturally specific, it would be expected that the technology featured would also be culturally specific. This raises other questions such as: Can one nation's science fiction be used to predict global technological trends? Does science fiction reach a worldwide

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<sup>6</sup> For the purpose of this thesis the English speaking West is defined as the United States, Canada, Great Britain, Ireland, Australia and New Zealand.

audience? Is science fiction being written by people in different cultures? Are a diverse group of people writing and creating it? Answering these questions will determine if any tool created from science fiction can have a global audience or if it must be limited to the English speaking West.

- How can the vision of science fiction and science fiction creators be used to guide strategy in the business and design worlds?

This paper will explore ways that science fiction could be used to gain insight and guide strategy, including those who support design financially and the designers themselves. This will be done by looking at how current scenarios and forecasting tools are used, followed by considering potential methods of infusing the design world with the knowledge science fiction possesses.

## CHAPTER 2: LITERATURE REVIEW

### Introduction

Science fiction is an untapped resource for business and design decision makers, and it can be used as a tool to identify plausible technological paths society may take, which can shed light on either opportunities or potential risks.

The goal of this thesis is to explore a genre of fiction to create something useful for strategy that could be used by organizations based on an exploration of traditional and current science fiction literature. The study will discuss the narrative from fiction, business, and design to explore and elucidate the thesis questions. Using pre-existing science fiction as a tool for decision makers is not a customary practice, at least not in a wide capacity, so knowledge has to be drawn from other sources.

#### **Pre-existing literature**

This review of the literature will serve to answer the questions stated in the first chapter:

- Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology?

- Are there factors or patterns within science fiction that can be used as a foreshadowing tool to indicate whether emerging or potential technology might become a reality?
- Is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context?
- How can the vision of science fiction and science fiction creators be used to guide strategy in the business and design worlds?

The first two questions will be explored primarily by examining the domains of scenario planning and the history of science fiction. Existing forums of scenario planning must be explored to help answer the last question: How can the vision of science fiction and science fiction creators be applied to the decision makers in the business world? Because the base argument being presented relies heavily on the knowledge of scenarios and strategic planning, it becomes the building block to understand why and how science fiction can be inserted into business practice, specifically business preparedness.

Like the study of scenarios, the history of science fiction also plays a dual role. This will be crucial to answering the second question: Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating

new technology? The history of science fiction also must be explored because the parallel development between science fiction and science that was discussed in the first chapter is theorized to be what enables science fiction to become a foreshadowing tool.

## Scenarios

The goal of this thesis is to design a method to utilize science fiction. The main argument as to why it is possible to use science fiction as a tool is that science fiction stories are pre-existing scenarios, meaning science fiction stories use factors from today to predict future outcomes by using a narrative (Ralston and Wilson 2006, 127). Science fiction has two main advantages; one is the vastness of the genre. Science fiction can supplement and add to current scenario planning. Using science fiction helps broaden the range of scenarios examined and enables designers to discover optimal solutions. The second advantage is that science fiction itself is based off of potential possibilities.<sup>7</sup> It is also somewhat natural that a literary genre be used to supplement this tool because the term itself, scenarios, was taken from the world of film and theater (Ralston and Wilson 2006, 15).

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<sup>7</sup> The 'what if' factor will be explain more in depth later in this chapter.

Instead of a team of designers or forecasters creating a few scenarios, which is the case in current scenario planning techniques, by examining science fiction foreshadows business or organizations can have hundreds to examine. Collection of science fiction data can be used on more the one occasion for more than one subject.

To understand how science fiction can function as part of scenario planning, one must first understand how traditional scenario-based tools are used in the business world and one must have an understanding of science fiction. The exploration of science fiction as pre-existing scenarios will be used to help answer the question, "How can the vision of science fiction and science fiction creators be applied to the decision makers in the business and design worlds?" It also should be noted that because the ultimate goal of this thesis is to create and design a tool, this question should be kept in mind when looking at all the reviewed literature.

### **What is Scenario Planning?**

Colloquially, a scenario refers to a chain of unfolding events that have yet to happen. For this thesis, and in the literature that has been reviewed or this thesis, scenario refers to "stories of possible futures" (Ralston and Wilson 2006, 15). It is primarily used to make flexible, long term plans and as cognitive exercises for planners and

executives. Part of the goal of scenario planning is to discover weaknesses that have been previously unnoticed. The approach is not wholly dependent on numbers; it calls for the users to create or absorb a narrative of future possibilities based on multiple data sets which can include trends and observations (Ralston and Wilson 2006, 9):

Because it is not tied to computer algorithms (which are, necessarily, reflections of the past), this approach is more likely to engender the sort of lateral thinking that is needed to anticipate future surprises and major 'inflections points' (Ralston and Wilson 2006, 9).

This lateral thinking is what sets scenarios apart from other methods. In the *Scenario Planning Handbook*, Ian Wilson and Bill Ralston contrast scenario planning to trend analysis. They argue that scenarios seek to take a holistic point of view, stressing that scenarios are unlike trend analysis, which follows an individual trend and is therefore limited in scope. It also limits its ability to see potential major shifts ahead of time (Ralston and Wilson 2006, 15).

The process of creating a scenario starts with information gathering. This information can come from different sources, including other business tools such as trend analysis. From this abstract data, a story of "what if" is created. These stories tend to remain relatively short, and a collection of stories are created.

## *Scenario Planning and Science Fiction*

Like science fiction literature, the key question in scenario planning is: What do we do if ... ? However, the difference between the two is that in scenario planning there is an added: What does this mean for what we do now? (van der Heijden 1997, 22). The art of creating scenarios relies on creating a range of projected paths. This is currently accomplished by looking at the past and the present: "Good scenarios are thinking and perception devices. They are not about forecasting highs and lows but about making a new reframed perspective visible" (van der Heijden 1996, 101). Van der Heijden explains that a scenario cannot be approached in the same way a weather forecast can. The point of a good scenario is not to give a range of probabilities but to reframe perspectives and explore questions.

Van der Hijden explains that prediction is not perfect because there is always uncertainty. The word prediction implies precisions, and van der Heijden stresses there must be a level of "you can't win them all" thinking when looking and trying to "predict" the future (van der Heijden 1996, 101). It is pointed out that, apart from nature, inertia is the most important source of predictability. He also comments that "[t]he more precisely we try to pin things down the more difficult prediction becomes"(van der Heijden 1996, 101). This means that while the overall direction may be discerned, the individual outcomes are not. Over time, these effects of "inertia" wear off. In *Scenarios: The Art of*

*the Strategic Conversation*, van der Heijden stresses that even with effects of inertia, variables make it so the future is not completely predictable; a person can never get it completely correct because other unexpected things interfere and change the course of whatever one is looking at (van der Heijden 1996, 107).

### *Predictability*

It is important to note that Professor van der Heijden uses the word "predictability" cautiously. He explains that prediction is not perfect because there is always uncertainty. There must be a level of "you can't win them all" thinking when looking and trying to "predict" the future. He stresses that the underlying elements, or "casual structure," have to be examined (van der Heijden 1996, 101-111). Understanding and dissecting the driving elements, or these casual structures, makes it possible to develop a process theory. The hidden drivers behind a technology or social change are not always evident. Because "casual structures" are often hard to discover, it creates a space for uncertainty and makes it impossible to be precise. Discovering the hidden drivers explains why things happen, how they happen, and it enables an understanding of the forces at play on possible outcomes.

Kolb's "learning loop" is shown below in Figure 3. It helps visualize this process of discovering hidden drivers. It concentrates on testing theories, creating experiences, observation and reflection, and forming abstract concepts and theories which leads to continuous development of ideas. His "learning loop" helps better the aim of the prediction and leads to improvement. It assists in the creation of a range of possibilities rather than one right answer (van der Heijden 1996, 38). It suggests that for things to go right, one must "[p]erceive weak signals, remember lessons from the past, and adapt quickly if these have not prepared us for what actually happens"(van der Heijden 1996, 95). Kolb's learning loop fully embraces and enables the "what if" factor found both in science fiction and scenario planning.

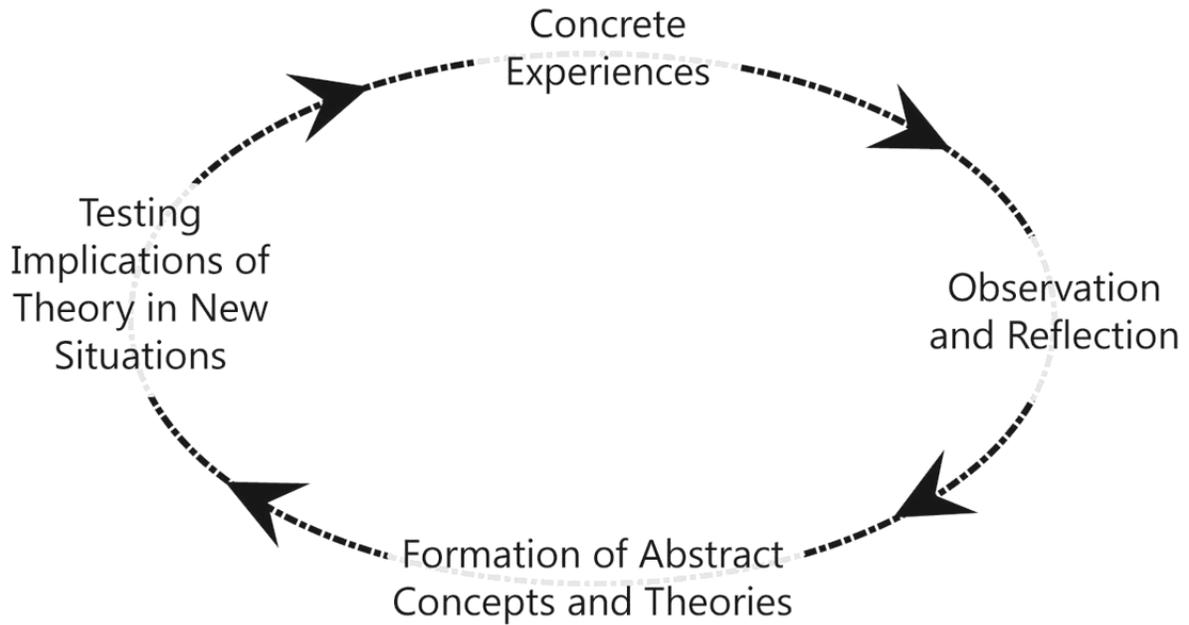


Figure 3: Kolb's "Learning Loop" (van der Heijden 1996, 38).

### The Advantages of Scenarios

Scenarios help prepare for a future that cannot yet be seen. They create a creative and dynamic method to explore possibilities, enabling a company to be able to move faster when change does come. As mentioned before, scenario planning goes above and beyond traditional trend forecasts and normal business projections because of its dynamic and flexible nature. Van der Heijden claims this fluid, dynamic method goes beyond the charts and numbers of traditional business analysis. This can give you an advantage over those ill-prepared for the change. Schwartz explained, "If you wanted to see the future you could not go to conventional sources of information. Everyone else

would know them as well and thus you would have no unique advantage” (Schwartz 1991, 10).

Professor van der Heijden states that success comes from a combination of three ideas: first, discovering a new way of creating value for customers; second, bringing together a new combination of competencies that creates this value; and third, creating uniqueness in this formula in order to appropriate part of the value created (van der Heijden 1996, 65). He stated that strategy is a company's success in the future; it sets the company up to be able to fulfill these three ideas. It is the idea that continual evolution is not only a good thing, but essential. For example, a film camera maker in the 1990s, such as Kodak, makes a quality product and has good sales (Kodak 2012). Their digital competitors' product is not very good. Naturally, the traditional film camera maker considers the digital competitor a potential problem, but fast forward ten years and they have a major threat to their business to which they must adapt (Smith and Yousuf 2012).

Likewise, a digital camera company, such as Kodak, who like many have made the transition from film to digital in the early 2000s but who did not see multi-use electronic devices as a threat, had major problems by the end of the first decade of the 2000s. However, if Kodak had considered the possibilities for these new improvements and products well in advance, rather than when they were becoming popular, they may have been able to develop a plan of action sooner, especially if they had considered the

possibilities before the technology for them was developed. This is where scenarios can help and where there is a potential of using science fiction. Traditional marketing forecasting methods have a limited scope, and companies often focus on the next fiscal quarter instead of uncertain long term changes.

As Ralston and Wilson (2006) explain in *The Scenario Planning Handbook*, that organizations often cannot find the time to develop a long-term strategy because key decision makers are focused on meeting short-term goals and resolving current crises. He goes on to explain that because companies are preoccupied with solving short term problems that any scenarios that are created are often short lived and ineffective (Ralston and Wilson 2006, 38). The result is that the bottom line, and this fiscal year are foremost and potential future problems are not even considered. And even if they do consider it and use current methods of scenario planning, that still is unlikely to prepare them for threats that do not yet exist. Scenario planning is long term thinking and seeing threats that are in their embryonic form, where science fiction can supplement scenario planning. Using Kodak as an example, the film company could have mutated itself to maintain a competitive advantage so that it could continue to create new value for customers if it had felt threatened by digital technology when digital technology had extremely limited capability. By sensing these week threats, it is possible to put together new combinations of competencies and create a unique product before they render your product obsolete.

## How Does Science Fiction Fit with Scenarios?

Storytelling is a key part of the human experience. It is how we have, for centuries, conveyed important morals to our children and how we have come to understand our past and the world around us:

It is a common belief that serious information should appear in tables, graphs, numbers or at least sober scholarly language. But important questions about the future are usually too complex or imprecise for the conventional languages of business and science (Schwartz 1991, 38).

Stories have a different psychological impact than graphs and equations because they have been with us since our childhood. Stories can give meaning and depth to data that cannot be achieved by using traditional means. The author of *The Art of The Long View*, Peter Schwartz, gives the example of Three Mile Island. He stresses that if the planners of Three Mile Island had created a story, or perhaps stories, of potential disasters instead of numeric analysis, they would have been prepared for when something did go wrong. He explains that the stories make the situations and the solutions more tangible and more understandable. People are better able to visualize and understand the complexity of the problem (Sikes and Gale 2006).

## The History of the Genre

Exploring the history of the genre helps answer the question: Are there factors or patterns within science fiction that can be used as foreshadowing tools that indicate emerging or potential technology that could become a reality? In this section, science fiction's history will be examined and its ties to scientific development will be examined. By doing this, the factors that give it its foreshadowing ability can be explored.

### Understanding Science Fiction

The genre of science fiction developed during times when there was also great technological growth and change. *Science Fiction: A Historical Anthology* states that "[s]cience fiction emerged, quite properly, when science did" (Rabkin 1983, 9). Clarke notes that Jules Verne's life "neatly coincided with the rise of applied science" (Clarke 1999, 5).<sup>8</sup> Verne, whose works were used to help define the genre, was able to be so successful because not only was he born at a "unique moment of time," but he also "took full advantage of it" (Clarke 1999, 5). Science fiction also has a link to the public

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<sup>8</sup> Ashley writes "Jules Verne was one of the most popular and widely read authors of the second half of the nineteenth century." He refers to Jules Vern as the "grandfather of science fiction" and says that he was "the first great popularize of science at a time when science and technology were only just starting to take a hold on people's lives." (Ashley 2010, VII)

awareness and public fascination with science, as it helps fuel interest and increases speculation. *The Cambridge Companion To Science Fiction* states that "[s]cience fiction was an outgrowth of the popular-science movement" (James and Mendlesohn 2003, xvii).

It is very much a genre of the modern age:

[I]n the first part of this century they began to see the far future as less far off, the workings of science less as a tool for the dramatic exaggeration of persisting human problems and more as seeds of actual human problems nearly upon us. This era saw the advent both of moving pictures and of chemical warfare. The stories printed on pulp had something, besides economics, in common with the newspaper. In a world of conflict made possible by science, the fictions of science became daily fare (Rabkin 1983, 221).

However, the term science fiction was not used until the twentieth century, even for stories we today consider to be science fiction. Science fiction did not emerge as a named literary genre until the 1930s saw the start of "science fiction pulp magazines (James and Mendlesohn 2003, xvi). Wells' stories were "scientific romances" and Jules Verne's were "extraordinary voyages" until they were reclassified and reprinted (Rabkin 1983, 221).

"Pulp magazines" greatly increased the popularity of science fiction and were a major resource for this thesis (Rabkin 1983, 221). The early magazines came in many different categories, from westerns to love stories, and in 1926 *Amazing Stories* appeared. Gernsback, the founder of *Amazing Stories*, had been publishing science fiction stories in

popular-science magazines and coined the name "Science Fiction." Other influential magazines were started shortly thereafter, including *Astounding Stories*, with the influential editor John W. Campbell (James and Mendlesohn 2003, xvi). This magazine, which would later change its name to *Analog*, would feature a host of well-known science fiction authors such as Arthur C. Clarke, Isaac Asimov, Orson Scott Card, Greg Bear and many others. Over a forty year period, the genre developed into a full bodied set of works and ideologies (Kelly et al. 2009, 9).

### *The Elephant in the Room: Science Fiction on Television*

Science fiction, at least modern science fiction, cannot be talked about without acknowledging that television programs and films have made a contribution to the genre. Johnson-Smith stated that while never the most popular genre, there have been science fiction programs on television since television began, *Captain Video and His Video Rangers* in 1949 being the first of a long line of television programs (Johnson-Smith 2005, 1).

Science fiction television, movies, games, and literature share most of same basic characteristics despite the different markets for these science fiction stories, with television programs and movies clearly aiming at a wider audience. Despite this wider

audience, science fiction authors still attempt to incorporate natural laws and scientific reasoning into their stories:

The [science fiction] author has to create a kind of scientific/common sense explanation for actions, one that is 'based upon reasoning from natural laws, whether those happen to be empirically true or not'. Therefore, science fiction narratives notably create their own limitations; for instance, Federation vessels in the various *Star Trek* series cannot exceed Warp 9.9. There are theories of how the barrier can be broken, of course, but any attempt at experimentation invariably ends in disaster, involves dubious alien technologies, or demands an unacceptable ethical and moral position. *Star Trek: Voyager -1995–2001*(Johnson-Smith 2005, 56-57).

Television and film science fiction is the form that is most widely available to the general public; it is rare to find someone in the western world who has not at least heard of *Star Trek*. Additionally, movies such as *The Hunger Games* and *Prometheus*, which are contemporary to the writing of this Thesis, have also been widely popular and have made it to the mass consciousness.<sup>9</sup>

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<sup>9</sup> The research the author has done for this thesis revealed that the majority of individuals from around the world have some knowledge of science fiction.

## Science Fiction Studies

The subject of science fiction is rarely found as an academic subject outside of literary studies. Despite the history and the popularity of the genre, the scholarship for science fiction did not begin until the 1950s (James and Mendlesohn 2003, xvii). It started simply with night classes but then expanded into scholarly journals and "Science Fiction Studies" in the 1970s (Kelly et al. 2009, 9). The academic field has grown since that time but still, naturally, focuses on literary critique and talks about the cultural relevance to modern society. The literature about science fiction itself rather than the subjects within are still limited.

## Different Perspectives

### Arthur C. Clarke

Arthur C. Clarke, in his book *Profiles of the Future*," starts out by saying that science fiction "does not try to describe the future, but to define the boundaries within possible futures must lie"(Clarke 1999, 5). Like Professor van der Heijden, Clarke says it is not possible to predict the future, and he goes so far to say that attempts to do so will appear ludicrous: "If this book seems completely reasonable and all my extrapolations convincing, I will not have succeeded in looking very far ahead" (Clarke 1999, 7). The best example of this is the BBC's Vision of the Future featured in the *Horizons* Television program in the 1960s; many of the ideas about the future were not accurate and in today's world appear almost silly (Short 1964).<sup>10</sup> In that same program Clarke says that "predicting the future "is a hazardous occupation, similarly to what he says in his book (Clarke 1999, 7). However, he does make an attempt at it, but instead of trying to pinpoint specific objects or events, he dissects trends and tries to form a rough outline and guess at what the future may bring. While clearly not absolutely accurate, he successfully foreshadows the modern communication networks in the BBC's television program.

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<sup>10</sup> Horizon is a long running BBC television program that explores popular science, future possibilities and new ideas.

Author C. Clarke is of interest because not only was he a science fiction writer, but he was a futurist himself. He noticed that science fiction writers are better at guessing what the future will be than some scientists are able to do. Clarke explains why science fiction writers have more often foreshadowed real changes than scientists: "With few exceptions, scientists seem to make rather poor prophets; this is rather surprising, for imagination is one of the first requirements of a good scientist"(Clarke 1999, 6). He goes on to explain that often "distinguished astronomers and physicists have made utter fools of themselves by declaring publicly that such-and-such a project was impossible (Clarke 1999, 5-6)[.]" This would be because they simply have closed themselves off to the possibilities of changes. "The great problem, it seems, is finding a single person who combines sound scientific knowledge - or at least a feel for science - with a really flexible imagination" (Clarke 1999, 5). Science fiction is not a prerequisite to put forth ideas about what the future may or may not look like, but Clarke argues in his book that it does help.

Arthur C. Clarke also points out that perhaps one of the goals of some science fiction is not to predict the future, but to prevent it. He states that George Orwell can take some credit for the fact that *1984* did not turn out to be the way it was in his book (Clarke 1999, 2). Orwell was able to spread awareness of potential threats technology could bring, even though that technology had not yet been developed. Arthur C. Clarke also notes that Ray Bradbury remarked, "I don't try to predict the future - I try to prevent

it"(Clarke 1999, 6). These writers try to gauge what could go wrong with potential modern technology and speculate on the outcomes. Their work was warning about 'what if.' They were able to bring attention to possible threats by making them seem realistic. By writing a narrative makes potential threat of a possible scientific advancement seem real and tangible.

Finally, Clarke also discusses his own qualifications and predictions in the updated section of the *Profiles of the Future*. He comments that it is only natural he was not completely accurate and confesses that he overestimated the time scale and underestimated the cost of the project he thought would happen(Clarke 1999, 6). Clarke implies that time scale is not as important as goals; understanding which way things are headed is more important than getting the exact date.

## **Innovation**

Eric Von Hippel's (2006) book *Democratizing Innovation* discusses user-centered innovation and development. At first glance it may seem that this subject is disconnected from science fiction and even scenario creation, but innovation is key to both. Science fiction discusses and foreshadows innovation, and scenarios prepare a company for innovations; because of this, understanding innovation in its various forms is important.

Hippel's book describes innovation that comes from sometimes unexpected places, grows from user needs and can lead to surprising advancements. Most critically, this ties back into the thesis questions by helping explore and understand possible applications:

- "How can the vision of science fiction and science fiction creators be applied to the decision makers in the business and design worlds?"

One of the key ideas in Von Hippel's book revolves around how development is at its heart a problem-solving exercise. "Product and Service Development is at its core a problem-solving process" (Von Hippel 2006, 63). Innovation by users is normally focused on improving a product, and their innovation process tends to take the form of trial and error. The whole process is described as a learning opportunity: through the process of experimentation, new problems are discovered and new solutions are found. This can be used to understand how technology is developed and how new technology emerges.

Figure 4: The Trial-and-error cycle (Von Hippel 2006, 63)

## Culture

Allen W. Bateau, in *Technology and Culture*, discusses the interaction of technology and human beings in society. The first few chapters of the book explain the development and the history of human technology and explanation of technology: "For an object to be considered 'technology,' as contrasted to a Rube Goldberg contraption or some object of local ingenuity, it must enter into social circulation"(Batteau 2010, 14). Bateau explains that if there was not a definition of technology, a pile of rocks or an improvised patch could be considered technology, rendering the term meaningless and useless. Allen W. Bateau goes on to explain that technology also has to embody some level of engineering. He writes that "technology [must] embody some level of

engineering, meaning a knowledgeable arrangement of forces and materials" (Batteau 2010, 23).

*Technology and Culture* makes a very bold but simple assertion, "Human desire throughout most of history has exceeded human capabilities"(Batteau 2010, 14).

Humanity strives to make our tools fulfill our desires. Humans, as a species, tend to dream about things that can make our existence better. *Democratizing Innovation* talks about users trying to find the best possible solution to create a product that creates a device that does the job better and more efficiently: making their lives better (Von Hippel 2006, 48). The quest for improvement and refinement is the basis for technological advancement.

This improvement is not blind: "What we understand as modern technology was the product of a specific set of cultural and social circumstances"(Batteau 2010, 25). One of the changes in technology was that, instead of relying on craftsmanship and skill, new players entered the field: science and modern technology. Together they not only changed technology but transformed the cultures they came from and eventually affected the lives of people across the whole planet (Batteau 2010, 24-26).

However, this new world of technology is not without its hazards and side effects (Batteau 2010, 62). Nuclear dangers were not fully understood and were downplayed, pollution was not considered a problem as the first factories were built, and the shifts and

problems with society were not recognized. Better understanding of technology, and the spirit that drives it, has created the need for new scenarios and ways of looking at and preparing for the future.

## Summery

The literature examined helped to frame the thesis questions by providing background information on scenarios, and science fiction. Scenarios were examined to provide background information on tools decision makers already use to help them prepare for the future. Science fiction's history was examined in order to understand why this genre is suitable to foreshadowing the future. This exploration of science fiction also provided insight into the potential thinking processes of science fiction writers and this knowledge was used in the following chapters when conducting research. In conclusion, Innovation and technological culture were examined to help provide the building blocks to turn the findings of this thesis into something that could be utilized to facilitate invocation.

## CHAPTER 3: METHODOLOGY

### Introduction

#### Elements Needed

The goal of this research is to develop a new methodology to use science fiction's ability to foreshadow imagined technology into actualized things enable to make better strategic decision. To do this, several things must be examined. The ability of science fiction to foresee technological and cultural changes has to be explored. The practice of science fiction creators as compared to designers should be assessed, and it will be determined how universal science fiction actually is. To explore these elements, different approaches are required.

The research methods were designed to answer four critical questions; these four questions naturally lead to numerous sub-questions which are central when analyzing the data.

These research questions are:

- Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology?

- Are there factors or patterns within science fiction that can be used as a foreshadowing tool that indicate emerging or potential technology might become a reality.
- Is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context?
- How can the vision of science fiction and science fiction creators be use to guide strategy in the business and design worlds?

## Surveys and Interviews

### Email and Phone Interviews

A key part of the research for this thesis has been contacting and interviewing published science fiction authors either with a telephone interview or a series of emails. Science fiction authors are extremely difficult to contact. In the course of research for this thesis, over two-hundred emails were sent out to various authors. Less than ten percent responded, and of those who did respond less than half were able to answer all of the questions; however, most were able to answer the majority of questions. Despite the difficulty, talking to authors was necessary to answer the first research question, “Do science fiction writers and designers share the same process or have similar processes

when thinking about and or creating new technology?" A series of less than thirty questions was sent to the writers, typically in multiple emails so additional follow up questions could be asked or clarifications could be made. Two authors were contacted via Skype, including the only female interviewee. The list of authors was taken from a fan website.

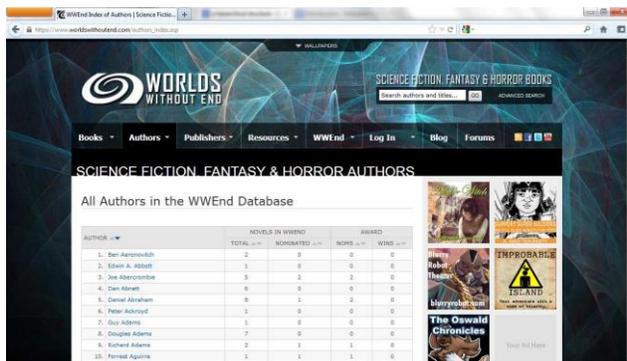


Figure 5: Authors Index (WorldsWithOutEnd.com 2011)



Figure 6: Author Michael Bishop's Home Page (Hutchins 2012)

The reason for using the fan site was to expand the search beyond those writers of whom the author has previously been aware of, thus enabling a wider sample of people to contact. The fan site use was called "Worlds Without End" and it was used to find a list of names and websites (WorldsWithOutEnd.com 2011). The fan website did not have any authors contact information listed, it only had websites about or run by the authors posted. The authors' private websites are where the contact information was obtained. All initial contact was done by email.

## Surveys

Multiple surveys were used in the process of the research for this thesis. Three surveys in total were used to answer two separate research questions: Two of the surveys answered the question: Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology? There was one set of survey questions for designers and one set of survey questions for science fiction creators to expand beyond those who were interviewed. The third survey created to answer the question: Is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context? This survey focused on people who grew up in non-English speaking areas

The survey created for the designers was intended to be a comparison to that made for science fiction creators. Similar questions were asked in both surveys in order to answer the research question, "Do science fiction writers and designers share the same process when thinking about new technology?" By comparing the questions more directly, even with a range of answers, an understanding about similar or dissimilar ideas and thinking processes between these groups could be established. This survey was done online via Google Documents' survey tool (Writely Team 2010).

The survey for the science fiction creators was designed to fill the gaps that such a limited pool of interviewees provided. Similar questions were used for both the survey

and the interviews. The people interviewed were all published authors who had some notability, whereas the people who participated in the surveys were predominantly students and recent graduates. The survey encompassed a wider variety of people, with differing skill sets and backgrounds. The survey was aimed at "creators," not just authors, and this included game designers, illustrators, animators, fashion designers. This was done because other creative people working in the genre could reveal insights that might have otherwise been missed.

The last survey was created to answer the cultural based research questions, is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context? This survey asked people who did not grow up in an English speaking country if and what kind of science fiction they had access to while young. It was designed to be anonymous with only basic, non-identifying, demographic questions asked.

All three surveys were distributed via two methods. The first method was delivered to participants in paper form in person. This in-person version was identical to those distributed online with the exception of a few spacing changes made to ensure the paper version was printable. The online versions were created by using Google's survey tool in Google Documents and posted on Facebook, Facebook forums, and some online design forums. Requests for participation for the designer's survey were sent out in the fall of

2011 and then again in the summer of 2012. All other surveys were sent out in the summer of 2012.

One of the biggest limitations with this research is that it was difficult to locate a great amount of people willing to take the survey. Despite posting the surveys on multiple design and writers' boards, few people were willing to participate. More definitive patterns could potentially be found with a greater amount of respondents.

## Online Science Fiction: Amazon and Condor

### **Amazon.com Analysis**

The online retail site Amazon.com was used because of its worldwide presence (Amazon.com 2012). This resource was used to help answer the questions, Is science fiction culturally specific or does it have cross-cultural elements? Can data from science fiction be used in a global context? The company has websites in nine different countries: the United States of America, Canada, China, France, Germany, Great Britain, Italy, Japan, and Spain.<sup>11</sup> While it is possible that this data is influenced because the company is based in the United States, and this might artificially inflate how much American media

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<sup>11</sup> The international sites were found on "Amazon International: Around The World," published by Amazon inc. (Amazon.com 2012).

shows up in the results, the site was used because it had an international presence and each site offers unique goods depending on its geographical location.

The top ten results of each country's Amazon site were found. To ensure that results appeared in the language of the site, "science fiction" was translated into the language of each of the site. The "top" results in all categories were searched for using "science fiction" in the appropriate language. Google Translate was used to translate the world science fiction into the different languages (Google Developers 2012).

There were three categories of things examined. The first questions were: What types of items were being sold? Were the items sold on the site under the category of science fiction limited to books and Hollywood films, or were there other types of items? These were used to judge the nature of the science fiction influence in these different countries. Next, the survey considered whether the items sold on the online retailer were written or created by people who were from the same country in which the Amazon store was based. This second question was targeted at finding out how international science fiction is. If each country's site was selling science fiction written by someone who is native to that country, then that is evidence that science fiction is global and not just a Western construct. The last question was, "What countries have authors who write science fiction? Is it just American science fiction or is there a variety of nationalities represented in the authorship of this genre?"

## Condor

Condor was used to supplement the surveys and to explore the global reach of science fiction (GalaxyAdvisors 2010). Developed by GalaxyAdvisors, Condor is a program that is primarily used to locate patterns of collaborative networks in databases via online sources (Gloor 2006, 4). These collaborative innovation networks or "COINs" are groups of highly self-motivated people who share a collective vision and collaborate with each other.<sup>12</sup> This collaboration leaves a distinctive pattern, as illustrated in Figure 7, of interconnected nodes.

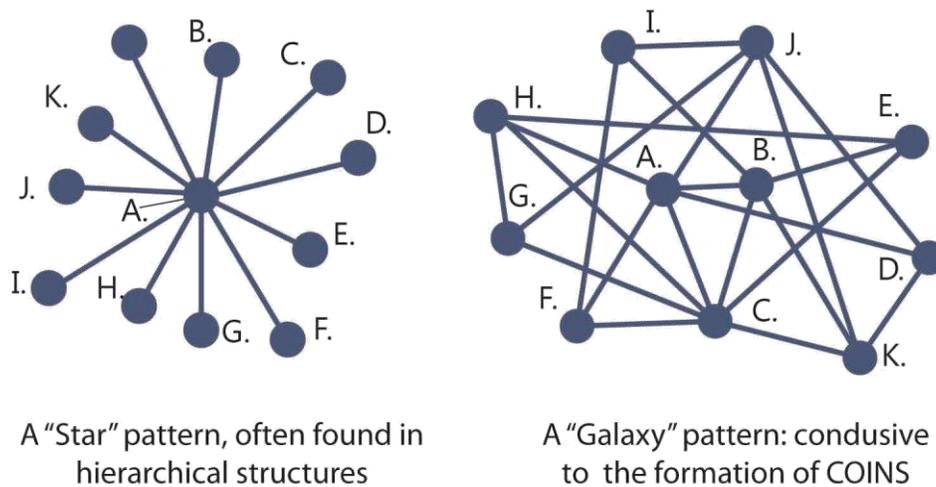


Figure 7: A Stars Pattern Versus a Galaxy Pattern (Gloor 2006)

This "galaxy" appearance occurs because the members communicate with multiple individuals freely instead of one individual as a primary source of communication,

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<sup>12</sup> "COINs" is an acronym for collaborative innovation networks.

as is in the case of hierarchical structures that have the appearance of a star. This is relevant because this signature of cross communication is found in these galaxy patterns. In the case of mapping online websites, galaxy formations appear when they give credit to a different website. For example, if website A cites websites B, C, D and F, but websites B, C, D, and F do not reference other websites, or only reference back to website A, we end up with a star configuration. If website A links to websites B, C, F, H and J, and those websites link not only to each other but to a different group of websites, we get a galaxy formation.

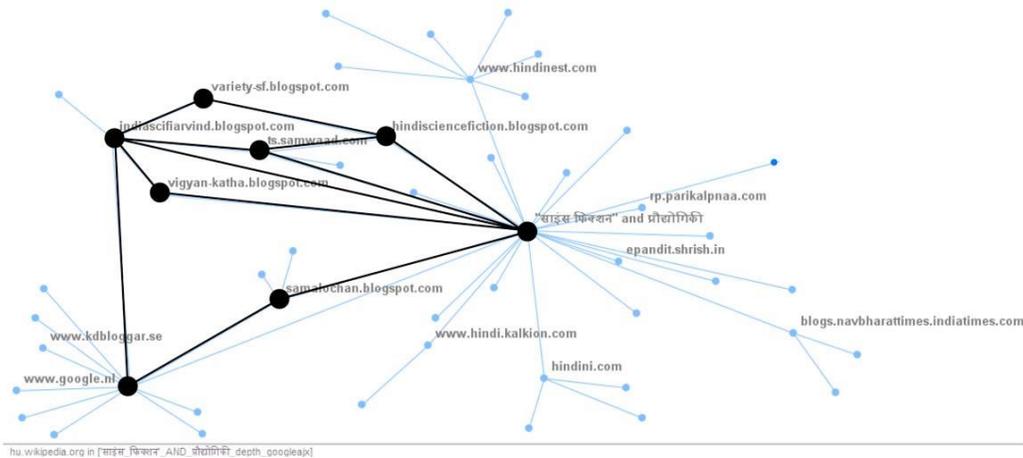


Figure 8: An Example of a Thin Galaxy Found Using the Web Collector

Condor has a "web collector" tool that can locate interconnected websites and networks. This tool allows for a broader look at the worldwide reach of science fiction because it can look at the World Wide Web, as it existed at the time of the search, to find

references of science fiction in multiple locations as it is connected with other terms. The program then creates a visualization of these websites and their connections. For this thesis, that visualization shall be the primary source of data.

## Science Fiction Short Stories

### **Astounding and Analog**

While many different science fiction stories, films, and television shows have been viewed by the author over the course of this study, it was determined that limiting the source of data was necessary. Limiting data to a single source was done primarily because of time restraints and because it was a practical way to control the data.

For this thesis, the main source of science fiction technologies and cultural changes in science fiction came from *Analog: Science Fiction and Science Fact*. This publication was used for many factors, including its long history, its notable authors, and access to a large collection dating back to the 1940s. Its consistency in format and content made it ideal for comparisons.

*Analog* is a monthly magazine that publishes science fiction stories and short editorials about current scientific discoveries (Schmidt 2012). The magazine started in the 1930s with the name *Astounding Science Fiction*. It continued to publish during the

Second World War, and while early editions are fairly rare, it has been continually publishing for more than eighty years (Lehrer 2010, 36).

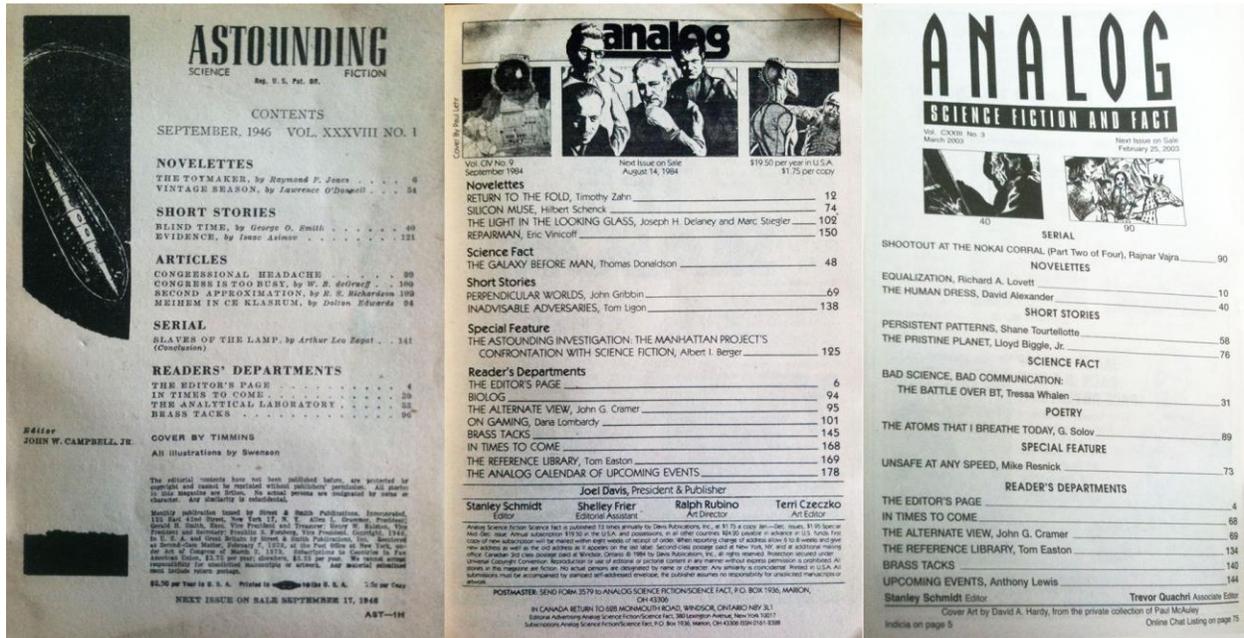


Figure 9: Astounding and Analog Tables of Content

What is notable about *Analog* is that the science fiction magazine has only had three editors over an seventy year period. The editors were John Cambell, Ben Bova, and Stanley Schmidt. The former of the two were published in *Analog* before they became editors (Lehrer 2010, 36-37). This creates a consistency few other publications have. The magazine's format has not been highly altered since the late 1930s. The content has also remained similar for most of the magazines' existence. Using *Analog* also provided other benefits because the publication features a vast variety of writers, including notable

authors such as Orson Scott Card, Isaac Asimov, Arthur C. Clarke, Spider Robinson, Jeanne Robinson, Frank Herbert, Timothy Zahn, Poul Anderson as well as many others (Schmidt 2012).

### *Analogs Versus Astoundings*

The magazine collection was divided into two parts for this thesis: *Analogs*, which dates from the early 1960s to the present, and *Astoundings*, which dates from the inception of the magazine until the 1960s when the magazine changed its name.

Since it was not possible to read every *Analog* published, the sample was limited to two issues from each year, with issues from March and September as they were six months apart and divided the year evenly in half. They were also chosen because they are during times of the year when there is not a lot of travel or popular holidays. This was done because it is unlikely that the publications would have a special edition or a themed addition published during these time periods. For example, a December edition might have a Christmas theme, and a summer edition might be thinner or thicker to accommodate people going on summer vacation. The collection used was not complete; if an issue from the selected months could not be found, one from the neighboring months was selected. This happened about five percent of the time for issues dating after

1961. In the case of *Astounding*, issues dating from the 1940s until the 1960s, the missing issues occurred more frequently during this time period. That collection was less complete; for some years, only one issue could be found, and there are some gaps.<sup>13</sup> It should also be noted that while it is normal for the magazine to publish one issue every month, there are a few months where there would be more than one issue published. The first issue would be published at the beginning of the month and the second near the end of the month. In the sample used, this happened more commonly in March than September. As Figure 10 demonstrates, most of the *Analog* data collected did come from the targeted months. Figure 11 shows the *Astounding* data; this data came from a wider variety of months, but eighty-four percent of the data came from the spring or fall.

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<sup>13</sup> On a personal note: the *Amazons* and *Astounding* come from a personal collection the author had easy access to. The oldest are rare and are often hard to find. A family member of the author had been collecting them since he was a child. It was his collection that was used. He had more than most libraries and any library that could be accessed.

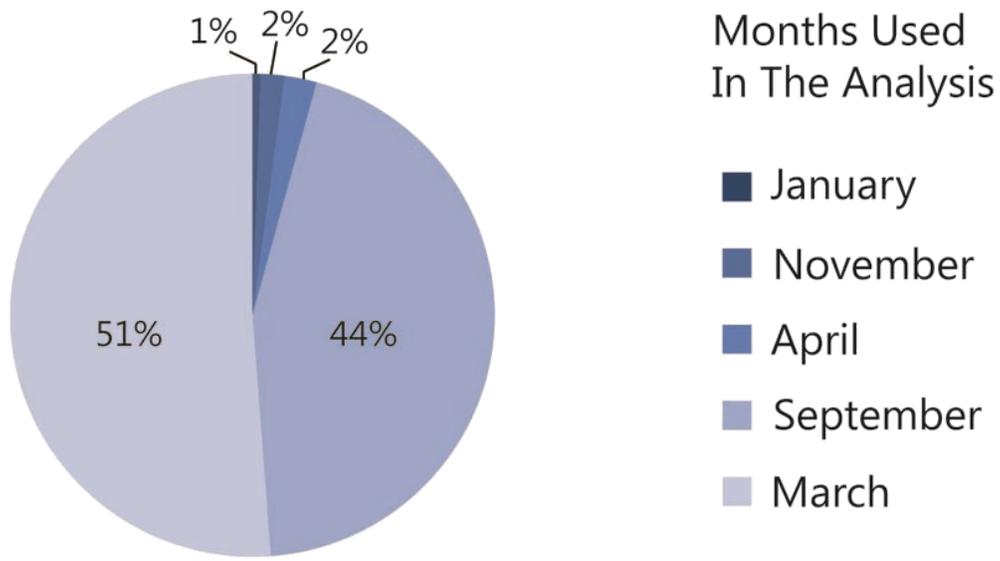


Figure 10: Percent of *Analog* Issues That Came From Each Month

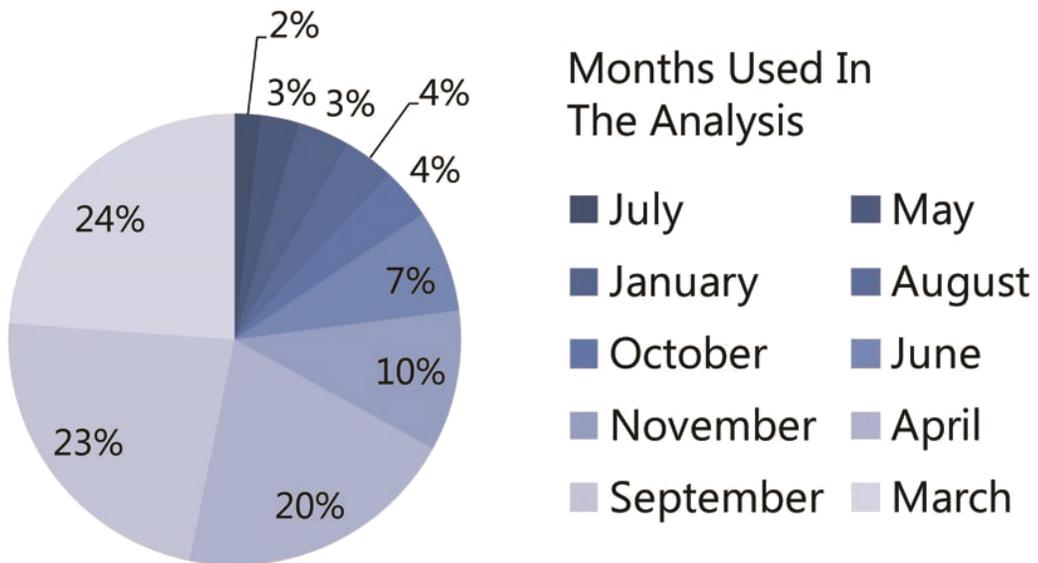


Figure 11: Percent of *Astounding* Issues That Came From Each Month

### *Creating a Database*

Individual science fiction foreshadows were collected from an examination of hundreds of science fiction stories.<sup>14</sup> After the foreshadows were collected they were assembled into a database and categorized. The foreshadows collected were divided into six categories: "Has Happened," "Partially Happen" "Could Happen," "Did Not Happen or Is Unlikely," "Changed, Replaced or Stopped," and "Stayed the Same."

The category "Has Happened" has been fact checked. News articles and other resources have been used to compare the technology or cultural shift described with what actually has happened. As the original database consisted of over two thousand entries, only the most relevant categories' could be tested for accuracy.

This database of foreshadows has been used to determine patterns. These patterns will be discussed in chapter 4. The category "Did not Happen or Is Unlikely" was also used to determine factors that preclude viability of technological ideas. This information was used to answer the research question: Are there factors or patterns within science fiction that can be used as a foreshadowing tool to indicate emerging or potential technology that will become a reality? This will assist in the development of the artifact.

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<sup>14</sup> In this thesis the term 'Foreshadows' has been used as a noun to describe technologies featured in science fiction that could potentially be real technology or closely resemble teal technology.

## How the Data Was Collected

The data was collected by a carefully reading of hundreds of science fiction stories. The author collected the foreshadows from published science fiction by first copying them on to small pieces of paper and then later entering them in an Excel database. The data was sorted into the categories after it was collected but before it was entered into the database. The data was divided after it was collected because the sorting was done as an exercise to survey and examine the collected foreshadows.



Figure 12: The Raw Data From Astounding and Analog Science Fiction Magazines <sup>15</sup>

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<sup>15</sup> Each reference was first noted on a small piece of paper, and then collected into an Excel file.

Each science fiction story was assigned a unique code that was used for citation purposes and to track the year published. The references notes were in the form of either quotes from the story, descriptions of the technology or culture, and/or the context in which the technology or cultural change was noted.

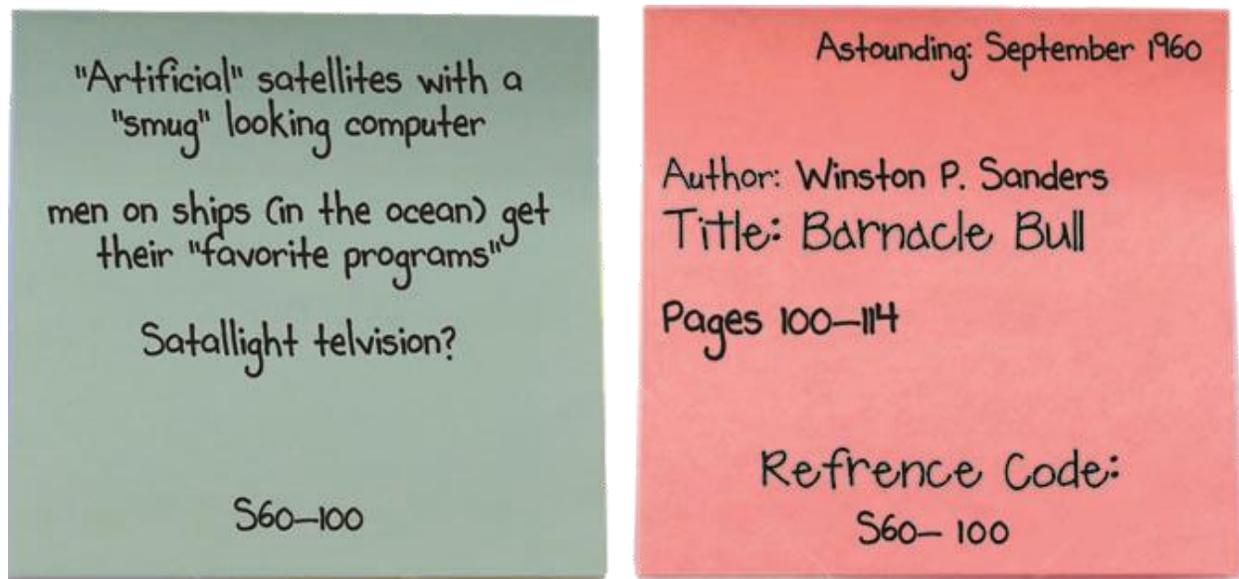


Figure 13: The "References Codes"

## Research Limitations

The two biggest limitations on both the surveys and the interviews are sample size: the surveys are each limited to a few dozen, the cultural survey only consisted of 22 participants. All of the surveys had less than thirty people who were willing to participate. While more participants would have been optimal, all of the surveys had a large enough sample size to be useful. This is true of the interviews with the authors, as well. The second, and perhaps largest, limitation of the cultural survey was that the survey was only in English. This helped inhibit it from gaining a larger number of participants and perhaps swayed the results because the participants had the potential access to English science fiction.

## CHAPTER 4: RESEARCH ANALYSIS

### Introduction

#### Puzzle Pieces

Each research method that was employed was used as a puzzle piece; the methods were designed to complement each other and the result reflected this. In many cases, more than one source, or different parts of the same sources, were used to answer a single research question. For example, the information gained from the Condor search was used to complement the Amazon data to show the global nature of science fiction. Likewise, the survey of the writers and the designers complemented the interviews that were conducted to show that there are some similar ways of thinking between the two groups.

There were a few surprises in the research. While many of the results were expected, some of the nuances that presented themselves were unanticipated. This is especially true in the cultural data. Before starting the research, the expectation was that science fiction was global, but this global presence was limited and heavily influenced by Western science fiction. It was discovered that science fiction is indeed global, and even though it is somewhat limited, it is more wide spread than expected. It was found that science fiction is blooming in unexpected places. It was found that people in many

different languages were talking about science fiction and science fiction was being written and sold in different languages in different countries. This was shown across the different data sets. Despite a few unexpected results, the different data sets complemented each other, and in the end the data was fairly consistent.

### **Do Designers and Science Fiction Writers or Creators Think Similarly?**

This section addresses the research question, "Do science fiction writers and designers share the same process or have similar processes when thinking about and or creating new technology?" This question was addressed through interviews, surveys and literature. The research done has indicated that science fiction writers and designers do indeed share some similar thinking when they are considering possibilities for future technologies. This was discovered primarily through surveys and interviews conducted by the author.

### *Thinking Processes Surveys*

As mentioned in chapter 3, two surveys were conducted to compare processes: one for designers, or people in design related fields, and one for science fiction creators. The questions were not identical but similar.<sup>16</sup> More respondents from the design and related fields survey responded than the science fiction creators, but there were enough respondents to both surveys to be able to compare them. Both surveys included people in a variety of different fields, and between the two surveys, fourteen different field categories were established. Most of the respondents in the designers and related fields survey were industrial designers, design managers or user experience designers, although other fields were also present. The science fiction creators' survey had more writers and game designers than any other field.

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<sup>16</sup> The survey questions can be found in Appendix A.

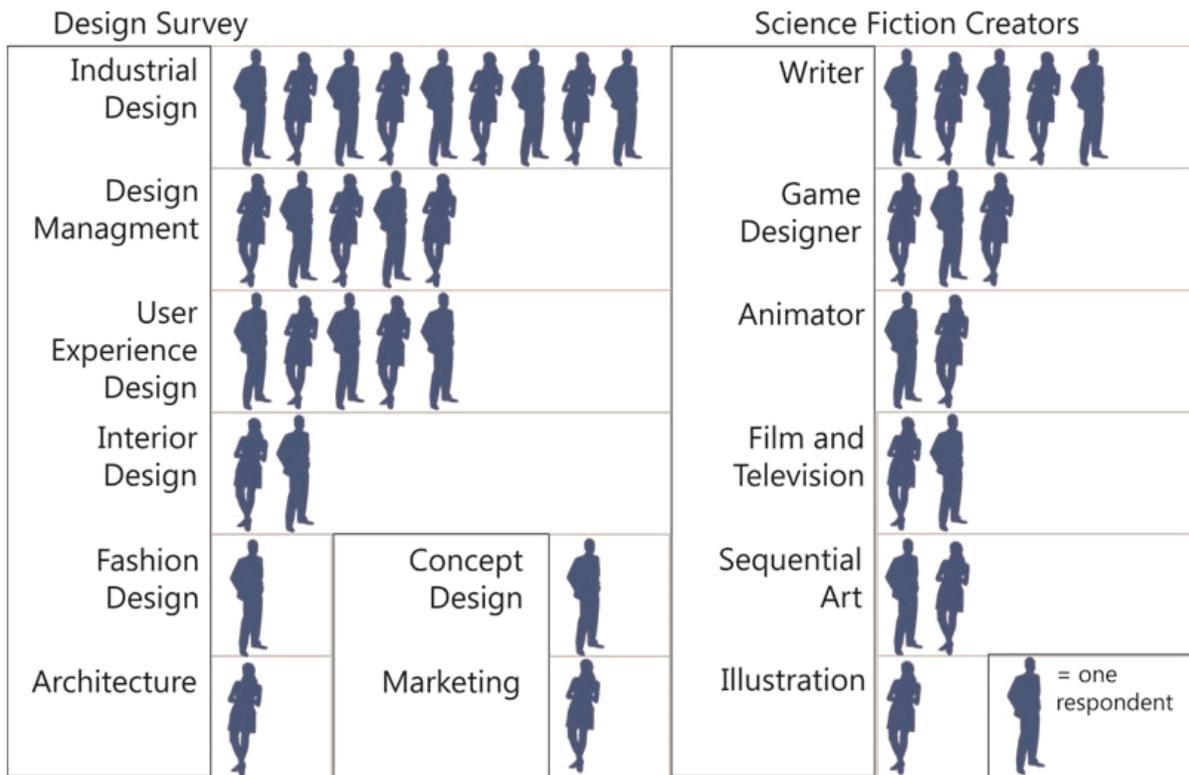


Figure 14: Fields of the People Who Took Part in the Surveys

The educational levels among the respondents were similar. This was expected because the respondents were primarily found on either online school design forums or online professional design forums, on the SCAD campus and through the author's personal network.

### Highest Level of Education

- Some College
- An Undergraduate Degree
- A Masters Degree
- Some Graduate School

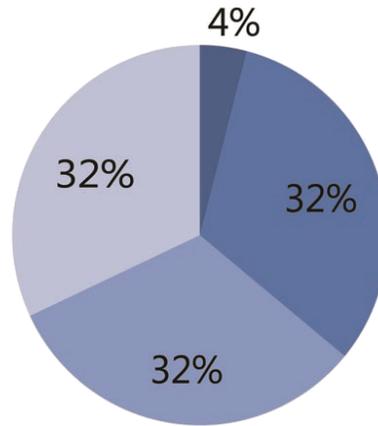


Figure 15: Designers and Related Fields Survey

### Highest Level of Education

- Some College
- An Undergraduate Degree
- A Masters Degree
- Some Graduate School

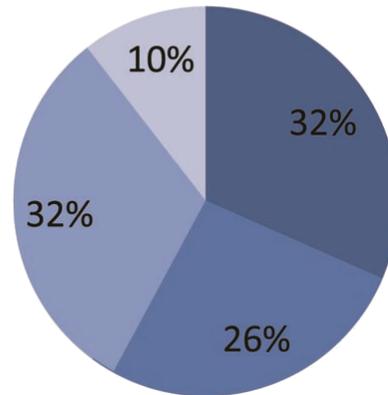


Figure 16: Science Fiction Creators Survey

All respondents had at least some college, with a fair amount having either some graduate school or having earned a master's degree. The published science fiction writers interviewed by the author also all had some college, with some respondents having earned terminal degrees, both M.F.A.s and Ph.D.s.

## Interviews with Published Science Fiction Authors

### Finding Authors Willing to be Interviewed

Interviews with published science fiction authors were carried out.<sup>17</sup> As stated in chapter 3, these authors were contacted over email and mostly agreed to do an "email" interview because they had scheduling limitations. It was possible to do a phone interview with one author, and a Skype interview was conducted with another. The questions the authors were asked were similar to the questions asked in the science fiction writers and creators' survey. Ten published authors graciously agreed to be interviewed.

### Authors' Backgrounds

All of the authors had published at least one novel; many have won awards for their writing and are well-known science fiction authors. The authors interviewed had levels of education similar to the writers and science fiction creators surveyed. All of the writers had received a college degree, with two receiving terminal degrees. The authors

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<sup>17</sup> What is the difference between author science and creators

interviewed come from a variety of fields and have a diversity of backgrounds. Many of them continue to work in other fields, including programming and teaching, in addition to writing novels.

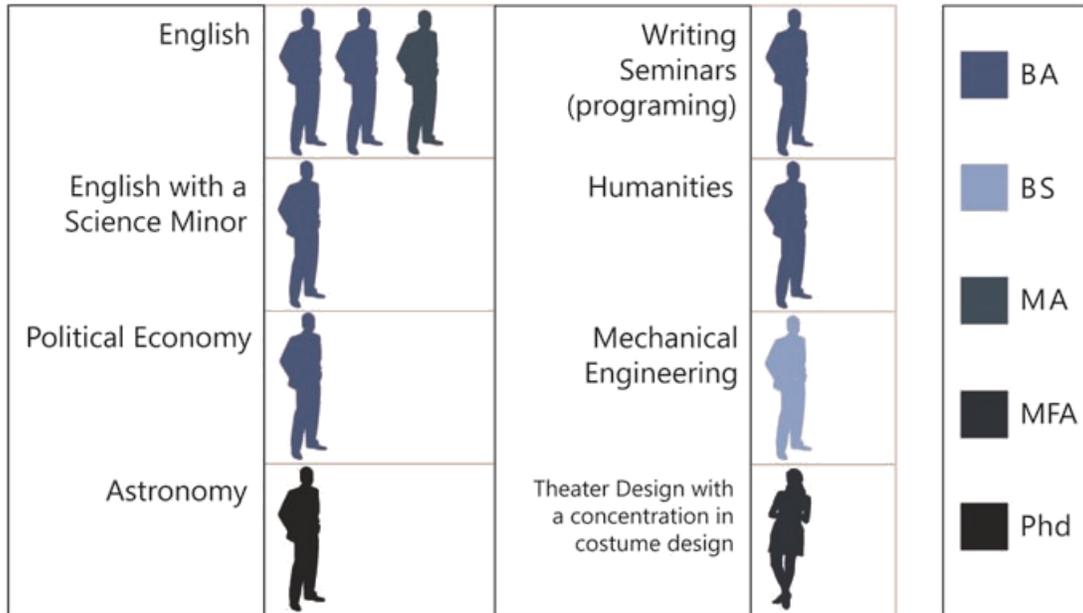


Figure 17: Fields and Education Level of Interviewees

It was assumed that some of the published authors would have experience or interest in science and technology, either via a formal background such as a degree or informal experiences. This informal experience could come from having an interest in the field of science or a family member who worked in science or technology. This assumption turned out to be correct. The diversity of fields indicated that science fiction writers indeed came from diverse educational backgrounds, some from fields relating to

technology and science, and their interview answers also showed this. In an email interview with the author, Jeff Carlson indicated he had family members who were involved in technical or scientific pursuits:

My [biography] lists my father and maternal grandfather as strong, early influences. Both men read science fiction. My father was an honest-to-goodness rocket scientist, working for NASA-Ames during the space race to the moon, and I narrowly escaped being named Armstrong, Apollo, or Rocket when I born (Carlson, pers. comm.).

He also commented that he "grew up in a household interested in big ideas, science, and the future, which are interests I wish were more common in modern America"(Carlson, pers. comm.). Others said that while they do not have a scientific background, they are in contact with people who do. The author Greg Bear noted that "being a science fiction writer puts me in frequent contact with both scientists and engineers"(Bear, pers. comm.).

Some of the writers also were or had family involved in other creative fields. Celia S. Friedman has a degree in theater technology and concentrates on costume design. She noted that her father greatly influenced her and that he was a technical writer. Ms. Friedman also noted it was her passion for communication that greatly influenced her.

(Friedman, pers. comm.). L. E. Modesitt, Jr. mentioned he had both creative people and those involved in science and engineering in his family:

My wife is a singer and an opera director who has been doing opera set designs for 20 years, and my father, although an attorney, did wood-working and made furniture as a sideline. I still have an inlaid chess table he made for me. My oldest son was a nuclear engineer for the Navy; one son-in-law is an engineer who designs and develops classified military satellite systems; another son-in-law is a Ph.D. engineer in industry specializing in the development of cutting edge materials for high tech businesses. A daughter is a doctor who is also a biomedical researcher dealing with techniques for treating female reproductive cancers (Modesitt, pers. comm.).

With this information, it can be assumed that many science fiction authors tend to have diverse set of influences. In chapter 1, it was asserted that writers tend to have a diversity of backgrounds, and some authors have formal or informal backgrounds that are based in technology, science, or a creative field. These authors may have degrees in things other than writing, or they may have family members who are technologically, scientifically or creatively inclined. The interviews with the authors support this assumption.

## Process Questions

A series of questions were also asked to answer the research question: Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology?

## What Influences Their Stories or Novels?

The interviews with the authors included questions pertaining to what influences or has influenced their stories or novels. Some of the questions asked determined what in general influenced their writing and what specifically influences the technology, or cultures in their stories or novels. The authors all cited multiple influences in their writing, including current technology, different cultures and science.

For instance, Mike Resnick cited different cultures as his inspiration. He did not talk much about technology, even though other authors did. His inspiration was human centered. Understanding how humans interact with the world around them and different cultures is clearly important in his writing. It should be noted that this is also used in scenario writing. Culture would be listed under factors. Kees van der Heijden writes, "[W]e believe that human nature or cultural imprint make people predictable" (van der Heijden 1997).

Mike Resnick's comments reflected this. He said that he "extrapolates" potential colonies on alien worlds based on the knowledge of a diversity of societies:

[My] strongest influence has been Africa. I've long been a passionate student of it, and my wife and I have taken half a dozen trips there. I think any reasonable person will agree that if we can ever reach the stars we're going to colonize them, and that if we colonize enough of them sooner or later we're going to run into a sentient race. Africa offers 51 distinct and different examples of the effects of colonization, usually deleterious, on both the colonizers and the colonized. Also, we extrapolate from what we know, and the most alien societies I know are those I've encountered in Africa. My first [four] Hugo winners, and quite a few nominees, were based on things African. It's been a rich source of inspiration for me. Over the years, I think I've done maybe ten science fiction novels and 20 stories based on things African (Resnick, pers. comm.).

Resnick was not the only science fiction author that talked about research being key to their processes. Most of the authors who mentioned their processes were inspired from their research, and Michael Bishop specifically said that he researched a diversity of subjects while writing science fiction, indicating he would use scientific knowledge from different fields. Many authors also mentioned reading scientific news indicating that knowledge of the scientific world was important as well. *The Writer's Guide to Creating a Science Fiction Universe*, a book on how to write science fiction, discusses how to use scientific law when writing science fiction. Ochoa and Osier reported that some knowledge of science is necessary to create a plausible story (Ochoa and Osier 1993, 2-

3). This sentiment was repeated in other books on writing science fiction. Ochoa and Osier write, "However imaginative your answers will be, they must be at least scientifically plausible" (Ochoa and Osier 1993, 2-3). This relates back to what the authors interviewed reported. Many of the authors and the books about writing science fiction stressed that authors should look into a variety of subjects and conduct research in order to enhance their stories.

Van der Heijden would also note this as an important element to consider when writing scenarios as one tries to figure out potential futures. The subject is a recurring theme in *Scenarios: The Art of the Strategic Conversation* (van der Heijden 1996). In an interview with the author of this thesis, the published author Michael Bishop responds similarly:

Usually a lot of initial research about whatever subject I'm ([whether it is] evolutionary development of our species, the colonization of another world, the likely varieties of intelligent or at least sentient alien life-forms) and then I allow the story and the daily writing process to help determine in which direction the narrative is going to go (Bishop, pers. comm.).

Bishop reported that he would research whatever topic he would be writing about before he fully developed his story. This indicates he was considering the scientific plausibility of any technology or cultural shift before he wrote about it.

A similar question was asked about technology to gauge if current technology inspired or shaped ideas for potential future technology. The book *World-Building*, written by Stephen L. Gillett and notably edited by Ben Bova, has a great deal of information on modern physics and stresses the importance of a science fiction writer to understand basic elements of physics when needed and to understand how technology works (Gillett and Bova 1996). When the science fiction authors were asked if current technology played a part in the creation of their science fiction stories, the answer tended to be yes. There was one notable no, but he explained that his stories tended to be more culturally based. David Louis Edelman wrote that he considered technology and needs of the people and projected what that would lead to:

In my *Jump 225* trilogy, the guiding principles I used for technology were: 1) they had (virtually) unlimited computing power, 2) they had (virtually) unlimited energy, and 3) they had several hundred years to learn and experiment. Given those three factors, it seemed to me you could go almost anywhere with technology and solve almost any problem (David Louis Edelman, pers. comm.).

Like Edelman, Gareth Powell explains that he thinks through the technology involved, including the problems that might come up. He too considered plausibility:

You can't give your characters enough antimatter to power a starship without working out where that antimatter came from, and how its appearance has affected society in terms of the economy and energy generation. As the old saying goes: 'you can't predict the car without predicting the traffic jam' (Powell, pers. comm.).

These authors' responses indicate that writers are problem-solving in a similar manor to designers. They are expanding on 'what if.'

Author Greg Bear explained how he considers the characters' daily lives. This points, again, to the author thinking about the user of the technology, and this type of thinking is similar to how the designer reported thinking about their users. Bear reports that society is the product of technology:

Society is shaped by technology, as are the characters' daily lives. And technology in turn is shaped by the psychology of both the culture and the characters, but more long-term. All of these forces dance around with the plot and setting throughout a story; in science fiction, at least one major facet of daily life is considered to have been changed by technology or scientific thinking, or by other forces likely external to the character; therefore, science fiction has aspects of a historical novel, or real life, where the characters are not always completely in charge of their fates (Bear, pers. comm.).

Mike Resnick has a very human centered approach, fitting with his African inspiration. His technological ideas were based on inertia (van der Heijden 1996, 61). He extrapolates from current technology and current factors, and from that he figures out where he thinks technology is headed:

If it's a human culture, I extrapolate from what exists today – or what existed in a similar situation in the past (such as a small, isolated colony). If it's an alien culture, I create it to fill the needs of the story (Resnick, pers. comm.).

These responses did not give a clear cut answer to the question of whether there were similar thinking processes between designers and authors, but they did show that authors are considering possible trajectories and are considering both the human element and the cultural impact of technology.

### Answers to Survey Questions

These surveys were designed to answer the following question: "Do science fiction writers and designers share the same processes or have similar processes when thinking about and/or creating new technology?" As explained in the previous chapter, similar questions were asked to designers and science fiction creators, the assumptions being that science fiction writers are not burdened by the same limitations or constraints as designers and are free to create a vast array of possibilities. If they do, indeed, have

similar processes it would be plausible that science fiction has foreshadowed some technological and cultural events because future designers would later follow the logical progression of a technology or shift to a similar conclusion.

### Responses to Questions:

*When looking at technology to use within your story, what factors do you consider?*

The science fiction creators were asked about the factors they consider when creating a story and, specifically, when creating the technology for a story. The respondents' answers were varied but there were repeating themes. These themes revolved around inertia, the human condition, and problem solving. The writers generally considered factors of "inertia"(van der Heijden 1996). As explained by van der Heijden in chapter two of his book *Scenarios: The Art of Strategic Conversation*, one of the most powerful parts of prediction is inertia, and based on their answers to this question, the science fiction creators are clearly thinking about possible trajectories of current technologies.<sup>18</sup>

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<sup>18</sup> As explained in chapter 3, Inertia is the continuation or expansions of current trends into the future.

Some of the Respondents Looked at Current Technology:

- "I usually write about future technologies that are extrapolated from present cutting edge ideas[.]"
- "[S]ome of the technologies that exist now can lead to something that is more impressive later if you have someone smart enough[.]"
- "[I] look at the story how I want it told and then what type of technology will enhance the story. Most of the time by this point while brainstorming certain aspects or ideas technology wise [that] have already been developed."
- "If you can make most of it realistic [based on current technology] you can get away with a couple large leaps."
- "I like to utilize plausible technology when possible"
- "How is it different than today? Where is technology going?"

**Table 1: Looking at Current Technology**

The respondents also considered human factors: what do the characters in their stories need or want? This was not as popular as the answers given above, but it was often in conjunction with the science fiction creators considering where current technology is headed. This would fit with the idea of the end user that we see in design.

Some of the Respondents Considered the Human Element::

- "The needs of the characters based on the conditions/rules of that world."
- "How will it affect us as human-beings?"
- "The most important factor for me when considering technology is what the characters would need to do."
- "If a technology exists then human society will be changed because of it and I have to think like an engineer and sociologist."

**Table 2: Science Fiction Creators Looking at the Human Element**

*Do You Focus on Your End Users?*

The question "Do you focus on your end users?" was included in the survey taken by the designers and people in related fields. This question was used as a comparison to explore similarities and differences between the thinking process of a designer when it came to a product and the thinking process of a writer when writing a story.

The result was that all but one of the respondents answered "yes" or "sometimes." The respondent who answered "no" noted he still thinks about the people using it, but he thinks of them as a group rather than individuals. When asked to elaborate on this, the majority of the answers related back to the needs of the user.

Most of the Respondents Focused on the End User:

- "I try to find out the needs and tastes of end users."
- "First I try to think about what the problem is. The \*real\* problem, for the end users."
- "Research primary and secondary[;] Introspection[;] Whatever makes sense[;] Futures predictions[.]"
- "I'll imagine the scenario of using the product in the real world."
- "By researching and trying to find exactly what the needs or problems actually are and finding various ways to solve them in the best way possible."
- "Customer insight, shadowing, observation, [caring] about what they have to say and what they can't put into words."

**Table 3: Focused on the End User**

The answers given by the people in the design related fields indicate that their survey is comparable to the science fiction creators survey. This helps validate the argument that science fiction creators and designers have similar thinking processes.

*Do They Share Any of The Same Processes?*

Both science fiction creators and designers were asked about their processes.

This question was used to determine if there were any similarities in the ideation process of the two groups. As was expected, a diverse array of answers was gathered from both

groups. While they were not entirely alike, there were some similarities. "Defining the problem" was key to many of the respondents' processes in both groups.

#### Talk About Your Process:

Creator:

- "Logical analysis. What makes science fiction (and even most fantasy) appealing is its basis in reality. For example, when creating a creature I comprise not just bits of other creatures together but an overall understanding of functionality and anatomical cohesion. It has to be able to—possibly—work. You really can only have one or two implausible elements and be ready to back that up somehow. The details are important. Even down to plants in an environment... rocks and grasses. They all should seem like they fit BY not fitting sometimes. What makes them most alien is if they are similar to plants that wouldn't normally coexist, yet in this case do. I need to know color theory and have a vast knowledge of existing flora and fauna ultimately. Because all those things make the viewer believe or disbelieve."

Designer:

- "Depends on the approach but generally the first part will be become familiar with the situation getting as much information and knowledge you can about it. After that I 'rephrase the problem' to make it a design problem and to see all the possibilities. Then I will start developing paths of possible solutions. At this moment I have developed a criterion to evaluate the possible paths and choose the one that fits better the client, the user and my expectations. After will be the ideation part in which hundreds of sketches will be produced exploring different aspects after selection of ideas will develop final concepts evaluation ageing and selection final design to be produce."

Creator:

- "I usually try to figure out what special needs their world creates, and thus what kind of technology would fulfill those needs."

Designer:

- "Defining the problem or the project is an important first step. It is very easy to go down the wrong path if expectations are not clear. Define the project streamlines the design process by hi-lighting the most challenging features."

**Table 4: Process for Both Groups**

There was a similarity in both groups' answers regarding their processes. Both groups talked about using logic to develop technology and both the science fiction creators and the people in the design related fields reported that they think about technology in the realm of what is plausible. Both science fiction creators and people in design fields are looking at the situation to find answers, whether real or imagined, and developing the solutions based on the problems of those situations. Fulfillment of needs was also mentioned by people in both groups. There is enough similarity in these answers to indicate that the two groups share at least some similar thinking processes.

*Would individuals in the design world be open to using science fiction as a tool?*

Designers and people in related fields were asked what design can learn from science fiction. This was an exploratory question asked to fill in any potential gaps that the other questions may not have uncovered. There were two general themes in the

answers, and one relates back to the idea that science fiction can inspire. This was discussed in chapter one, and in the past some designers and engineers have been inspired by science fiction. The second was more in line with the hypothesis of this thesis.

Designers and people in related fields were asked how designers could learn from science fiction.

- "For Inspiration[:] Imagining the product in the real world, to understand how something could exist. Making the product seem realistic even though it really isn't. The ability to tell a story around a theme."
- "[Science fiction] is a tool for exploring possible futures within a narrative. They are almost always metaphors of today's realities trying to get us to focus on the minutia of cultural topics. But these same systems can be an amazing tool towards broadening and coalescing understanding amongst team members and other stakeholders."
- "[R]esearch what's out there (in [science fiction]) and evaluate its possible successes in different contexts success from a real-time user-centered standpoint...then alter or change as needed[.]"
- "[T]hinking outside the box helps the designer by not limiting them to what they think they can do. Science fiction helps make the impossible seem plausible."
- "[Science fiction] could be inspiration by themselves; [science fiction] is nothing but a byproduct of creative imagination reinforced by intelligent reasoning. [T]hey could be conceptual goals themselves[.]"
- "If anything, to study ideas outside the realm of everyday thinking, it is good to keep sharp and a broader view of the world than just the day-to-day. [I]t is all based in ideas and imagination, two great elements to work with."

Table 5: Can You Learn From Science Fiction?

The designers report that they feel the value of science fiction is in the genre's ability to look at a "broader view" of the world.

## **Conclusion**

Science fiction authors and designers share many similar thinking processes when looking at potential technology. Both groups talked about using logic to develop technology and both groups considered the world and the manner in which the technology would be used in.

## Cultural Survey

Cultural survey participants were those who grew up in areas that are not English speaking. The vast majority came from areas that would not be considered part of "Western" civilization. This was key in the exploration of the global nature of science fiction, helping to answer the question: "Can data from science fiction be used in a global context?"

The survey was designed to give insight into how science fiction is perceived by non-English speakers. Are they familiar with the genre? Does their culture have their own version of science fiction?

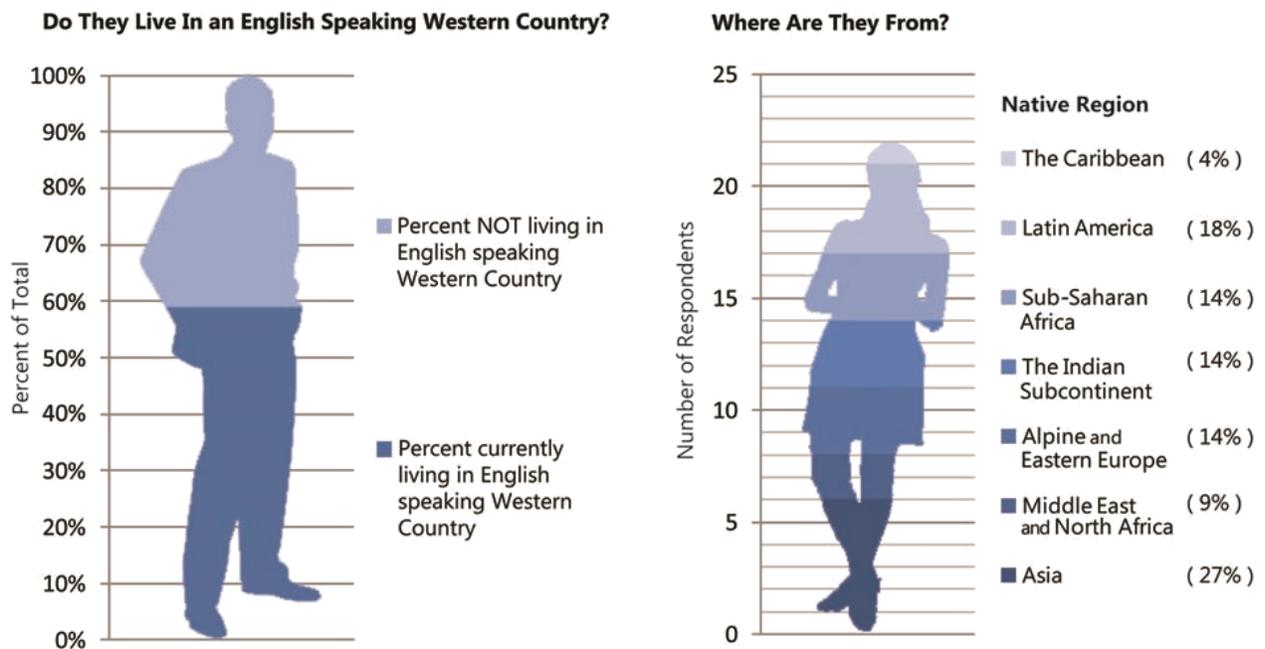


Figure 18: Home Country of the Respondents

Over twenty people were surveyed; three came from Europe. The Europeans consisted of people from the alpine countries and Eastern Europe. The largest group came from Asia; the countries included Vietnam, Hong Kong, China, and Indonesia, with the most people coming from China. The second biggest group of people came from Latin American countries; these countries included Honduras, Colombia, Panama, and Peru. The rest of the participants came from a variety of places, including Morocco, Iran, India, Pakistan, Nigeria, Somalia, Uganda, and Trinidad.



Figure 19: Countries the Survey Participants Comes From (Feinberg 2012).

Over seventy percent of the participants were aware of science fiction or somewhat aware of it, and a little over half reported that they enjoyed science fiction.

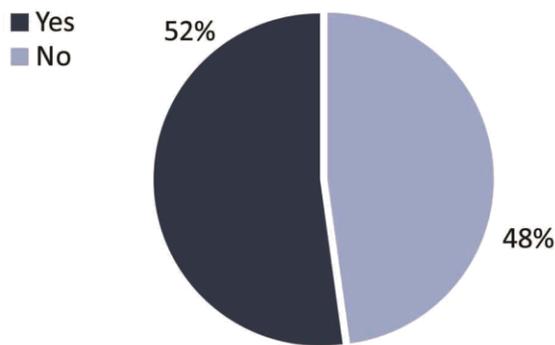
### Awareness of Science Fiction

*Does your culture have stories science fiction?*

One of the first questions in the survey was: "Does your culture have stories that show technology that might exist in the future? If yes, can you name some of them?" The majority answered either no, not really, or that they could not think of any. The answer was not consistent among people from the same country: most of the Chinese

participants said no, but some said yes and even named a few, including *Little Dragon Boy*, - TV Show, *Modern Emperor Conflict in China*, *Future Cops* and *Future X-Cops*. This indicates that exposure to science fiction is varied and while it exists in China, the wider population may not be consumers.

### Are you a "fan" or watch science fiction?



### Are you familiar with science fiction?

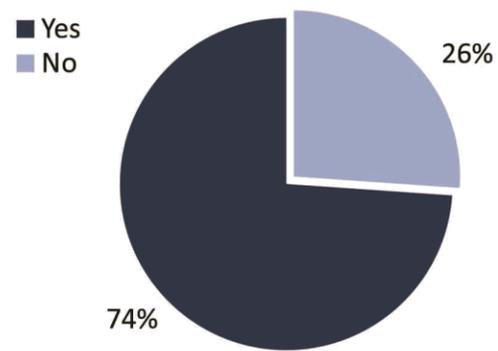


Figure 20: Results from the International Survey

The participants did repeatedly mention names of science fiction that originated in the United States. To the question, "What science fiction is popular in your country?" one of the Europeans answered, 'Big Hollywood movies set in the future - this includes those about Zombie outbreaks (e.g. *28 Days [L]ater* etc) and those about machines (e.g. *Transformers*) or aliens (e.g. *War of Worlds*). We generally get most of the big films." One of the participants who came from Africa reported, 'I watched *Back to the Future* growing

up in Nigeria, also *Star Trek* on television. I've also watched other movies like *The Minority Report* on DVD." Even though participants could not always name something that is popular in their culture, seventy-four answered yes to the more broad question of "Are you personally familiar with any science fiction stories, stories that are set in the future or have a technological theme in them?"

### *Who Watches Science Fiction?*

The question about who watches science fiction got a wide range of answers, and other information about potential fans of science fiction varied too widely to find a discernible pattern; however, based on the variety of respondents, it can be assumed that there is a diversity of science fiction consumers. The science fiction writers come from a diversity of back grounds and the survey indicates that there is a wide range of viewers of science fiction. This is relevant because it makes it possible to say that science fiction is applicable to a wide range of situations.

## Online Analysis

### Amazon.com

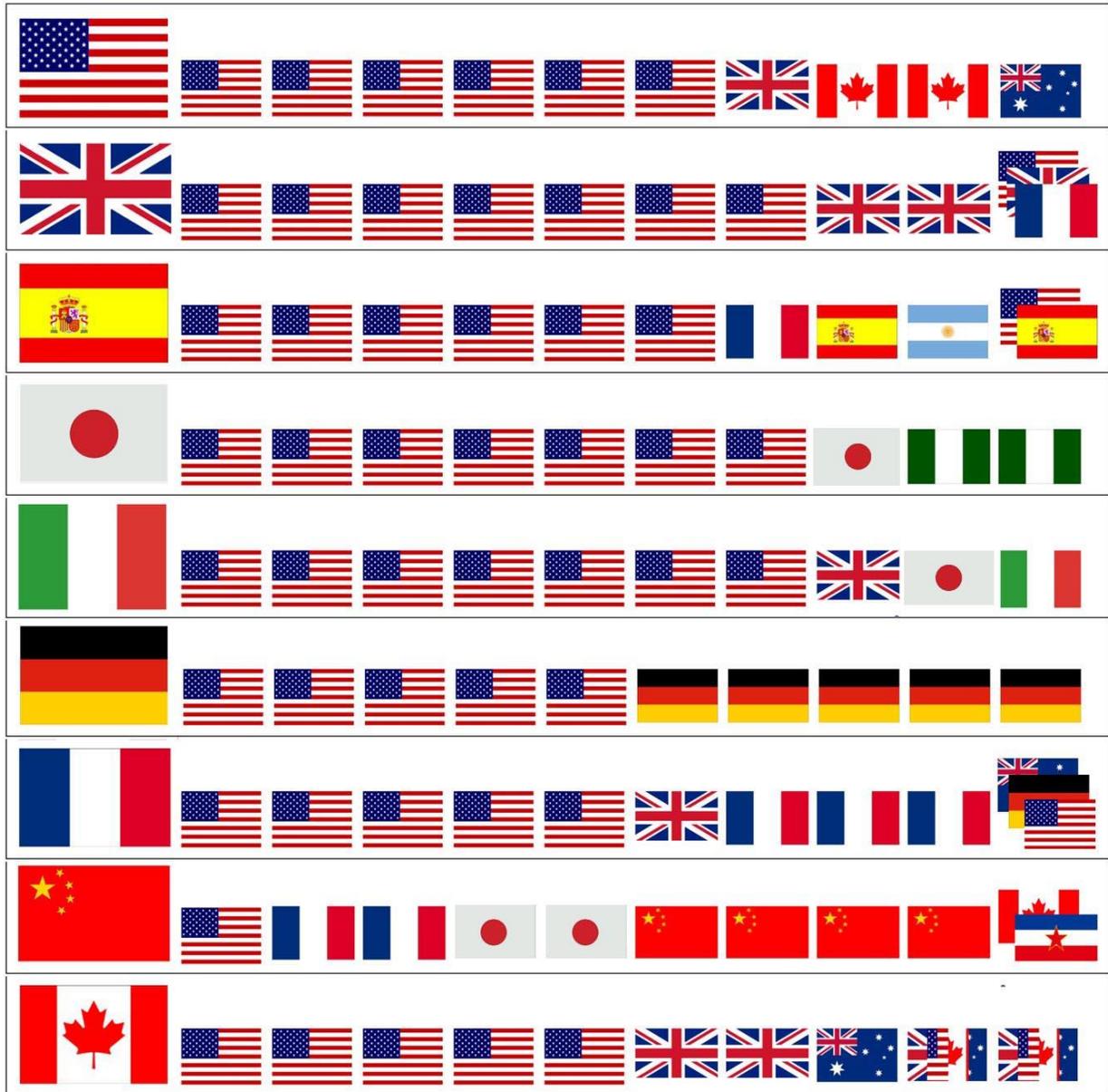
An analysis was done of the online retailer Amazon.com and its international domains, and a sampling of the top ten results was compiled.<sup>19</sup> Based on the initial results of the survey data, it was expected that American DVDs would be popular in most of the markets, but it was unclear if each market would have native science fiction authors.

The language of each country was used in the individual searches. Using *Google Translate*, the phrase "science fiction" was translated into Chinese, French, German, Italian, Japanese and Spanish (Google Developers 2012).<sup>20</sup>

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<sup>19</sup> All of the Amazon.com subsidiaries were accessed in September of 2012. This list of international domains was found on the company's website (Amazon.com 2012). It should be noted that the Austrian Amazon site was not included because the Austrian website is connected to the German Amazon online retailer's website.

<sup>20</sup> The website "Google Translate" was used in September of 2012 to translate science fiction into multiple languages (Google Developers 2012).



Key:

Large Flags Represent Specific Nations' Amazon Sites

Canada Amazon.ca	France Amazon.fr	Germany Amazon.de	China Amazon.cn	Italy Amazon.it	Japan Amazon.co.jp	Spain Amazon.es	The United Kingdom Amazon.co.uk	The United States Amazon.com

Small Flags Represent A Products Country of Origin

Argentina	The former republic of Yugoslavia	Australia	Nigeria	Multi-Country Collection	English Speaking Collection

Figure 21: Countries of Origin for Science fiction Products <sup>21</sup>

It was discovered that in all but one market investigated there were products created by a native to that country that was present in the data. Canada was the only exception. All of the countries, including Canada, had at least one item that was in the language of that country, and most countries had more than one. This strongly indicates that there is science fiction creation being done in multiple countries and in multiple languages. This was further reinforced by items being created in countries that did not have an Amazon website. A box set of DVDs that was being sold on the French Amazon's site had DVDs that represented three different countries, including Germany and Australia, and the Spanish Amazon had a book listed that was written by an Argentinean. Some of the writers whose books were being sold could be listed under two countries; for example, in Spain's top ten there was a Spanish/American writer who writes in Spanish but teaches at an American university (University of North Texas 2008).<sup>22</sup>

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<sup>21</sup> It should be noted that the flags represent the countries of origin for the products listed in specific country's top 10 science fiction results: (from top to bottom) Canada, China, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States of America. Flags included that do not have a local Amazon include Australia, India, Nigeria and the former country of Yugoslavia. There is also a combination flag that includes Australia, the United States, Canada, and United Kingdom that is used to represent "English Language" for items where multiple English speaking countries were involved.

<sup>22</sup> This information was verified by checking the university's faculty listings.



Figure 22: CD Cover for a Nigerian Band Entitled: "Science Fiction" <sup>23</sup>



Figure 23: Multi-national CDs Sold on Amazon.fr

However, there were regions that were noticeably missing in the data set. Only two items originated in Africa, both by the same creator, and none originated in the Middle East. India was also notably absent from the data set. One possible answer could be that Amazon's website does not yet have a retail website in these locations, which might explain the gap. Three of the nine countries that did not have science fiction was created in their country appear in other countries searches. For example: science fiction from Spain only appeared in the Spanish Amazon site search. It is also possible that science

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<sup>23</sup> The first image comes from a CD cover for a Nigerian band with the name of "Science Fiction" that was sold on Amazon.co.jp. The second image was found on the French Amazon site and is a DVD box set which includes science fiction movies produced in a mix of different nations (Amazon.com 2012).

fiction is not popular in the regions where there was the data gap; this will be tested later in this chapter with a different tool.

It is evident that the dominate country offering science fiction is the United States and the dominate language is English. The flaw of using a website run by an American company is that it is unclear if the large amount of American created and English speaking results is because of the website's bias or if there is genuinely a strong desire for these products among people. Half or more of the results were American-created in five out of the nine countries, and all of them had at least one American product being sold. China was the only exception to this trend; it was the only country without a large amount of American results, but it still had a sizable number of French results. This still clearly indicated a heavily Western bias in the results. Fifty-four percent (forty-nine out of the ninety) of the combined results were from the United States.

It was not expected that the Chinese would be producing more science fiction than the Japanese. Due to the popularity of Japanese animation among young people in the United States, Japanese science fiction was expected to be more global. However, Japanese films did not appear in the data set. Only three Japanese products were found on an Amazon site outside of the Japanese online retail outlet.

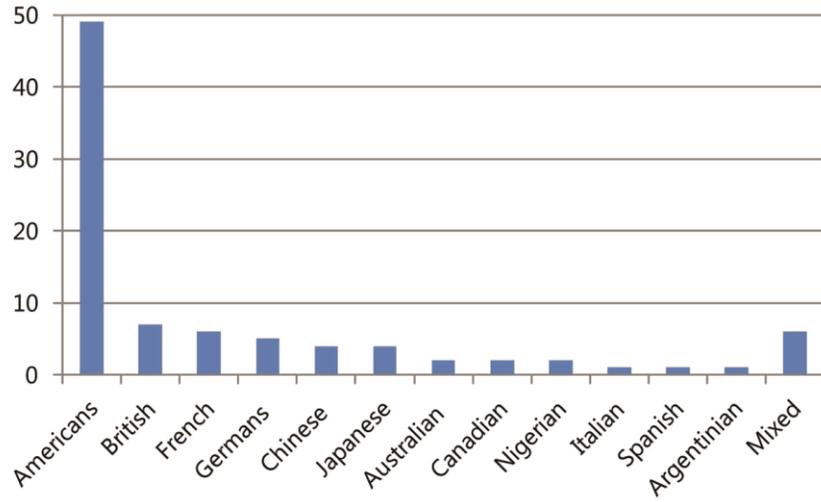


Figure 24: Origin Countries of Products

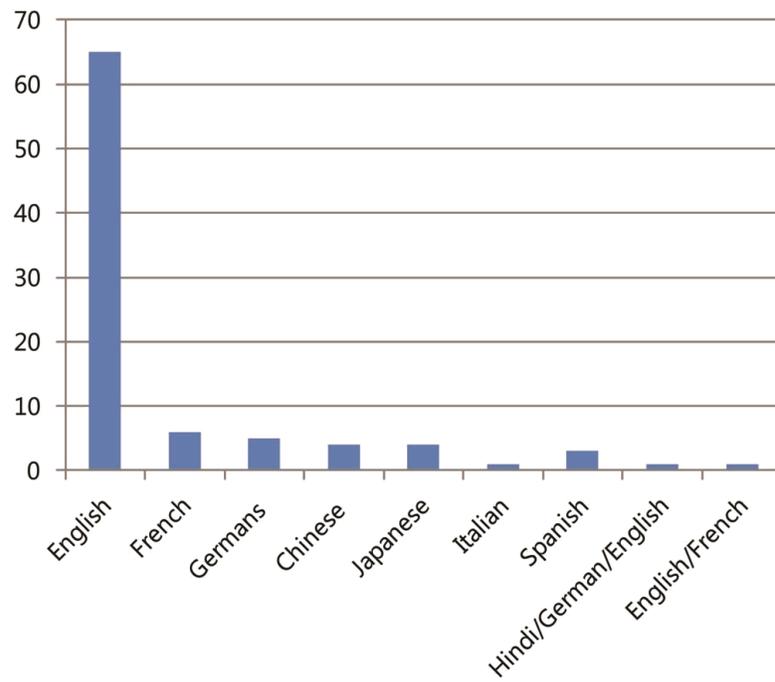


Figure 25: Predominate Languages

## **Books, Films or Something Else?**

The items being sold were also examined. This was done to determine if science fiction was truly international. This research was designed to answer the sub-question: will the data be dominated by American DVD sales or will other products be popular as well? The items were divided into a few broad categories. These categories include books (hard cover, paperback and e-books); motion pictures; artwork (which could include home decor, figurines and other related items); recorded television shows on either DVD or Blu-ray; music (either on compact disks or as MP3); recorded books or books on disk (these also could be either on compact disks or as MP3s); toys (such as action figures or stuffed animals); video games; and magazines.

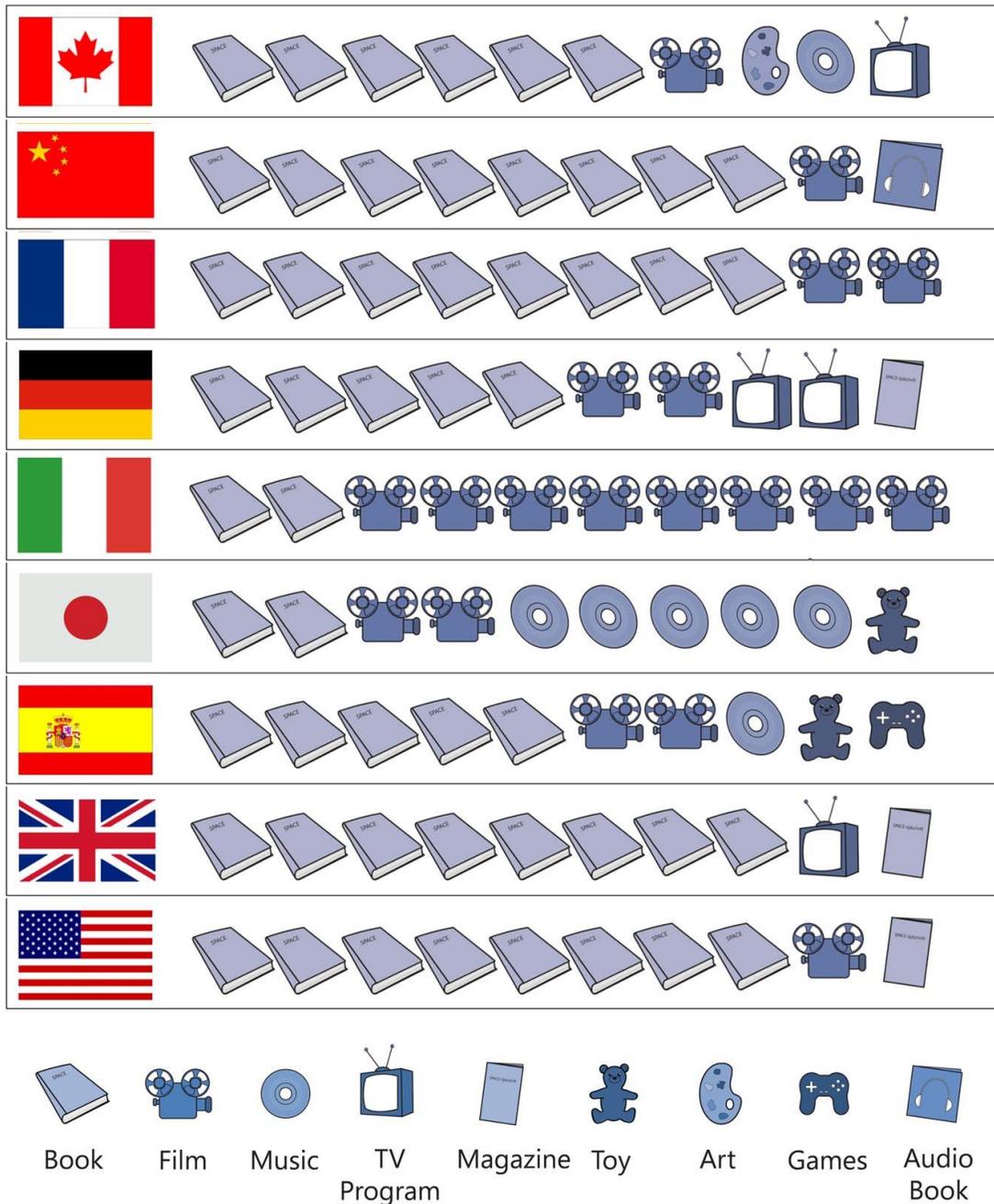


Figure 26: Types of Products <sup>24</sup>

<sup>24</sup> It should be noted that the flags represent the countries of origin for the products listed in specific country's top ten science fiction results: (from top to bottom) Canada, China, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States of America. The symbols represent the type of products sold, these products include, books, motion pictures, artwork/home decor, television shows, music, recorded books/books on disk, toys, games, and magazines.

The most unexpected discovery was that books were the predominate form of media. The forum was expected to be the Hollywood film because of the prolific nature of the American film. Fifty-eight percent of the media sold were in the form of books, twenty-one percent were films and a surprising eight percent were in the form of music. All other categories combined made up less than fourteen percent of the total. While books were dominant in most markets, Italy was one of the few countries where books were not popular. Instead, Italy's results corresponded to what was expected for the whole data set: American films translated into Italian were by far the most popular item in that market. Japan's results were the most unexpected because of the popularity of Japanese Animation that portrays futuristic ideas; that market was dominated by music, most of which were sound tracks to science fiction films.

The data would indicate that science fiction literature is one of the most, if not the most, popular form of science fiction media around the world and that new science fiction literature is continually created. Not only is science fiction literature being created by a diverse set of people, but this science fiction is being consumed by people in different locations with different backgrounds.

## The Number of Results

The number of results from each search was also noted. It is expected that there would be fewer science fiction products sold in newer Amazon websites, perhaps because the newer Amazon websites may not have established a supply chain and user base. The results are still informative because, despite the difference in age, each website would still have a massive amount of inventory and could be compared to other Amazon sites of the same age. If one country's store opened the same year as a second country's store, yet one has a far fewer number of science fiction products, it can be assumed that science fiction is likely less popular in the market with the fewer results.

Year	Country	Total Search Results	Year	Country	Total Search Results
1995	US	351,713	2002	Canada	228,482
1998	UK	272,419	2004	China	925
1998	Germany	388,347	2010	Italy	9,938
2000	Japan	38	2011	Spain	7,644
2000	France	383,710			

**Table 6: Number of Results for Translated "Science Fiction"<sup>25</sup>**

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<sup>25</sup> The program "Condor" was used in September 2012. Condor is a program that was created by GalaxyAdvisors for network analysis. The program harvests data from online sources and creates a visual map of that data.



Many searches were conducted but the most relevant searches were paired with translated terms to look at science fiction in multiple languages. This data filled in the gaps left behind by the Amazon research and the survey questions. The search looked at what websites were saying about science fiction in more than a dozen different languages. Two terms were used in each search. One term was "science fiction" and was translated into the target language, and the second word used was either "future," again translated into the target language, or the translated version of the word "technology." This was done because the word for science fiction is similar in many languages, so the secondary word ensured that only results in the targeted language would show up. Two words were needed to ensure that the data was more accurate. For example, the French word for science fiction is exactly the same as the English word, and the only difference between the English word and the German word is a dash. The languages used were chosen partially based on the Amazon data: the six languages that appeared in the Amazon data were used, and additional languages were added if they appeared somewhere in the results. A few languages from areas that were notably absent were also added. Using the website Google Translate, science fiction was translated into Arabic, Chinese, Croatian, French, German, Hindi, Italian, Japanese, Russian, Spanish and Swahili (Google Developers 2012).

English: science fiction	English: technology	English: future
French: science fiction	French: technologie	French: avenir
Japanese: サイエンスフィクション	Japanese: テクノロジ	Japanese: 将来
Italian: fantascienza	Italian: tecnologia	Italian: futuro
Spanish: ciencia ficción	Spanish: tecnología	Spanish: futuro
German: Science-Fiction	German: Technologie	German: Zukunft
Chinese: 科幻小说	Chinese: 技术	Chinese: 未来
Croatian: naučna fantastika	Croatian: tehnologija	Croatian: budućnost
Hindi: साइंस फिक्शन	Hindi: प्रौद्योगिकी	Hindi: भविष्य
Arabic: القمص الخيالي	Arabic: التكنولوجيا	Arabic: المستقبل
Russian: научная фантастика	Russian: технология	Russian: будущее
Swahili: Sayansi ya Kubuniwa	Swahili: teknolojia	Swahili: baadaye

Table 7: Chart of Translations

### *A Simplistic Pattern Was Sought*

While Condor is an advanced tool, a relatively simplistic pattern was sought. Were there numerous nodes, and how connected are the nodes? How thick or thin is the network? The "thickness" or "thinness" of the network was used to determine if science fiction being was being talked about or possibly created in the specific language.

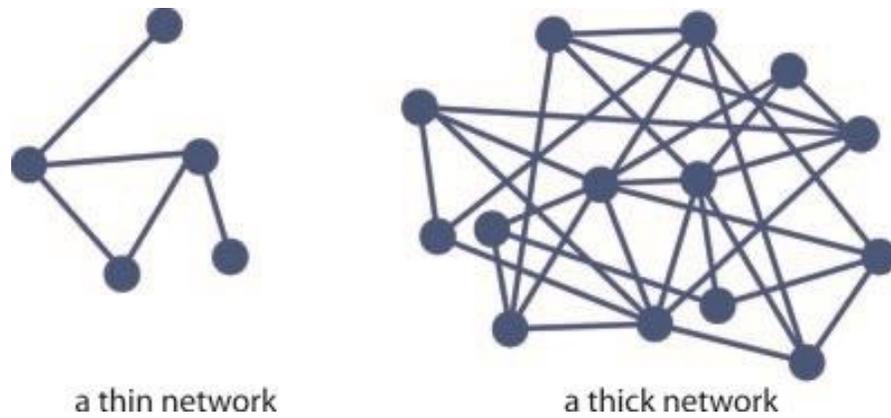


Figure 28: An Example of a Thin Network and a Thick Network

As was expected, some languages had thinner networks than others. The Swahili search results were the thinnest. The Swahili term for science fiction and technology only had one website connected to the term. The Swahili name for science fiction and future was just as thin and also had a single website being linked to it. The website that was found in both searches was the same. This indicated that science fiction, at least not online, was not popular in places where Swahili is spoken.



"sayansi ya kubuniwa" and baadaye in ["Sayansi\_ya\_Kubuniwa\_and\_baadaye\_depth\_googleajx]

"sayansi ya kubuniwa" and teknolojia in ["Sayansi\_ya\_Kubuniwa\_and\_teknolojia\_depth\_googleajx]

Figure 29: Swahili Translations for Science Fiction, Future and Technology or "Sayansi ya Kubuniwa," "baadaye" and "teknolojia" <sup>26</sup>

### *Science fiction, Technology and Future*

Other languages had a substantial difference between the terms “future” and “technology.” The two Condor searches for Arabic were very different. The Arabic translation of “science fiction” paired with “technology” had a number of websites and some small galaxy patterns were found in the data. It is relatively thick, this would indicate science fiction is talked about (GalaxyAdvisors 2010).<sup>27</sup> In contrast, the Arabic translation of "science fiction" paired with "future" was a star shape and it contained no galaxy

<sup>26</sup> The program "Condor" was used in September 2012. Condor is a program that was created by GalaxyAdvisors for network analysis. The program harvests data from online sources and creates a visual map of that data.

<sup>27</sup> Each node represents a single website.

patterns. The pattern found in the Condor search was also very thin, with few websites included in it.

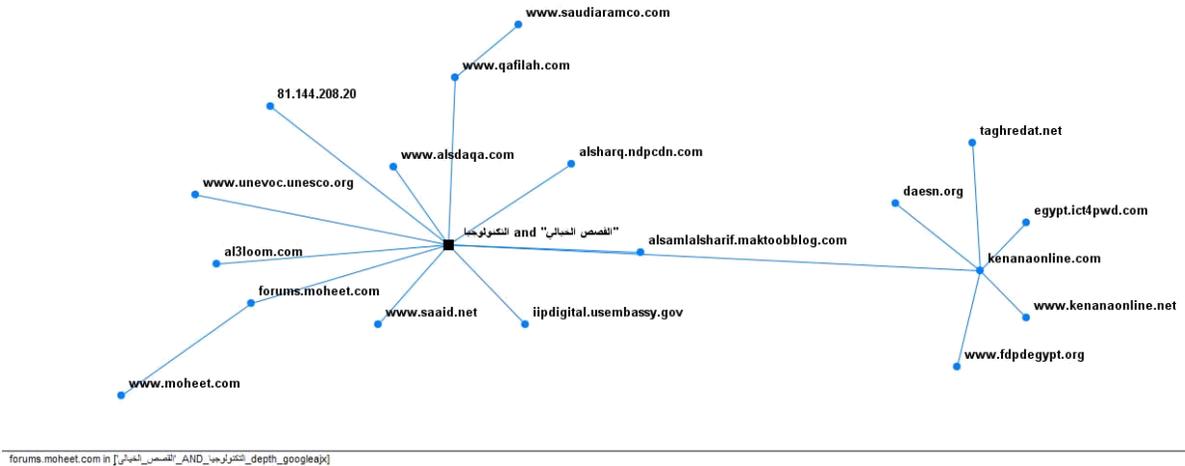


Figure 30: Arabic Translations for Science Fiction and Technology or "القصة الخيالية" and "الذكورونجيا" "المس تق بل"

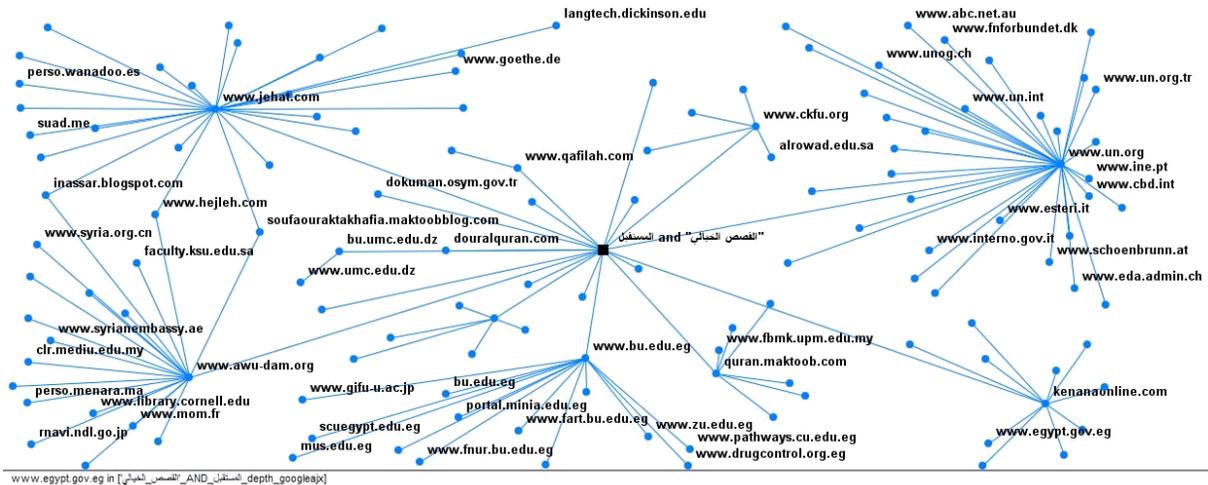


Figure 31: Arabic Translations for Science Fiction and Future or "القصة الخيالية" and "المستقبل" "ال تك نول و ج يا"

### *Do the Country Codes Match?*

It was noticed that the domain names did not all end in ".com, .net, and .org." The URL Country Codes, the last part of a URL or the "country code top-level domain," indicated that the origins of discussions were worldwide (ibiblio.org 2012). Because each nation is assigned a unique country code, it is sometimes possible to trace a website back to the country of origin. While a country can sell a domain name to a private organization, this happens mostly in the case of ".fm" or ".tv"; the country code "Gov." always belongs to governments (Icann.org 2012). In the Arabic technology data set, country codes from various nations appeared, some in northern Africa or Western Asia, but also from eastern Asia, Europe, and Oceania. Country codes for nineteen different nations appeared within the Arabic technology set alone. Even though most of the connecting websites were ".org," there was an ".eg," an Egyptian domain name, that connected to a ".jp" domain, which is Japanese. This is a sign that there is a global conversation.

ae =	United Arab Emirates	dz =	Algeria	ma =	Morocco
at =	Austria	eg =	Egypt	my =	Malaysia
au =	Australia	es =	Spain	pt =	Portugal
ch =	Switzerland	fr =	France	sa =	Saudi Arabia
cn =	China	me =	Montenegro	tr =	Turkey
de =	Germany	it =	Italy	int=	international
dk =	Denmark	jp =	Japan		
gov.eg =	Government of Egypt	gov.it =	Government of Italy		

**Table 8: Country Codes That Appear in the Arabic Language Data Set (Icann.org 2012)**

The Arabic data set was not the only language that had a noticeable difference between the two searches. Both searches done in Croatian revealed that there were websites mentioning science fiction in that language. The Croatian language data had a similar structure as the Arabic language data, mostly collections of stars with a few galaxy patterns. The Croatian “future” search also had a diverse set of country codes, and a diverse set of Wikipedia language prefixes appeared within it (Wikimedia.org 2012). All together, fifteen country codes were present. With the exception of “.tv,” most of the domain names are likely to be associated with the country they belong to (VeriSign 2012). The Condor search also had fourteen Wikipedia links connected in various different languages, including English and Russian.

<b>ba =</b>	Bosnia	<b>hr =</b>	Croatia	<b>se =</b>	Sweden
<b>ca =</b>	Canada	<b>hu =</b>	Hungary	<b>si =</b>	Slovenia
<b>de =</b>	Germany	<b>it =</b>	Italy	<b>tk =</b>	Tokelau
<b>eu =</b>	European Union	<b>me =</b>	Montenegro	<b>tv =</b>	Tuvalu or Television
<b>ge =</b>	Georgia	<b>rs =</b>	Russia	<b>uk =</b>	United Kingdom

Table 9: Country Codes That Appear in the Croatian Language Data Set(Icann.org 2012).

### Japanese and Chinese Data Set

The Japanese and Chinese searches were both of particular interest because a low amount of results came up during the Amazon searches. The question became, would the results from Condor's web search show a different picture than that of the Amazon.com analysis? This would show that even though they are not buying science fiction based products, customers are still talking about science fiction.





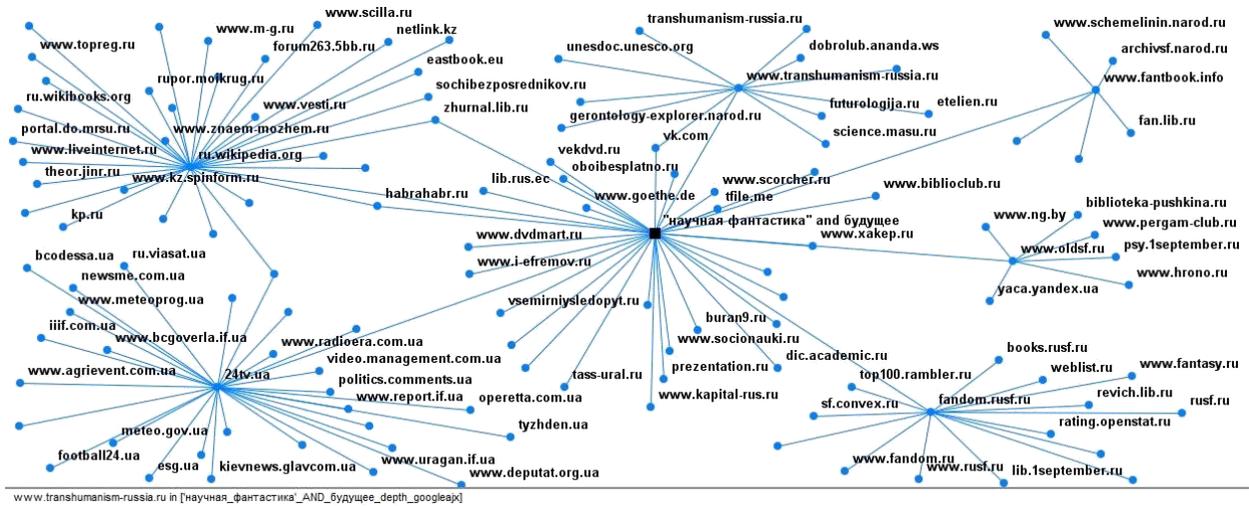


Figure 34: Russian Translations for Science Fiction and Future or "научная фантастика" and "будущее"

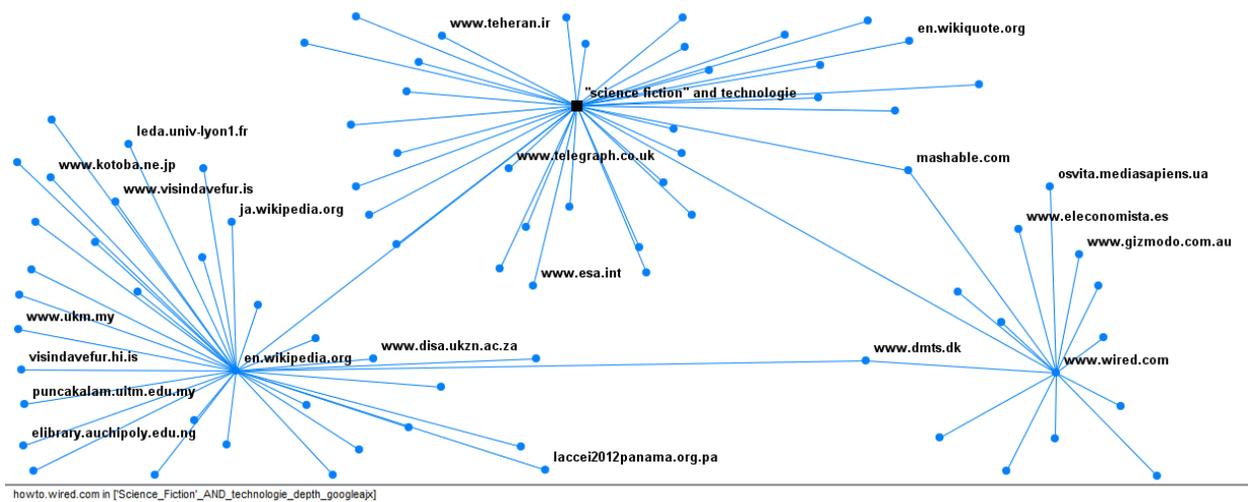


Figure 35: French translations for Science Fiction and Technology or "science fiction" and "technologie."

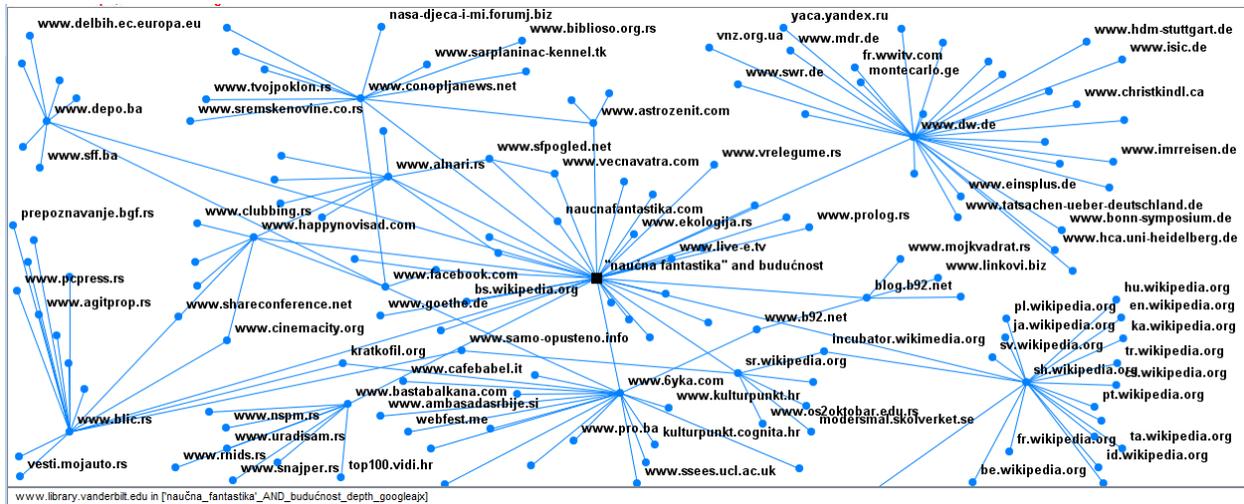


Figure 36: Croatian Translations for Science Fiction and Future or "naučna fantastika" and "budućnost.."

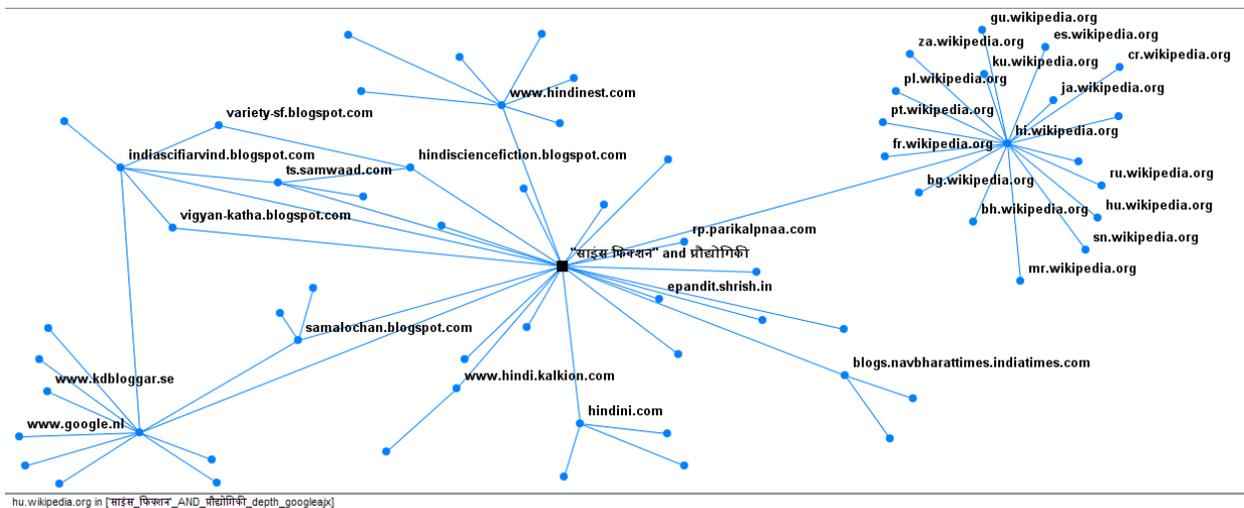


Figure 37: Hindi Translations for Science Fiction and Technology or "साइंस फिक्शन" and "प्रौद्योगिकी."

Most of the languages have at least one of the two terms, future or technology, which created a similar pattern: primarily sets of stars with a few galaxies. The most galaxies were not found in the big Western languages, such as French, English and

Spanish, but in the thick data set for Croatian and the thinner data set for Hindi. This is some of the strongest evidence that science fiction is a global phenomenon.

Overall, this data suggests that science fiction is being talked about in different languages and in different places. This, along with the Amazon data, strongly shows that science fiction is global.

## Published Science Fiction Stories

### *Astounding Data Categories*

A vast amount of data was collected from published science fiction stories. The data was used primarily to help answer my first research question: Are there factors or patterns within science fiction that can be used as a foreshadowing tool that indicate emerging or potential technology might become a reality?

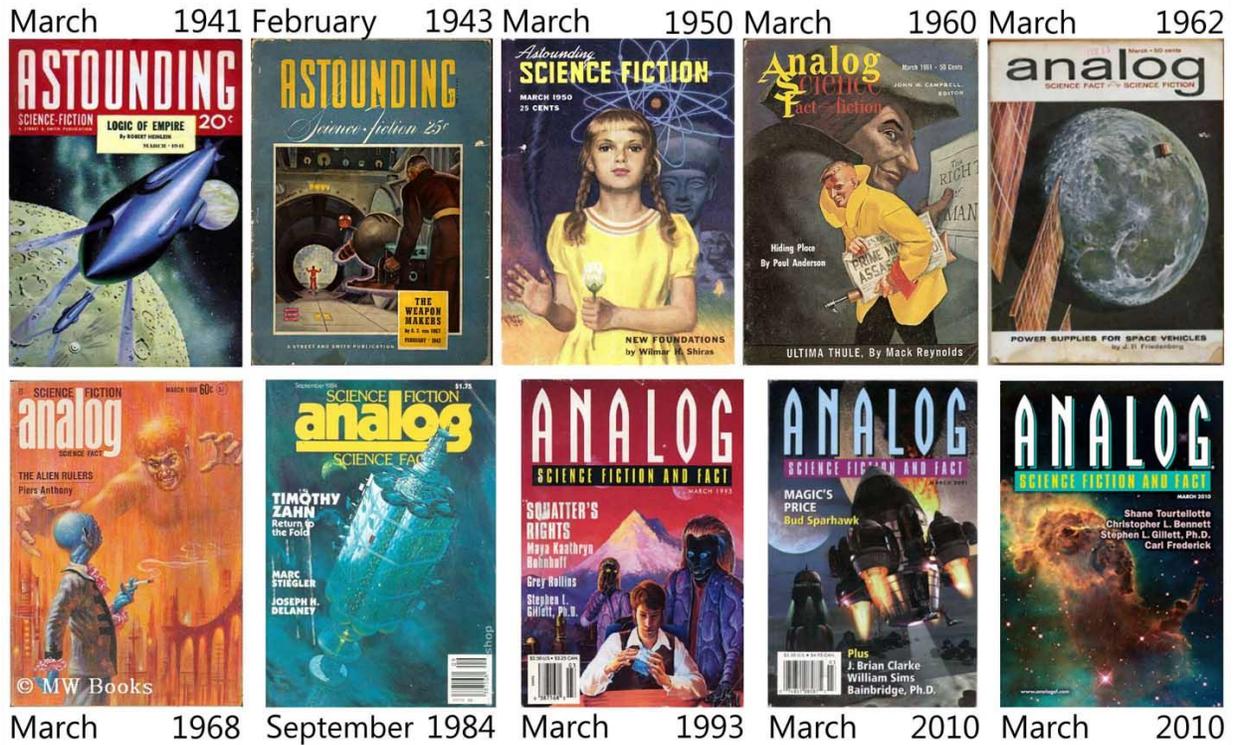


Figure 38: *Astounding* and *Analog* Covers Ranging from the 1940s to 2010.

The data is made up of data collected from *Analog Magazine*, previously called *Astounding Magazine*. As explained in chapter 3, this data was divided into two time periods corresponding to the change in the magazine's name. The complete unedited data set had over two thousand entries. The data collected was divided into different categories based on their content.

These categories are:

- "Has Happened,"
- "Happened in Part or Only Limitedly,"
- "Has Not Happened But Still Could,"
- "Did Not Happen or Is Unlikely,"
- "Changed, Replaced or Stopped" and
- "Stayed the Same."

This was done both to discover patterns and because the ultimate goal of this thesis is to develop a tool. The category with the data that is *still possible* makes up the largest amount of the total data in the *Analog* data set, and the second largest category in the *Astounding* data sets. This category is notably larger than any other category in the *Analog* data set at forty-two percent. This category is made up of foreshadowed technologies that have a potential to become actualized. This finding was surprising because it was expected that more data would fall into the highly unlikely category. This means even older science fiction contains a great deal of potential technologies that may yet be realized.

Percent of Each Category Compared to the Total Data

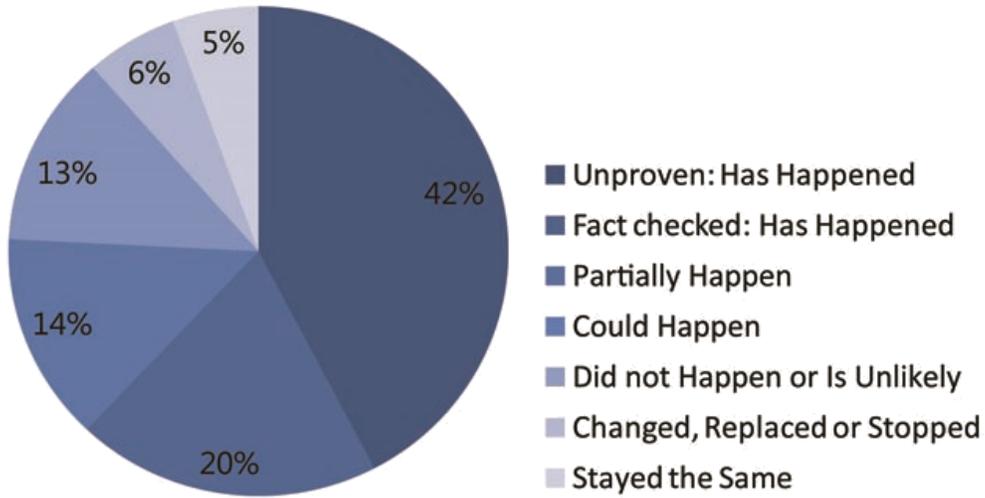


Figure 39: *Analog* Data Subdivided into Seven Categories

Percent of Each Category Compared to the Total Data

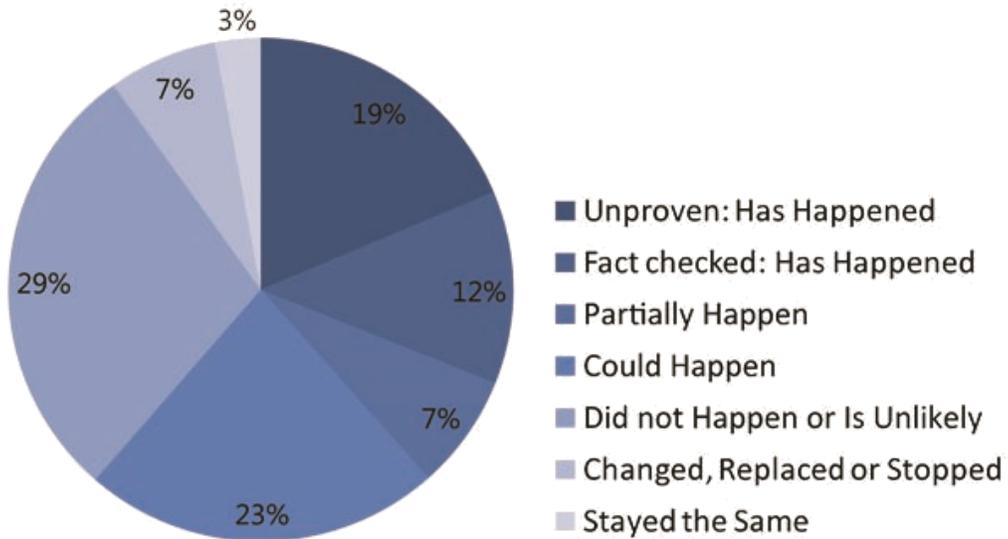


Figure 40: *Astounding* Data Subdivided into Seven Categories

“Has happened” only makes up fourteen percent of the total data in the *Analog* set, and “fact checked” makes up less than ten percent of the total data. The interesting difference between the *Analog* and the *Astounding* data is that the *Astounding* data has a higher percent of “has happened” than the *Analog* data. This is important because it means that over time science fiction “foreshadows” are more and more likely to come true, meaning that science fiction will most likely continue to foreshadow future events.

### **Science fiction Idea to Actualizations**

The data points used are made up from taking forecasted technology or cultural events and comparing them to technology that exists in the real world or cultural shifts.

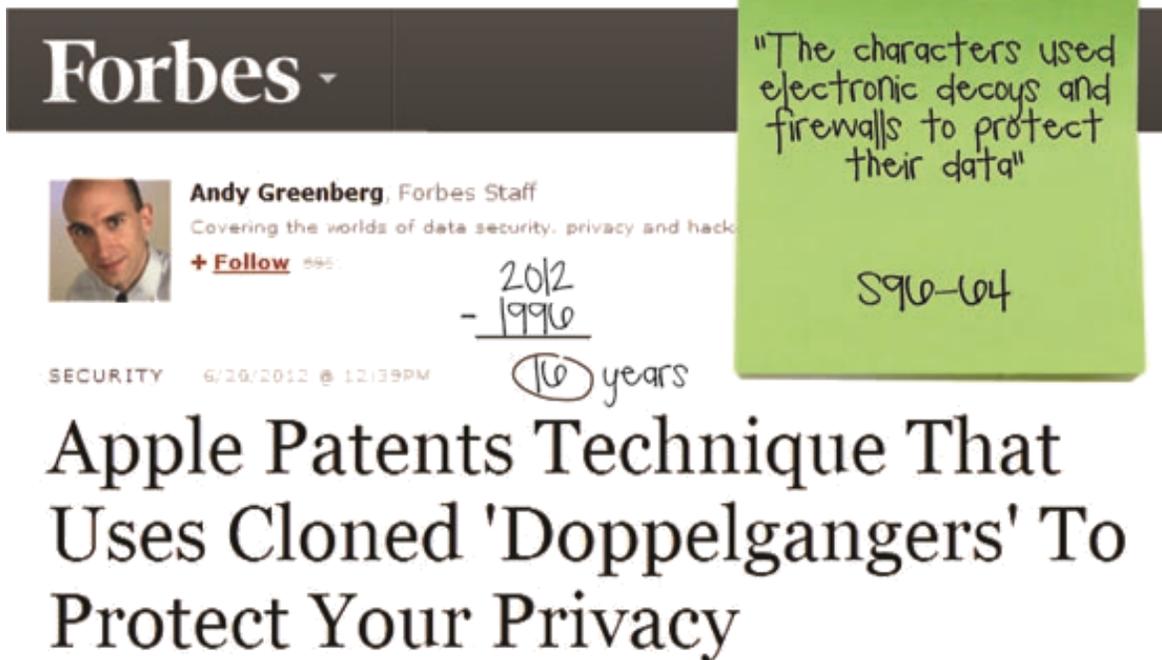


Figure 41: Science Fiction Technology Was Compared to a News Article<sup>28</sup>

The time ranges were determined by matching the story reference, or foreshadow, with a technology or cultural shift that actually happened. For example, "The characters used electronic decoys and firewalls to protect their data" was matched with the following innovation: "In 2012 Apple started using a 'Doppelgangers,' or decoys that puts out false data to protect online privacy"(Greenberg 2012). The difference between the year it was published, 1996, and the year that a similar technology happened, 2012, is the range that appears below the figure. The amount of time between the foreshadowed and the real technology or cultural shift is listed in Figure 42.

<sup>28</sup> This was done to determine the length of time between the 'Foreshadow' and 'Actualization.'

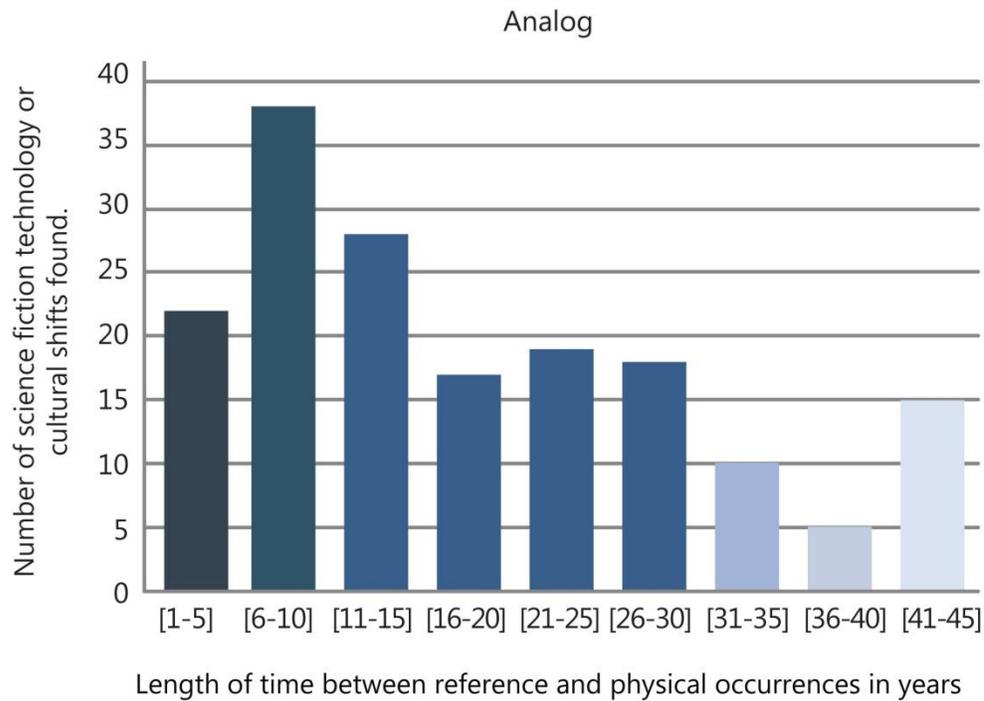


Figure 42: *Analog* Foreshadowed to Actual Technology or Cultural Change <sup>29</sup>

Within the *Analog* data there was a tendency for the foreshadowed technology or cultural shifts to resemble developed technology or actual cultural shifts in a little less than one decade. There were thirty-eight individual foreshadowed technologies or cultural shifts noted that highly resembled developed technology or real cultural shifts between six and ten years, which is approximately one quarter of the total amount of data sets. The

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<sup>29</sup> The numbers on the left of the figure represent the number of individual technology or cultural references found. For example, "The characters used electronic decoys and firewalls to protect their data" would count as a single technological reference.

mode was eight years. The second largest cluster of foreshadowed technology or cultural shifts that highly resembled developed technology or real cultural shifts is between ten and fifteen years. More than a third of the accurately foreshadowed technology or cultural shifts had a time span of between six and fifteen years from literary ideas to real physical or cultural things. It should also be noted that after forty years, there is an increase in the amount of technology or cultural shifts that are realized, although it represents less than ten percent of the total data.

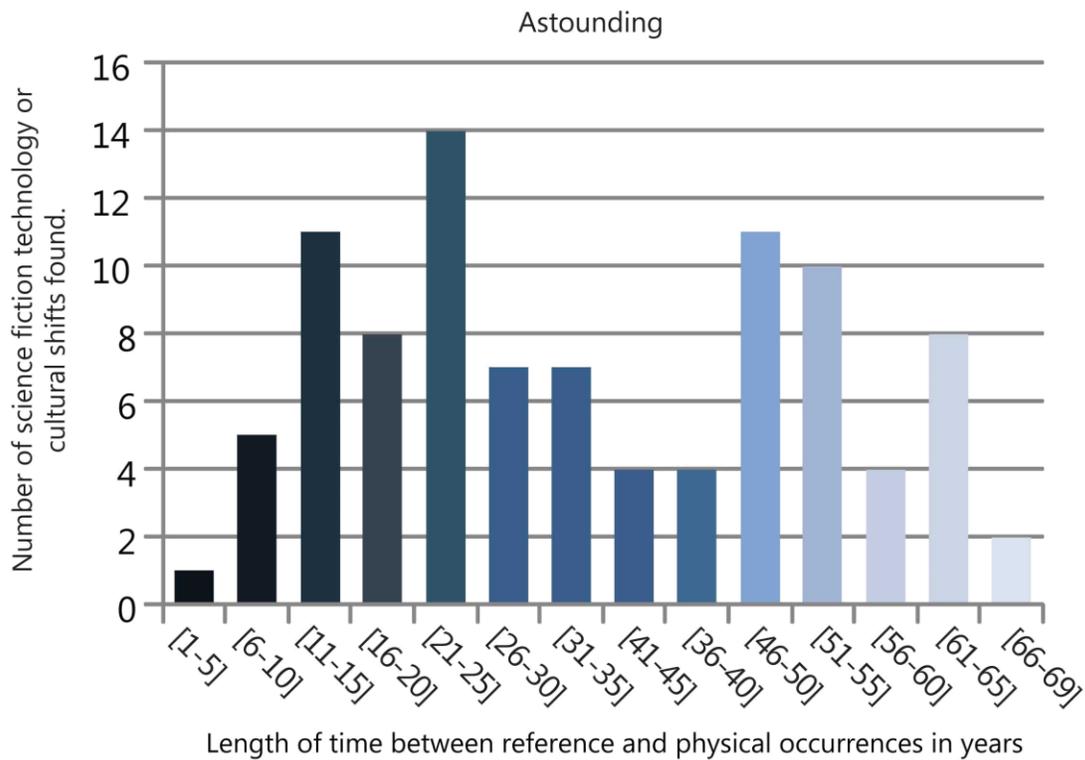


Figure 43: *Astounding* Foreshadowed to Actual Technology or Cultural Change <sup>30</sup>

The second data set is more diverse than the first. The maximum time period between science fiction technologies or cultural shifts and actual technologies and cultural shifts for the *Astounding* data can be up to sixty-nine years, while the *Analog* data has a maximum time difference of only fifty years. It is also a smaller data set with a little more than half the data nodes of the *Analog* set. In the *Astounding* data the

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<sup>30</sup> It should be noted that a single piece of data represents the amount of time it takes for an individual foreshadowed technology or cultural shifts to resemble developed technology or actual cultural shifts.

foreshadowed to real has four peaks, two with relatively short periods between foreshadowed and actual and two with relatively longer periods between foreshadowed and actual. The first is 11 – 15 years and the second, and largest, is from 21 – 25 years. This is where the bulk of the foreshadowed to real data nodes sit. The cluster that ranges from 11 – 25 years has thirty-four percent of the data. The second cluster that consists of the third and fourth peak has a much longer time shadow, with the ranges sitting between 45 and 55 years. And even though it is smaller than the first cluster, it still holds twenty-two percent of the data.

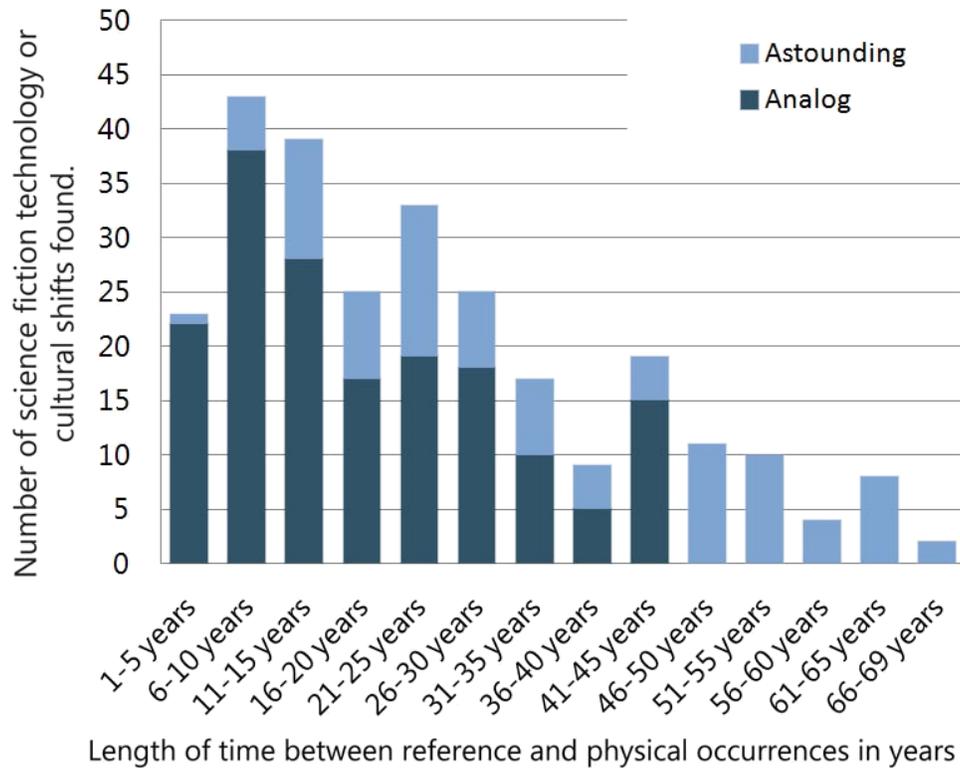


Figure 44: *Analog*, *Astounding* and Combined Foreshadowed to Actual Technology or Cultural Change <sup>31</sup>

In comparing the data sets, four peaks are evident: three in the *Analog* data, three in the *Astounding* data and four in the combined data set. The first peak in the *Analog* data occurs before the first peak in the *Astounding* data, but the peaks in both data occurred close to the ten year mark. The second peak takes place at 21 – 25 years in both data sets and becomes apparent when the two data sets are combined. The third peak is

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<sup>31</sup> It should be noted that each data point is represents the amount of time it takes for an individual foreshadowed technology or cultural shifts to resemble developed technology or actual cultural Shifts.

also staggered but takes place near the 45 year mark, and the last peak comes solely from the *Astounding* data. These peaks show that there are patterns. The data indicates current science fiction can be used to look at possibilities for a decade, or two decades in advance, and forty years in advance.

## Discussion

The data showed that there were patterns in science fiction foreshadows becoming actualized in real technology, or cultural shifts. It is unclear why this is; however, there are potential explanations as the section below explains.

### **The Data Sets Did Not Match**

There were several peaks in the data but the two groups did not have the same ones. The *Analog* data's first peak occurs sooner than the *Astounding* data's peak, but reason is unknown. This could have been caused by several factors. The sample size for the *Astounding* group was much smaller than the *Analog* group of data. This discrepancy could be from precision; the author of this thesis is not a historian and all the data could not be fact checked. It was sometimes unclear when technology was first invented or started to be commonly used, and it was sometimes unclear when a cultural shift

precisely happened. A practical explanation could be that some of the data sets from *Analog* were published less than a decade before this thesis was written. It can potentially take ten years for a plausible idea to be brought to market or widely used. Given more time, the foreshadows featured in the stories could be developed, tested and actualized.

### **The Data Tapers Off After 10 Years**

These theories do not explain the larger pattern seen in the data. None of the theories explain the tapering off effect seen in the data, even though one of the theories does potentially explain the later peak in the *Astounding* data.

### **Explanation of the Patterns**

If inertia is paired with an understanding of user needs, it could explain why there is an initial increase and why there is a secondary increase of foreshadows becoming real technologies or cultural shifts later on.

### *Inertia Is Key*

The ten year increase might be caused by inertia. As discussed by van der Heijden, inertia loses strength the more time passes (van der Heijden 1996, 95). Science fiction authors could be picking up weak signals and concluding that they would most likely be amplified in the next decade. More and more unknown factors would change the course of technological advancements over time, making their predictions less accurate over time.

### *An Understanding of User Needs Is Key*

The secondary increase after forty years could be explained by authors' understandings of potential user needs. Both the interviews and the surveys done for this thesis indicated that some science fiction writers consider user needs and human desires when creating a technology. Considering potential needs and novel uses of technologies that have not yet been created could overcome the limitations of inertia. These ideas could be based off abstractions of possible trajectories of current technologies, but because these ideas are not directly tied to current technological knowledge, their development could potentially take a longer time. These ideas have a tendency to be

descriptions of what the technology does rather than how the technology specifically functions. This allows an author to consider technologies that are not currently possible.

## Summary

The research has helped to provide answers to the research questions. The interviews along with surveys have indicated that science fiction authors have similar thinking processes as designers when thinking of potential future technology. Authors are considering possible trajectories and are considering both the human element and the cultural impact of technology.

The sampled science fiction has not only showed patterns but provided examples so that a list of factors could be developed. The online research and additional surveys indicated that science fiction is indeed global. Together this research will now be examined again to develop a method to actively use science fiction to assist with strategy for organizations.

## CHAPTER 5 DESIGN AND ARTIFACT

### Framework

Science fiction is an untapped resource for business and design decision makers as it consists of scenarios and forecasts of future societies, either far future or near future, and explores potential technology. As stated in chapter 1, the objective is to use science fiction as a tool for strategic decision making. This tool could be potentially used by anyone with a stake in the future.

### Introduction

In this chapter the research findings and insights are used to develop a method, or a tool, through which business people, entrepreneurs and managers can utilize works of science fiction to identify plausible futures and help them to make informed decisions as a way to prepare for future changes. This artifact consists of a central scheme built upon both the trial and error cycle and the learning loop and will incorporate a series of activities that were derived from the findings in chapter 4. The central scheme will be used as a core to provide a base in which someone using this system can navigate and use the smaller tools.

The basic idea behind this method is to create a system that design managers and entrepreneurs can use to help them prepare for potential unexpected conditions.

The final product is by no means a replacement for scenario planning but rather an expansion and a way to utilize stories about the future.

### Concept Exploration

In chapter 1 the question was asked: How can the vision of science fiction and science fiction creators be applied to the decision makers in the business and design worlds? This following section will focus on preexisting tools that could be examined in order to make a system to answer that question.

#### *The Trial and Error Cycle*

The trial and error cycle of product development in the book *Democratizing Innovation* looks surprisingly like Kolb's "learning loop"(van der Heijden 1996, Von Hippel 2006). By looking at them together it becomes clear that there are similar types of thinking in product development and in scenario creation. Both of these cycles represent a double loop.

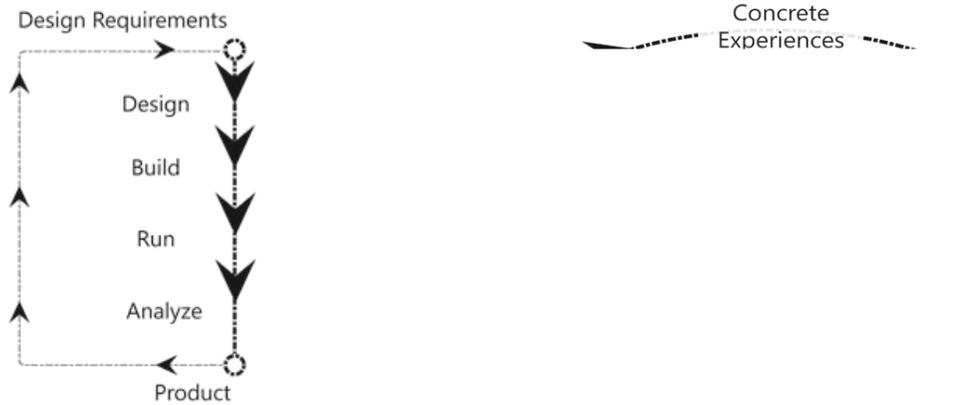


Figure 45: The Trial-And-Error Cycle  
(Von Hippel 2006)



Figure 46: Kolb's Learning Loop (van der Heijden 1996)

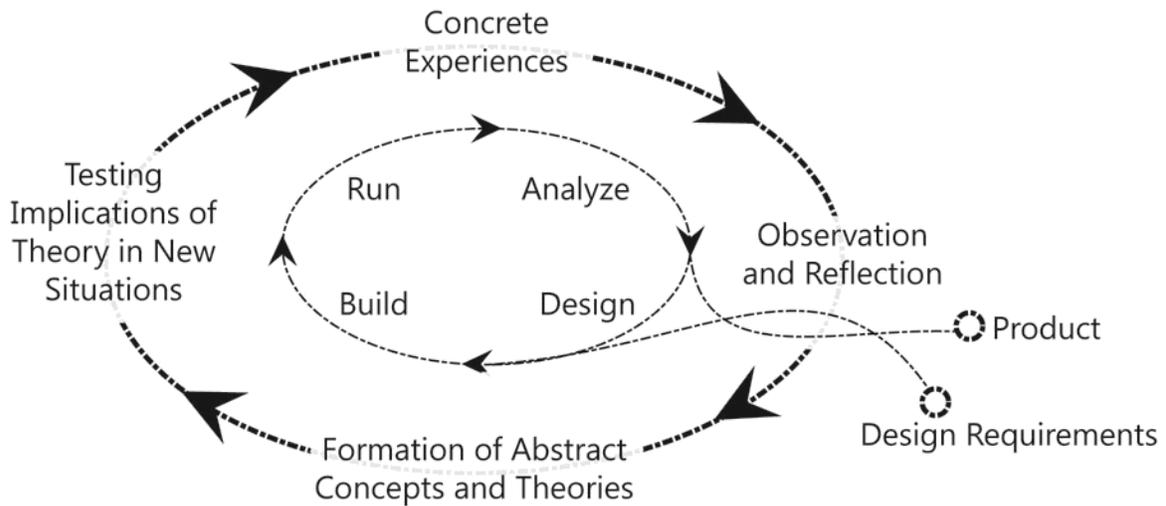


Figure 47: The Trial-and-error cycle with in Kolb's "learning loop"

The two cycles are very similar. Both have four parts, and both are based on the concept of constant revision. Because of their apparent similarities, they were combined in order to further examine their similarities. While the names are different, both loops have extremely similar concepts. Each cycle has four steps involved that somewhat

correspond. When the new cycle was created, as shown in Figure 47, *Design* was linked with *Formation of Abstract Concepts and Theories*, *Build* was linked with *Testing Implications of Theory in New Situations* but was also loosely linked with *Formation of Abstract Concepts and Theories*, *Run* also was linked with two ideas, it was linked with *Concrete Experience* but it could also be connected with *Testing Implications of Theory in New Situations*.

For example, if someone is designing a toaster, this person would most likely start with the design requirements: it must toast bread, it must not burn the consumer. After the design requirements are determined, then the designer develops a new concept for the toaster, or *Designs* the new toaster. This could be something like adding an egg cooking station or a horizontal toaster to melt cheese. After ideas about how the toaster should look and feel are formed, the toaster could be built; this *Building* could be in the form of drawings, models or prototypes, or an actual test of the product. *Testing* could be in the form of building or trying the new type of toaster or trying different variations of the toaster. One version of a toaster could be created in chrome, or one in black. *Running*, or *Testing Implications of Theory in New Situations* could also mean user testing the product or conducting experiments. It could also mean waiting to see what issues arise without doing any organized testing. *Analyze and Observation* and *Reflection* could mean

processing the information gathered and seeing if this new toaster is an improvement on the last version. Does it toast better?

### *Creating a New Cycle*

The attributes from the trial and error cycle and the learning loops do not line up completely and need to be adapted in order to utilize science fiction. Testing *Implications of Theory in New Situations*, *Build*, *Concrete Experiences*, and *Analyze* do not match evenly and *Build* is out of scope for this project. Because of this four attributes were used from the two cycles, *Design* and *Analyze* were drawn from The Trial-and-Error Cycle and *Test* and *Observe* were taken from Kolb's Learning Loop and a fifth one was added

There were several possibilities for the fifth process. One possibility was to add an additional *Reflect*. This was deemed unneeded because that could fall under *Analyze*, or even *Observe*. *Collect* was chosen because research is a vital part of the design process and collecting information is vital in understanding problems. Because of this it was added to the cycle.



Figure 48: Adapting the Cycle for Science Fiction

### Lessons Not Learned from Science Fiction

Science fiction does not necessarily predict the future; sometimes the authors' vision of the future bears little to no resemblance to our modern world, and never will. As *The Writer's Guild to Creating a Science Fiction Universe* notes, "[science fiction] is as famous for its wrong predictions as it is for its right ones" (Ochoa and Osier 1993, 198).

The question becomes: are only the correct predictions worth examining, or is there some use in looking at the things that science fiction authors got wrong? Perhaps it is possible to learn from these mistakes by examining what they have in common. Are there repeating themes in the wrong foreshadows?

These wrong foreshadows are potentially just as useful as the correct foreshadows if we can determine some of the reasons why they were not actualized. For this reason a

collection of inaccurate foreshadows was gathered. They were used to help find traits that make foreshadows more or less likely. This further explores the question: Are there factors or patterns within science fiction that can be used as prediction tools that indicate which technology might become a real technology or consumer goods? This also leads towards an application and answers the question: How can the vision of science fiction and science fiction creators be used to guide strategy in the business and design worlds?

### *Developing the Framework*

A list of factors was created to help determine if a science fiction foreshadowed technology will or will not become a real world technology. These factors were created based both on elements found in the failed foreshadows and the successful foreshadows. For example, in a 1980s short story, the author wrote about a "Stenobot"; she described it as a humanoid robot who would take notes. This technology was never invented and is not needed because of the invention of the word processor and because speech to text technology has replaced the very need for this technology to actualized (Schwartz 1980a).

This example would be included under: Is there some other technology that will fulfill the same need?<sup>32</sup>

#### Factors

- Is there a strong desire or need for this technology?
- Is there some other technology that will fulfill the same need?
- Is society changing in a ways that it will no longer be needed or desired?
- Does this technology require a dramatic and quick change of habits or life styles.
- Who would use it? Is it a niche group or does it have potential for other applications?
- Is it practical?
- Is the technology affordable?
- Will it likely be affordable in the future?
- Does the technology have multiple uses, or is it locked into one use?
- Is it perceived as an improvement or does it have an advantage making it worth the investment?
- Is it likely that future uses could be added to this technology?
- Is the technology rapidly improving?
- Is it more complex than previously thought?
- Is it more harmful than previously thought?
- Is it likely that this trend will or has this trend gone in the opposite direction

**Table 10: Factors Developed From the Foreshadows**

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<sup>32</sup> A list of science fiction failed technologies can be found in Appendix C.

This is not dissimilar to Clarke's three laws of predictions or Rogers' perceived attributes (Clarke 1999, 14). Both of these lists could be compared to the factors list created for this thesis. Clarke's list focuses on the realm of possibilities or what elements would make it more or less likely for a science fiction technology to be actualized; the list is short but each law is to the point.

Clarke's Three Laws are rules that govern prediction:

- When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong.
- The only way of discovering the limits of the possible is to venture a little way past them into the impossible.
- Any sufficiently advanced technology is indistinguishable from magic.

**Table 11: Clarke's Three Laws (Clarke 1999)**

Clarke's laws are simple but provide a unique way of looking at possible future technology.

Roger states that "it should not be assumed, as sometimes has been in the past, that all innovations are equivalent units of analysis. This assumption is a gross

oversimplification"(Rogers 2003). His Attribute list is short but covers many of the same general ideas as the list developed from the science fiction stories.

Perceived Attributes of Innovation are as follows:

- Relative Advantage
- Compatibility
- Complexity
- Trialability
- Observability

**Table 12: Attribute List (Rogers 2003)**

This list resembles the much shorter attributes list. Relative advantage could match with affordability, multiple uses, or if it is perceived as an improvement. Factors such as if the technology would require a change of habit fits nicely under compatibility. Complexity would affect multiple factors, such as if the technology or cultural shift would require a dramatic change of habits or lifestyles or if the complexity would exhibit development. Factors such as practicality and if it is aimed at a niche group could fit under trialability, because if it is not practical it will not be accessible. Observability could

translate into affordability, and also might be affected by the target is a general audience or a niche group.

## Discussion

In this section we will examine each of the factors and look at foreshadowed that were matched to the factors that were previously discussed. There are two general categories of foreshadows, ones that have been *successful* and ones that have *failed*. The successful foreshadows come from the *Has Happened Fact Checked Analog* and *Astounding Data* sets. The *failed foreshadows* are from two data sets, *Did Not Happen* or *Is Unlikely* and *Changed Replaced* or *Stopped*.

It should be noted that these factors do not exist in isolation; if a technology is strongly desired but not currently affordable, it is likely there will be some effort to make the technology more affordable or services might be developed around this technology. For example, farmers do not always own all of their harvesting machinery, but because this technology is essential to them, they may form a co-op with other farmers in order to utilize the technology.

<i>Is there a strong desire or need for this technology/cultural shift?</i>	
<p><i>Failed Foreshadows: No, there is not a strong desire or need.</i></p> <ul style="list-style-type: none"> <li>• The apartment had wall to wall glowing carpet (Sheffield 1986).</li> <li>• Holographic TV completely replaced normal TV in the story (Callin 1983).</li> <li>• The story showed paper magazines popular far in the future. "fell over a magazine stack in the room"(Zettel 1999).</li> </ul>	<p><i>Successful Foreshadows: Yes, there is a strong designer or need.</i></p> <ul style="list-style-type: none"> <li>• "Artificial Satellites with a "smug" looking computer, men on ships get "favorite programs" to men on ship (Sanders 1960).</li> <li>• Heart and lung "exciter" (It was described as a heart and lung machine) (Rey 1942).</li> <li>• Make an artificial skeleton from "porous silicone plastics" (Asimov 1946).</li> <li>• Password required for "logic" (computer) but a virus could break it. Sounded extremely similar to a password protected computer (Leinster 1946).</li> <li>• News update hourly, 10th addition of that day. (Is similar like the news media of today) (Garrett 1959).</li> <li>• In the story there was an increase in and official nurse practitioners and they had to get officially recognize. (Rey 1942).</li> </ul>

Table 13: Is There A Need For It?

The rationale behind this factor was if there is a strong enough need, or desire; other factors such as cost would not be as big of a barrier because more resources would be allotted to the development of this technology or cultural change.

Examples of foreshadows were chosen and will be discussed. While it might be possible to install wall to wall glowing carpet, and may have been done in limited instances, it was categorized under the failed science fiction because it is not strongly desired. The story takes place in a residential apartment, and done to the extreme (Sheffield 1986). The second failed foreshadow was listed not because it is not possible that holographic TV may come into existence, but because they completely replace normal television in the story. 3d media completely replacing 2d media could be compared to television completely replacing radio; television became popular but did not replace the desire for radio. While there may be a strong desire for holographic technology there would most likely still be a desire for 2d media as well.

Is there some other technology or habit that will fulfill the same need?	
<p><i>"Failed" Foreshadows: Yes, there is a different technology that will fulfill the same need.</i></p> <ul style="list-style-type: none"> <li>• In the story there was a "galactic postal union" sending paper letter in outer space (Goulart 1977).</li> <li>• "Stenobot" they used a humanoid robot instead of word processor at the university (Schwartz 1980b).</li> <li>• In the story there were Robodrivars, robot would fly cars (Thompson 1990).</li> </ul>	<p><i>"Successful" Foreshadows: This technology replaced an earlier technique or technology.</i></p> <ul style="list-style-type: none"> <li>• Computers make typewriters obsolete (Leinster 1946).</li> <li>• Salt battery salt zinc and agnesium, used (Macfarlane 1969).</li> <li>• The character used voice dictation "dictation to a recorder" not a secretary (Anderson 1953)</li> </ul>

**Table 14: Is There Some Other Technology**

The rationale behind this factor was if there is a competitive technology or cultural shift that fulfills the same need but does it in a manner that is perceived as superior then this competitive technology may replace the original technology.

While it is possible there could be a galactic postal union, the main method of communication would undoubtedly not be via paper, as e-mail and text messages often take the place of letters; it would be reasonable to think that digital communication will continue to be prevalent. The second failed foreshadow features a humanoid robot working as a secretary; this can be paired with the successful foreshadow in which a

computer fulfills the same need as the humanoid robot and also is multifunctional. The failed foreshadow with humanoid robots and flying cars did not happen for similar reasons. The self driving cars are driven by computers not by robots. The computer fulfills the same need but is multifunctional.

<i>Society changing in a way that it will no longer be needed or desired?</i>	
<p>"Failed" Foreshadows: yes, society is changing.</p> <ul style="list-style-type: none"> <li>• In the story there was a problem: More and more unskilled workers are needed (Clement 1966).</li> <li>• Genetically engineered wheat fields cover the Mojave desert by 2008 (Pournelle 1974).</li> </ul>	<p>"successful" foreshadows, no, it is not changing or has changed to need this technology more..</p> <ul style="list-style-type: none"> <li>• Smoking but in the near future (Padgett 1942)</li> <li>• shift from industrial to service economy (Quick 1980).</li> <li>• Trust computers, as a place for original sources (Anderson 1953).</li> </ul>

**Table 15: Is Society Changing**

The rationale behind this factor was that if society changes, the use of the product would be obsolete. There are historical examples of this; for example, with the introduction of cars, many technologies associated with the horse and buggy were no longer needed or desired.

<i>Does it require a change of life style?</i>	
<p>"Failed" Foreshadows: Yes, this change would require a dramatic change of life styles.</p> <ul style="list-style-type: none"> <li>• Food just powder and pills, no need for forks (Anderson 1957).</li> <li>• Real pets rare, artificial pets common (Rosenblum 2005).</li> <li>• Robotic android water. "Seated him at the table of a restraint" (Garrett 1959).</li> </ul>	<p>"Successful" Foreshadows: No, it does not require a dramatic change of habit or a life style.</p> <ul style="list-style-type: none"> <li>• The people in the story drank a lot of coffee (McLaughlin 1958).</li> <li>• A house computer chimed, the computer had a phone with in it and controlled things in the house (Bohnhoff 1993).</li> </ul>

**Table 16: Does It Require a Change of Life Style**

If the technology or cultural shift requires a dramatic or sudden change of life style it is unlikely that it will be quickly and widely adapted. There is a notable exception to this rule: if the desire or need is great enough, people will adapt.

This factor was tested using failed foreshadows. The first was deemed unlikely because food is an integral part of human socializing and eating together is a cultural activity. To completely replace food would require a dramatic change of habit.

<i>Who would use it? Is it a niche group or does it have potential for other applications?</i>	
<p>"Failed" Foreshadows: yes, it is a niche group.</p> <ul style="list-style-type: none"> <li>• Almost everyone lived in a commune (Noakes 1972).</li> <li>• Computers are only used as calculators (Ott 1977).</li> <li>• Only computer "tecs" know how to read computer documents (Brown 1982).</li> </ul>	<p>"Successful" Foreshadows: no, the technology can be used by a wide group of people.</p> <ul style="list-style-type: none"> <li>• "personal coms" (They were like cell phones, everyone had one, all the school kids even had one (Shelley 1989).</li> <li>• In The story the electric cars charging time improved, 1/2 hour charge to drive 200 miles (Oltion 2002).</li> </ul>

**Table 17: Who Would Use It**

If your product is marketed, sold and used by a niche group, the diffusion of the technology or cultural change might be stunted or the stigma of that niche group might affect how the technology or cultural shift is perceived. This is not to say technology that is focused on a niche group may not thrive and be used for a long period of time.

Specialized equipment is often isolated to one group, but it may also be strongly desired by that one group, and that factor may override that it is limited to a niche group.

<i>Is it practical?</i>	
"Failed" Foreshadows	"Successful" Foreshadows
<ul style="list-style-type: none"> <li>• Scientist made a super smart chimp who could use a type writer (Vinge 1966).</li> <li>• Atomic energy in Helicopters (in the not so far future) (Padgett 1946).</li> <li>• everything hovers, tables, chair even the bed (Killough 1984).</li> <li>• Jet powered skates common(Lambe 1979).</li> </ul>	<ul style="list-style-type: none"> <li>• Information on the "card" placed it into the "viewer" (Vance 1955).</li> <li>• Pays with a "card" for a hotel, gives it to "[hotel] registry machine" (Anderson 1953).</li> <li>• "stun" pistol, non leather firearm (Anvil 1959).</li> <li>• Kept digital files not paper files(Wald 1969).</li> </ul>

**Table 18: Is It Practical**

The rationale behind this factor was if the foreshadow or potential product or cultural shift are not accessible, people will not be able to "try" it out and will not be likely to adapt it. *Trilliabilty* affects adoption rate.

<i>Is the technology affordable</i>	
<p>"Failed" Foreshadows: No, this would not be affordable.</p> <ul style="list-style-type: none"> <li>• Humans are on mars with self replacing robots (by 1995) (Gribbin 1985).</li> <li>• Computes and space travel very common by the early 80s (Maxwell 1973).</li> <li>• Humanoid air robots for house work, had eyes and blinked (Jeppson 1988).</li> <li>• "Desk" sized computer for Advanced calculations (only) (Hubbard 1947).</li> </ul>	<p>"Successful" Foreshadows: Yes, this is affordable.</p> <ul style="list-style-type: none"> <li>• Electric cars charging time improved, 1/2 hour charge to drive 200 miles (Oltion 2002).</li> <li>• Solar power used hundred of Parabolic mirrors "sprayed metallic coat" (Sanders 1963).</li> </ul>

**Table 19: Is the Technology Affordable**

This factor is hard to separate from the following question of: Will it be affordable in the future? If it is not affordable, and the desire to have this technology is low, this technology is unlikely to be widely adapted.

<i>Will it likely be affordable in the future?</i>	
<p>"Failed" Foreshadows</p> <ul style="list-style-type: none"> <li>• Moving roadways in LA Chicago and NY (like moving sidewalks, but for cars)(Piper 1950).</li> <li>• A space elevator built by 2018 (Stone 2005).</li> <li>• A large sold force field that can work for 70 years (Spinrad 1964).</li> </ul>	<p>"successful" Foreshadows</p> <ul style="list-style-type: none"> <li>• Phone buzzed, clicked receiver Martha['s] [Face] "showed on the screen" (Leinster 1946).</li> <li>• "Tapes" think card sized, with some data on it (Padgett 1946).</li> <li>• Cab had Wi-Fi connected already in it (Lovett 2006).</li> </ul>

Table 20: Will It Likely Be Affordable?

Computers use to be out of reach for the average person, but because the cost of making computers has become less, and the demand for them because of their multi-functionality is high the technology was widely adapted and became realty.

<i>Does the technology have multiple uses, or is it locked into one use?</i>	
<p>"Failed" Foreshadows: These technologies are locked into one use.</p> <ul style="list-style-type: none"> <li>• Wrist phone, is only a phone (Peirce 1994).</li> <li>• Talk only small communication device (Farrar 1996).</li> <li>• There are Land lines only (Shelley 1987).</li> </ul>	<p>"Successful" Foreshadows: Yes, this technology does have multiple uses.</p> <ul style="list-style-type: none"> <li>• Small communication devices with built in cameras (McCaffrey 1966).</li> <li>• The phone blinked, so they switched away from the encyclopedia (Norwood 1982).</li> <li>• "Wafer computer" did his bills on it (Nicholson 1979).</li> </ul>

**Table 21: Does The technology Have Multiple Uses**

In the first chapter of this thesis the example of a camera was used to demonstrate how a multi-functional product could replace a single function product. Camera companies have to compete with smart phones. People use their smart phones as their camera because the quality is good and it can do more than one thing. Instead of carrying around several pieces of equipment, an individual only has to carry one multi-functional device.

<i>Is the technology rapidly improving?</i>	
<p>"Failed" Foreshadows: The technology has improved and made other technology no longer desired.</p> <ul style="list-style-type: none"> <li>• Brown data cube on the corner of the desk - large and obtrusive data storage (Collins 2002).</li> <li>• Computers printed out everything, there is no screen (Wald 1967).</li> <li>• News disks, not paper but a physical object needed to get news (Pulski 1983).</li> </ul>	<p>"Successful" Foreshadows : Yes, this technology has rapidly improved.</p> <ul style="list-style-type: none"> <li>• Very small very thing computers (Zettel 1999).</li> <li>• Solar powered reader, he "had every book he could think of" (Rollins 2004).</li> <li>• Remote sensors implanted in a body could send signals to medical teams (Wald 1967).</li> <li>• increasing power in computers (Rucker 1980).</li> </ul>

**Table 22: Is The Technology Rapidly Improving**

Computers are a good example of this. If the technology has added features, making it more affordable or morphing in one way, these changes could easily make the technology more affordable; it could also make this technology more desirable and potentially more competitive.

<i>Does this technology require a dramatic and quick change of habits?</i>	
<p>"Failed" Foreshadows: Yes, this would require a dramatic of habits and a fundamental change in thinking.</p> <ul style="list-style-type: none"> <li>• brides hire stand-ins for wedding photos (fake bride or groom) (Bartell 2009).</li> </ul>	<p>Successful" foreshadows: No, these changes could be adapted into current habits or current life styles.</p> <ul style="list-style-type: none"> <li>• "American" Radio Satellites (Sanders 1960).</li> <li>• Read the news on his pocket computer ('dug' the computer out of his pocket to read headlines with it') (Lerner 2003).</li> </ul>

**Table 23: Does It Require A Dramatic Shift?**

If the technology does require a dramatic change of habits, it is unlikely it will be adopted. When TV was introduced people were already used to sitting in their living rooms listening to the radio; while one could say the experience is different, it did not require them to do anything more than what they already were doing.

*Is it perceived as an improvement or does it have an advantage making it worth the investment?*

"Successful" Foreshadows: Yes it is perceived as an improvement worth investing in.

- Doctor "changed" a computer record, computer generated a fake man (Anderson 1953).
- Mechanical brains (very similar to a "computer") is used by everyone, (in business epically) (Oliver 1952).
- Underwater mining, "rich manganese deposits" (McLaughlin 1958).
- "genetics division" of chemical company, genetic engineering done by companies (Anvil 1949).
- There is a built in Antenna, and antenna advances (Padgett 1942).
- There are improvements in Ceramic technology, to be used in space (Sanders 1963).
- Used electronic Decoys and firewalls to protect data (Farrar 1996).
- Remote location devices, bench markers transmit (Tubb 1962).

**Table 24: Is it perceived as an improvement**

People are unlikely to invest in a product if they do not see it as an improvement. If people think a different technology will do what they want better and cheaper it is natural that they will invest in that product over a competing product.

**Is it likely that future uses could be added to this technology? Or is this technology rapidly improving?**

"Successful" Foreshadows: Yes, this technology is rapidly improving.

- He Carried Powerful lights and Cameras where ever he went. (implied it was easy, and light weight) (Cooper 1956).
- A logic (or a PC) speaking voice or video, checking the weather, connecting to programs, checking facts, "who is on today race who was so and so " using a "tank" (servers) to access the data (Leinster 1946).
- Artificial heart (the one in the story had a "battery" under arm pit) (Hall 1963).

**Table 25: Could Future Uses Be Added**

This is taken from a biological trend; species who are adapted to do one specialized thing often go extinct when that environment changes. This is true in the product world as well. Single use products that do one thing very well may be very popular, but they have an inherent vulnerability. A smart phone can take a high resolution picture, and many people will buy a smart phone and not invest in a digital camera. The digital camera's single purpose made it vulnerable.

*Is it more complex than previously thought?*

"Failed" Foreshadows: Yes, it is more complex than previously thought.

- Most diseases cured (Donnell 1945).
- Leave a message in junk DNA (Levinson 1996).
- Cleanly could erase memories by the 1990s (Vinge 1966).
- Computes and space travel very common by the early 80s (Maxwell 1973).

**Table 26: Is It More Complex?**

There is sometimes a case of optimism in science fiction, sometimes this is optimism over how society will change, and sometimes this is optimism on how simple a problem is. This factor is designed to attempt to counter act that.

*Is it more harmful than previously thought?*

"Failed" Foreshadows: Yes, these things were more harmful than thought.

- Drugs are perfectly acceptable and offered like wine (LSD and so forth)(O'Brien 1972).
- Radiation burns not a big deal (Rey 1942).
- Asbestos spacesuits (Pournelle 1974).

**Table 27: Is It More Harmful**

Sometimes a substance's full potential or risks are not known until wide spread use. Radiation is a good example, people simply were unaware of how dangerous it was and that exposure had long term consequences.

<i>The trend went in the opposite direction</i>	
<p><i>"Failed" Foreshadows: This trend has gone in a different direction.</i></p> <ul style="list-style-type: none"> <li>• As technology improved reading decreased. (Goulart 1977).</li> </ul>	<p><i>"Successful" Foreshadows: There continued to be inertia for this trend</i></p> <ul style="list-style-type: none"> <li>• Humans have gone to the moon(Anderson 1957)</li> </ul>

**Table 28: Trend Went In The Opposite Direction**

This factor is unlike the other, sometimes underlining factors for a trend or a technology are not easily discernible and unexpected shifts can happen. There may be some other shift or technology developing that are not known about.

## Activity Cards

### Potential Applications for Factors

These factors could be used in a variety of different manners and have potential practical applications. Activities have been created that utilize these factors.

The activities are on cards. Cards were created because other well known and well used design tools are also in this form. Inspiration for these cards was drawn from commonly used tools such as de Bono's *Six Thinking Hats* and IDEO's Method cards (The

de Bono Group 2012, IDEO 2012). Both the Six Thinking Hats and the Method cards inspire action and give their users direction and guidance.

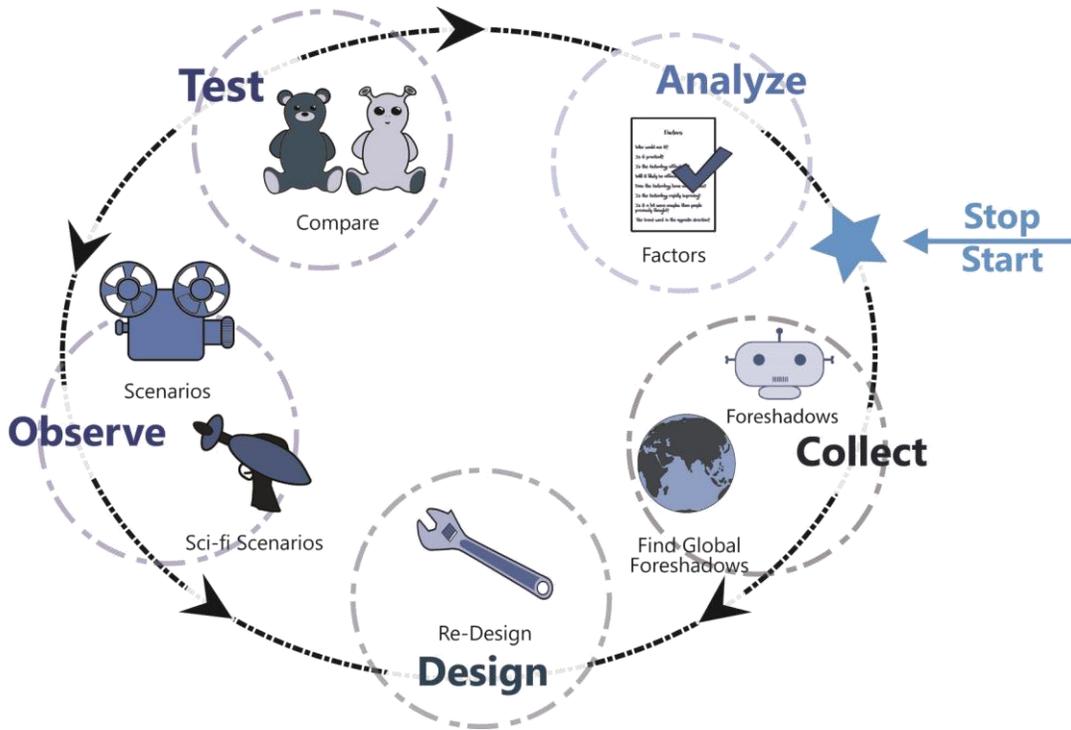


Figure 49: Matching the Cards to the Cycle

These cards are paired with the cycle, and each is attached to a step in the cycle.

These cards represent exercises that are created to facilitate strategic thinking.

## Activity Introduction

The front and back of each card is shown. The front is shown on the right side with an icon and the name of the card, as seen in Table 29. The back has the type of card written on it, and will have the instructions printed on the back of the cards in the final version.<sup>33</sup>

The cards are divided into three groups, **Information Cards**, **Activity Cards** and **Mix Cards**. The user should make two piles of the cards when using them. The first pile should include the **Activity Cards** and the **Mix Cards**. The second pile of cards should initially only include the **Information Cards**, but eventually should include the used **Mix Cards**. As the user "plays" with the tool, he or she should move the "used" Mix cards into the **Information Cards** pile.

The **Information Cards** include a list of foreshadows created by a review of *Astounding* and *Analog Science Fiction and Fact*. They feature a short description of foreshadows found. They also include a list of factors that were derived from a study of the foreshadows.

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<sup>33</sup> The final version of the card are found in Appendix D.

## Instructions

Before users began, they should first quickly outline personal, company, product or strategic goals.

The by dividing the cards into two piles. One pile contains all the **Activity Cards** and all of the **Mix Cards**; the second pile contains all of the **Information Cards**. The users should shuffle the cards after combining the **Mix Cards** with the **Activity Cards**. In this version the Information Cards are linked with a list; in the final version the Foreshadows and Factors will be each listed on individual cards

The users only selects cards from the *activity card pile*. They can either select a card at random from *the activity pile*, or select the cards based on their needs. The user can also use the activity cards individually instead of selecting random cards.



Figure 50: Layout

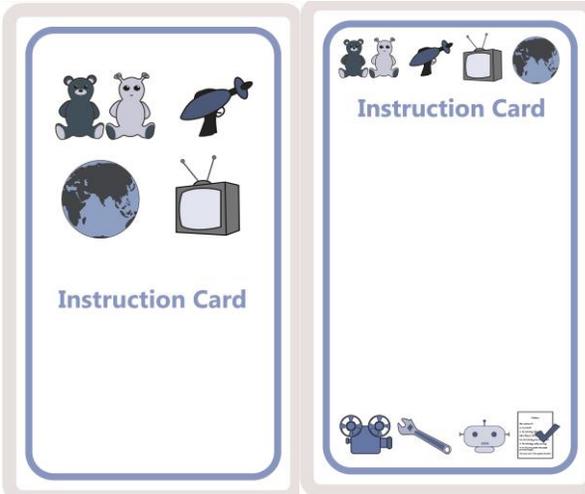
The Cards' Instructions	The Front and Back of The Cards
<p><b>Basic Instructions</b></p> <p>Start with the <b>Mix Cards</b> and the <b>Activity Cards</b> together. As the <b>Mix Cards</b> are used, move them into the Information Cards pile.</p> <p>Only select cards from the <i>activity card pile</i>.</p> <p>To Play: Select a card at random from <i>the activity pile</i>, or select the cards based on your needs.</p> <p>If you're in a group, take turns selecting cards.</p>	

Table 29: Basic Instructions

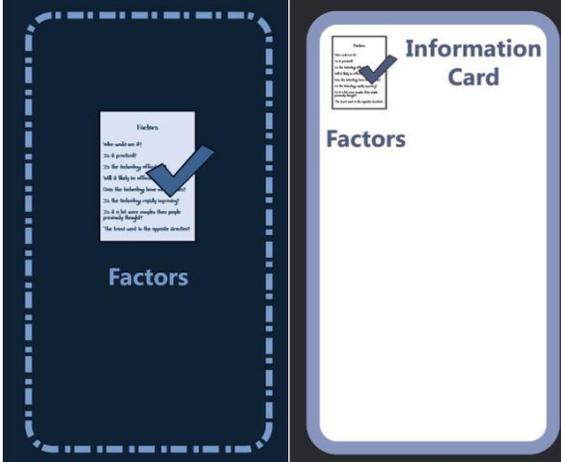
Factors (Information Card)	
<p>These are lists of factors that are derived from both failed and successful science fiction stories. These factors are designed to determine the likelihood that science fiction foreshadows will be actualized.<sup>34</sup></p>	

Table 30: Factors

<sup>34</sup> The factors are listed above and in Appendix B.

**Foreshadow "Has Happened"**  
**(Information Card)**

Pick a foreshadow that is *relevant* to your product, company or goals. This foreshadow should resemble technology that you find essential for modern life -OR- pick a random foreshadow.<sup>35</sup>

This card is used in conjunction with other cards.

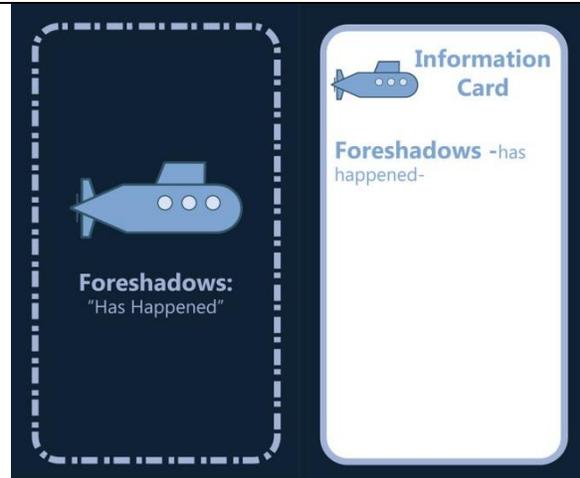


Table 31: Foreshadow "Has Happened"

**Foreshadow "Might Happen"**  
**(Information Card)**

Pick a foreshadow that is *relevant* to your product, company or goals -OR- pick a random foreshadow.<sup>36</sup>

This card is used in conjunction with other cards.

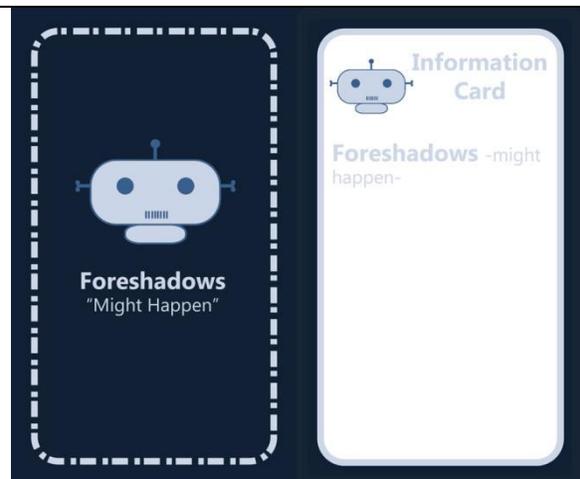


Table 32: Foreshadow "Might Happen"

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<sup>35</sup> The foreshadows "Has Happened" are listed in Appendix C.

<sup>36</sup> The foreshadows "Might Happen" are listed in Appendix C

### Foreshadow "Might" (Mix Card)

Find a foreshadow that you think may happen by either searching science fiction for a foreshadow.

-OR- Write down a foreshadow you are familiar with.

After you find an example of a technology or cultural shift, summarize it in a single sentence.

To see an example, refer to the **Foreshadow Information Cards**.

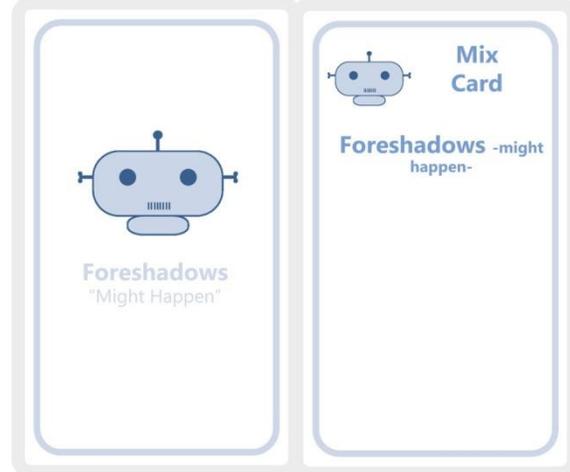


Table 33: Foreshadow "Might Happen" Mix Card

### Foreshadow "Has" (Mix Card)

Find a foreshadow that you think has been actualized by either searching science fiction for a foreshadow or writing down a foreshadow you are familiar with.

Match this found foreshadow with an actualized technology, innovation or change.

After you find an example of a technology or cultural shift, summarize it in a single sentence. For examples refer to the **Foreshadow Information Cards**.

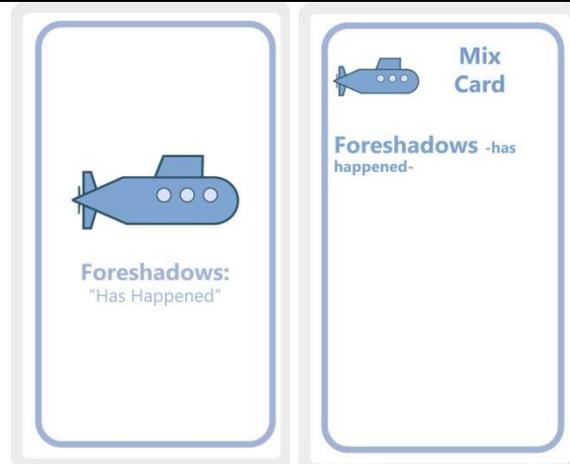


Table 34: Foreshadow "Has Happened" Mix Card

### Global Foreshadows (Mix Card)

Find a foreshadow from global science fiction.

If you're from an English speaking country, read or watch science fiction that comes from a different country or part of the world.

-OR- If you're from a non-English speaking western nation, find a foreshadow from your home country or a foreshadow that was created in a language other than English.

Find an example of a technology or cultural shift and summarize it in a single sentence.

For examples refer to the **Foreshadow Information Card**.



Table 35: Global Foreshadows

### Compare (Activity Card)

Choose a foreshadow. The foreshadow can be chosen at random or selected based on your own product, goal or strategy.

The foreshadows can come from the **Foreshadow: the "Might Happened," Information Card** can be selected from one of the completed **Mix cards**.

There are two options:

You can either compare it "free style," Brain storm, discuss it or consider what your product has in common with the foreshadow and what are the differences.

-OR- use the **Factor: Information Card** as a base for comparison.

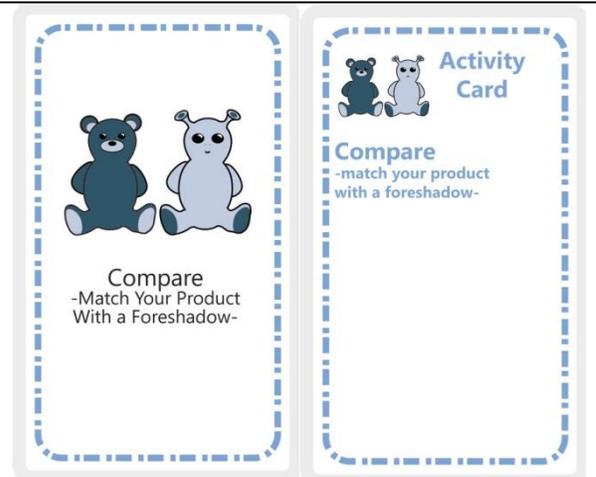


Table 36: Compare

### Re-Design "factors" (Activity Card)

Using the **Factors: Information Card**, determine which factors your product, company or goals fulfills.

After you have found which factors your product, company or goals fulfill and which factors it fails to fulfill, you should write a small paragraph or discuss how you can alter your product, company, or goals to better fulfill these factors.

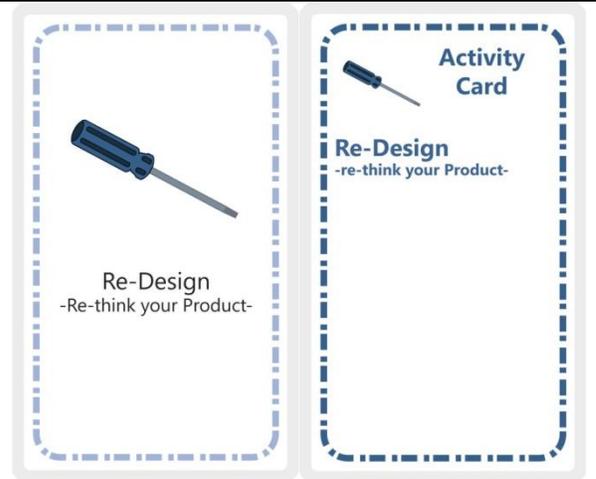


Table 37: Re-Design Factors

### Re-Design "New" (Activity Card)

Brainstorm or discuss a new product, strategy, goal or change that will be competitive in 10, 25 or 50 years. Either use the **Factors: Information Card** to determine if your new product fulfills the factors or use **Foreshadow: "Has Happened"** to guide the idea development.

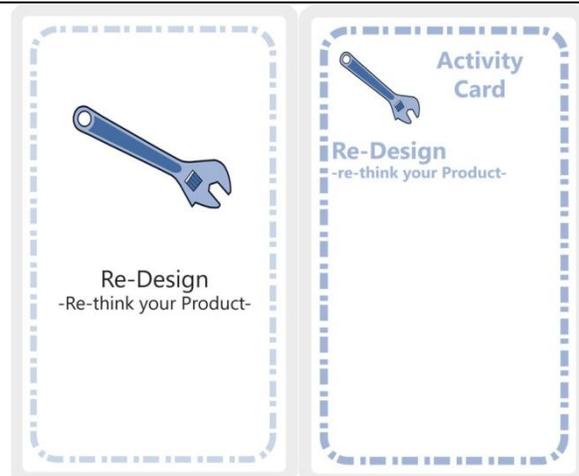


Table 38: Re-Design

### Factors ( Mix Card)

This card is a brainstorming tool. The goal is to examine science fiction foreshadows and use them to develop new factors.

Consider and discuss possible additional factors that could affect if science fiction foreshadows become actualized.

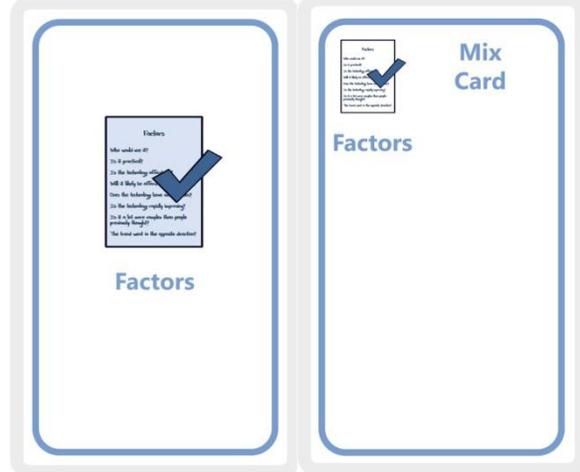


Table 39: Factors Mix Cards

### Scenarios "Build a Long Scenario" (Activity Card)

Write a multi-paragraph description of a future 10, 25, 50 or 100 years from now. The description should feature the product, innovation or change you or your group is aiming for.

Create a short history of the future and feature the changes and the shifts that we may experience. This description should include a description of changes to the world based on changes we are experiencing or technology innovations in today's world.

Consider what factors would affect changes and how your product, innovation, or goal fits into this new world.

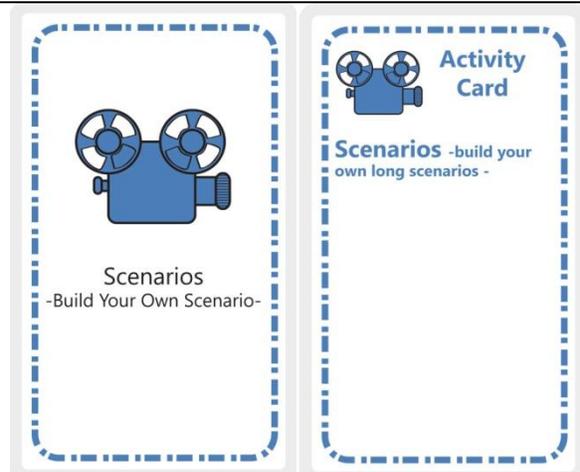


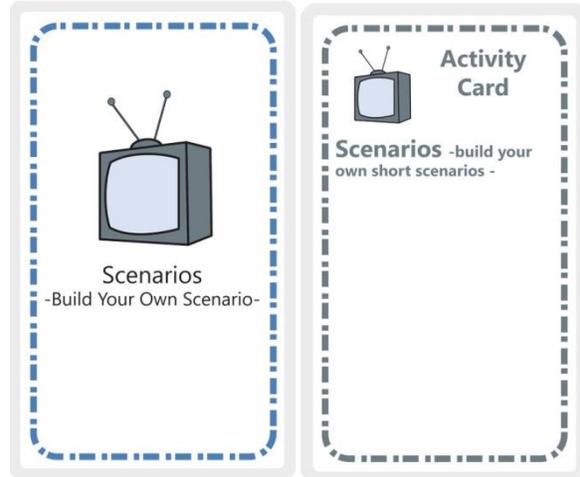
Table 40: Scenarios "Build a Long Scenario"

**Scenarios "Build a Short Scenario"  
(Activity Card)**

Write a paragraph and describe a future 10, 25, or 50 years from now. The description should feature the product, innovation or change you or your group is aiming for.

This description should include a overview of changes to the world based on changes we are experiencing in today's world or technology innovations in today's world.

Consider what factors would affect changes and how your product, innovation, or goal fits into this new world.



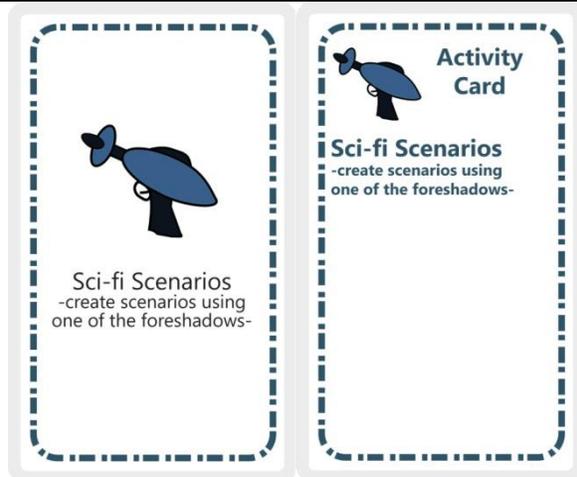
**Table 41: Scenarios "Build a Short Scenario"**

**Sci-Fi Scenarios "Build a Scenario Using Foreshadows" (Activity Card)**

Write a short description of a future 10, 25, 50 or 100 years from now. The description should feature the foreshadow but will not consider the original context the foreshadow was featured in.

Create a short history of the future, feature the changes and the shifts that we may experience. What changes are needed to make this "foreshadow" a reality? and/or How does this foreshadow change the world?

Consider what factors would be involved in these changes.



**Table 42: Sci-Fi Scenario "Build A Scenario"**

## Testing the Cards

Tests were carried out using the author's personal network which consisted of a design professional, a psychologist and an artist. They reviewed the cards and provided feedback. This feedback focused on the layout and usability of the cards, which was useful in discovering minor problems to be revised in subsequent versions of the cards.

After the initial review, an in-depth test was carried out using two small groups. The first set of testers included two designers and an entrepreneur. The second group included an engineer and a financial administrator. The testers were representative of the target audience.

### **The First Group**

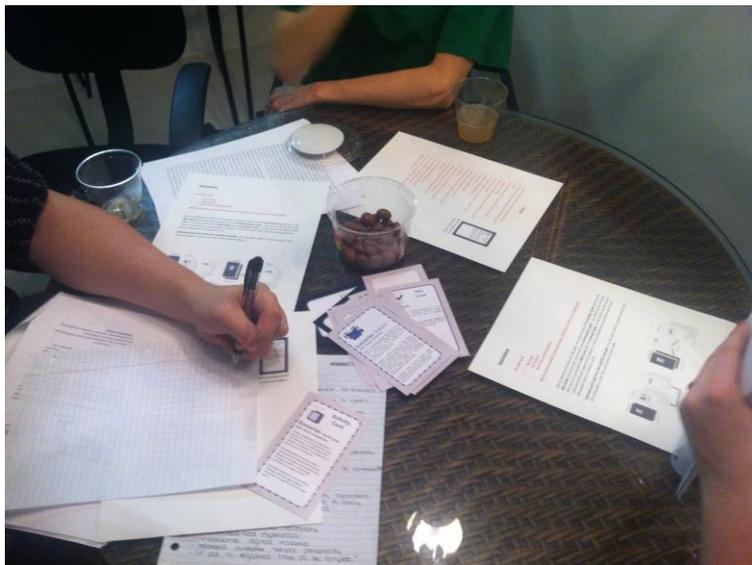
This test required the first group to use the cards to carefully evaluate two case studies; 1) an existing company involved primarily in the sale of consumer goods and 2) a startup proposal for a company structured around experience design for large audiences.

The existing company is a local retail business in Savannah, Georgia. The startup proposal was seeking investors concurrent to the writing of this thesis.

The first group worked as a design team. They began by outlining and discussing the goals of both the established company and the startup. This included challenges

faced by both enterprises. Subsequently, they followed the instructions and used the cards.

All of the designers and the entrepreneur found the cards to be a helpful tool. They gained insight into problems they had outlined, and were able to think about the potential directions of their companies in a different way. Overall, they reported that they had a positive experience and would recommend this tool to others.



**Figure 51: Testing the Cards**

The recommendations made by the group included some modifications that could be applied to later versions of the cards that could potentially enhance their usability. The most significant was the addition of a new component. In addition to technology and products, they suggested that the cards include services. They explained

that they had found that services are a core element of their future plans and felt that it would be helpful if there was a greater focus on that aspect of a business.

The designers suggested that some of the cards were better suited for individual use and some cards were better suited for groups. They recommended separating the cards into two groups; 1) individual exploration and 2) group activities. This would expedite the discovery process in both settings, which would in turn allow for greater insights.

The group concluded that it might be helpful to change “write” to “discuss.” The testers found that the process of writing paragraphs was an impediment that it could be unnecessarily laborious, and it made them hesitant to use cards that required writing.

They suggested that outlining and brainstorming would be not only be more useful, but allow the process to flow more freely for users. They further suggested that even an option of drawing and documenting could be used in place of “writing.” Finally, they suggested that if it is possible, directions on the cards should be simplified in later editions and that the “Factors” and “Foreshadows” should be placed on separate cards. This would make it easier to use expediting the discovery process.

## The Second Group

The second group took a similar approach to the first group. They evaluated a hospice that they were involved with. They began by outlining and discussing the goals of the established non-profit hospice. This was inclusive of both basic operations and services. Subsequently, they followed the instructions and used the cards.

They found the cards useful and interesting. They felt they could be a useful tools for both for profit and non-profit organizations.



Figure 52: The Second Group Testing the Cards

The recommendations of the second group were fairly similar to the first group. They also recommended that “write” should be changed to “discuss,” and agreed that the cards should be simplified. This would make them more user-friendly.

The second group recommended that the factors be altered. They found the word “technology” to be too limiting and recommended the use of a more neutral word. They found the “Factors List” was useful if they omitted the word technology in favor of a word like “product” or “service.”

## **Summary**

Based on the tests, the cards appeared to be a successful way to help plan for the future. Both target groups found them to be useful. Minor changes were suggested, and these will be taken into account upon the design of subsequent card set

## **Conclusion**

This tool consists of activates that can help designers plan for the future. While the cards themselves are unique, the basic forum of cards with activities has been successful before (The de Bono Group 2012). The activities can be used in various stages of the design processes.

## CHAPTER 6: CONCLUSION AND FUTURE RESEARCH

### Conclusion

This thesis has explored science fiction and its potential as an instrument of innovation. This is possible because science fiction is based on the question of: 'What if'. It would be short-sighted to imply that science fiction reliably predicts all future technologies, but rather that science fiction often is a precursor to consumer goods. This is aided by the amount of science fiction literature. Science fiction is based in the realm of broad possibilities and the vastness means that science fiction has had the opportunity to explore many futures.

Many different research methods were used in the course of this thesis. The interviews with the authors revealed that some of the writer think of the characters and a type of end users, and consider what types of technologies they would need and what cultural changes may have affected their lives. Two surveys were used to compare designers and science fiction creators. This revealed that the two groups indeed had some commonality with thinking processes. The results strengthened the assumption science fiction writers are not burdened by the same limitations or constraints as designers and are free to create a vast array of possibilities. By looking at Amazon.com, an online retailer, and by using a program to look for networks in website, it was revealed

that science fiction is being written, consumed and talked about in languages other than English. A survey done with people that came from non not English speaking Western countries indicated that science fiction is being consumed and created, albeit limitedly, by people all around the world. Finally, by looking and examining decades of science fiction stories factors were created, and patterns of science fiction foreshadows becoming actualizations were found. These foreshadow themselves helped created the exercises and cards that enable the user to utilize this vast genre for a practical purpose.

## Expanding on the Research

### **More Variety in the Sources**

The research could be continued by expanding the data set. Because of time and resource limitations, it was not possible to include other publications and other media types into the research. Adding these additional data sets could change or strengthen the results.

It would be interesting to discover if the patterns that were discovered in the Analog and Astounding data would also be evident in a wide range of sources such as television, radio, movies, comics, and even other types of literature. For example, long running science fiction television shows like *Star Trek* or *Battleship Galactica* could be

used as data sets to discover if their technological and cultural predictions had similar patterns. Movies and comics could also be examined; even old radio science fiction programs could be used. While including things like movies and comics may be difficult and cause problems with consistency in the data set, it would help to dramatically increase the data set.

Research on the patterns itself could reveal interesting results. The cause of the patterns featured in the Astounding and Analog section of chapter 4 is still unknown and it is unknown why are the peaks and valleys so well defined?

### Expansion of the Cross Cultural Research

There is a great deal of opportunity to examine cross cultural science fiction. Studies on cross cultural science fiction are limited and mostly focus on topics within the science fiction stories themselves.

Science fiction literature from different cultures could also be analyzed for the content to further explore if cross cultural science fiction could also be used to foreshadow possible technology or cultural trajectories. The cross cultural content analysis would reveal if ideas in science fiction tend to be universal. Science fiction from different languages would have to be translated to give a true sense

The survey participants were asked what their financial situation was by selecting which one of seven phrases best fit their families' financial situations. This was done to determine if there was a notable correlation between class and exposure to science fiction. Studies on exposure to science fiction and the impact it had on the people involved could provide interesting data.

## GLOSSARY

**Actualized Foreshadow:** This term is used to describe technology or cultural shift that was talked about in science fiction that has become real, or are now tangible.

**Analog:** It is a long running "pulp" science fiction magazine that features short science fiction stories, novels separated in parts, small articles about popular science, etc. The magazine was formally called *Astounding* until an editor changed the name of the magazine in nineteen sixty. It continues to publish a new issue each month. The current full name is "Analog: Science Fiction & Fact."

**Astounding:** It is the first name of the science fiction "pulp" magazine currently called *Analog*. *Astounding* was a popular science fiction magazine that featured short science fiction stories. It was started in the nineteen thirties with a similar format as the *Analogs*. The magazine published monthly issues.

**Casual Structure:** They are the underlying factors of causality. These factors include technology, culture, environmental, policy, etc. that currently exists. Casual structures are the factors that will shape the future outcome of any change or event. Casual Structures were described in Van Der Heijden's book, *Scenarios, The Art of the Strategic Conversation*.

**COINs:** a "COINs" is an acronym for collaborative innovation networks which are groups of highly self-motivated people who share a collective vision and collaborate with each other.

**English speaking West:** For the purpose of this thesis the English speaking West is defined as the United States, Canada, Great Britain, Ireland, Australia and New Zealand.

**Foreshadows:** Are science fiction technology or cultural shifts that are set in the future and have the potential

**Galaxies (or Galaxy Pattern):** A network with several interconnected members or nodes in which each node communicates with other nodes freely or directly rather than a network with one member who communicates with everyone.

**Inertia:** (As it relates to 'process theory' and 'casual structure'.) The continuation of a trend, either in technology or within a culture.

**Process Theory:** The outcome of an event or events are the results of a composition of causes or a casual structure. It is the theory that an event is the result of a multiple set of inputs and a complex environment rather than a single factor.

**Pulp Magazines:** The term is used to refer to popular non per-reviewed magazines that were printed cheaply and were also inexpensive to purchase. These magazines were typically less than two hundred pages long and were first printed during the early part of the twentieth century. Only a few titles still publish.

**Scenario Planning:** This refers to a creative process involving the creation of plausible future scenarios for the purpose of decision making.

**Scenario:** A scenario is a synopsis (or potential or projected outcome) in the forum of a narrative or a story. The term Scenarios is used in reference to scenario practices

**Science fiction:** (For the purpose of this thesis.) A science fiction story is a work of fiction that is built or created around a rule or rules (or basic principles) of known or theorized science. The stories also must be set in the authors' future, this future can be either the near future or the far future.

**Star (or Star Pattern):** A network with one member or node in which all communication goes though rather than a network where everyone or all nodes communicate with multiple members or nodes freely or directly.

**Terminal Degree:** The highest degree in a field that is commonly available such as a Masters of Fine Arts or a Doctor of Philosophy.

**User Centered Innovation:** As explained by von Hippel in *Democratizations of Innovation* 'User Centered Innovation' is when the users of a product or service has the power to directly influence the final product. This can be when the users is able to develop services or objects for themselves, or when the user has a product or service designed around their specific needs

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## APPENDIX A

### Surveys

#### Protocol For Designers and Design Related Fields

**What do designers think about when thinking about innovation, and how do designers think up future technological innovation?**

Please tell me as much as you can, everything is helpful.

\* Required

**What is your highest level of education? \***

- Primary School
- High School
- Some College
- An Undergraduate Degree
- Some Graduate School
- A Masters Degree
- A Terminal Degree (such as an MFA or PHD)

**What field are you in?**

(For example Industrial Design, Interactive Designer, Interior designer... )

---

**How long have you been in your field?**

- I am a student
- less than a year
- 1-5 years
- 5-10 years
- over 10 years
- over 20 years

**What process do you go through when you design a product or a system?\***

For example, If you were to design a toaster, would you look at other pre-existing toasters? Would you do field testing?

---

**Do you look at societal needs as a whole when creating designing something? (or creating technology?)**

---

**Do you focus on your end users?**

- Yes
- No
- Sometimes

**If yes, Can you describe how you do this?**

What factors do you take into account?

---

**What do or would you focus on instead?**

(if not the end user)

---

**If you were working on a blue sky project what factors would you take into account?**

---

**Do you think that entrepreneurs and businesses could use or learn from science**

fiction? (i.e.

enhancing their bottom line, futures predictions, product development, etc.)

---

(If no) Why not? (if yes) What areas in particular do you feel would benefit the most?

Please, go into as much detail as you can.

---

How do you feel designers could use or learn from science fiction? (i.e. enhancing their

bottom line, futures predictions, product development, etc.)

---

(If no) Why not? (If yes) How in particular do you feel do you think they would benefit the most?

---

Are there any other groups of people that you think could benefit from Science Fiction?

---

Has Science Fiction changed the way you look at newly released technology?

---

Do you feel as Science fiction has influenced your views on technology as a whole?

---

Do you think Science fiction has influenced your life in unexpected ways?

---

Do you feel as Science fiction has influenced your designs in anyways?

---

How do you define Science-Fiction?

I am looking to see how you personally define it.

---

How would you personally define a “concept car” (i.e. a product that may be developed in the future)

---

Where do you think the line between concept car and science fiction (or future visions) is drawn?

---

Is there anything you think I missed?

---

Would you be willing to talk to me more about this topic or design?

Yes

No

**(If yes) Could I have your email please?**

---

**What do Sci-Fi 'Writers and Creators' think of technology for their creations?**

Please tell me as much as you can! Everything is helpful!

\* Required

**What is your highest level of education?\***

- Primary School
- High School
- Some College
- An Undergraduate Degree
- Some Graduate School
- A Masters Degree
- A Terminal Degree (such as an MFA or PHD)
- Other

**What field are you in? \***

(For example an English teacher, a writer, a set designer ... )

---

**How long have you been in your field? \***

(if it is a hobby that counts too)

- I am a student
- less than a year
- 1-5 years
- 5-10 years
- over 10 years
- over 20 years

What is your educational background?

---

Did you grow up reading or watching science fiction?

---

How long have you been involved in science fiction?

This can include watching/reading about it or creating it

---

What got you into a science fiction to start with?

---

Do you have any one in your family involved in creating developing technology?

(Such as a  
designer, engineer or craftsperson?)

---

if yes can you talk about what they did?

---

What is your role in creating science fiction?

---

What process do you go through when you create a science fiction story or create

something for a science fiction story?

---

When looking at technology to use within your story, what factors do you consider?

---

Do you research current technology (or keep it in mind) when looking at what technology to use in your story?

- Yes
- No
- Sometimes

If so, what do you look for or at?

---

How do you develop/create the culture of the people within your story?

---

When thinking of culture(s) in your story do you think a lot about your own cultural background or do you look in to (research) other cultural.

---

If you do look at other cultures what do you look for or think about?

---

Do you think business people could use or learn from science fiction?

---

If no, why not? If yes, how do you feel business people could use science fiction?

---

How do you feel designers could use science fiction?

---

Who do you think could benefit by looking at/reading/watching Science Fiction?

---

Has Science Fiction changed the way you look at newly released technology?

- Yes
- No
- Maybe a little

If yes, could you talk about how you think it has changed your outlook?

---

Do you think Science fiction has influenced your life in unexpected ways?

---

What are the subfields within the genre? How do you define them?

---

Do these subfields treat Technology differently?

---

Can you and how would you define a “concept car?”

---

Where do you think the line between concept car and science fiction (or future visions) is drawn?

---

Would you be willing to talk to me more about this topic?

Yes

No

If yes, could I have your email please?

---

## Protocol For The Multi-Cultural Survey

### Stories About The Future (English)

I am looking for a non-western perspective of "science-fiction" and other forecasting fiction.

\* Required

### Stories In Your Culture

**Does your culture have stories that are set, or take place, in the future? If yes, can you name some of them? \***

These stories could be in the form of television, movies, books, radio or oral traditions.

---

**Does your culture have stories that show technology that might exist in the future? If yes, can you name some of them? \***

These stories could be in the form of television, movies, books, radio or oral traditions.

---

**Can you think of any "science fiction" stories, these are stories that are set in the future or have a technological theme, that are popular where you are from, your home country or where you grew up? Can you list them and talk about them please?**

These stories may come from a different culture or country.

---

**If yes to any of the first three questions; What kind of people do you think watch or listen to these stories?**

For example: older people, young men, middle aged woman, people who like one kind of music or any other groups

---

**Do you think stories about future technology from your own culture or science fiction stories have the potential to influence what technology people buy or use?**

**Do you think people have been or are being influenced by science fiction or stories of the future after they have seen or heard or read a story?**

Have people already been effected by science fiction? Please tell me why, or why not?

---

**Are you personally familiar with any "science fiction" stories, stories that are set in the future or have a technological in them?**

If yes, can you describe them and talk about where and how you read, saw, or listened to them?

---

**If yes, Are you a fan of science fiction?**

---

**Your Background**

I have a few background questions. These are very imported to me so please answer honestly. I will not ask your name.

---

**What do you consider your ethnic group?\***

Be specific please!

---

**What is your native country?\***

What country were you born in or grew up in?

---

**Where do you currently live? \***

Please list both your current nation and city.

---

**What languages do you speak?\***

(please include ones you are learning too)

---

**What was your family's financial situation when you were growing up? \***

Pick the option that fits best.

- "We had very little and it was hard to get the basic necessities."
- "We did not have much, but we had enough to get by."
- "We did not have much money, but we did not have to worry."
- "We had some money, but not a lot."
- "We had some extra money, we lived comfortably "
- "We had some extra money and could occasionally afford nice things."
- "We had plenty and could afford many nice things."

**Currently, what is your financial situation?\***

Pick the option that fits best.

- "We had very little and it was hard to get the basic necessities."
- "We did not have much, but we had enough to get by."
- "We did not have much money, but we did not have to worry."
- "We had some money, but not a lot."
- "We had some extra money, we lived comfortably "
- "We had some extra money and could occasionally afford nice things."
- "We had plenty and could afford many nice things."

**Is there anything you would like to add?**

---

**Thank-You**

This will be used to help me go forward with my master's thesis. Thank-you very much!

## Interviews

### Sample First Email

Subject: Masters Student In Design Hoping to Talk to Sci-Fi Authors for a Thesis.

Dear Mr. or Mrs.

Hello, my name is Elysia Wells and I am a graduate student at the Savannah College of Art and Design, and I am currently working on my thesis for a MFA in Design Management.

My Thesis is on using Science Fiction in the Design World. The focus of the thesis is inspired by my belief that there is much that can be learned from science fiction, and my objective is to use science fiction as a tool for decision makers, designers, businesses, non-profits and anyone else with a stake in future technology.

My goal is to talk to writers, editors, illustrators and others who create or otherwise work with science fiction to understand underlining factors in how they "create" technology or develop future or parallel worlds. I cannot do this until I find professionals who are willing to talk to me.

I am writing you because of your work in the genre of Science. I am interested in talking to you about 'future technology' and even the future of culture. I hope to talk to you because you are a versatile writer, you have written many novels and stories. I believe your knowledge would be highly beneficial to my research.

Would you be willing to talk to me about your work via an interview or even simply by email? I understand that your time is very valuable, and even answering just a few questions would be a tremendous help to my research.

Thank you very much for your time!

Sincerely,  
- Elysia Wells

## Informed consent

*Informed Consent:*

[ I understand that these questions will be used for research and I agree that my responses can be used by Elysia Wells and those working with her. If I request that my name not be used any identifiable information in regard to my name and/or company name can be and will be removed from any material that is made available to those not directly involved in this study]

To agree please type that you agree and your name.

+ \_\_\_\_\_

Name of Researcher: Elysia Celeste Wells

## Protocol For Published Science Fiction Authors

### The Questions (Sample)

I tried not to include any questions that you had already answered on your website. I don't always catch everything so forgive me for overlapping questions.

First, What is your background? Where did you grow up??

Your biography didn't talk much about your educational background, It said where you study but not what you studied?

Do you feel your educational background has affected your writing?

Has your work in other types of writing changed how you write science fiction.

Has anything else strong influence your writing?

Did you grow up reading or watching Science Fiction? How long has Science Fiction been a part of your life? (this includes writing about it, reading about it, thinking about it)

Is anyone else in your family involved in creating and developing technology? (such as a designer, engineer craftsperson, or even a crafty person) Could you briefly talk about what they do?

This is a complex question and I apologize but I was not sure how to phrase it. What process do you go through when you create a science fiction story or create something for a science fiction story.

When deciding what technology is available to your characters, what factors do you consider?

Do you ever research current technology (or keep it in mind) when thinking about what technology to use?

I have a few questions about Culture, my background is in anthropology and my study includes culture so I had to include it.

How do you develop or create the culture in your story?

When thinking of culture(s) in your story do you think a lot about your own cultural background or do you look into (research or think about) other cultures?

If you look at other cultures what do you look for or think about?

How do you think your own culture influences the technologies you pick to use in your stories?

These questions are about how Science Fiction can be used outside of enjoyment. I am trying to find out what you think of science fiction being used for more practical application.

Do you think business's could use or learn from science fiction? If yes why, if no why.

Do you think designers could use Science Fiction, if yes why, if no why not? (you may have noticed a pattern in my questions)

What would you tell a business person, a designer, or an inventor who thinks science fiction is a waste of time?

Does your experience with Science Fiction change how you look at technology? and if it does, how?

How do you personally define Science fiction?

Which of your book's (or any of your work) focused the most on culture? Basically which one of your books would you suggest I read or reread.

And then my last question: Is there anything else you think I should know that I missed??

## APPENDIX B

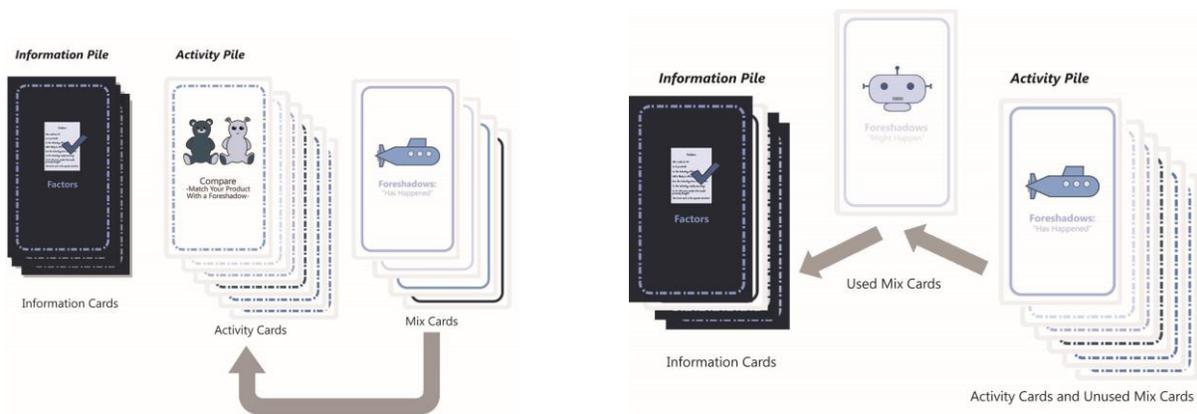
### Artifact Instruction Sheet

#### Instructions

- 1. Print the cards**
- 2. Print or save the "supplementary material" This material includes the "factors" two sets of "foreshadows"**
- 3. Before starting quickly outline personal, company, product or strategic goals.**

Start by dividing the cards into two piles. One pile contains all the **Activity Cards** and all of the **Mix Cards**, the second pile contains all of the **Information Cards**. You should shuffle the cards after you have combined the **Mix Cards** with the **Activity Cards**. In this version the Information Cards are linked with supplemental material, in the final version the Foreshadows and Factors will be each listed on individual cards.

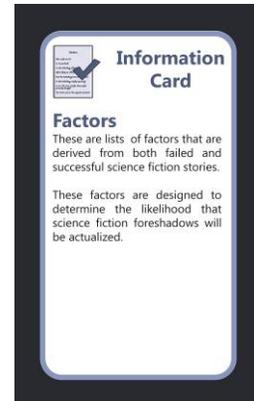
**Selected cards only from the *activity card pile*.** You can either select a card at random from *the activity pile*, or select the cards based on their needs.



## Supplementary material: Factors

### **Factors**

- Is there a strong desire or need for this technology?
- Is there some other technology that will fulfill the same need?
- Is society changing in a ways that it will no longer be needed or desired?
- Does this technology require a dramatic and quick change of habits or life styles.
- Who would use it? Is it a niche group or does it have potential for other applications?
- Is it practical?
- Is the technology affordable?
- Will it likely be affordable in the future?
- Does the technology have multiple uses, or is it locked into one use?
- Is it perceived as an improvement or does it have an advantage making it worth the investment?
- Is it likely that future uses could be added to this technology?
- Is the technology rapidly improving?
- Is it more complex than previously thought?
- Is it more harmful than previously thought?
- Is there likely to be a counter trend? The trend went in the opposite direction



*(used in connection with any card that calls for "factors")*

## APPENDIX C

### Foreshadows

Foreshadows were collected from Analog Science Fiction and Fact magazine (formerly Astounding Science Fiction) They were collected from stories featured in the magazine.

The stories come from a range of years, dating from the 1940s until 2012.

#### *Foreshadows: Has Happened*

<i>(Foreshadow)</i>	<i>(Reference Code)</i>
major environmental disaster caused by humans "cutting" corners"	M02-50
"Cards sent a message automatically" to office	M61-9
"com web" switched image appeared on the screen	S72-10
"data net" remote data storage	M94-120
"DeskSlate" in a table	M75-70
"Door scanner" for security	S68-55
"earplugs buzzed" (talked to someone)	S63-18
"Gun" bring someone down unharmed	S64-50
"map computer" in the car, it is very common, in the dash board(sounds like modern gaps)	M88-18
"palmtop" a small screen computer, extremely thing, very common	M99-53
"personal "coms" (like cell phones, everyone had one, all the school kids even had one.	S89-39
"plastic" artificial heart, doesn't work in everyone, still needs a heart transplant eventually	M76-140
"Radio" communication( would flash news into robots brain,) wireless communication	S68-146
"reds domestic collapse" Russia changed and the soviet union not as powerful as it was.	M66-8
"speaker screen" on normal phone, screen on normal phone, sometimes video talk	M68-55
"used hand computer" to take notes	S89-114
"white board" on wall screen via computer	M83-94

(GPS) The orbiting satellite monitors could see the vessel	S66-10
(smaller/not room sized) filing computer	M66-8
7 billion people on the planet in the next century	S66-10
A computer problem can cause legal problems, and errors that are hard to fix	S67-85
a digital electronic device with a small TV on it	M81-14
Almost everyone had a "palmtop" data computer	S03-70
Artificial heart (the one in the story had a "battery" under arm pit)	S63-77
attempts to, and makes Genetically engineered foods to feed the growing population	S87-133
Auto parker, auto parks a car	S80-78
Batteries are much-much smaller, getting smaller and smaller	M76-12
Benedict is the pope in 2011	S76-98
better ceramic technology,(some able to hold powerful acids) (used to help destroy evidence in the story)	M66-108
Cab had wi-fi connected already in it	S06-10
Cabs, insert credit card to pay	M83-116
Called a cab via the computer	M79-12
Called and saw a face on the screen	M76-140
Cameras on Road Ways	M66-132
Can change eye color medically	M05-08
can easily connect to computer data bases	S86-86
Cans heat the food when it is opened.	M63-18
Car computer, self diagnoses it's self and decided when it needs to go to the shop	S85-100
Carbon/Fume scrubbers required for smoke stacks	M77-76
carried a "stun gun"	M89-102
Carried a small portable computer with them everywhere	M94-96
Cars can partly drive themselves, new "conscious computer"	M93-102
Classism, on the rise, discrimination based on class.	M798-56
Colony internet network, like computer system, (network)	M89-140
Communicated via screen, voice video long distance	J62-8
Computer Chimed with a call	M93-14
Computer helped save fuel	S82B-76
Computer tablet, to watch morning news	S01-67
Connects to a different computer remotely, work stored on one computer, done a different computer	M76-140
considered a CD player out dated technology	S98-105

Desks connected to the "community network"	S86-86
Digital movies, all on disk (digital storage) not on film.	M93-102
domestic computers very popular and common, personal home computers	M81A-14
Downloaded all his files to the internet for long term storage "cleaning out the office" wasn't the chore it use to be/	S03-10
Dynamic translator, accurate computer translation	M93-14
Earth like planets found.	M00-73
Easy to transfer data and files	S82B-76
Electric cars charging time improved, 1/2 hour charge to drive 200 miles	S02-74
	M81A-
Electronic device in fabric, put into fabric	108
Electronic messages, sent to friends, (sounds like text)	S84-104
Employed a mixed of sex, less/no gender discrimination	M68-10
Face of passport had information on it, police men carried a computer/device to check the data on cards with him (on his belt)	S74-16
Female CEO not too strange	S71-10
Female fighter pilot, still very much a girl, but has a degree in aircraft engineering	M75-14
Flat plate, computer with a stylus for an individual	M88-125
Fresh charge in his "stingbolt"	M68-40
Game to keep fit,	M00-47
Grants and scientific study budgets cut.	S99-71
Ground transmitter transmit data of location	S63-54
Growth of communication networks	S80-10
holding portable TV screen, reading a magazine, watching TV, "like people use to read"	M71-8
House computer chimed, had a phone call and controlled things in the house	M93-14
Improvement in Ceramic technology, to be used in space	S63-18
increase in cancer testing, for cure, used mice and dogs,	S79-106
increased amount of "injections"	S91-58
increasing amounts of female CEO's	S92-70
Increasing problems getting health insurance, got death benefit but trouble with health insurance (though labor union)	M98-120
Increasing use in solar power, problems with low energy collected by solar power	S63-47
Insurance still is not good, worse problem. (set in near future)	M98-120
Kept digital files not paper files	S69-77

Libya is a trouble start, starts a revolution	M88-18
Luminous dial on his wristwatch, 23:03	S67-96
Makes a call on his [computer]	M76-140
Mars rover has lasers, and scanning devices, along with various radios to scan and record the marten service	S68-146
Mars rover used solar cells for power, delayed in common and communicated via satellites	S68-146
Mars rover, controlled itself partly but half an hour delay control from earth	S68-146
Medical technology helps tissue regeneration	S63-54
Metal touch consol (but also had voice)	M85-12
Mixed race people more and more common	M02-50
Monthly fee for computer net service, (describes basically mobile internet)	S86-86
more and more doctors are "she's"	S81A-82
More and more work is done in offices	M87-110
more woman, men and woman both on spaceships.	M73-76
Near future, men on the moon mult times	S67-96
No good solutions for waste/especially nuclear and chemical	S80-110
Note book compute with small flip screen	S83-114
Optional video, just voice on telephone,	S86-75
ordered via voice to look at a menu, it appeared on the screen	S73-78
	S81A-
People could own (human) DNA sequences	112
Pistol stunner, can stun them from a distance.	S82B-20
Plastic prefab homes shipped to remote mining settlement,	S73-52
Pocket computers connected with data base (portable tablets and phones connected to the internet)	S86-86
Pocket "computer" Study the display	S93-84
Pocket brain, extra electronic data storage device/computer	M87-110
Pocket computer, linked to "satellite" and other computers to work	M80-78
Portable (land line) phones	S67-96
Portable survey computer	S80-10
probes turned up no evidence of life (currently) on mars.	S05-72
problems with "knowledge overload" it is imposable for someone to be skilled in (more then two or three) fields, more and more knowledge specialization, a problem with getting insights and correlations.	M66-8
Pulled out his pocket computer, (didn't open it before he used it)	M80-95
Pulled small computer out from his coat	M99-11

Radio / takers implanted/connected to/in each farm animal so you can brand and keep track of the farm animal	S99-71
Radio earplugs	M71-8
Read the news on his pocket computer ('dug' the computer out of his pocket to read headlines with it')	S03-10
Realistic looking holographic image	M85-83 S82B- 112
Realty TV craze,	
Remote file transfer (files basically kept on a networking) for research and medical files	S86-86
Remote location devices, bench markers transmit,	J62-62
Remote sensors implanted in a body could send signals to medical teams	S67-57
Russia continues to be big in space exploration	S90-16
Salt battery salt zinc and magnesium, used	S69-40
satellites to get TV, data, and videos streaming to you	M70-50
Scanned a business card and information comes up	N95-85
Scanning security mechanisms in door jam, for "frisking."	M66-132
shift from industrial to service economy	M80-95
skin contact require "A stick," that needs direct human interface to operate, humans touching it to work	M02-76
Small "smart computers" by 2000	S83-80
Small camera, swallowed it, cheeked out his insides, recorded everything	M86-16
Small communication devises with built in cameras	M66-43
small communicator attached to his belt	M69-10
Small computer, large screen, joy stick controlled	J62-8
Small device had complete music library , touch or voice	M00-73
Small hand held computers	M88-96
Small home computers	S69-93
Small personal portable computers	M80-120
Small portable data storage devices	S69-93
Small recording device with removable memory	S67-133
Small removable mini tape, easy to use, keep	S97-130
Small, very small recording chips	S82-112
Solar power used hundred of Parabolic mirrors "sprayed metallic coat"	S63-18
Solar powered reader, he "had every book he could think of"	M04-60
sounds like cell phone. "communicator vanity case" goes everywhere, puts you in contact "no matter the distance"	M61-9

Space exploration mostly unmanned because of political problems and budget problems.	S021-84
Space programs cut backs, but privet companies investing in space flight	S73-94
special "radio" to link electronic devices, sounds like Wi-Fi	M88-125
Spoke into hand computer	M68-40
Spoke into notepad to take notes (sounds like small computer or a smart phone)	S89-119
"Telescreen" phone, "good morning" saw on the screen	M64-82
The character had a Car phone, story indicted it was somewhat common.	M66-132
The computer/ communicator phone	M83-136
The phone blinked so switched away from the encyclopedia	M82-106
The state is broke, economic crises	S84-76
Three wheeled one person scooter (sounds similar to a segway)	S80-78
Took out his note pad and "switched it on"	M90-108
Two computers linked together, computer to computer networks	M66-8
U.S. has a new economic depression, marked by unemployment, protesting, and factories (auto factories to start with) closing	M80-95
unemployment a major problem, marches	M80-95
US had a new depression, but Australia is doing very well	M77-122
Use of Video chat	S84-12
Used computer "laptop" with a remote connection	M91-12
Used electronic Decoys and firewalls to protect data	S96-64
Very small very thing computers	M99-105
Video chat more and more popular, very common	S02-80
Video communication between earth and space station	S63-18
Video/Video phones, widely used in computers	M99-82
Wafer computer" did his bills on it	M79-12
Weight and obesity a bigger problem, common to be overweight.	S86-86
Widely used genetically changed plants- To grow with less water and bigger	A86-16
Wireless communication, network phones,(easy, light)	M82-70
Woman hold PHD and high ranks, not uncommon	J62-8
Woman tend to get more academic degrees then men (at least the woman in the story)	M68-40
work station is touch, did her work on her "desk" with her computer	S74-16
Worries and plague still a problem despite advanced medical technology	M66-42

*Foreshadows: Has Not Happened*

*(Foreshadow)*

*(Reference Code)*

Space ships with offices, desks table, screens charts	M73-76
Rotating Space Station, "town wheel" city in a space station	M07-86
3d camera (moved in smooth arcs)	S75-80
Genetic tampering, and engineering, could form patterns	S66-10
Three Wheel scooter, personal transport for security	M61-9
Space suit woven with Kevlar to protect against sharp things	S93-16
Synthetic heart being developed but not good until after 2020s	S63-77
Holographic artificial ski	S86-86
Invisibility via an absorption field, took waves ,scanned and duplicated them on the other side.	S86-75
"used brail type system, so not to mess with translator program to talk notes and talk to it}	N95-45
Hidden camera looks like a stone (works in low light), but it activated by finger print.	A96-85
Fiber glass gang signs, like tattoos but implants	S05-85
Larger ships sent to explore with smaller light weight more powerful to be scouts	S05-55
Larger electronic white boards	S05-55
Transdermic injector, no needles	S05-55
Self sufficient Airships	S89-36
Used fresh water from poles, pumped it out	S89-36
Data chips implanted in everything, pants to people	S05-85
"manufactured minds" AI with emotions, trained psychologist needed to help with computers	S05-48
Alien planet, habitable via environmental domes	S05-48
A translator warn a as small necklace	S05-08
"regeneration stimulators" aboard a ship, "code for dental" created teeth, to heal sat In renovation chair in sterile cabin (sometimes problems, mistake made buck teeth, needed a replacement)	M73-76
Molecular structure creator, can reconstruct a cell to a diamond	S89-12
Computer implanted in head, to interface, telepathically communicate with	S74-16

person, but can't hear the persons thoughts	
Space station above mars	S05-72
Virus on a spaceship	M03-40
More use of translator programs, talk the translate	S05-48
Climate control system also helps prevent the cold germ from spreading (helps prevent infection)	S05-48
Virtual reality entertainment complex, more popular then traditional movies, linked to a network	S96-64
Creates a startgate like wormhole to travel, common travel for the wealthy	S96-100
Prolonged life via replacement parts, (down to blood)	S96-100
Screen interfaces: holographic, instead of 2d , 2d with voice andd touch	S96-100
Nano Surgery, with magnetic sensors	S96-100
Image on the phones screen, phones have small screens	M98-12
Space tourism popular "space flight adventure"	M98-12
Holograms in desk as teaching aids	M98-80
Entire office was a screen, computer screen and computer in the desk	M99-52
controllable polarized sunglasses	M99-11
Blimps collect lighting to power things on the ground	M99-11
Space ship lands and takes off like helicopter but needs help from rockets	M99-11
Small spacecrafts have an AI that can "shout" and helps run the ships	M90-11
Holographic assisted in therapy	M98-120
Shuttles based on space stations to visit no earth places	S99-11
Crew slept for two weeks, 2 years passed for them, but 2,600 real rears via cry sleep and fast travel	S02-66
Genetically engineering people via computer (screens out genes and manipulates to fit new environments - "tweaks us to keep us healthy)	S02-60
Ship to deliver frozen embryos to populate a world, (4000 years traveling half light speed)	S02-66
"a maintenance bot scuttled away on its regular rounds" a robot to repair the ship`	S02-66
Clones bodies for spare parts, "duplicates"	S99-71
Cloned meet a major food source	S99-71
Small 2 to 4 person space mining craft	S81A-18
Computer rewrote human brain, messed up, called everything by cheese names	S05-45
Detailed understanding of how the brain worked, used it to cure	M03-60

pathological violence, and drug additions	
His communicator automatically called for help	M03-76
Helped species, African elephant, helped via genetic engineering	M03-90
Riffler that could shoot or slice, no sounds, still need to be a marks man or woman	S96015
Weather controlled satellite, network	S69-73
Self contained space suite with small motor he found it "neat"	S67-90
Space suit can withstand extreme cold and extreme heat	M70-50
Electronic suites, special silk, electronic shields, good for extreme cold	M70-50
Everything is synthetic, even human voices	M00-73
Children have GPS implanted	S08-74
Slates and stylus more and more popular	S08-80
Bionic implant common medical treatment	S08-50
Implant "advisor" yells at the boy, can only see can't read thoughts	S08-74
Probe with live things, Rats sent on probes to mars	M70-50
Holographic table top, (also could be used for porn)	M80-111
A suit that enhances strength and stamina worn by the military	M98-132
Ships hobbled together from pieces from other ships,	M98-102
Robots repair things, rewire cables and work via TV	M98-120
Eye drops make contact lenses	S06-10
Portable ion plasma cannon	M03-90
Common voice interface as the means of working with a computer	M85-83
Simulated meat as basic food stuff	S75-114
Paper work all digital (used stylus to sign"	M02-50
"spray derma foam" into cuts after they are cleaned, "medkit" sews 14 stitches into the cut on her head	M68-88
Genetically changed altered plants and animals, used for terraformed worlds	S97-1145
Spaceship used fiber optic cables not copper wires	S01-94
Spider like robot, methodically spiraled to scan, rover for other worlds	S68-146
The holographic sky is warm and sunny, even cheery trees in the space station	S84-150
The air was recycled through a biological filters in the space craft	S89-17
Touched a switch on his throat to make a translator into a different languages, translate back too	M81B-14
Most medical diagnostic equipment portable	M81B-14
Cabs, types in address, don't talk to driver, uses credit card too	M83-116

Used a magnetic grappling hook to ketch an ocean test device	66-10
Solar heated water in space, on spaceships	S63-47
Turned on the communicator to call the space station, screen lit up with a woman's face	S64-43
Most colonies were under domes	S85-106
Artificial gravity	S85-106
Cancer patient becomes a cyborg, brain but cybernetic body	S73-12
Corps, regenerated in medical tank,	M76-46
AI, computer interface, complete with emotions and sympathy	M83-94
Medical bot, first aid on living person	S90-16
Better treatment for cancer, cure for most cancer, can stop and weed out cancer cells	S84-12
Genetically engineered algae to better make oxygen	S90-90
Man on space ship, has his own oxygen regeneration device, doesn't use the "air" utility	S90-90
"air fee" Utility bill on space station	S90-90
Magnetic boot to get around spaceship	N95-45
Travel in solar system used anti-mater	S06-90
Interstellar community, has AI representative because it's hard to travel beyond the stars	S06-90
Artificial food in space	M06-8
Psypyx "dead" implant, AI of a deceased human informing a living human mind	M06-8
Cybrogs, half human half computers	M06-8
All computers touch, data on pad in hand, touch	M06-50
Deck of card projected, it responds to finger movements	M06-60
Created a giant balloon of air ins space	M06-100
Destroyed a sun building a new nuclear fusion star, for power	M06-100
artificial self made sun at the center of a system	M06-90
Auto self sealing emergency bulkheads	M06-90
"space bikes" small single person space crafts	M06-90
modified virus: A "bug" kills you if you don't tell the truth	M06-90
Tight beam message, sends messages deep into space	S05-8
Space station has it's own networks, including TV network	S05-8
AI, future computers, "older computer" experience with human let them gauge moods accurately	S99-80
Bactria with genes, can turn eyes color, and can undo by killing the Bactria	S99-71

Adult, and effective genetic therapy to cure problems	S99-95
Simulation box, live the life of a soldier, via vivid dreams	S87-154
Projected displays with in a help, system linked to outside aircraft and target displays	S87-154
Attention "back to the reader" used electronic readers instead of books in schools	S87-10
Weapons that throws sleep, stun gun that causes unconsciousness	M89-11
Emergency reenter pod, two persons, heat shield and parachute	M89-78
Large space station, many docking points and artificial rotating gravity	M89-78
Free flying solar observatory, giant camera	M89-78
Luna base, and navy base off earth	M73-76
Hyper-communication, uses quantum pals to send single far away	M73-111
Solar power and other green power sources are the primary source of power	M75-70
People live in space houses, private homes in orbit or by a space station	M75-70
Mines on Pluto, low paid workers,	M75-70
Genetically design humans	M75-122
Plastic bubbles made up a space colony	S75-10
Transfer Pod, shuttling people from different orbits,	S75-10
Crab like robots	S03-70
Humans were getting use to being immortal, very few children, advances in medicine	S03-70
Genetically engineered o stimulating bone growth plus drugs	M02-10
Shuttle with increasing amounts of labs	M02-10
Extract water from poles to create liquid oxygen and hydrogen fuel for rockets	M02-10
Medical computer controls and creates designer humans	S66-10
injector collects single cells, and can inject cells back to do repairs	S66-10
Automatic machines taking care of waste management	S73-94
Rubbery fabric used in ships to make the ships bigger in space.	S73-94
Space ship 4 rotating disks, made from two separable units, small deck filled with supplies because less gravity	S73-94
Robots gives people drugs, auto medical asst.	S73-12
Robot was covered in "tough ceramics"	S73-12

How to read the reference code: Example: **S73-10**

The first letter = Month	The first set of	The last set of
Example: <b>S = September</b>	<b>numbers = Year</b>	<b>numbers = the</b>
J: = January                      L: = July	For Example <b>73 =</b>	page number or
F: = February                      G: = August	<b>1973, 47 = 1947 and</b>	the individual story
M: = March                              S: = September	<b>52 = 1952</b>	
A: = April                                O: = October		For Example <b>10 =</b>
Y: = May                                 N: = November		starting around or
U: = June                                D: = December		on <b>page 10</b>

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1962 January, "Naudsonce," H. Beam Piper, 6-44 Code: J62-8

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1983 March, "Quiddities," Ray Brown, 92-113 Code: M83-94  
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1990 March, "Passages," Joe Haldeman, 010-31 Code: M90-12

1991 September, "A Sweet Disorder," Julia Ecklar, 56-70 Code: S91-58

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1992 September, "Human Lives," Braian C. Coad, 74-85 Code: S92-75

1993 March, "Squatter's Rights (Part 1 of 3)," Squatter's rights, 14-73 Code: M93-14

1993 March, "The Ghost in the Machine," Grey Rollins , 100-121 Code: M93-102

1993 September, "Small Victories," Linda Nagata, 82-105 Code: S93-84

1993 September, "Course Changes," Jerry Oltion, 14-38 Code: S93-16

1994 March, "The Loop Hole," Dave Creek, 118-128 Code: M94-120

1994 March, "We Three," Rick Shelley, 94-114 Code: M94-96 M94-96

1995 November, "Mona," Addie Lcoe, 84-85 Code: N95-85

1995 November, "With Others Eyes," F. Alexander Brejcha, 38-69 Code: N95-45

1996 September, "Beyond the Volcano," Ned Farrar, 62-89 Code: S96-64

1996 September, "Starplex (Part 3 of 4)," Robert J. Sawyer, 96-144 Code: S96-100

1996 September, "Something On My Mind," Grey Rollins, 12-37 Code: S96-15

1996 April, "Big John," Doug Larson, 82-99 Code: A96-85

1997 September, "Second Chance," Fran Van Cleave, 101-131 Code: S97-101

1997 September, "From Every Opening Flower," Jonny M. Duffy and G. David Nordley, 114-145 Code: S97-115

1998 March, "The Stones from Which Meadows Grow," Wolf Read, 78-93 Code: M98-80

1998 March, "Tramp," David Alexander and Hayford Peirce, 94-113 Code: M98-102

1998 March, "In Loco Parentis," Edward H. Seksay, 120-131 Code: M98-120

1998 March, "Rules Of Engagement," Michael F. Flynn , 132-146 Code: M98-132 M98-132

1998 September, "while You Wait," Kathy Oltion, 102-112 Code: S98-105

1999 September, "McAndrew and the Fifth Commandment," Charles Sheffield, 10-29 Code: S99-11

1999 March, "Means Of Survival," Sarah Zettel, 104-115 Code: M99-105

1999 March, "Flowers and the Last Hurrah," Kristine Katheyn Rusch, 52-71 Code: M99-52

1999 March, "Elephants' Graveyard," David Alexander and Hayford Peirce, 10-41 Code: M99-11

1999 September, "Holding the Key," Shane Tourtellotte, 92-131 Code: S99-95

1999 September, "TCoB," Kandis Elliot, 71-76 Code: S99-71

1999 September, "Rustle Of Spring," Laurence M. Janifer, 80-89 Code: S99-80

2000 March, "The Eyes OF Freedom," Remona Louise Wheeler, 46-65 Code: M00-47

2000 March, "The Suspended Forth," Paul Levinson, 72-83 Code: M00-73

2001 September, "The Precipice (Part 4 of 4)," Ben Bova, 90-131 Code: S01-94

2001 September, "The Upgrade," Brian Plante, 67-79 Code: S01-67

2002 March, "Hearts In Darkness," H. G. Stratmann, O10-37 Code: M02-10

## ABOUT THE AUTHOR



Elysia Wells sees patterns where others see chaos. She strives to understand the situation in order to create solutions. This drive for understanding is what brought her to the Design Management program at SCAD where she was able to develop and strengthen her skills. She learned about a broad range of topics including design, research, strategy, and scenario development. She was able to utilize these skills while researching for and writing this thesis.

Prior to starting the Design Management program she earned degrees in both Studio Arts and Anthropology. Anthropology gave her a chance to explore humanity and understand the diversity of the human species. Art allowed her to explore

shape and form.

Elysia's experience of living in a diversity of places also taught her to look at the world with a critical, yet understanding, eye. Growing up in Las Vegas she learned to appreciate diversity, she was exposed to novel thinking and introduced to a variety of design styles. Living in Historic Savannah exposed her to the Deep South, which is another side of American culture. Living in Belgium has introduced her to European culture and design.