UNIVERSITY OF READING

ENHANCING SCIENCE COMMUNICATION IN RESEARCH PROPOSALS TO INFLUENCE FUNDING DECISION-MAKING

PHD PROGRAM

HENLEY BUSINESS SCHOOL - MARKETING & REPUTATION DEPARTMENT

FAJER AL-HUSAINI

STUDENT ID

AUGUST 2022

‘Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.’

FAJER AL-HUSAINI

Table of Contents

Dedication

Obtaining a PhD was my lifelong dream. Anyone close to me would tell you this is Fajer's dream since forever. I have faced many difficulties in life, one of which was the sudden passing of my father. He would always call me "Dr. Fajer", and smile. I remembered these words, always, as I worked hard on this dissertation. He would have been so proud. To my mother, this one's for you. You've seen my struggle with all the hard work, I had to endure handling the loss of my father, and were always there to support me, even when this loss has impacted you the most. I can't thank you enough for being the best mother any child could ever ask for and I want to dedicate this work to you as your lifetime accomplishment. You've invested so much in me and this is the fruit of your labour.

My husband Abdullah. You have been my backbone of support throughout this entire journey. From searching for schools to apply for, to being so excited when I got accepted. Being there for me every step of the way, even traveling with me just to attend classes. I am lucky to have you, and appreciate everything you did to help support me in fulfilling this journey.

My Manager Moahmmad Al-Basry and Team Leader Bodoor Sayed Omar at Kuwait Oil Company. Thank you both for your full support throughout this tiresome journey. You have both always encouraged me when I was feeling tired and made sure that I would complete my studies even during the busiest seasons of work and for that I will always be grateful.

Finally, I would like to thank my supervisors, especially Mike Molesworth, who has been my guide during the entire process of obtaining this PhD. From registration paperwork, to providing your time consistently throughout the past three years. Words cannot express the amount of gratitude I have for you as a person. Your enthusiasm has been my number one form of support to continue when I felt lost at times. You believed in me and pushed me to go further without limitations, and your trust in particular ignited the fire in me to continue to proceed. I was fortunate to have such a great supervisor, and wish you all the success in your future endeavours. Dr. Georgiana Grigore, I have had the privilege to work with you and appreciate all the time and effort you put forth in reviewing my work even after you have moved to Leicester. You are an amazing person and I can't thank

you enough for everything that you have done for me. Finally, thank you Dr. Melisa Mete for your guidance throughout this journey.

Reflection on PhD Experience

The PhD experience has been one that will forever change my life. In the events of the sudden COVID-19 world Pandemic, the environment we live in has become one that has presented an unprecedented challenge. Before proceeding, I would like to acknowledge the work of not only the NHS front-liners, but in my opinion, the members of faculty who have been at the forefront of this pandemic, generously committing their time to the excel of our academic journeys, while facing the added responsibilities of being at home with their families. I would like to thank everyone reading this document for their time to provide feedback during these hard times and hope you enjoy reading it as much as I enjoyed working on it.

The PhD program has been interesting for me because I work full time in Kuwait at Kuwait Oil Company (KOC), and have been required to travel back and forth to attend module classes, which was weekly at times, making the airport my second home, and the coffee shop at the airport and airplane seat at times, my working desk. Although presented with the challenge of constant traveling, this provided me with an experience that showed me how much endurance and strength I have to complete a program that is so dear to my heart. I have committed myself completely to progress with this research on time and ensure I achieve all requirements to proceed with the program according to schedule. This included completion of all assignments, attending all modules, taking RDDP classes as well as attending online seminars.

Modules included in the first year were Introduction to Thesis Literature Review, Quantitative Data Analysis: Finding Patterns with Regressions, Pedagogy Seminars and Advanced Qualitative Methods. All modules provided different insights to my research project. The quantitative class familiarised me with how to read and interpret quantitative papers, where insights are quantified with numbers and hence provide strategies for further understanding of phenomena being researched. The literature review class shed light on how to critically read and challenge existing literature to identify research gaps that would frame or lay out the research question. The literature review class was crucial to my learning process as it helped me identify existing theories,

understand how these theories shape communication and marketing strategies and helped me appreciate the thought process that goes into developing an interesting and relevant research project. The pedagogy class was interesting because it showed the process or 'the behind-the-scenes' of teaching, which I wasn't exposed to as a student. This module unravelled the amount of preparation required in order for us to learn in the best way possible, which made me appreciate how hard it is to teach. Pedagogy has so many layers, one of which I believe to be the most important is understanding cultural diversity and therefore requiring a teacher to be culturally sensitive. Being at a university that embraces cultural diversity from different countries, I came to the realisation that students from different countries learn differently, respond to different methods of teaching in different ways, and it is our responsibility to ensure inclusiveness of each student in the classroom and understanding their learning needs. Therefore, the responsibility of teaching is much greater than conveying terms and concepts, rather it is the essence of inclusive communication to convey these concepts in a manner that is understandable to all students as much as possible. This is an important lesson that I will be taking to heart when I consider teaching. The next module I attended was the qualitative module, attending half of the classes on campus and the remaining classes via classmate recordings due to the full lockdown enforced in the State of Kuwait, which made me unable to fly to the UK. Qualitative methods I believe are an opportunity to meet people and understand perspectives. They allow for us to meet new people, expose us to different cultures and to me, are an eye-opening experience that sparks great interest for research. What I took away from this class is the importance of planning and being systematic when conducting methods. Paying attention to detail is critical in order to optimally obtain required information for the research at hand. Small things such as when to schedule an interview, what recording device to use, making sure your mobile phone is on silent mode, being sensitive and appreciative of people, knowing how and when to probe questions without being abrupt— intricate little details count for a lot when conducting qualitative research, which made me realise the importance of planning ahead and ensuring the researcher thinks in great detail.

I have attended 2 RDDP classes on campus, namely: How to Write a Thesis and How to Avoid Plagiarism. How to write a thesis provided structure on how best to section the thesis and what needs to be focused on when

writing. The avoiding plagiarism class for me was very important as it addressed the different methods of referencing, its importance as well as how to reference different information within the thesis document. The remaining 11 RDDP classes (certificate of attendance found in Appendix A) were attended online due to the pandemic and travel restrictions. The pandemic changed my learning habits, where the experience of being tentative to a person speaking to me from a screen became the new normal. It was also comforting to be able to see my colleagues and as well as interact with other students during online classes, which gave a sense of appreciation for technology. Being a distance student has been quite the experience. Quite the opposite of the common thought where distance learning is considered hard to manage, I had an amazingly easy-going experience via optimal use of available technology. Skype, Zoom, MS-Teams and email were my go-to communication tools and proved very useful to obtain on the spot feedback.

Additional Work

An additional project I have been working on during the first year is writing a book chapter titled: *Corporate Social Responsibility and Corporate Reputation During the COVID-19 Pandemic: The Case of Kuwait's Oil Sector*. Working at Kuwait Oil Company (KOC), I have been involved with the development and communication of KOC's major CSR projects during COVID-19, which involved the construction of the Kuwait Field Hospital—a hospital dedicated to hosting COVID-19 patients and being the first vaccination centre that serves Kuwait's Ministry of Health (MOH) and inhabitants of the country. The Company also constructed large quarantine facilities to house COVID-19 patients, all of which have been used excessively as the number of cases kept rising. Rather than just write a book chapter I decided to work on this as a project and obtain interviews from representatives from the Kuwait oil sector and the recipients of the CSR projects—the Ministry of Health professionals. Although choosing to do a project rather than just a chapter would be time consuming, I opted to conduct this research in order to obtain useful insight to this unique situation regarding the impact of such majorly visible CSR initiatives on the Company's reputation. The main concern was to find out whether CSR initiatives during a world pandemic have a great impact on reputation and whether time for execution and completion in particular, have an impact on companies' reputations. The interviews were scheduled between June 2020 – July

2020 where I was able to interview five oil sector representatives and 2 doctors from the Kuwait Ministry of Health who have been heavily involved in the crisis response to COVID-19 by the state of Kuwait. The project provided tremendous insights and confirmed that CSR during COVID-19 has changed perceptions about the oil sector's reputation in response to national calls for assistance, as well as made the oil sector representatives realise the importance of CSR activities that serve different organisations in need. The participants from the oil sector also emphasised that their own perception of the importance of CSR has changed. They believe that their CSR initiatives need to be more focused on actual needs of their stakeholders, they want to meet with their stakeholders more often and they realise that there is a pressing need to implement large, permanent CSR initiatives that are highly visible. They stressed that high visibility projects such as constructing facilities that serve the general public on a daily basis such as a specialised clinic or hospital, provide the sector with a positive image, while ensuring that these facilities are managed and run professionally. A large project or facility is much more appreciated than a one-time CSR initiative that is easily forgotten once done. This project gave me experience in conducting interviews and made me realise that there are several interview skills needed to obtain information from participants in an optimal manner, one of these important skills is tentative listening. Being a good listener allows for further expression of opinion and allows for better probing to retrieve information. The book chapter was successfully published in September 2021, which was my first academic contribution to the field of Corporate Social Responsibility. This publication gave me insight into what the publication process entails, including how to address reviewers' comments and how to improve the quality of the chapter based on their comments.

Seminars & Conferences

During lockdown, I was able to attend a virtual seminar organised by the Kuwait Foundation for the Advancement of Sciences (KFAS) on 14 September 2020– named: Weathering the storm: How healthcare systems navigate the pandemic: Lessons Learned, which was given by Prof. Alistair Mcguire from London Business School. The seminar discussed the economic implications of COVID-19 on the world at large, its impact on healthcare systems around the world, and in particular on the State of Kuwait. Attending this seminar allowed me to participate in shedding light on the Kuwait oil sector during the Q&A session, where I discussed whether the CSR projects

implemented in the book chapter project I was working on, would have economic impact on Kuwait's Ministry of Health. This was a very interesting experience for me as it was my first time linking what I have written into a discussion within a seminar.

On the 10th of May 2022, I was able to attend a seminar also organised by the Kuwait Foundation for the Advancement of Sciences (KFAS) named Writing a Research Funding Proposal given by Prof. Samy Azer. This seminar in particular was very interesting as it provided me with insights that are directly related to my study. Prof. Azer is based in the University of Sydney as well as King Saud University in Saudi Arabia, which showed that the phenomenon of optimising proposal writing for grant funding is a problem faced by scientists all over the world (not limited to Kuwait). Prof. Azer discussed optimal proposal writing from his own experience, and given the timing of the seminar where I was in the writing up phase, I could draw links between what he was explaining from his own perspective, with the findings in my study. What I found interesting was that although he was trying to simplify proposal writing from his experience, I also felt that he was articulating optimal proposal writing with difficulty. This observation confirms that the topic of my thesis is indeed complex and requires further investigation.

Conferences

I also participated in Henley Business School's Doctoral Conference, which was held on 22 September 2021, where I presented my research in a poster. This was also my first time participating in an academic conference as a speaker, which provided me with the opportunity to engage with peers as well as professors in explaining my research and elevating my research pitch.

Early Ethics Approval & Approval from Kuwait Institute for Scientific Research (KISR)

COVID-19 didn't hinder my progress with my research as I was able to make best use of this time to develop my interview guides, methods, and submit my ethics form along with participant consent forms, which were all approved by the Henley Business School (HBS) ethics committee in May 2020 before attending my confirmation VIVA. I also was able to obtain the approval of KISR's Director General at the time Dr. Samira Omar, who I would like to thank for her tremendous support, to proceed with the research and start contacting scientists.

PhD Experience in Kuwait

Being a PhD student in Kuwait is a privilege due to the Kuwaiti culture and the sample being interviewed. The Kuwaiti culture has the highest regard for PhD students as we are perceived as hard workers who are in the pursuit of learning. PhD students in Kuwait are considered a source of pride—pride in the Kuwaiti youth—who are seen as the future of the State of Kuwait. This perception made my quest to obtain interviews relatively easier than my colleagues in the program, who have shared their experiences and difficulty in obtaining interviews during our PhD monthly meetings. Also, the selected dataset was very helpful. Being of scientists who went through their personal PhD experiences, they "saw themselves in me". I had reminded them of what it meant to be a PhD student who is on a difficult journey. This triggered feelings of empathy, where the scientists tried to help me by any means possible. Obtaining interviews through word of mouth created a phenomenal snowball effect, where a total of 37 participants were successfully recruited for the study. I had also noticed that they were willing to give me more time than what was originally intended because of this empathy. Moreover, the selected topic of this research was very important as the topic was so dear to the scientists' hearts. As the scientists expressed, writing a proposal for research is a very stressful and strenuous exercise that exerts much of their effort, and selecting this topic in particular to talk about was of high interest to them. They were intrigued by the topic because of its difficulty. Scientists expressed the need for such a topic to be explored so they can understand how to better communicate within their proposals. Others said that they felt like the 'underdog' because exploring how a research proposal is written sheds light on the amount of thought, hard work and dedication that goes into proposal writing, hence this project to them, shows the difficult job of scientists and portrays them in the image that they deserve. I have been greeted with great enthusiasm and gratitude by the scientists and I would like to thank each and every one of the scientists who gave me their time, attention and patience to conduct the interviews as well as provide me with the guidance and documents needed to fulfil my research. Without their support, this research would have not been possible.

All in all, the PhD program experience has been very productive for me and has matured my research skills to be able to develop an interesting research project. I have been successful at the implementation of a full-

time PhD program using latest technologies and was able to endure flying-in weekly for classes, which was motivational for me to excel in my PhD experience. In the following section I identify my research question and introduce the topic being studied.

ENHANCING SCIENCE COMMUNICATION IN RESEARCH PROPOSALS TO INFLUENCE FUNDING DECISION-MAKING

Abstract

Although science communication with the general public (Olson et al., 2013; Olson, 2015; Dahlstrom, 2014; Fischhoff & Scheufele, 2014; Kwon & Nelson, 2016) and with policy makers (Torres, 2019; Dahlstrom & Scheufele, 2018; Lidskog et al., 2020) has been explored, highlighting that information needs to be presented in a meaningful context for people to understand its value, there has been less attention paid to how scientists communicate research proposals in order to *gain funding* for research. In this study I draw from storytelling theory to explore the complex process of communicating for science funding. Storytelling has been used as a common communication tool that can project meaning. Humans intuitively communicate via stories in their daily conversation to provide context that allow others to interpret our unique experiences (Schank, 1999). Storytelling has also been used in other contexts such as marketing, branding, public relations as well as in science communication. However, there is an absence of theory that addresses how stories can be used to obtain funding for scientific research. The aim of the project is therefore to (1) understand how applications for research funding are structured, (2) understand how scientists communicate their research to funding committee members, and (3) to uncover how certain communication aspects influence funding decisions. The project outcome is to provide scientists with a communication theory that would aid in securing funds as they communicate more clearly to funding agents.

CHAPTER 1: INTRODUCTION

1.1 Background

Obtaining funds for research is a task experienced by scientists and academics all over the world. With an ever-increasing demand for research funding, and an increase in competition for such funds, scientists are faced with the challenge of writing proposals that are relevant and more appealing than their competitors' (Tammi, 2009). In this study I examine a type of organisation that relies on securing external research funding, and that has not been significantly covered in management, or organisational storytelling literatures: Science and Technology Institutes (STIs).

Science and Technology Institutes serve the specific purpose of providing solutions to industry (Hering et al., 2012), unlike university research that is often seen as mainly focusing on academic contribution in terms of basic, or fundamental research (Bentley et al., 2015). STIs have the focused responsibility of solving existing problems in the societies in which they operate, making the focus of their research more directly applied than universities (Hering et al., 2012). The main objective of applied research then becomes to develop solutions to existing problems that would in turn enhance our lives (Joubert et al., 2019). STIs' purpose is unique, often intangible and very hard to track for progress. This presents a challenge for researchers at STIs to 'market' what they do in order to receive funding for research, and that in turn makes them a suitable focus for an examination of how science funding is obtained.

Yet while working at the Kuwait Institute for Scientific Research (KISR), I have found that scientists often struggle to explain their research to funding committees. This constitutes a serious issue because without funding, knowledge cannot be generated, and without the capability of persuading committee members for funding, many opportunities for useful knowledge generation will be missed. This could deprive the world of solutions to existing problems and that leads to a lack of enhancement of our daily lives. Whether in a written proposal document or a presentation during a Proposal Review Meeting, scientists at KISR found themselves at times *'lost in translation'* where the benefit of their research was not communicated effectively. This has led to a communication dilemma of how scientists can communicate their proposals in a manner that is understood, and in a format that encourages

funding. I therefore introduce my research gap: how can scientists communicate their proposals in a manner that encourages funding?

STIs operate like NGOs in that they produce science at no profit and so require grant funding to work on initiatives. However, NGOs usually produce tangible initiatives that have measurable goals, whereas STI's performance can be less easy to demonstrate. For example, an NGO can track the number of tents provided for a refugee camp, the number of blankets distributed to poor families and the number of food aid boxes distributed in a country destroyed by famine. However, scientific knowledge cannot be quantified nor easily tracked. The amount of investment in money, resources and time without a definitive outcome produces very high risk for funders, especially bearing in mind that scientific research may fail (and often does) and definitive results are not guaranteed. For example, a funder may be approached by an STI to fund a new type of stem cells research project that is assumed to cure colon cancer. Moreover, researchers at STIs cannot guarantee that their trials succeed, nor can they guarantee the outcome of their research, which presents high risk to funders. In turn, scientists need to convince funders to fund their projects knowing the high associated risks with no reassurance for return on any investment. This highlights the need to understand the complex communications processes related to funding applications to inform more convincing proposals that may encourage funding, i.e., my aim is to better understand science funding communication to improve the process of securing funds.

1.2 Problem Statement and Context

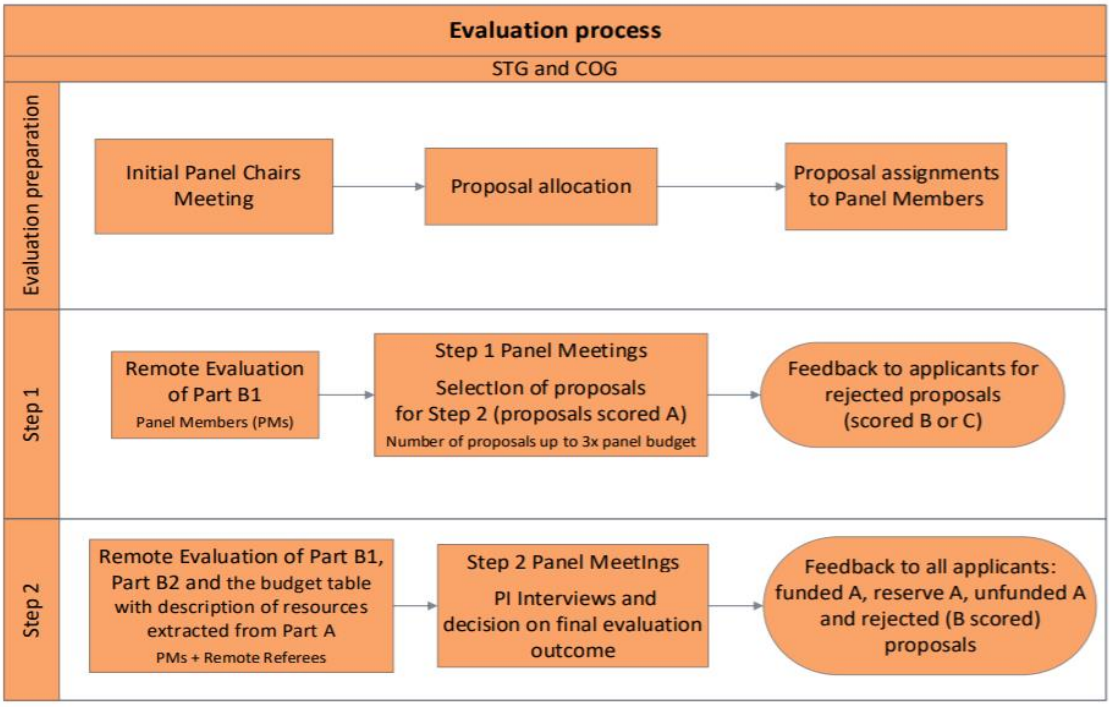
My research question is therefore: How can scientists improve science communication within their proposal to encourage funding decision-making?

Science & Technology Institutes (STIs)

Acknowledging that science communication is difficult has been clearly established in existing literature, however there is still a gap pertaining to the understanding of such difficulties in communicating science to a funding audience. Science and Technology Institutes face the challenge of obtaining funds for futuristic research where competition is high and funds are scarce. Although my study is conducted at a research institute in Kuwait, I introduce a case from Europe to highlight this challenge as an international phenomenon rather than simply local

to Kuwait. In order to provide further contrast on research funding organisations, I present the European Research Council as an international funding organisation that was set up in 2007 (ERC, 2022). I use the ERC as an illustrative example to present the context of my study within a familiar international research funding institute, while my study focuses on Kuwait. Using the ERC as an example is useful to explain the context of this study as the ERC's grant approval process is very similar to KISR's in which it includes the submission of a written proposal that is rigorously reviewed by experts, where applicants of proposals that pass the initial screening are invited for an in-person interview where they explain (perform) their proposal live in front of a review panel who then makes the decision to fund based on the outcomes of that meeting. "The ERC is the first pan-European funding body for frontier research and aims to enhance the dynamic character, creativity and excellence of European research at the frontiers of knowledge. Project selection for funding is based on peer review where since 2007, more than 12,000 projects and over 10,000 researchers have been selected for funding" (ERC, 2022). The ERC has a rigorous peer review process where thousands of candidates apply for grants and only some are selected for funding. The evaluation process is illustrated in the flowchart below.

Figure 1.1: Europe Research Council (ERC, 2021) Frontiers Research Grant Evaluation Process Flowchart - for International Context Illustration Purpose



As illustrated above, there are three main screening steps that take place for proposal evaluation at the ERC. The preparation step involves allocation of proposals to corresponding peer reviewers who are assigned to initiate the review. The following step is the remote evaluation process by panel members who then meet to select proposals that score well (A score) and provide feedback for rejected proposals (Score B and C). The final step in the evaluation process is screening A-scored proposals and confirming budgets as well as allocation of resources. The PIs mentioned in the proposals are then called for an interview (presentation) with the ERC funding panel where a final decision to fund is made. Finally, feedback is sent to all A-scored applicants, whether they are approved for funding, are unfunded or rejected (B score) (ERC, 2021). In essence, in order to apply for grants from an international funding organisation, the applicant submits a written proposal, which is then peer reviewed, further screened rigorously by a panel and is then subject to an in-person interview. As will be explained below, the Kuwaiti Institute I have selected for this study, follows a similar approach to proposal review for funding, making the selected dataset internationally relevant. I now present how science funding functions in Kuwait.

Selected Institute: Kuwait Institute for Scientific Research (KISR)

The Kuwait Institute for Scientific Research (KISR) is Kuwait's National Lab. Much like all national labs across the world, KISR is the formal research entity in the country that is specialised in providing applied solutions to the country's existing challenges in multiple sectors.

KISR employs scientists from different backgrounds and disciplines and comprises of 4 major research centres namely: Water, Petroleum Studies, Environment & Life Sciences and Energy & Buildings. These centres are based on Kuwait's research needs and research proposals are subject to approval for funding through an internal proposal cycle process, as well as external funding from the Kuwait Foundation for the Advancement of Sciences (KFAS - a government funding agency), other Governmental Bodies and Commercial Clients. Scientists develop proposals for review by different committees depending on the estimated project budget.

There are 3 different levels of proposals at KISR. The first level is called K-Projects (KISR- projects) estimated around £20,000, the second, is called C-Projects (Client-Projects) estimated between £100,000 and £200,000, and finally, "flagship projects", which are national-level projects that do not have a value cap. Such projects can be

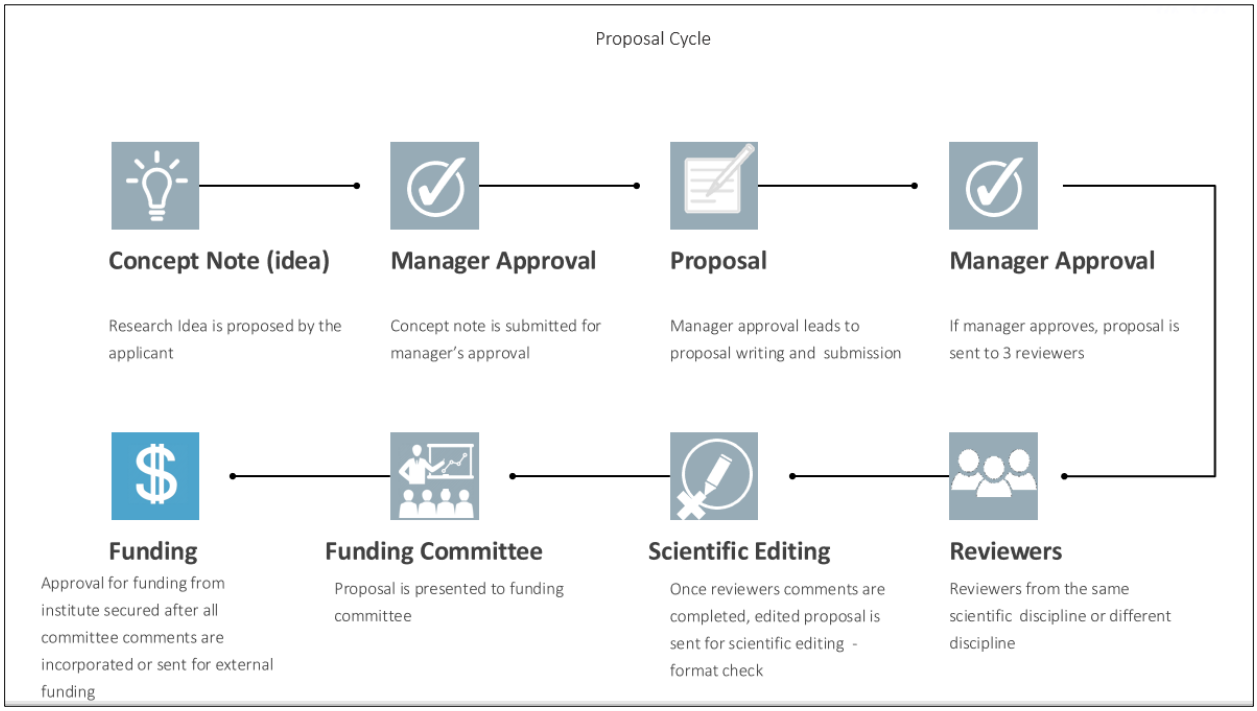
worth millions of Pounds and are subject to governmental approval such as the Kuwaiti Supreme Council for Planning and Development. Each level of committee has a different set of committee members. For example, projects of up to £20,000 consist of junior-level management of the same centre (for example a scientist applying from the water centre presents to a committee consisting of program managers from the water centre). For projects ranging between £100,000 - £200,000, committee members comprise of centre directors who are senior scientists with different scientific backgrounds. Finally, for Flagship projects, committee members are at the Director General level, external stakeholders/government bodies involved in the project of senior level as well as senior advisors. These members are mixed between having scientific and managerial backgrounds, which makes exploring the use of storytelling an experience that needs to be observed carefully.

While working at the Institute myself, I have found that these research proposals are quite a complex document that is not easy to understand to a non-scientist. I have also found that the sums asked for such proposals is substantial, meaning that a research proposal is viewed as an expensive investment that has no solid guarantee of outcomes, which turns into a major risk. The challenge that then arises is, how can applicants communicate a research proposal that reduces perceptions of risk and encourages release of funds? In the following section, I explain the application process at the institute being studied in order to contextualise the problem faced when applying for funds and its complexities.

The funding of scientific research at KISR starts with a *'proposal cycle'*. The cycle starts with a research idea, then writing a concept note and finally once done, the research proposal document is written. Once the proposal is written it goes for initial screening by the associated manager, who if convinced with the idea, will send the proposal to 3 internal reviewers who will provide their comments. If well scored by these reviewers and all comments are covered, the proposal will be sent to the scientific editing office, which ensures the proposal is formatted according to the institute's requirements. After the proposal is fully edited, it finally receives an appointment for presentation at the funding committee. The funding committee receives the proposal prior to the presentation, where the committee members review the proposal in preparation for the meeting. Applying scientists on the other hand prepare for the meeting and then present to the committee at the scheduled

appointment date. Finally, the committee makes their decision to fund once the presentation is completed and they have had a chance to deliberate. The decision is communicated in writing via a scoring sheet that also includes each member's comments, which need to be addressed by the applicant. The proposal cycle can range from six months to a year and a half in duration, depending on the workflow of the initial reviewers, the schedules of the committee members and the amount of follow up effort put forth by the applicant. The following figure simplifies the proposal cycle at the research institute explored in this case study:

Figure 1.2: KISR Proposal Cycle



Much like the ERC process, a written proposal is submitted and goes through a rigorous peer review process. Once the proposal is agreed as potentially viable for funding, the applicant is invited for a meeting to present the proposal to a funding committee (presentation) where a final decision to fund is made. Once the meeting is completed, feedback is sent to all applicants. The above examples indicate that funding for research is rather a phenomenon experienced around the world and not only in Kuwait, where applicant scientists face similar funding challenges.

Although KISR has not published its annual report as it has shifted its status to confidential, I present statistics from the Kuwait Foundation for the Advancement of Sciences (KFAS), which is a major source of

funding for KISR. These statistics are used to show the potential for the amount of funding in Kuwait, which sheds light on the scarcity of funds and the competitive environment for accepting proposals. The excerpt below is taken from the Kuwait Foundation for the Advancement of Sciences' (KFAS) Annual Report 2019.

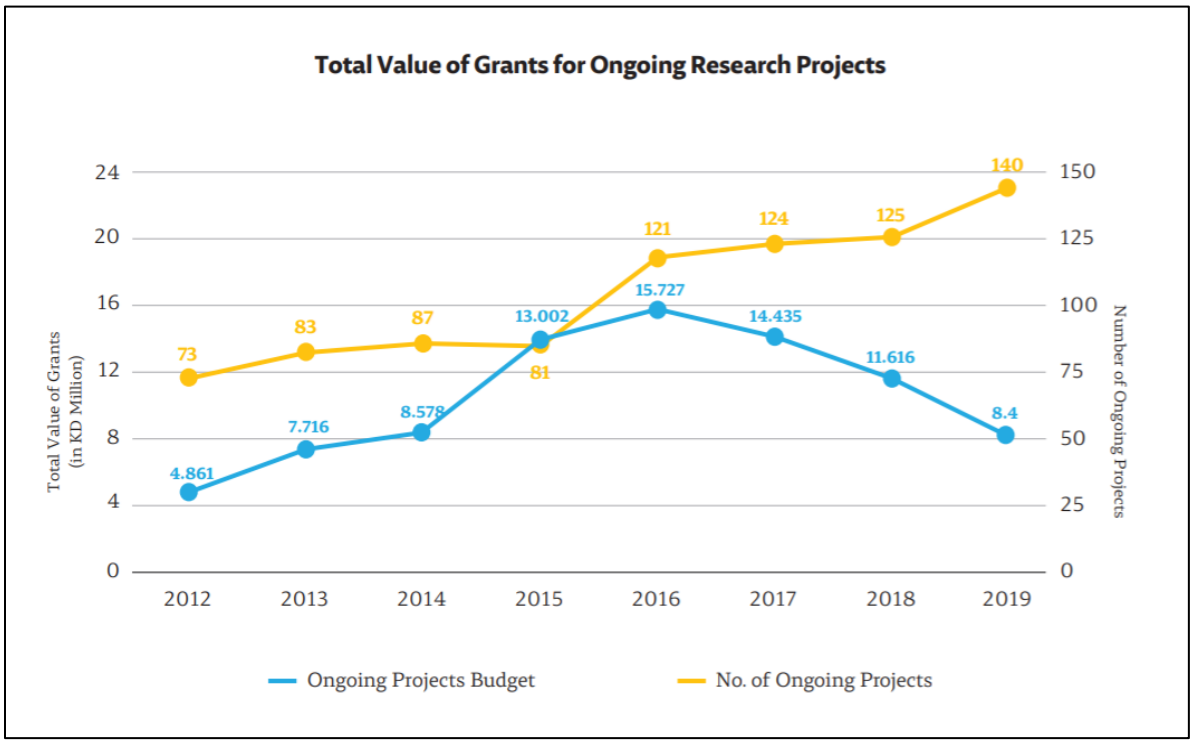
"Investing in Research and Research Capabilities"

"KFAS plays a central role in providing research grants and capacity building opportunities for the local research community and private sector, aimed at developing innovative and sustainable solutions to address national priorities and enhance businesses, as well as strengthen the competencies of local researchers. This is supported by the Foundation's wide network of collaborations and partnerships with international centers of excellence and prestigious international institutions" (Kuwait Foundation for the Advancement of Sciences, 2020). This statement highlights KFAS's main role of contributing to solving Kuwait's pressing needs through research and enhancing the skills of Kuwait's scientific community.

Research Support Statistics

"In 2019, KFAS spent approximately GBP 45.6 million for funding research. A total of 293 research proposals were funded, of which 90 were new projects, totalling approximately GBP 9.4 million. The total number of ongoing research projects reached 140 research projects, amounting to approximately GBP 20.7 million, and 63 projects were completed, totalling approximately GBP 15.5 million" (KFAS, 2020). The following chart shows the total value of grants versus the number of ongoing projects from 2012 to 2019.

Figure 1.3: KFAS Ongoing Projects Value



The chart shows the contrast between the increase in number of ongoing projects versus the declining total value of grants. This example clearly highlights the dilemma faced by applicant scientists with the increase in competition for scare funding in Kuwait where the number of ongoing projects in 2019 reached 140 while the amount of funding declined to approximately GBP 23 million.

In this context, the medium of science communication i.e., *'the research proposal'* has not been explored in the literature. While the current literature focuses on communication of scientific results to the public/policy makers (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021), the focus of my research is communicating science before it is executed, meaning communication of science as a conceptual idea rather than a completed project. Communicating conceptual ideas adds a complexity of risk of the unknown as explained above, which instils the requirement to understand how best to communicate such ideas in a manner that is first, understandable and second, reduces risk. The information required within a research proposal shall be explored in order to identify how information is presented, what information is required and how that information is formatted for its intended audience.

Science communication literature addresses the public and policy makers as an audience for science communication (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021), and also looks at the scientist as a communicator (Banks & Di Martino, 2019; Bloomfield & Manktelow, 2021; Maninno et al., 2021) to understand how *'good science stories'* are formatted and hence communicated. In the case of this research project, the dataset comprises of a complex audience that is of diverse backgrounds and roles. In this context, to understand the dataset as a whole, I explain who the people involved in research at KISR are. The organisation consists of scientists from different levels as well as managerial staff from different levels who are not scientists. Scientists from Juniors to Seniors all conduct research, which is applied for through writing a proposal document that goes through the proposal cycle. Some management staff also apply for research funding because their department is concerned with research, this includes the techno-economics division who is responsible for developing statistical reports that serve several sectors across Kuwait. These reports for example include energy consumption statistics, water consumption statistics, etc. The proposal application process as described above includes multiple actors who are the applicant, peer reviewers and committee members. As an applicant scientist writes the proposal and then presents it to a funding committee, I have decided that it is imperative to understand perspectives from these multiple actors on what constitutes a *'good proposal'*, following previous research, which focuses on the communicated information (the proposal document in my case) and the actors involved in the communication process i.e., the communicator and his intended audience (in my case, the applicant scientists and the reviewers/committee members as their audience).

1.3 Research Aims, Objectives and Questions

The aim of this research is to explore and examine the existing practice of grant application to develop new categories of effective storytelling that can be communicated in grant applications. The research objectives are to uncover what information is required by funding committee members, how good proposals are structured and how information is presented and formatted to influence funding decision making. This thesis also examines current practices in science communication literature to develop a comprehensive framework that adds to the science communication domain.

Research Questions

1. What are the characteristics of different audience roles that are involved in the funding of research proposals?
2. What are these audiences looking for in a research proposal in order to make a positive funding decision? To answer this, I also ask: in what specific ways do applicant scientists successfully deploy aspects of *'storytelling'* to present their research proposals to funding audiences?
3. How do scientists prepare for live presentations to funding audiences, and what happens during the proposal review meeting interaction when negotiating the proposal? To answer this, I also consider how committee members experience presentations of research proposals and what happens during the meetings.

1.4 Brief Research Methodology

A case study approach was used and a total of 37 in-depth interviews were conducted with scientists applying for funding and funding committee members in order to explore how proposals are communicated and whether different audience members evaluate different information when reviewing proposals for funding. Sixteen proposals and feedback forms were also collected and analysed to gain further insights and to establish data corroboration with interview accounts.

1.5 Rationale for Research

Communicating science is generally a difficult challenge as it involves complex scientific knowledge, data and terminology that is not understood by all (Green et al., 2018; Torres, 2019). There is clear acknowledgement for the need of science communication research and science communication literature although exists, is lacking and fragmented. Issues pertaining to science communication are highly dependent on context and case studies are therefore incoherent and are not widely evidence-based (National Academies of Sciences, Engineering & Medicine, 2017).

The approach to science communication has been viewed as a holistic system (Institute of Medicine, 2010). This system includes, the target audience, their understanding of the scientific topic, the available

information surrounding the scientific topic, the science communicator, communication channel and frequency of information exposure to take some examples. It is agreed that science communication differs depending on the case and context, and is hard to determine as each case contains its own variables, scenarios and complex elements (National Academies of Sciences, Engineering & Medicine, 2017). A more holistic approach to understanding science communication becomes a necessity in order to uncover the *'full story'* behind effective or ineffective science communication approaches although are very hard to make common (National Academies of Sciences, Engineering & Medicine, 2017). For example, science communication for informing the general public about a health hazard involves different mechanisms and approaches to messages development than communicating the same health hazard between scientists. The mode of communication also differs in the same case where for example a press conference, press releases and social media message can be effective for the general public, while specialised conferences and detailed scientific, evidence-based reports can be used for a more specialised scientific audience. The holistic approach therefore can be used to examine each science communication case on its own but from a rather more element inclusive view to uncover the *'entire picture'* (Institute of Medicine, 2010).

Science communication represents complicated content (Scheufele, 2013; Fischhoff & Scheufele, 2014; Olson, 2015; Torres, 2019) and complex audiences (Dahlstrom & Scheufele, 2018; ElShafie, 2018; Lidskog et al., 2020). Existing literature discusses science communication techniques to be used for the general public or policy makers (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021), where the contemporary technique being promoted is the use of storytelling (ElShafie, 2018; Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). However, storytelling in science communication can be further explored as a possible approach STIs can use to increase likelihood of funding. Storytelling, as a broad approach to human communication, represents a useful framework for examining how science funding applications unfold. Indeed, the literature already describes the use of storytelling by charity organisations (NGOs) who are responsible for generating funding in order to support different causes that would help vulnerable groups (Nguyen, 2015). Charity organisations were found to use stories targeting specific audiences (Holt & Thompson, 2004, cited in Nguyen, 2015) by ensuring the stories

developed are in line with the audiences' expectations. Although storytelling has been applied in different contexts such as management, marketing and branding, these applications cannot fit for an STI as STIs do not produce retail products, hence storytelling on packaging cannot be used. Neither do STIs make profit, therefore applications of storytelling for selling cannot be utilised as such. As storytelling is used as a compelling communication approach, I attempt to explore how it is used by STIs to lower the perception of proposals' risk and encourage funding.

Scientists work on complex challenges to provide solutions that cannot be measured or understood by a non-expert. This raises the issue of under appreciation of science (de Bruin & Bostrom, 2013; Banks & Di Martino, 2019) and the difficulty in communicating the essence of research to a potential funder. However, in the case of science funding in Kuwait – my context here – funding committees consist of an especially diverse audience. Funding agencies are comprised of people of different backgrounds. These backgrounds may be scientific (both directly related to a proposal, but also other unrelated fields), managerial, or even a mix between the two, therefore scientists also need to pay attention to their audiences who may have different agendas, interests and varying experience with relevant scientific terms and processes. In this context, there is a need to understand, who exactly scientists are trying to communicate their research proposal to, while also understanding the dynamics of such communication. For example, maintaining a strictly methodical scientific communication format when speaking to a scientist funder or speaking with less scientific jargon when faced with a non-scientist funder. There is a need to understand what works best in such cases. Although the literature addresses communicating science, focus is on communication to the general public or policy makers, hence creating a gap that needs to be addressed in terms of communicating to this specific, complex audience. On the other hand, scientists themselves are also complex communicators by nature (Banks & Di Martino, 2019; Bloomfield & Manktelow, 2021; Maninno et al., 2021). It is argued that scientists communicate in a manner most comfortable to them and barely differentiate between different audiences, which leads to a lack of understanding and negative perception amongst audiences who do not have sufficient scientific background (de Bruin & Bostrom, 2013).

This creates the dilemma of the complexity of science communication in terms of content as well as the source of information (i.e., the communicator).

1.6 Significant Contribution

Findings suggest that scientists applying for funding need to take the unique complexity of the audience into consideration when drafting the proposal document as well as view the proposal as a complex story rather than a purely scientific document. Different types of audiences appear with corresponding information required to satisfy such audience to make a funding decision. Audiences in this study are classified based on their backgrounds, hence ability to critique research proposals. These audiences vary in the understanding of science, but are all affected by a story. Audiences are classified as the *'expert scientist'*, one who is an expert in the field of the proposed project. The expert scientist, based on knowledge of the field, is able to be highly critical of the science being discussed. The second audience type is the *'scientific layman'*, which is a scientist audience member who is a non-expert in the proposed project field. This type of audience becomes a layman in which they do not have a grasp of the science being proposed and hence cannot make a comprehensive scientific judgement of the proposal as they are unknowledgeable of the proposed project field. The final audience type is the *'universal audience'*, which is an analogy of what all diverse members of the audience want to hear in a research proposal pitch. Secondly, and based on the notion of multiple audiences, the proposal structure was found to be highly complex. Proposals follow a methodical scientific format as well as a narrative format. While the identified audiences mentioned the need for a story to be told, in this study I have found that proposals are required to follow complex multiple plots that consist of a narrative that is inclusive of methodical scientific writing in order to achieve audience information requirements that would instil trust in the proposal's information. Thirdly, another aspect of science communication explored in this study is the performance of science communication where I identify the understanding of effective performance in the negotiation of funding proposals as a necessity to generate trust in the science communicator and hence encourage funding. Understanding the parameters of how a performance influences funding committee members allowed to draw insights on how best to perform science stories. First, this thesis identifies new types of audiences for science communication, in which an applicant must

‘align the proposal narrative’ to their existing stories and relative interests to stimulate emotional engagement with the proposal through shared interests and beliefs, which I call ‘narrative alignment’. Narrative alignment works as the emotional frame that lays the foundation of the proposal’s story by showing the significance of the research proposal to the funding audience. Second, I explain the proposal in terms of a story with 3 complex plots that address these specific funding audience needs of 1) validity, i.e., explaining the importance of the proposal to fulfil the funders’ specific objectives and show how they would co-contribute to the betterment of society. 2) Scientific merit to shed light on scientific contribution by addressing a research gap in the field and showing accurate selection of research methods. 3) Achievability i.e., reassuring funders on the proper allocation of resources such as manpower selection, time allocation and equipment and materials. The final contribution in this thesis is viewing proposal application meetings as a performance through the application of dramaturgy. The proposal review meeting is viewed as a staged performance that considers 1) a backstage preparation phase where the applicant prepares for the science negotiation performance with their family members and scientific peers to mimic their different audiences. 2) the performance itself as a science negotiation performance in a front stage that focuses on impression management where the applicant and the audience members engage to maintain the performance and reach a final decision. I conclude with specific advice on how to develop effective science funding communication and provide suggestions for further research.

1.7 Overview of the Research

The rest of the thesis is structured as follows. I will first discuss science communication literature, which explains the risks associated with funding science, its various audiences, the difficulty of communicating science, and how people understand science. I then introduce storytelling literature as a way to understand and theorise the complexity of science funding communication. I will explain its evolution and contemporary formats and show how a story is shaped to convey messages to the recipient. Finally, I will present the applications of storytelling in science communication literature to demonstrate how it has been recently used to communicate scientific results. In doing so, I will set out the theoretical foundations of the study and show how storytelling can potentially be used as a tool to help scientists with the funding dilemma. Since scientists in this case study also

negotiate their proposals in a funding committee presentation, I will describe performance theory and highlight its implications on science negotiation performance. I conclude with recommendations on how to create appealing proposal applications that encourage funding, while also providing insights on how to improve performance during science negotiations to receive funding. Finally, this thesis will identify contributions to the field of science communication and provide insights on further required research.

CHAPTER 2: LITERATURE REVIEW

In the review of science communication literature, I address three major concerns in science communication that are relatable to this study. 1) examining literature that addresses different **science communication audiences**, i.e., the recipients of science communication. 2) I explore contemporary science communication mediums with a focus on **the use of contemporary storytelling**. 3) I discuss the scarcity of science communication literature in terms of communication performance where **I draw from dramaturgy theory to describe how performances influence an audience's perceptions.** In this section I highlight the difference between communicating research results in contrast to communicating science in research proposals for the purpose of funding. I also explain the dilemma of science communication, its difficulties in terms of the science communicator himself and how information is presented versus how it is understood by non-scientists. I then explain how science communication literature uses storytelling as a communication tool that helps various audiences better understand science results and explore how storytelling may be a good option for applicant scientists to use within their research proposals to encourage funding.

As emphasised in previous research, communicating science in general is not an easy task (Dahlstrom & Scheufele, 2018; ElShafie, 2018; Lidskog et al., 2020). Several studies highlight that a key issue is the amount of controversy that science is associated with (Somerville, 2012; Scheufele, 2013; National Academies of Sciences, Engineering & Medicine, 2017), making the task of communication complex and difficult. When discussing science communication, the majority of research also focuses on communicating to a common audience—the general public (Olson et al., 2013; Dahlstrom, 2014; Fischhoff & Scheufele, 2014; Olson, 2015; Kwon & Nelson, 2016) or in some cases, policy makers (Dahlstrom & Scheufele, 2018; Torres, 2019; Lidskog et al., 2020). The emphasis is also on communicating scientific results, discussing controversial science with the general public and policy makers such as climate change (Somerville, 2012; Jones, 2014), and other papers focus on issues related to a specific scientific field such as nursing and communicating results or controversies within that field to the general public/policy makers (Dahlstrom, 2014; Kwon & Nelson, 2016; Lidskog et al., 2020).

On the other hand, there is a science communication dilemma at the earlier stage of the research process, *before* the scientific research actually takes place, i.e., when grant funding is applied for. Indeed, the majority of science research requires some form of funding application. This involves a unique audience of funders and peer reviewers that are neither the general public, nor policy makers, but may act on their behalf. As research on science communication is based on a *'standardised'* audience consisting of either the general public or policy makers (Beckers et al., 2007; ElShafie, 2018; Yuan et al., 2019; Mannino et al., 2021), this study makes the context unique as I introduce communicating science to senior scientists and senior executives who work in a research institute to award funding. This suggests a need to explore how to communicate to a highly specialised audience who are also decision makers that determine which scientific studies go ahead long before results need to be communicated more widely. These decision makers do not look at or debate on scientific study results, they rather are the gatekeepers determining what science becomes available to the world, which cures become available, which technologies become available, and how our lives are ultimately enhanced by scientific research based on their initial decision to fund. Proposal reviewers and scientific funding committees therefore have a highly influential role in deciding how our world is shaped, and how our lives are improved, or otherwise. Most research explores the *'final'* communication of research results, but not the communication that takes place to make research happen, which is therefore assumed to be non-problematic, yet we lack studies that examine this process.

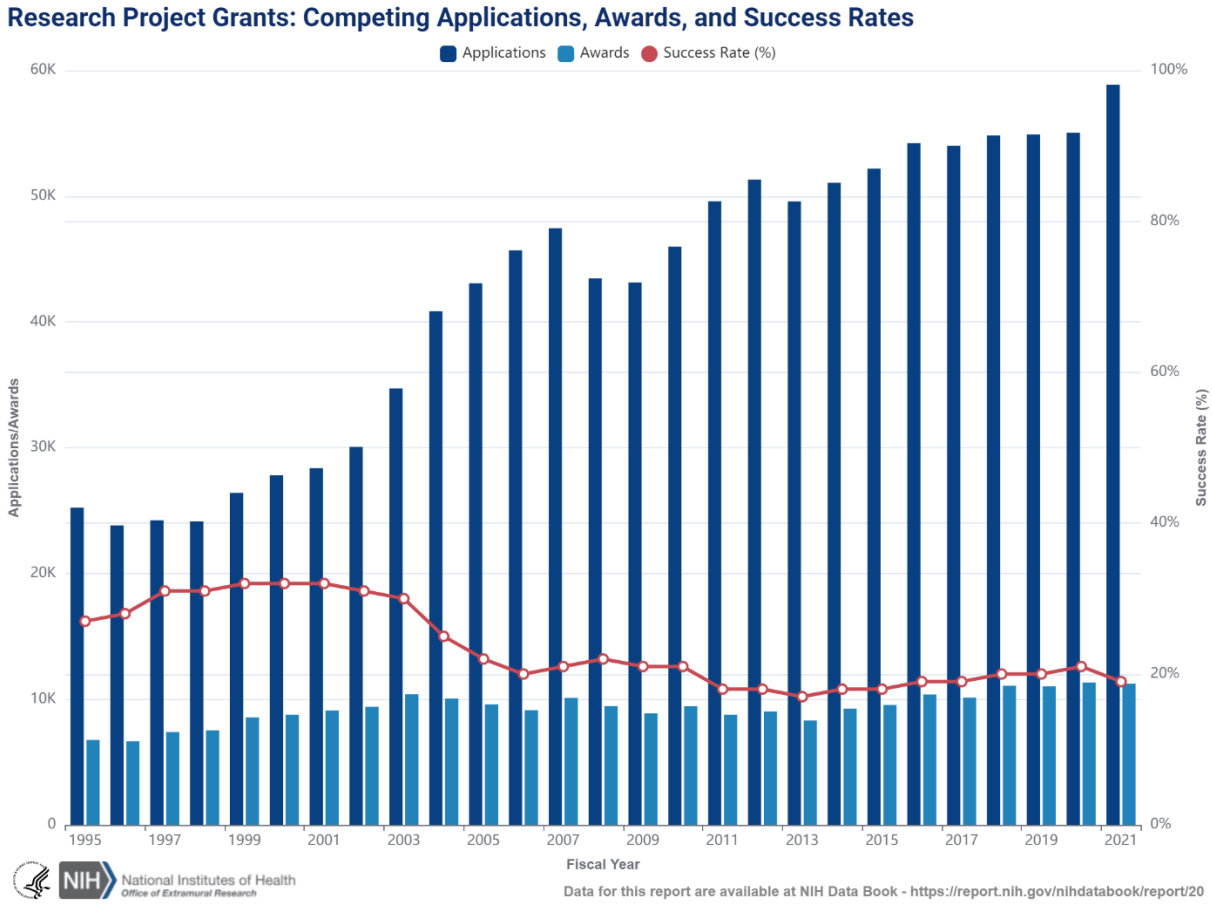
To explore how research projects are communicated to funders we might first consider risk and uncertainty associated with research. We can then review how audiences are understood to interpret science research, I then introduce science communication literature and explain its most contemporary formats. Finally, I explain how contemporary communication tools have potential to be used for scientific proposal pitches to secure funding.

2.1 The Dilemma of Science Communication – High Risk and Uncertainty

In an era where knowledge is considered one of the most powerful tools to possess, creating a sense of reassurance to secure investment is considered a rather difficult task. Investing in research is in turn associated with risking money on a completely uncertain outcome. A recent example of this dilemma was investing in the development

of the COVID-19 vaccine (Yamey et al., 2020). As evident in the below chart published by the National Institutes of Health in the United States, funding for scientific research has shown a decline in applications submitted versus success rates for grants awarded, which shows only 20% of submitted applications have successfully obtained funds.

Figure 2.1: (NIH, 2022) Research Project Grants: Competing Applications, Awards, and Success Rates



Thus, when addressing science communication, understanding the strong perception of uncertainty that surrounds science (Olson, 2018; Battiston et al., 2021) is required. Issues pertaining to uncertainty of communicating science in the literature are presented as two-fold. First, uncertainty of the produced science itself, i.e., content (Olson, 2018; Yuan et al., 2019), and second uncertainty about or trust in the science communicator i.e., source of

information (Lupia, 2013; Fiske & Dupree, 2014; Wilson et al., 2016). Communication of science therefore becomes risky in terms of the trust in the data or scientific content being presented/discussed, and whether the communicator himself is to be trusted.

These two issues generate the paradox of scientific consensus, meaning agreement of the scientific community about the scientific content being discussed (Battiston et al., 2021), i.e., agreement between members of the scientific community on whether the scientific results being communicated are correct and reliable (Banks & Di Martino, 2019; Battiston et al., 2021; Bloomfield & Manktelow, 2021), and whether the communicator has the scientific authority to speak on a certain subject. For example, climate change is considered a problem to most scientists, while others believe that the earth has a means to mend itself and hence climate change becomes part of the process and is not as big a deal. Trust in scientific content, the communicator as well as scientific consensus are therefore risks of science communication that create a challenge in communicating science to different audiences. Whether consensus is not in place between scientists themselves, political bodies involved or the general public, science without consensus is associated with uncertainty and therefore becomes revolved around individual's perceptions from their long-held views and self-motivations (Sujan et al., 1993; McCright et al., 2016 cited in National Academies of Sciences, Engineering & Medicine, 2017). As science is evidence-based, a lack thereof leads to disagreement between scientific communities and therefore creates uncertainty (Banks & Di Martino, 2019; Battiston et al., 2021; Bloomfield & Manktelow, 2021). Such topics can be ones related to obesity, climate change, health effects from vaping, and the cause and effect of technologies on society health, for example (Somerville, 2012; National Academies of Sciences, Engineering & Medicine, 2017). Therefore, it is very difficult to determine whether scientific information can be trusted.

This is also attributed to the fact that audiences themselves decide on whether the person sharing the scientific information is credible and trustworthy or not and based on that assumption decide on whether to believe the scientific information being presented (Fiske et al., 2007; Fischhoff & Scheufele, 2013; Lupia, 2013; Yuan et al., 2019). This lack of consensus creates a sense of confusion over believability amongst general audiences and therefore potentially creates a divided public that does not know who to trust or believe (Bucchi & Saracino,

2020; Battiston et al., 2021), which generates a challenge for science communication in general. These challenges create the dilemma of how best to communicate science in a manner that reduces uncertainties and that generates trust.

As indicated by Hon & Grunig (1999), Rahn & Transue (1998) and Roduta-Roberts et al., (2011) cited in the National Academies of Sciences Engineering & Medicine, 2017: p.43, the main characteristics of trust include three main elements: **"**integrity (those who can be trusted are fair and just), dependability (they can be relied upon to do what they say they will do), and competence (the ability to do what they say they will do)." According to Lupia, 2013 (cited in the National Academies of Sciences, Engineering & Medicine, 2017: p.44), "People generally rely on two kinds of social information to determine whom they will believe and find credible on scientific issues: (1) having common interests, defined as the perception that the communicator and listener desire the same outcome from the communication, and (2) perceived expertise." This means that the credibility of scientists and the perception of being trustworthy depends on whether both parties desire the same outcome and also includes how a scientist is viewed in terms of being an expert within their field (Lupia, 2013; Yuan et al., 2019).

As described by the National Research Council (2012) and Wilson et al., (2016), trust is also positively impacted by the perception of "providing accurate information; being truthful; being concerned with public welfare; showing concern, and care; and being seen as knowledgeable." These qualities have a positive impact on trust where scientists who show such qualities are perceived as more trustworthy. Going back to the uncertainty and risk surrounded with science, building a self-referenced narrative with visual evidence builds believability in the science communication narrative, therefore making it more appealing to the audience (Burke, 1969; Fisher, 1984; Fiske, 1993; Sujan et al., 1993; Levy & Peracchio, 1996; Schank, 1999). Believability establishes credibility, which in turn leads to trust and reduced uncertainty (Bruine de Bruin et al., 2007, cited in National Academies of Sciences, Engineering & Medicine, 2017). It has also been shown that people with less knowledge of the scientific discipline being discussed show more trust to scientists related to the field i.e., *'people with scientific authority'* where trust is granted to scientists who are experts in the field by individuals whose *'social-*

identity' is considered less scientific (Lupia, 2013; Scheufele, 2013; Yuan et al., 2019). The notion of research funding then can be expressed as how can an applicant scientist reduce the risk and uncertainty associated with his research proposal in order to secure funding? If general audiences have difficulty in trusting scientific results as well as the communicator, does the same problem occur in STIs and funding application? If so, how can this problem be mitigated?

In short, research has developed the need to establish trust in science communication based on the characteristics of the audience, and how they are likely to interpret any communication efforts. As I have noted, the audience for grant applications is different from those for the final results of research, and as the research has not taken place yet, the role of credibility in communication and the nature of communication content may also be different. This raises the issue of how do people interpret science itself, which implies the need to understand audiences which will be explained below.

2.2 Audience Complexity in Science Communication

While I have identified the dilemma of content versus communicator trust in science communication, there is also a need to understand how people interpret science in order to determine the best way to communicate it. Science communication research has identified several communication models such as "the deficit model" which assumes the scientist responsible for communicating science where they have the *'obligation'* to convey scientific research, and the audience being scientifically *'ignorant'* and must develop the responsibility for wanting to understand (Bauer, 2008, cited in Bray et al., 2012; Scheufele, 2013).

Science communication later developed to understand the underlying goals of science communication including: "PAS (public awareness), PES (public engagement), PPS (public participation) and PUS (public understanding)" (van der Sanden & Meijman, 2008, cited in Bray et al., 2012) where these goals are driven by "dialogue, discussion or action" (Bray et al., 2012). Science communication models have therefore gone through changes due to the understanding that such communication has different motives, which are affected by audiences where communication models need to be adapted to fit the purpose of communication in alignment with the audience (Bray et al., 2012; Scheufele, 2013).

Science communication cannot be streamlined in the same format to different audiences as different audiences process scientific information in different manners (Slater, 1996; Siegel, 2017; Hajdu & Simoneau, 2020). The method of communication also affects the comprehension and receipt of scientific information (National Academies of Sciences, Engineering & Medicine, 2017; Hajdu & Simoneau, 2020). One method used in science communication is "framing" (Kotler & Keller, 2015). Frames create an angle where a certain topic is discussed from a lens that fits the audience segment (Bray et al., 2012; Kotler & Keller, 2015; Martinez-Conde & Macknik, 2017). For example, framing a scientific topic in terms of a problem that needs to be addressed in order to reduce public health hazards, or introducing a new technology that positively impacts food security. A frame therefore presents scientific information in a format that is more familiar to the intended audience's beliefs (Kotler & Keller, 2015) and creates an emotional attachment with the audience in order to formulate an opinion and stimulate action (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019).

However, science communication is complex and so we may not assume that people respond in the same way. For example, people tend to focus on self-learning as a short cut in order to process information that would enable them to make decisions (Yuan et al., 2019). People also rely on their emotions and have their own beliefs and motivations, hence the challenge of communicating complex scientific information becomes difficult as people use "mental shortcuts" to break down such complex information in a comprehendible manner, in order to make decisions (Tversky & Kahneman, 1974). These shortcuts pose a challenge for science communication as they make people biased with their own beliefs and understandings rather than systematically analysing the presented evidence from science, hence affecting the perception of uncertainty in science (Scheufele, 2013; Bruine de Bruin et al., 2007, cited in National Academies of Sciences, Engineering & Medicine, 2017; Banks & Di Martino, 2019). An example would be mental shortcuts that are related to past experiences, which in turn lead to casting more emphasis on feelings that are related to the past experience instead of the presented scientific evidence (Tversky & Kahneman, 1974). Therefore, it has been found that involving emotions in science communication can lead to a stronger understanding of risks and benefits related to science (Finucane et al., 2000, cited in National Academies of Sciences, Engineering & Medicine, 2017) and emotions lead to higher degrees of

motivation to take action towards these risks as opposed to not using emotional appeal (Cohen, 2011; Joubert et al., 2019; Bloomfield & Manktelow, 2021). A recent example would be the narrative used during the COVID-19 pandemic. Scientific evidence has proven that social distancing would significantly reduce the spread of the Corona virus (Courtemanche et al., 2020), but the narrative communicated to individuals was "Stay at home to keep your family safe." Connotations of saving family members, children and especially grandparents were used to create an emotional appeal and stimulate the action of social distancing by imposing empathy (Bonell et al., 2020).

Scientists however write and report to each other in a more objective, methodical manner—a scientific format that they are used to (Banks & Di Martino, 2019; Bloomfield & Manktelow, 2021; Maninno et al., 2021). This includes a research question, hypothesis, experimental work and finally results reporting. The specific format of communication that scientists are trained on makes them confined in their own communication norms i.e., scientists' day-to-day work confines them in a research bubble, where their communication language may become *'wrapped around the science'* (Green et al., 2018; Siebert et al., 2018; Banks & Di Martino, 2019). This entails that scientists become caught up in their own terminologies that come naturally to them when speaking about what they do (Fischhoff & Scheufele, 2013; Suzuki et al., 2018). Hence, a communication barrier is created between scientists and people whom they speak with who do not have their expertise. It has also been observed that scientists *'do not necessarily understand'* the type of information required for each audience they encounter and in turn, are unable to communicate in an effective manner with decision makers (Fischhoff et al., 1982). Scientists have been observed to communicate details in a complex manner that is not understood by non-experts in their field (de Bruin & Bostrom, 2013; Banks & Di Martino, 2019), which may be one of the issues that discourage investment in research; funders simply do not understand what the research is, or can do.

An illustration of the notion above is clearly observed in the Netflix movie "Don't Look Up", where Leonardo Dicaprio and Jennifer Lawrence are astronomers who find out that a massive comet is about to hit planet earth, which will result in catastrophic destruction and the death of all living beings if not stopped. Leonardo Dicaprio and Jennifer Lawrence attempt to communicate the news to the President (Meryl Streep) and her Chief

of Staff (Jonah Hill) where the scientists struggle to communicate their concern. Below are quotes from the scene, which shows how scientists have difficulty communicating to non-scientists:

> *The President: You have 20 minutes to tell me what you wanna tell me, then tell me why you're telling me about it.*
>
> *Scientist (Dr Mindy): 20 minutes?!* – he means 20 minutes only? He is shocked and looks nervous, because as a scientist he does not know how to explain something so complex in such a short period of time.
>
> *Dicaprio's character, Dr. Randell Mindy*, quickly starts using scientific jargon to explain the comet phenomenon to the president, while looking at his scientific notes*: it's coming from the Oort cloud, the outermost part of the solar system… and using Gauss's method of orbital determination and the average astrometric uncertainty of 0.04 arcseconds.*
>
> *President: whoa! What the hell is… what?*
>
> *Chief of Staff: I'm bored, just tell us what it is.*
>
> *PhD candidate (Kate Dibiasky): what Dr. Mindy is trying to say is that there is a comet directed towards earth and according to NASA's computers, that object is gonna hit the Pacific Ocean at 62 miles due west off the coast of Chile.*
>
> *Chief of Staff: then what happens? Like a tidal wave?*
>
> *Scientist (Dr Mindy): no, it will be far more catastrophic. There'll be mile high tsunamis fanning out all across the globe. If this comet makes impact, it will have the power of a billion Hiroshima bombs. There'll be magnitude of 10 or 11 earthquakes.*

The scene above shows how scientists are wrapped around the science where their preferred method of communication is strictly scientific. Communicating science is difficult for scientists because they are trained to speak methodically as is their daily norm. When speaking to a non-scientist audience, like the example of the president above who is very restricted with time, the manner of communication needs to change for this particular audience to be able to understand the science being communicated. Rambling on with jargon as illustrated above led to agitation and boredom because scientific language is too complex for a non-scientist audience to understand.

"Science is a search for evidence, but science communication must be a search for meaning." (Elshafie, 2018: p. 1213). People understand the value of science when it is put in a meaningful frame (Elshafie, 2018; Banks & Di Martino, 2019). Perception of science is not as intuitive to a general audience, where scientific information is difficult to comprehend to non-scientists (Olson et al., 2013; Olson, 2015). The issue then arises of how to communicate scientific information to an audience in a manner that is generally accepted and comprehendible (Olson et al., 2013; Dahlstrom, 2014; Siegel, 2017; ElShafie, 2018).

Science in general is regarded as an unknown topic, that is difficult to explain to the general public, due to the requirement of high specialisation (Dahlstrom & Scheufele, 2018; ElShafie, 2018; Torres, 2019). The issue does not only lie in the complexity of science in itself, but there is also a serious communication issue by the scientists themselves (Olson, 2015; ElShafie, 2018; Mannino et al., 2021). The question then becomes: How can scientists *'break down'* such barriers, and develop a language that is easily understood by the evaluators of their research proposal and be effective in securing funding? Before getting into a proposed solution, an understanding of audience complexity is required.

Different audiences have different beliefs, values and interests (Slater, 1996; Gregrich, 2003; Scheufele, 2013; Gough et al., 2014; Hajdu & Simoneau, 2020). When communicating science, research has identified strategies to *'mitigate the effects'* of these competing elements in order to promote understanding of science and persuade the public (Wilson et al., 2016; National Academies of Sciences, Engineering & Medicine, 2017). One of these strategies is to present information that is in line with common values shared with different audiences (Gough et al., 2014; Hajdu & Simoneau, 2020).

"Audience Segmentation" is a term used to divide audiences with different backgrounds into groups (Slater, 1996; Kotler & Keller, 2015). Audience segmentation focuses on developing "tailored messages" for each audience group that coincide with their beliefs and values in order to stimulate action (Slater, 1996; Kotler & Keller, 2015). While studies have examined how best to communicate science to generic audiences such as the public or policy makers, studies in audience segmentation for scientific communication are still lacking (Fischhoff

& Scheufele, 2013; Kwon & Nelson, 2016; Yuan et al., 2019) and methods for understanding and outlining audience segments are not unified (Slater, 1996).

Policy makers, for example, are considered a complex audience that is involved in a complex model of decision making (Gregrich, 2003; Akerlof et al., 2018; Hajdu & Simoneau, 2020). Policy makers have been found not to give high attention to scientific information when making political decisions as there are many external factors involved such as personal beliefs, values, personal interests, budgets and policy implementation to name a few (Gregrich, 2003; Lupia, 2013; Kwon & Nelson, 2016). Studies on policy makers understanding and use of science communication in decision making are very scarce as it is very difficult to access their ability to understand the scientific information being presented (Kwon & Nelson, 2016; National Academies of Sciences, Engineering & Medicine, 2017). This is mainly attributed to the complexity of the audience where their scientific knowledge and backgrounds are diverse, making it difficult to establish a clear science communication mechanism that would work for such complex audience (Fischhoff & Scheufele, 2013; Lupia, 2013; Hajdu & Simoneau, 2020). Therefore, science communication is difficult due to the complexity of the content, complexity of the communicator's background as well as complexity of the audiences who are intended to receive the scientific information. This indicates that when communicating science, audiences need to be taken into consideration, as well as the individual case being studied (actions required) as science communication cannot be unified due to the complexity of the communication environment.

Science is dynamic and constantly changing and the advancements in technology are becoming more and more useful in producing solutions that make our lives more sustainable (Joubert et al., 2019). This dynamism produces the challenge on how to increase the support towards science. The solution lies in the development of a communication tool that makes science more appealing and relevant to stimulate care towards science (Bray et al., 2012; Martinez-Conde & Macknik, 2017; Joubert et al., 2019). Research institutes have now turned towards the use of narrative to communicate science and engage different audiences (Siegel, 2017; Dahlstrom & Scheufele, 2018; Joubert et al., 2019). I have identified storytelling as a tool that can be used for communicating science as it is a universally recognised means of communication (Schank, 1995) and is naturally occurring within

human communication (Schank, 1999). In the section below, I provide details about storytelling theory and show how it is currently used in science communication.

2.3 Storytelling as a Communication Tool

Storytelling has been identified as a common means of communication that is universally accepted as part of human nature when communicating (Schank, 1995; Schank, 1999; ElShafie, 2018; Joubert et al., 2019), but scientists rather believe that science should be communicated 'empirically' to avoid bias (ElShafie, 2018). A counter argument suggests that stories already exist in form within scientific data and it just becomes a matter of "distilling" that data into the story that already exists (ElShafie, 2018; Banks & Di Martino, 2019; Bloomfield & Manktelow, 2021). Therefore, stories in science communication exist, and scientists needs to find a means to communicate in a story format that is understood by their intended audience to get their message across in a more meaningful manner. As stories need to provide meaning to the intended audience in order to establish a strong connection (Olson, 2009; Olson et al., 2013; Siegel, 2017; ElShafie, 2018), stories function to stimulate emotions in order to grasp the attention of an audience. Therefore, the main objective of a story is to establish an emotional connection with the audience (Burke, 1966; Fisher, 1985; Siegel, 2017; ElShafie, 2018) in order to generate meaningful thoughts that stimulate action (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019).

Storytelling has been applied in management research, often through the use of experiments. For example, experiments were used to determine whether consumers respond to packaging or advertisements that contain stories or not (Escalas, 2004; 2007). Perceptions are the key to triggering purchase behaviour—this is where storytelling can have a great impact (MacInnis & Folkes, 2017). The key to telling a great story is for the story to sound realistic and interesting enough to capture an audience's attention (Fanning, 1999). According to Aaker (2018), stories can capture attention by developing trust, a connection and adding value (Giesler & Fischer, 2018). "Stories are powerful tools that break through distractions, disinterest and content overload, making an audience take notice, stay engaged and remember" (Spiller, 2018: p.11). The key to stories is that they create a connection through evoking emotions that resonate with an audience— making them memorable (Schank & Abelson, 1995; Siegel, 2017; Dahlstrom & Scheufele, 2018). Studies have investigated the use of storytelling in the context of

organisations (Boje, 1991) as well as its use in sales (Gilliam & Flaherty, 2015), but nonetheless, the context of scientific research institutions is yet to be explored. As discussed above, science communication literature discusses trust and audience perception as communication issues. So, if stories can generate trust as well as develop an emotional connection with audiences, is the use of stories in science communication beneficial? I introduce the use of storytelling in science communication below and later explain story format and how it functions as a communication tool.

The main objective of scientific institutions is "to demonstrate their impact in effective ways" and "have the ability to sustain their work" (Gomez, 2017: p.2). This can be done through utilisation of communication tools that would help gain public insight on the roles, responsibilities and achievements of scientific institutes. The issue with communicating science is that it can be very complex and hence difficult to promote action (Scheufele, 2013; Yuan et al., 2019; Lidskog et al., 2020). This is where storytelling can assume a major role. Scientific institutions in terms of communication can be viewed as non-for-profit organisations. As is the case with many national laboratories, their role is to make new discoveries in order to make our lives better (Joubert et al., 2019). With non-for-profit organisations, research has shown that the use of "personal stories" creates a stronger emotional connection with an audience and encourages donations by establishing connections with people rather than an entity (Siegel, 2017; McInerney, 2018). Therefore, in order to achieve engagement with science communication we can view stories as a narrative that wraps emotions with facts in order to convey a message and stimulate care from audiences (Martinez-Conde & Macknik, 2017; ElShafie, 2018; Joubert et al., 2019).

Understanding how storytelling narratives might influence science communication is an area that is understudied (Dahlstrom, 2014). Previous studies suggest that audiences are more susceptible to understand scientific information through the use of narrative (Gomez, 2017; ElShafie, 2018; Green et al., 2018; Matei & Hunter, 2021). This is especially evident in the presentation of scientific data in the form of a story narrative as opposed to numerical and statistical data alone, where narrative format makes it easier to connect, relate to and recall scientific communication (Dahlstrom, 2014; Peters, 2012 cited in National Academies of Sciences, Engineering & Medicine, 2017; Dahlstrom & Scheufele, 2018). Although people may find it difficult to

understand numerical data in science communication, there is still evidence that the presentation of numerical data within science communication establishes further credibility among audiences in fields such as climate change and the environment (Somerville, 2012; Myers et al., 2015; Martinez-Conde & Macknik, 2017; Green et al., 2018). Rational items such as facts, numbers and data that are considered important in businesses or science are not usually remembered after being seen or heard (Green et al., 2018). But when a story is weaved around them, an emotion is stimulated and in turn gets attached around them, making that same piece of information or data or percentage, stick in the audiences' minds (Green et al., 2018). According to Singer et al. (2011), stories become more memorable than statistics as they can be continuously retold. Facts that are reported in statistical format are less engaging than when told intertwined with a story (Brophy, 2009). Therefore, stories can be used as a tool to report statistical information in a more memorable way (Siegel, 2017; Green et al., 2018). Storytelling in science communication has been explored through the establishment of communication frameworks, where an "anecdote-creation framework" developed by Cohen (2011) is an example of how science communication has been explored. Cohen's framework depends on 4 major foundations "setting (i.e., the time and place where speakers should actively take their listeners), characters, (i.e., individuals who make a situation come to life), plot (i.e., the action sequence of the anecdote), and moral (i.e., the lesson that the speaker wishes to convey)" (Torres, 2019: p.108). Cohen's setting entails identifying a time in which the story is set to take place. A research proposal is formatted in a manner that requires specific information to be communicated. Much like Cohen's framework, sections within any research proposal comprise of a setting (when the research is proposed to take place) characters being the applicant scientists who propose going through a series of events (experimental work) in order to develop a solution to a problem (moral of the story). This framework provides an initial guide that can be built on in terms of communicating research proposals as the established framework rather covers communication of scientific results only.

Evidence from neuroscience studies also suggests that brain activity is triggered differently when being exposed to a story narrative and it can be heavily engaging (Green et al., 2018; Suzuki et al., 2018; Martinez-Conde et al., 2019). Personal stories have been shown to stimulate areas in the brain that coincide with areas in

the brain of the storyteller hence showing a mimicking effect due to narrative engagement (Green et al., 2018; Suzuki et al., 2018). Therefore, a well-structured story leads to narrative transportation and hence greater persuasion due to a story's immense capability for engagement (Green & Brock, 2000).

In order to understand how stories work, it is imperative to define what stories are and how they are formatted. The following sections discuss storytelling literature, show how a story format has evolved and how it functions as a tool to attract audiences' interest.

A story is a visual or verbal narrative account of any real or imagined event (Dahlstrom & Scheufele, 2018; Lenhart et al., 2020). Human life is surrounded and filled with stories. Therefore, the conversations we have in our daily life provide context that allow others to interpret our unique experiences (Lenhart et al., 2020). According to Fisher (1984, cited in Lund et al., 2018: p.273), "humans are seen as homo narrans where telling stories are an essential part of their nature" and "human memory is story-based" (Schank, 1999: p.12). People are therefore natural storytellers; hence they like to tell stories and like to receive them as they also store information in their memories based on stories. Storytelling is therefore an art, we tell stories all the time to our co-workers, peers, family and children (Schank, 1999). All living beings communicate in some form or another, and have perfected that art. However, due to the evolution of man, an evolution in the means of communication was inevitable (Schank, 1995; Joubert et al., 2019). What differentiates humans from other species is their ability to convey emotion, thoughts and feelings (Schank, 1995), hence these distinctive communication variables create societal cohesion (Coen, 2019). According to Brophy (2009), storytelling "is as old as the human race, and its impact remains as strong today as it was in Biblical times." The main element revolving around the power of stories, is that they can be relatable to each and every person's own experience, hence making them easily memorable as they are related to our daily lives (Burke, 1969; Fisher, 1984; Schank, 1995; Fiske, 1993; Yoder & Kowalski, 2003).

Humans have come a long way from primitive cave paintings and sign language to articulate speech. Communication is innately connected to storytelling, and that makes storytelling as old as human history (Schank, 1995; Joubert et al., 2019). Humans have a *'biological urge to explain'*, which was evident in the different modes

of commination used to convey and share their experience. Such modes of commination included "cave drawings, traditional dances, poems, and songs", making stories a communication tool that is used by all cultures (Gabriel, 2004; Anderson, 2010; Kent, 2015; Martinez-Conde & Macknik, 2017). According to Coen (cited in Joubert et al., 2019: p.1), "All animals (and many plants) communicate in one way or another, but only humans tell stories." Therefore, storytelling is what separates humans from animals making communication a more experiential exercise that conveys meaningful information that is shared over history (Joubert et al., 2019).

Given that humans are seen as recipients of stories, the use of stories therefore makes it easier to digest and remember facts - which is why storytelling is increasingly becoming a powerful tool that leaders, politicians, teachers and managers use to motivate, inspire or persuade their listeners (Burke, 1966; Bormann, 1972; Fisher, 1985; Aristotle, 1991; Gomez, 2017; ElShafie, 2018; Green, et al., 2018). Storytelling is regarded as an integral part of human interaction, as people do not only listen to stories. A much higher level of cognitive response is ignited when stories are told. This response entails that as people listen to stories, they start to process these stories in relation to stories they already know (Burke, 1966; Fisher, 1985). This relation creates a chain reaction of stories processing, where people make sense of their world based on establishing a connection between a new story with old stories that they already know (Burke, 1966; Fisher, 1985; Schank & Abelson, 1995). This demonstrates that information is also stored in the brain in a story format as it is the natural human behaviour to retrieve information (Schank & Abelson, 1995). The following illustration is used to show retrieval of information through stories:

Emma is telling the story of when she first found out that she was pregnant and she narrates her story as follows:

> *Emma: I'm pregnant! I absolutely had no idea why I was feeling so sick every morning, the constant bloating, and loss of appetite!*
>
> Her friend Kathy responds: *Oh my gosh, I was bloated all the time when I was pregnant, but I didn't experience morning sickness though...*

Emma: Oh my morning sickness was horrible, I just thought something in my gut wasn't right. The thought of being pregnant did not even cross my mind because I had just finished my cycle! Once the bloating got worse, I decided to see a doctor and the ultrasound unveiled the pregnancy!

The way Kathy responds during the conversation shows that while she was listening to Emma's story, she had recalled the story of her own experience of her pregnancy. Kathy was listening to Emma's story, recalled her memory of being pregnant and reported it in a story format. This shows how human interaction and making sense of the world around us is naturally story-based (Schank, 1995; Torres, 2019), where humans think and interact in the form of stories. It also shows that people make sense of the world based on the repository of stories stored in their brains, where the process of stories retrieval is activated in order to make sense of the world (Schank & Abelson, 1995).

Stories are narratives with plots and characters going through a series of events over time (Gabriel, 2013; Dahlstrom & Scheufele, 2018; Fischer et al., 2020). According to Escalas (2004), a story must contain three essential elements—characters, chronology, and causality. Stories contain characters that interact with each other and serve as agents of cause and effect by reacting to events (Bruner, 1990). Chronology or time is configured in stories as episodes, each with a beginning, middle, and end where stories organise events temporally, meaning that activity occurs over time (Bruner, 1990). Causality refers to the relationships among story elements that allow for inference making i.e., the characters' goals lead to actions that result in outcomes (Bruner, 1990). When people process a story, they establish relationships among the story's elements by linking their knowledge about goal-oriented action (Burke, 1966; Fisher, 1985; Pennington & Hastie 1988; Torres, 2019).

Stories follow a standard structure consisting of a beginning, middle and an end which is known as a "dramatic arc" (Joubert et al., 2019: p2). The sequence of events in a story and its consistent causality is what keeps the momentum of the story going, thus attracting the attention of the audience (Bruner, 1990; Escalas, 2004; Kent, 2015; Joubert et al., 2019). Stories also consist of a structure, which is derived into the term "Plot" (Kent, 2015). The plot can be regarded as the *'skeleton'* in which the story is built (Kent, 2015), where the entire elements of the story branch out of this main skeleton that show the progression of the story narrative itself (Kent, 2015).

According to Tobias (1993, cited in Kent, 2015), it has been observed that there are common story plots humans have used since the beginning of communication, dating back to the stone ages or even before that in the form of *'human instinct'* which are based on *'action and feelings.'*

The difference between a story and a plot is that the story explains the "and then", while a plot explains the "why" of the situation we are describing (Martinez-Conde & Macknik, 2017). Plots explain the cause-and-effect relationship of events while a story takes us through the journey (Dahlstrom, 2014; Kent, 2015; Martinez-Conde & Macknik, 2017). The causal relationships within the plot are ones that use emotional appeal and hence move the audience to further interaction through stimulating emotions (Dahlstrom, 2014; Martinez-Conde & Macknik, 2017; Joubert et al., 2019; Bloomfield & Manktelow, 2021). Plots are therefore regarded as a powerful element to use within a story in order to engage audiences in a scientific story narrative (Kent, 2015; Martinez-Conde & Macknik, 2017). Plots are the *'process'* followed by the narrator to put the story together (Kent, 2015; Fischer et al., 2020). A story generates interest into an upcoming event, while a plot intrigues the audience to recall past events and establish connections with those events and characters in order to guess the consequence or ending (Dahlstrom, 2014; Kent, 2015; Martinez-Conde & Macknik, 2017; Fischer et al., 2020). Therefore, a plot allows for further cognitive processing of the story with the audience that starts to develop causality in order to predict the ending. Plots in essence tie all elements of the story together. Researchers have agreed upon main elements that compose an intriguing story, which are: "a clear objective, an intended audience, and a call-to-action; follow a structure with a beginning, middle and ending (Kent, 2015); have at least one main character about whom the story is written; be authentic or real and spark the emotions of the audience" (Spiller, 2018: p.12). The storyteller needs to understand his intended audience (Slater, 1996) in order to craft a story with an appealing emotional message catered specifically to that audience (Kent, 2015; Green et al., 2018). The story in turn needs to walk the intended audience through a sequence of events unfolding to result with a call-to-action (Dahlstrom, 2014; Kent, 2015; ElShafie, 2018; Torres, 2019). Audiences however, must not be taken for granted. For example, "humans have story schemas" (Mandler, 1978, cited in Solja et al., 2018: p.295) meaning that people have basic or instinctive knowledge of how a story is structured (Escalas, 1996). This knowledge intrigues the audience to

predict the sequence of events the story is supposed to unfold (Solja et al., 2018), making it very difficult to develop a story that may sound unrealistic. Unrealistic stories therefore, create the potential risk of being perceived as inauthentic (Spiller, 2018). According to Kent (2015: p. 483), "Stories need to be rational, or make sense, and should be believable, or resonate with an audience's beliefs." In order for a story to be impactful, the audience needs to relate to it. This relationship with the story comes from its *'believability'*, meaning that for the story to create emotional impact, the audience needs to feel that the story can project a real-life situation that is close to their beliefs and is rationally accepted (Fanning, 1999; Dahlstrom & Scheufele, 2018; Bloomfield & Manktelow, 2021).

According to Kent (2015), the main purpose of the plot is to develop a holistic story—one that feels wholesome in terms of elements that are not *'fragmented'*. When a story is fragmented the recipient feels a sense of distortion, or disappointment/disapproval of the story being told. This can be further explained by Aristotle's storytelling format dating back to over 3,000 years, where he identifies that stories follow the format of a beginning, middle and an end comprising of a chain of cause and effect (Kent, 2015; Bloomfield & Manktelow, 2021; Matei & Hunter, 2021). A beginning involves setting the scene, where character(s) are identified along with their *'intent'* (Kent, 2015). The middle is action oriented where the character(s) take action to fulfil their intent. This action constitutes of a series of events that the character goes through in order to achieve their main intent (Kent, 2015; Torres, 2019). The end is the final outcome of the cause and effects of the beginning and middle sections, which includes the final conclusion, the moral of the story—making all sequence of events make final sense (Kent, 2015; Bloomfield & Manktelow, 2021; Matei & Hunter, 2021). As I have described a general story format and the main idea of what plots do, it is important to illustrate how modern stories are shaped and how they could be used to communicate science. Below, I introduce the modern storytelling format.

Storytelling has not been explored in a wide array of contexts (National Academies of Sciences, Engineering & Medicine, 2017), however some include organisation behaviour (Boje, 1991), sales (Gilliam & Flaherty, 2015), public relations (Kent, 2015) and branding (Fanning, 1999). Although noting that humans are homo-narrans (Fisher, 1984), understanding the different contexts in which storytelling is applicable and its

detailed application is an area that yet needs to be explored. Several scholars have published theories that describe the storytelling process, which has influenced several industries, including film (Mckee, 2010). But there is still room for further exploration and challenges of existing storytelling theories that would help explain its use in different contexts. One of the most impactful theories of storytelling is by Joseph Campbell, "an influential American mythologist working in the field of comparative mythology and religion" (Fredheim, 2011: p17). Joseph Campbell published 'The Hero with a Thousand Faces' in 1949 where his emphasis on the function of mythology was to "supply the symbols that carry the human spirit forward" (Fredheim, 2011: p17). 'The Hero with a Thousand Faces' describes the "monomyth" concept where the story is presented in the flowing three stages from an analysis of "recurring myth patterns" from myths around the world: "the rites of passage: separation-initiation-return" (Fredheim, 2011: p18). The hero goes on an adventure into a mystery, he is encountered by a series of difficulties, which are later conquered. The hero then returns a changed man and "bestows boons" to his society (Fredheim, 2011). "It is important to note that the monomyth does not require all of these elements to be present. Typically, a given myth will isolate and expand upon only one or two parts of this cycle" (Campbell, 1993, cited in Fredheim, 2011: p. 246). I will describe the elements of the monomyth in context to applicability to scientific stories only as follows:

- *Separation Stage*

"The separation stage of the hero's journey concerns itself with the origin of the hero and the motivation for the quest. It is subdivided into the following categories:

1) The Call to Adventure,
2) Refusal of the Call,
3) Supernatural Aid,
4) The Crossing of the First Threshold and
5) The Belly of the Whale." (Fredheim, 2011: p19)

According to Campbell, the hero is regarded as a *'noble or is of divine origin'* (in my case a scientist of great expertise in his subject field) who is going on a call to adventure (in my case a journey to solve a problem).

The hero goes through a series of cognitive disputes to find out whether to accept this journey or not and is aided by a force that provides him with the necessary tools to proceed (in my case required information from the literature review, which provides the scientist with the tools to identify the research gap and develop an idea of what methods need to be used to solve the identified problem). The hero then *'encounters the threshold guardian who has both a protective and destructive aspect'* (in my case the program manager and internal reviewers who are the guardians of releasing the proposal into the proposal cycle). Once the hero encounters the guardian he is immersed into an *'unknown world'* and undergoes a *'metamorphosis'* in which the hero is changed and is prepared for the following stage: initiation. (Fredheim, 2011). In my case, the scientist upon completing the first round of review, where his proposal is amended before being sent to the committee. He is now ready to *'initiate'* working on the intended challenge of presenting the proposal to the committee.

- *Initiation*

"The initiation stage is where the hero gains what he needs in order to reinvigorate his community. It is subdivided as follows:

1) The Road of Trials;
2) The Meeting with the Goddess;
3) Woman as the Temptress;
4) Atonement with the Father;
5) Apotheosis and
6) The Ultimate Boon." (Fredheim, 2011)

Upon completing the separation stage, the hero is now ready to face the turbulences and turmoil in his journey where he turns into a divine presence, a divine presence in a metaphorical sense. The scientist starts to gain confidence in his proposal document and starts the preparation phase for the proposal presentation. Meeting with the Goddess could metaphorically represent the scientist going through a series of mock-presentations with family members and peers in preparation for the committee meeting. His peers offer goodwill and support in order to improve the presentation content. Woman as temptress is what I see as distractions faced by the scientist

that can delay the proposal process such as distraction from their daily work requirements, or even following up on the proposal cycle's paperwork to ensure the proposal arrives to the committee presentation on time. Atonement with the father can be viewed as a professional mock-presentation done at the senior scientific level that occurs as a practice run prior to the actual funding committee meeting. This is where the scientist receives most beneficial value to improve their proposal content and performance prior to entering the committee. The ultimate boon is the feeling of pride once the proposal and presentation slides are completed. The ultimate boon becomes the confidence a scientist needs prior to entering the committee presentation.

- *Return*

The return stage is the most important stage, as it ensures the continued flow of spiritual energy and justifies the hero's retreat from the world. In this stage the hero returns and reintegrates with society. It is subdivided as follows:

1) Refusal of the Return;
2) The Magic Flight;
3) Rescue from Without;
4) Master of the Two Worlds and
5) Freedom to Live." (Fredheim, 2011).

In the final return stage of the monomyth, the hero returns to society. In my case this stage involves the scientist proceeding to present the proposal to the funding committee. This results in the magic flight where the scientist presents with confidence as they have gone through the turmoil of necessary preparation. The scientist endures the proposal meeting and answers all questions from committee members where he masters the performance. Once the scientist endures the meeting and the proposal is approved, the scientist is now free to conduct his research and pursue his goal of returning to society with the ultimate boon of making society a better place with his beneficial research results.

The modern story format above suggests how a scientific story can be told in a manner that is simple to comprehend to a generic audience. However, the story above is the story of how the scientist endures the proposal

cycle process from writing to final acceptance for funding. This is not the essential story I am looking at. What I am looking at in this study is the story within the research proposal document itself. The research proposal document describes a problem that needs to solved in a scientific manner that is to be executed by a proposed team in the future. It is not a completed story that has a clear ending. It does not describe turmoil that the researchers endured to obtain results as the results do not exist yet. Therefore the "dramatic arc" structure of a story as is, seems to be out of place when communicating within a research proposal. This leads to the need for further exploration of storytelling in order to arrive at an enabling theory that can be used in this study. Also, as explained earlier, it is important to take into consideration that scientists do not understand the dynamics of communication, let alone the format of a story. However, a story format, if mastered, can create a narrative that is both appealing to an audience and comprehendible (Kent, 2015). In the following section I explain what a good story consists of.

I have discussed general storytelling formats and the modernization of this format, but I am yet to discuss what constitutes a *'good story'*. According to Dahlstrom (2014), a good story establishes a strong connection between the cause and effect, where the cause should be unexpected, as people are not curious about *'predictable chains of events'* (Green et al., 2018; Matei & Hunter, 2021). A good story also does not utilise common sense as the mystery around the story is what attracts the interest of the audience (Green et al., 2018; Matei & Hunter, 2021). Storytellers must keep the audience in suspense, where the chain of events keep probing questions that the audience immolate in their minds and are curious to find answers to (Green et al., 2018; Matei & Hunter, 2021). This is why following a format in the story, which does not unveil everything from the beginning is necessary to keep the audience engaged till the end (Matei & Hunter, 2021). Stories' main mechanism is to take the reader on an exciting journey of discovery, with the ultimate goal of creating a change in the reader (Burke, 1966; Cohen, 2011; Torres, 2019). This change occurs through learning (Matei & Hunter, 2021). 'Good stories' highlight discovery as discovery is an intriguing plot that sparks interest (Tobias, 1993, cited in Kent, 2015; Matei & Hunter, 2021). Science by nature is considered a journey of discovery, where scientists are the actors constantly looking

for new solutions to existing problems. This gives greater potential for science to produce good stories that would initiate interest amongst an audience (Bray et al., 2012; Matei & Hunter, 2021).

If we examine the story in communicating science, the main objective is to discover something new that would lead to new knowledge, which would in turn change the world we live in to the better (Joubert et al., 2019). The story of a scientific research proposal therefore entails transporting the reader into a journey of learning, where unexpected causes and effects are connected in order to develop a solution that would help humanity. The main objective of a story in a research proposal is to transport the reader through learning, in this case a funding committee member into taking action (Burke, 1966; Cohen, 2011; Torres, 2019), which is making the decision to fund. According to Matei & Hunter (2021: p. 315), "Stories are always teachable moments. They add value, reveal new possibilities, and encourage imagination of future scenarios and actions." Similarly, Campbell's "dramatic arc" suggests that good stories show action and development of the hero on his journey, while returning to society a changed man that bestows boons on his society. There is limited research on how a story functions to spur action or change perceptions of science.

While existing literature acknowledges the use of storytelling as a tool to convey findings of scientific research to the general public and policy makers, in my study I challenge the notion of depending on the "dramatic arc" alone to convince committee members to make a funding decision. Although existing literature discusses using the above dramatic arc and plots as storytelling formats to engage the general public or policy makers when explaining scientific results, in my case, the nature of funding is more sensitive than communication of scientific results due to the involvement of a monetary factor. The proposal format in itself does not only include a narrative writing format, but also includes methodical scientific writing. Also, the intended audience is different, being senior scientists and senior management officials who are experts in their own fields. This notion suggests that the story of a research proposal can be viewed as more complex and would therefore require further exploration into how reviewers and committee members are interpreting a proposal. There is first a need to understand who the committee members are in terms of their knowledge background. We then need to understand what they are looking for in a proposal in terms of their background knowledge and how they are influenced by the various

sections of the proposal. Therefore, focusing on storytelling as a communication tool in the case of scientific proposals and how audiences engage with these stories has value in understanding a different set of audience for science communication that has not been explored in previous literature.

While I have described the story format and how good stories function, it is important to highlight the complexity of the proposal document and realise its complex format. The proposal format consists of narrative sections as well as methodical-scientific sections, which require to be understood in terms of how they function to influence the funding decision. The main objective of a story is to stimulate imagination through creating emotional connections that would stimulate action (Green & Brock, 2000; Olson, 2009; Olson et al., 2013; Siegel, 2017; ElShafie, 2018). However, methodical-scientific writing stimulates a different cognitive response i.e., argument-based processing (Escalas, 2004) as it does not follow a story format. In this context, I introduce this thesis' enabling theory of narrative transportation versus argument-based processing to initially describe how the proposal document's formats and sections potentially function to influence funding behaviour.

2.3.1 Enabling Theory: Narrative Transportation Versus Argument-Based Processing

Stories provide a different means for information processing. The main idea behind storytelling is to invoke emotions when processing information. Emotions are seen as a tool for building a strong connection that will resonate in the audience's mind. A story acts as a stimulus for emotions, which then triggers information processing in a *'narrative manner'* (Burke, 1966; 1968; Fisher, 1985). A narrative provides information in a form that is more intriguing and exciting for a receiving audience. Once a character is introduced, people are interested in finding out the sequence of events this character is going through and start relating their own experiences with that character through the formation of associated emotions (Fisher, 1985). The character, for example, may trigger familiar personas with the receiving audience and imagination is triggered in information processing. As referenced by Solja et al. (2018), narrative processing comes naturally to humans therefore, presenting information in a narrative manner is more easily accepted by people as it is the natural way of thinking and processing of information. Story formats, the dramatic arc and the use of plots are all tools used to induce narrative transportation. These story development tools help shape the story narrative in a format that is easily

comprehendible and intriguing to the audience (Campbell, 1949; Tobias, 1993; Kent, 2015), where the main aim is to stimulate action through emotional attachment (Green & Brock, 2000).

Stories can transport people into narratives (Gerrig, 1993; Green & Brock, 2000) where narrative impacts people's emotions, cognitive thinking, imagination and information recall (Green & Brock, 2000; Siegel, 2017). Transportation leads to consistent belief with the story's embedded beliefs (Green & Brock, 2000), which makes narrative transportation an effective communication tool for persuasion. Story receivers become transported through two main components: empathy (Slater & Rouner, 2002) and mental imagery where they start using their imagination (Green & Brock, 2000). Emotional stimulation causes the receiver to imagine the characters in the story, and develop empathy towards that character (Siegel, 2017; Bloomfield & Manktelow, 2021). Narrative processing as discussed earlier is a means of including emotions in digestion of information (Green & Brock, 2000; Escalas, 2004; Siegel, 2017; ElShafie, 2018). Emotions therefore act as a compelling positive distraction that leads to establishing connections with the characters of the story being told (Green & Brock, 2000). This in turn leads to the consumer being "transported" in the narrative (Söderlund & Sagfossen, 2015: p.105) making the consumer "immersed in the story" (Van Laer et al., 2014: p.800) through stimulating imagination. Once a consumer starts imagining the story he becomes carried away or lost in the story, therefore removing rational cognitive processing out of the equation (Green & Brock, 2000). The aim is to stimulate the audience to make an emotional decision based on positive influence from the story being told. The story's objective is to create emotional appeal (Siegel, 2017; ElShafie, 2018) and that this imagination may lead to making an emotional decision towards the desired action. Narratives have the ability to change beliefs based on transportation (Gilbert et al., 1993) regardless of whether they are true to our real-world (Green & Brock, 2000). Nonetheless, individuals who are immersed in a story have been proven to have less tendencies towards cognitive thinking and counter arguing (Green & Brock, 2000).

Narrative transportation also induces narrative self-referencing (Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007), where the audience relates events from the story being told to their similar past experience, and the memory recollection of that experience occurs. Self-referencing is triggered through the recreation of

similar past events and analysing the narrative through the lens of those past events, therefore establishing emotional connections (Burke, 1966; Fisher, 1985; Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007). The audience therefore is immersed in the narrative by envisioning themselves as the character in the narrative due to memory retrieval of similar experiences that induce self-referencing (Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007).

However, not all individuals are transported at the same levels (Green & Brock, 2000). Different people have different responses to narratives and external factors as well may have an influence on transportation (Green & Brock, 2000). In the case of decision making in funding scientific research, I believe that there are additional complexities such as a diverse audience, the need for more detailed information, and the critical thinking nature of the funding committee member's job (their main role). In this context, the story of a research proposal needs to be considerate of these differences in audience and should present information in a manner that is consistent with these different audiences' requirements. External factors such as the nature of the funding committee pertaining to its main function, which is being critical of the research being presented also needs to be taken into consideration when devising the proposal's story. As scientists are trained in a methodical format of communication, one needs to understand that the mind-set of the scientist is revolved around evidence-based findings (National Academies of Sciences, Engineering & Medicine, 2017; Banks & Di Martino, 2019; Bloomfield & Manktelow, 2021; Maninno et al., 2021). With that in mind, I realise that scientists also are trained to think with an analytical approach and hence also engage in argument-based processing when communicating science, which I introduce below.

The opposite of narrative processing is argument-based processing (Escalas, 2004). Argument-based processing occurs when an audience is exposed to facts or information that are not presented in a narrative story format and therefore engages in elaboration (Green & Brock, 2000). The audience analyses the presented information and starts developing arguments in their mind as to whether the information will impact their beliefs negatively or positively (Escalas, 2004). Cognitive elaboration entails consistent analysis of the main points presented in the argument in a mode of constant critique (Green & Brock, 2000). For example, in consumer

behaviour studies, a consumer starts analysing if a product's functions are useful or not and starts developing comparisons with other similar products, thus depending solely on the facts presented in order to make a purchasing decision (Solja et al., 2018). In the context of scientific research an example would be presenting data in charts and graphs (Bigg, 2016) as opposed to telling the story behind the data and expressing the data in terms of narrative. The receiving audience initiates cognitive elaboration, where critique is activated and the audience thinks in terms of arguments of whether the presented data is believable or not and whether it coincides with the receiving audience's beliefs (Fanning, 1999; Green & Brock, 2000; Gough et al., 2014; Hajdu & Simoneau, 2020).

As indicated by Green & Brock (2000), individuals who are highly critical and in turn tend to think more frequently, are less impacted by storytelling. Although transportation occurs, the need for strong arguments is required in order to persuade them. Whereas people with less need of critical thinking do not distinguish the difference between strong or weak arguments, and hence are more easily persuaded. Green & Brock (2000) indicate that narrative supersedes elaboration induction, meaning that transported individuals did not have a heightened need for elaboration once immersed in the story's narrative (Green & Brock, 2000). However, the story of scientific research proposals specifically requires that funding committee members have the job of scrutiny. Their job is to critique the proposal in order to make sure that it is worth the investment, which makes it imperative to understand how to weave stories that would trigger such audience.

People, especially when faced with critical situations in which their opinions are asked for, tend to function with traditional systematic or heuristic modes described in dual-process models of persuasion (e.g., Chaiken, 1980; Petty & Cacioppo, 1981, cited in Green & Brock, 2000). These models of persuasion imply that the audience focuses on multiple arguments and refer to their own experiences in order to make a decision (Green & Brock, 2000). On the other hand, narrative transportation suggests that narratives help "immerse" the reader into the story, where their focus becomes on one argument and they pay less attention to counter arguments being presented. The main issue that then arises is, the need to understand how can we communicate a research proposal to a diverse audience of scientists as well as non-scientists. We need to understand whether audiences of a

scientific background need to hear a story as well or if they are confined to their analytical communication methods. In my study I argue that funding committee members use both narrative transportation as well as analytical processing to make funding decisions, which will be reported later in the results section.

To recap, telling a (science) story entails using the basics of storytelling which is a plot that includes a setting, main character, outcome and resolution (Bower, 1976) in a dramatic manner of highs and lows known as Campbell's (1949) "dramatic arc". The story takes the audience through the character's series of events that have their tensions, i.e., cause and effects to grasp the audience's attention (Cousineau, 2020). When communicating the research proposal, a scientist needs to think about what the most critical information to share is required in order to tell a *'good story'* (Green et al., 2018). Being of different nature than a generic scientific story, a research proposal should be viewed as more complex. Previous research identifies the story of science as the narrative of communicating problems and obstacles and how these obstacles would be solved (ElShafie, 2018; Green et al., 2018). Essentially the story of science is a story of discovery, with the character's journey of challenges they go through to find a solution that would benefit mankind (Green et al., 2018). A research proposal on the other hand has a more complex story as it is tied with higher risk due to the funding element as well as the futuristic element of research that has not yet been completed. There is therefore a necessity to understand what an applying scientist needs to focus on when telling the story of a research proposal. The use of the scientific story plot identified by Green et al., (2018) and ElShafie's (2018) "dramatic arc" needs to be explored as well as identifying more elements that need to be taken into consideration if they may arise. In this section I summarise the written portion of stories, where the focus is on the research proposal document itself. However, in my study, the proposal is also performed. Storytelling theory often assumes written format, making absent issues relating to how stories are presented or performed. This is significant for science funding communication because this may involve various oral performances of the story relating to the research. Scientists present their research proposals to funding committee members in order to persuade them. In this context, I acknowledge and explain the importance of the performance of scientific stories and attempt to understand how these stories are performed and how they

influence funding action. In the next sections I consider issues of the oral presentation of a story and its overall performance.

2.4 Oral Storytelling: The Performance of a Science Story

As science communication is surrounded by risk due to uncertainty (Olson, 2018; Banks & Di Martino, 2019; Battiston et al., 2021; Bloomfield & Manktelow, 2021), in the above section I have addressed the concern with scientific content and identified storytelling as a compelling tool to use when communicating science. Stories are relatable, easier to comprehend and therefore allow the recipient to clearly understand scientific content, and hence with more clear understanding (Dahlstrom & Scheufele, 2018; Bloomfield & Manktelow, 2021), content becomes less ambiguous and can therefore reduce uncertainty of science. I have also identified that people need to trust the source of information i.e., the storyteller himself, where people tend to trust individuals who have scientific authority (Battiston et al., 2021) to reduce risk when it comes to science communication. Risk reduction as indicated in studies by Bauer (1960) and Cox (1967), can be linked to the "schema" study by Copeland (1923). According to Bauer (1960), people engage in risk reducing behaviour when their perceived risk has surpassed a level that can be accepted. This means that people try to reduce risk by engaging in activities that reduce this perception such as "seeking more information" (Bauer, 1960: p.94). In the case of science communication, people are turning to scientists as a trusted source of information, which was especially apparent during the COVID-19 pandemic (Battiston et al., 2021).

Although storytelling in science communication addresses the written portion of the story i.e., the narrative, science stories are also orally communicated i.e., performed. Whether communication occurs in a science fair, a consortium, official meeting or a general announcement to the public, the context of science communication performance is an aspect that is not covered extensively in the literature. Scientific research proposals are not only written, but are also performed, live, in front of an audience. Science communicators are therefore actors who perform in front of an audience whom they engage with in a persuasive manner in order to induce behaviour. An example of such oral communication would be during the COVID-19 pandemic, where the world was in urgent need to develop a vaccine (Yamey et al., 2020; Kuter et al., 2021). Science is not generated

without an expense. Research requires funds and funds are provided by organisations who are seen as investors (Yamey et al., 2020; Kuter et al., 2021). Investing in science is risky as it is associated with high cost (Yamey et al., 2020) and therefore requires complex communication in order to secure funding. During the pandemic, scientists applied for funding in order to develop the vaccines that are used to combat the Corona virus, where funds for the initial trials stage were estimated at US$2 billion (Yamey et al., 2020). Scientists have written research proposals and might have had to present their proposals to investors in order to make a case for funding. Also, during the pandemic, scientists themselves, in an unprecedented manner, were seen extensively on media providing information about the development of the virus and later on about the vaccines—urging people to take the vaccine in order to combat the pandemic (Battiston et al., 2021). This notion confirms the relevance and importance of oral storytelling in science communication where the performance of the science communicator portrays trust and becomes vital in stimulating desired actions. In this context, I introduce oral storytelling and its link to performance theory literature to explore the notion of performance in science communication.

According to Curenton (2006, cited in Lenhart et al., 2020: p. 339), oral storytelling is "the act of verbally expressing our real-life or fantasy experiences to another person". Since the ancient times, human societies have used oral storytelling to convey thoughts, actions and shared values to name a few (Fischer et al., 2020; Lenhart et al., 2020). An oral storytelling performance is described in the literature as "an artistic process that works with what we may call the technologies of the human mainframe – memory, imagination, emotion, intellect, language, gesture, movement, expression (of face and of body) and, most crucially, relationship in the living moment – person-to-person or person-to-group" (Sobol et al., 2004, cited in Marlar, 2010: p. 359). A more efficient definition of oral storytelling is "a contextualised-performance" in which a story is presented in terms of context (Marlar, 2010: p. 359). Oral storytelling is viewed as complex as it involves multidimensions of communication including verbal and non-verbal communication modes such as verbal i.e., use of language, vocal i.e., use of voice and finally, visual i.e., use of gesturing, posture, and facial expressions (Marlar, 2010; Banks & Di Martino, 2019).

Oral Storytelling also depends on presentation skills, which help the storyteller in conveying the story (Yoder & Kowalski, 2003). These skills focus on the verbal, vocal and visual multidimensions discussed above. Verbal skills include the use of emotional evoking words such as "roared instead of laughed" (Yoder & Kowalski, 2003: p. 40). Vocal skills include the use of tone and voice (formal or informal), and using tone to convey emotions (Yoder & Kowalski, 2003). Yoder and Kowalski also emphasise on "pacing the story" in which the performer is able to pause when needing to introduce or emphasise on a point. All these connotations are provided with oral storytelling, hence providing an advantage on written storytelling. Moreover, oral storytelling allows for the use of gesturing and body-language such as eye contact where studies have proven increased attention to stories from body language use (Hood & Hao, cited in Banks & Di Martino, 2019; Lenhart et al., 2020). In order to understand implications of oral storytelling, one must delve into dramaturgical analysis introduced by Ervin Goffman (1959), which is summarised below.

As represented in Goffman's (1959) performance theory "All the world's a stage and all the men and women merely players they have their exits and their entrances and one man in his time plays many parts", William Shakespeare. Goffman's literal translation of Shakespeare's quote describes the world we live in as an actual stage, where individuals are actors who perform in front of an audience. Whatever the situation may be, people's interactions are seen as a play where the individual puts on different masks or faces, which resemble our different personas that appear depending on who we are interacting with (Goffman, 1959; Newkirk, 1995; Da Silveira et al., 2013). These different personas entail that we have different roles and authorities in our lives. For example, a mother can have the role of an educator, the role of a sister and the role of a grandchild at the same time, but her actions and demeanour are not the same when assuming these roles. Each role has its different set of authorities. In the mother's role, she has authority over her children, but in the grandchild role this authority is diminished. Roles and authority on the other hand provide status (Goffman, 1959). This status can be either "ascribed" i.e., implied by the role (comes automatically) such as the mother or the sister or "achieved status", which is earned, e.g., professor. A performance is highly based on beliefs, values habits and interactions with others (Goffman, 1959). One can only determine a person's role or authority from their "role performance" as

described by Goffman (1959) where individuals engage in "impression management" as they act in the manner that they want to be perceived.

Dramaturgical analysis has already been used to understand interaction in organisations (Manning, 2008). Dramaturgical analysis in organisational studies was used to uncover social conflicts (Mccormick, 2007), understand interactions between salesmen and prospect customers in public relations encounters (Fawkes, 2015), understand promotion, specialisation, authority, management of team loyalty and other processes in organisational hierarchies (Mccormick, 2007) as well as understand underlying social interactions in organisational change management, and enhancing organisations by encouraging innovative behaviour (Schreyägg & Häpfl, 2004). Goffman's approach is used in organisational studies to reveal "the theatrical structure and logic of organisational behaviour" where interactions (performances between actors and spectators) are used to stimulate change or desired actions (Schreyägg & Häpfl, 2004).

In organisational studies, trust is considered the main pillar for interaction (Manning, 2008). Individuals' interactions with organisations are based on trust, where the assumption that both parties are fundamentally trying to achieve the same end goal of sustaining the interaction (Manning, 2008). In the context of this thesis, it is important to understand how science funding is organised through the complex process of developing proposals and presenting them to an audience. As identified earlier, one of the main concerns with uncertainty in science communication is trust in the science communicator (Lupia, 2013; Yuan et al., 2019; Battiston et al., 2021). Understanding the dynamics of how trust is established through dramaturgy, then becomes a necessity in order to derive how best science communicators can appear trustworthy to their intended audience.

Mccormick (2007) and Da Silveira et al. (2013), highlight that a performance is all the activity of an individual or team "on a given occasion which serves to influence in any way any of the other participants" (Goffman, 1959: p. 15) and dramaturgical analysis is part of a symbolic interaction (Stryker, 1981). As performances are understood as part of our social reality, performances that are maintained by interactions solicit change (Clark & Mangham, 2004; Da Silveira et al., 2013). Goffman describes a performance as acting in his analogy of having a "front stage and backstage", where the "front" is the face the actor puts on that he wants other

people to see, which is used in situations where the audience is unfamiliar or more formal, and the "backstage" is where all the chaos is concealed—it is where the person is more relaxed and is able to stop the "act" put on for audiences, because they are simply not there or because the audience in the backstage is familiar and intimate (Goffman, 1959) hence there is no need to put on a more structured, formal persona. The stage is the place of the interaction itself. This can be a meeting room, a class room or a conference stage. The stage is the setting of where the interaction takes place and each setting has its own rules of social governance i.e., social norms (Goffman, 1959). These norms could be how to act at a conference, a classroom or a wedding and what to wear, i.e., different dress codes for certain settings (e.g., formal/informal). Also, within an interaction, actors give impressions and expressions (Goffman, 1959). Expressions are segmented into two types: expressions we give –which are intentional and expressions that we give off—which are unintentional (Goffman, 1959). An example of an intentional expression would be a genuine laugh at a funny joke, where an unintentional expression would be a clear fake smile. In the first example, body language matches the emotion, while in the second, body language does not match emotion and can be detected by the audience. Within a setting, maintaining social interactions requires mutual agreement on social norms of that particular setting by both the actor and audiences in order to reach a "working consensus" (Goffman, 1959). A working consensus entails that people engage in practices that would ensure the continuance of the interaction (Da Silveira et al., 2013). A working consensus is achieved by either the use of "defensive or protective practices" where both ends try to maintain the interaction (Goffman, 1959). Defensive practices entail actions an actor takes to protect their impressions (their front). For example, smiling and nodding in agreement to a certain point made by the audience, when in actuality you have no clue what they are talking about. While protective practices "tact" are actions the audience take in order to protect an impression (Goffman, 1959), for example, if the actor has spinach in their teeth, the audience could choose not to say anything about it to the actor to avoid embarrassing them and save face (Goffman, 1967). Therefore, members within an interaction function on social norms in order to maintain the interaction by preserving both the performer's and audience's face (Da Silveira et al., 2013).

In branding studies, Goffman's work was used to understand elements of consumer interaction with brands. As indicated by Da Silveira et al. (2013: p. 31), "Goffman's (1959, 1967) thinking has implications for the reconceptualization of brand identity", where a brand consistently works on saving face with the consumer's brand identity, this assumes the notion of brands building their identity over time while continuously interacting with consumers who then identify with the brand once the connection is established. Therefore, understanding interactions provides insights on how organisations as well as individuals operate in terms of communication.

One of our natural modes of human communication is storytelling, as we use it in our everyday lives to convey, thoughts values, beliefs and ideas to name a few (Fischer et al., 2020; Lenhart et al., 2020). Due to the fact of daily use of storytelling, most of us have encountered an individual who is extraordinary at telling stories (Yoder & Kowalski, 2003; Green et al., 2018). People who are naturally "gifted" storytellers are able to generate interest and stimulate emotional response (Yoder & Kowalski, 2003; Kent, 2015; ElShafie, 2018). Although natural storytellers have greater success in telling stories, storytelling on the other hand can be an acquired skill (Yoder & Kowalski, 2003; Kent, 2015; ElShafie, 2018). Especially in science communication, once the fundamentals of storytelling are taught, the skills required to build good scientific stories can be acquired (Yoder & Kowalski, 2003; Kent, 2015; ElShafie, 2018; Green et al., 2018). "By the nature of their practice, scientists can also be excellent storytellers. In fact, they are taught to think like storytellers. Yet, many scientists don't know it yet" (Matei & Hunter, 2021: p.315). However, the important observation to understand is that an audience makes a perception of the storyteller before deciding to listen to the story (Yoder & Kowalski, 2003). This means that the credibility of the storyteller plays a role in perceived trust of the storyteller, hence has an impact on the audience's willingness to listen to the story to be told due to established rapport (Yoder & Kowalski, 2003). Once rapport is established the storyteller is able to communicate their future vision, beliefs and values in a manner that stimulates the audience's attention (Yoder & Kowalski, 2003). This entails that credibility of the storyteller as well as their storytelling skills have a great influence on the audience.

Referring again to the Netflix movie "Don't Look Up", the same scene with the president shows a great example of how scientific authority is taken into consideration during an oral storytelling setting:

President: how certain is this?

Dr Mindy: there's 100% certainty of impact.

President: please don't say 100%

Chief of Staff: Can we just call it a significant event?

Dibiasky: but it isn't potentially going to happen. It is going to happen!

Dr Mindy: exactly 99.78% to be exact.

Chief of Staff: oh, great so it's not 100%

Dr. Oglethorpe: well scientists never like to say 100%

President: Call it 70% and let's just move on

Dibiasky: but it's not even close to 70%

President: you can't go around saying to people that there's 100% chance that they're gonna die. You know? It's just nuts. We should get some of ***our scientists*** *on this. No offense, but you're just two people that walked in here with.*

Dr. Oglethorpe: Dr. Oglethorpe!

President: Dr. Og… Ogilvy blah

Dr. Oglethorpe: I've been head of planetary defence at NASA for 15 years. And Dr. Mindy (Dicaprio) is a tenured professor of astronomy at Michigan State, where Miss Dibiasky (Lawrence) is a doctoral candidate.

The president has her arms folded, which shows objection and disinterest.

Chief of Staff: I'm sorry did you say Michigan State?

Dr. Oglethorpe: Exactly. They have an excellent astronomy department.

Chief of Staff: Yes, come on bro? (With sarcasm)

Dibiasky: are you kidding you wanna see my SAT scores?!

Conversation continues

President: if this breaks before then we lose congress. And there's nothing we can do about it anyway. The timing is just…it's atrocious. Okay at this very moment, I say we sit tight and assess. Let's get some other people on this, some ***Ivy Leaguers****. And you and I will review the NASA plans. (With deep sarcasm).*

The conversation above shows that the president has developed a perception of the scientists before even meeting with them and hence was not ready to listen or take them seriously. The president and her chief of staff also showed disinterest as the University of Michigan is not an Ivy League school, hence giving off the perception that these scientists are not that experienced and in turn, are not seen as experts. This creates the dilemma of scientific authority where the audience makes a preconceived notion of the quality of the science being communicated before even listening to the oral presentation, thus creating an issue of trust and a major challenge for scientists to communicate to a non-scientific audience.

There is a lack in literature about the use of performance theory in science communication. There are however some studies in nursing (Newkirk, 1995), but there isn't a clear understanding on how performance theory is used when communicating science to different audiences. The literature focuses on science communicators who communicate with the public i.e., scientists communicating scientific results to the public (Lupia, 2013; Wilson et al., 2016; Yuan et al., 2019). While other research discusses the intervention of journalists to bridge the communication gap between scientists and the general public to communicate scientific topics as they have the skill-set to *'translate'* scientific content into content that can be easily understood by the public (Mannino et al., 2021).

On the other hand, science communication in terms of proposals requires that a scientist themselves perform live in front of a diverse audience. The notion of a live performance entails the need to understand performance parameters and recognise how these parameters can be used to stimulate funding behaviour through utilising oral storytelling. The phenomenon of dramaturgy analysis in pitching scientific research proposals is unique in context, hence my study allows for drawing inferences on the use of dramaturgy in science communication from a new perspective—to draw insights on how best to perform the story of research proposals in order to obtain funding.

Chapter Summary

In summary, existing literature explores science communication for common audiences such as the general public and policy makers (Dahlstrom & Scheufele, 2018; Torres, 2019; Yuan et al., 2019; Lidskog et al., 2020; Mannino

et al., 2021), however in my case, a complex audience of expert scientists and expert executives paves a new road for exploration of science communication audiences. All humans are storytellers (Aristotle, 1991; Schank, 1999) as we live in a society that constantly interacts with one another, therefore making the exchange of accounts in a narrative form, that is naturally more interesting to the listener, a more powerful tool to communicate information (Burke, 1966; Bormann, 1972; Fisher, 1985). Stories consist of a known format of a beginning, middle and end, which should be followed in order to attain undistorted interest from the audience (Kent, 2015; ElShafie, 2018; Green et al., 2018; Matei & Hunter, 2021). The issue pertaining to a scientific research proposal is that the end remains unknown as the research is yet to be conducted. The scientist cannot proceed with the experimental work without funding; hence the story being told to funders becomes incomplete, or at least cast into the future (where it will be completed). As discussed earlier, such uncertainty means that science communication is associated with risk. Risk is derived from the content itself (i.e., information) (Kwon & Nelson, 2016; Wilson et al., 2016; Yuan et al., 2019) as well as the source of information itself (i.e., the communicator) (Fischhoff & Scheufele, 2013; Lupia, 2013; Scheufele, 2013; Battiston et al., 2021). Both these issues lead to problems with asserting trust (Fiske et al., 2007; Fischhoff & Scheufele, 2013; Fiske & Dupree, 2014; Wilson et al., 2016; Yuan et al., 2019).

As storytelling is used as a compelling tool to communicate science in a manner that is easily understood (ElShafie, 2018; Green et al., 2018), the risk from content understanding is reduced, hence trust in information can be obtained. Due to the complexity of information presented in a research proposal as well as the complexity of its audience, we need to explore how best to present the story narrative within the proposal in order to stimulate funding action.

Although Joseph Campbell's (1949) "dramatic arc" has been identified in the literature as a model for telling the story of science (Elshafie, 2018), I argue that the story of a research proposal is different as it is more complex in terms of content, has a different audience and is associated with the high risk of making a funding decision. I suggest that the "dramatic arc" format of storytelling cannot be used as is on its own and further complex storytelling needs to be explored.

The main problem with telling the story of a scientific research proposal is that the ending is completely risky and unknown. As a matter of fact, in order to know the ending, the committee needs to approve funding. Therefore, you are fundamentally paying money to see the ending, which could be favourable to the investment or unfavourable to the investment. For this reason, conducting research on such complex storytelling is required, in order to unveil how best to communicate proposed scientific research projects in a storytelling format that would work better in the scientists' favour. Narrative transportation is identified as my enabling theory where its use in advertising and packaging to reduce analytical processing in consumers, leading to purchase is acknowledged. Narrative transportation theory suggests that individuals are immersed in the story via narrative (Gerrig, 1993; Green & Brock, 2000) and hence pay less attention to arguments presented (Green & Brock, 2000). I argue that narrative transportation although needed, cannot be generalised to all audiences, especially in more complex contexts such as pitching proposals for scientific research. I emphasise that stories are rather told in different versions to suit different audiences who look for different elements within a story (Slater, 1996; Fischhoff & Scheufele, 2013; Siegel, 2017) that they would like to hear based on their backgrounds. These differences are also triggers to purchasing behaviour—in my case, funding behaviour and cannot be ignored. I draw attention to scientists being trained in methodical writing and interpretation of information, hence adding a further dimension to science communication that needs to be addressed, which in essence is the identified gap of narrative transportation theory that needs to be elaborated in order to address such a different audience.

On the other hand, science stories are also performed, hence performances have an influence on trust in the communicator himself (Lupia, 2013; Yuan et al., 2019; Battiston et al., 2021). I therefore identify the need for dramaturgical analysis of the interaction between the applicant and the funding committee members in order to shed light on the importance of oral storytelling and its implications on communicating science to different audiences as well as identify how scientists can perform their proposal stories in order to encourage funding.

As scientists face the challenge of obtaining funding for their projects, this challenge is ought to be solved using a unique mode of communication. The issue is what can a scientist do to enhance the chance of obtaining research funds? In this study, the use of storytelling in research proposals will be explored. How do scientists

present their research ideas? If a story is used, does it follow a plot? Does it use emotional appeals or analytical appeals? Does it follow the suggested temporal structure of a clear beginning, middle and an end in a dramatic arc, and is it likely to have an influence on funding? What are reviewers and committee members looking for in a research proposal in order to make a funding decision? What happens during the funding committee meeting performance? In the following section I describe the methods used to carry out this exploration.

CHAPTER 3: RESEARCH METHODOLOGY

I now describe the methods used to understand storytelling in science funding communication, I start by discussing related research philosophy and how the methods themselves include ethical concerns and approval.

In lieu of the context explained in chapter 1, I have made the decision to split the dataset into 2 to contrast the beliefs of scientists applying for funding with the beliefs of committee members in terms of how they perceive research proposals in terms of content and what constitutes a *'good proposal'* in terms of writing format as well as live presentation during the meeting.

The first dataset is the applying scientists who are concerned with their own scientific discipline and area of expertise. While the second dataset comprises of committee members who are senior scientists or senior executives. The senior scientist can either be of the same scientific discipline as the applying scientist or be of a completely different discipline than the applying scientist. The senior executives do not have scientific expertise but are experts in their own discipline such as economics. In terms of the dataset being examined in this study, I draw attention to the complexity faced in the type of audience being sampled, where the mix of individuals comprises of both highly specialised scientific backgrounds that are very different, as well as individuals who are non-scientists but have very advanced specialties in non-scientific disciplines. This dataset is unique in terms of audience identification within science communication literature, as most of the current literature focuses on the general public or policy makers as audiences who are non-scientists (Dahlstrom & Scheufele, 2018; Torres, 2019; Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). Therefore, a unique set of audience members adds to the literature of science communication in terms of understanding how to communicate science to a much more complex audience i.e., senior scientists and senior specialist executives. In addition, the context being studied requires a specific action to be stimulated from science communication, which is funding. Current literature focuses on stimulating action towards science that involves climate change or general health (Somerville, 2012; National Academies of Sciences, Engineering & Medicine, 2017; Bonell et al., 2020; Courtemanche et al., 2020). The notion of communication for receiving scientific funding is a new context, which is aimed for exploration. As indicated above, I explore the written content of the scientific proposal in order to uncover what type of

information is required to be included within the proposal for the specific audience of funding committee members. While science communication literature focuses on content, scientists at the examined institute also perform in front of a live audience, meaning that the proposal is presented during a formal funding committee meeting, where the scientists engage with the committee members in order to pitch their proposal for approval. The notion of performance of science communication is not discussed thoroughly in the literature, in which my study will provide new insights on how science communication is performed. I emphasise on the importance of dramaturgy in science communication in order to draw inferences on how best to interact with a complex audience and stimulate funding behaviour.

I attempt to unveil how the difference in audience as well as the required action of funding suggest that a more complex story needs to be told in order to influence funding behaviour. In this case study, the scientific research community's dilemma in applying for funding will be explored, where scientists not only write their proposals, but also pitch their research proposals in a meeting held with funding committee members who are the gatekeepers for the release of funds. I explore how scientists communicate within their research proposals in writing, as well as try to understand their performance aspect of proposal pitching in order to contribute to the literature by providing insights on how best to communicate scientific projects for funding purposes. I identify how proposal communication can be improved by embodying several communication theories that would eventually lead to a favourable funding outcome. This research contributes to the scientific research community's struggle when competing for funding, by providing a detailed understanding on how to communicate research at a higher level when involved with a highly specialised and complex audience rather than the general science communication to the public or to policy makers.

3.1 Research Philosophy

Science storytelling in this study is not viewed through a positivist lens as the construct of telling stories in a research proposal is reliant on common values, beliefs and audience self-motivations as indicated in previous science communication literature (Sujan et al., 1993; Kahan et al., 2009 cited in National Academies of Sciences, Engineering & Medicine, 2017). The academic positivist lens that approaches understanding societies

specifically relies on empirical scientific evidence, such as controlled experiments and statistics that are derived from observations (Kolakowski, 1972). However, science communication involves emotional connotations to funding decision-making in particular which cannot be understood through a completely positivist approach. Social interactions are required to learn more about the funding decision-making process; hence the approach of social constructivism has been used to derive inferences directly from the participants' experiences to explore the funding decision-making process.

Science storytelling can be influenced by social theories in science communication through the understanding of the intended audience's values, beliefs and self-motivations (Sujan et al., 1993; Kahan et al., 2009 cited in National Academies of Sciences, Engineering & Medicine, 2017). Once the audience's goals and directions are clearly identified (through their strategic directions, missions/vision for example), a scientist can embed these values, beliefs and motivations within their science communication to obtain audiences' trust (Sujan et al., 1993; Kahan et al., 2009 cited in National Academies of Sciences, Engineering & Medicine, 2017). This process in academic literature is emphasised by Vygotsky, 1978 where he believes humans collaboratively learn through experiencing cultures and language to build perceptions of the world and understanding reality. In other words, scientists can build their stories collaboratively with their audience through embedding their beliefs and understanding of reality and the world into their proposal's narrative. In contrast, this study is derived from a relativist ontology and an interpretivist epistemology, meaning that knowledge is generated within a context that is relevant to the participants being researched (Stake, 2006). Knowledge is therefore informed within a social context such as perception, persuasion preference, individual behaviours, and social influence where I have further subjected the communicated information to my own interpretations. Knowledge is looked at through an emic approach where truth is created via deep interactions with participants in order to fully understand and describe the phenomenon being researched (Stake, 2006). Therefore, the influence of storytelling on committee members is not measured using quantitative design, as this cannot capture how storytelling has an influence on funding action through the experiences of those involved, including their understanding of the content and their emotional responses to it. In other words, understanding how storytelling has an influence on funding alone

through a series of closed ended questions does not provide a full understanding of how exactly it might influence the presentation of pitches and subsequent funding behaviour.

We need to understand the context of storytelling within a natural setting i.e., in an actual committee meeting and observe how storytelling is used, and how it is experienced by those involved. For example, I have planned to take note of the presentation, introduction of the research proposal, story plots used, and use of storytelling and emotional appeals. Interviewing participants who can provide insights about their feelings and experience during committee meetings was important to highlight their social behaviours. An inductive qualitative approach therefore allowed me to contextualise funding behaviour in terms of perception (Merriam, 2015), i.e., in what ways is storytelling considered a meaningful approach to seeking funding?

3.2 Research Design

A case study approach (Meredith, 1993; Langley, 1999; Robson, 2002; Stake, 2006; Yin, 2014) has been selected to ensure the context of funding decision-making, and the experiences of those involved in pitching for funding is captured as it is related to values, beliefs, and motivations. A case study allows for understanding the phenomenon of research funding in its natural setting (Meredith, 1993; Langley, 1999; Robson, 2002), which provides an interpretation of how scientists present their work, and how funding committees perceive such research proposals and how they make decisions. Essentially, the case study provides a holistic view and describes how a committee member is influenced to make a decision (Morris & Wood, 1991) and what exactly influences these decisions.

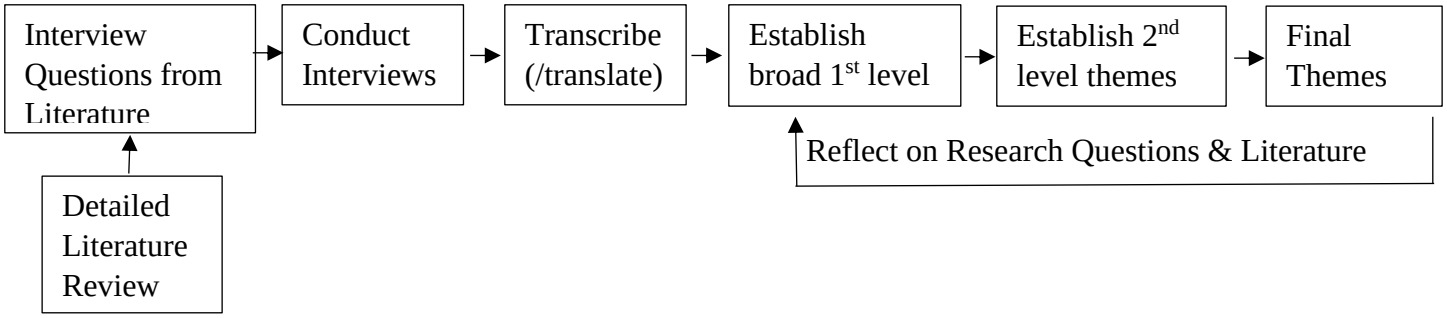
In order to explain how a funding decision is made in relation to how knowledge is presented, both funding committee members and applicant scientists were interviewed in-depth, individually. The purpose of these in-depth interviews is to help explain how applicant scientists pitch their proposals, in terms of communication. I explored what aspects of the proposal are interesting to committee members by documenting their response to these pitches, by identifying what sparks interest to different segments of committee members and tied these into storytelling terms while noting which of these terms are most relevant when making funding decisions.

Qualitative methods such as in-depth interviews allow for the expression of the experience directly from the participants (Strauss & Corbin, 1998), facilitating an inductive methodology (Merriam, 2015) to develop a grounded theory, where I developed themes that arose from participants' reporting of their experiences (Glaser & Strauss, 1967; Creswell & Poth, 2016). Themes help explain and contextualise (Stake, 1995) which aspects of storytelling have value in the process of making funding decisions, and potentially provide a solution in context to the real-life situation faced by scientists that they can benefit from. As I identified the challenges to science communication being trust in the information as well as trust in the science communicator (Lupia, 2013; Yuan et al., 2019; Battiston et al., 2021), I approached this study to address these two main concerns. The first through interviews and analysing proposal content to uncover how proposals are written/structured. And the second challenge through dramaturgical analysis from interviews to uncover issues pertaining to the science communicator, which shall be explained later within this section. I have used thematic analysis to identify the approaches presented by participants. Data generated from interviewing both the applicant scientists and the committee members were grouped based on themes that provide insights and inferences about how a written proposal or committee meeting is approached.

A multi-method qualitative approach was carried out in order to achieve data trustworthiness and authenticity of accounts (Lincoln & Guba, 1985). Qualitative data was collected via in-depth interviews with scientists *and* with funding committee members, and secondary data from submitted written concept notes/research proposals as well as review/feedback forms. Samples of submitted concept notes/proposals that have been approved or rejected were collected to conduct research on those samples in order to increase the amount of the secondary data collected. The Henley Business School (HBS) ethics committee approved this research design.

The qualitative approach provides grounded theory development, which can help explain what factors in a research proposal influence positive funding decisions (Glaser & Strauss, 1967; Merriam, 2015). The essence of this research is to describe and explain what it is about a scientist's pitch/proposal that leads to a funding decision to be made, in its natural setting (Glaser & Strauss, 1967; Glaser, 1978). Grounded Theory Methodical Approach is demonstrated in the figure below:

Figure 3.1: Grounded Theory Methodical Approach Process



As per the above explained grounded theory framework, upon completion of a thorough literature review, I developed the question themes based on theoretical implications identified in existing science communication literature. There are several angles to be considered in order for these interviews to provide most impactful insights, which are indicated in the table below:

3.2.1 Question Themes and Theoretical Implications (Table 3.1)

Question Themes	**Insight Sought**	**Implications for Theory Generation**
Who are the committee members? What is their scientific background or are they scientists?	Understanding audiences	Audience Diversity
Who are the scientists involved with the pitch? What is their background, what is their background in communication?	Understanding scientists' communication norms	Communication format (content)
What are the approaches to communication scientists take within a written proposal?	Understanding scientists' written communication norms	Written Communication format (content, storytelling vs not storytelling – methodical scientific format)
What information is a committee member expecting from communication?	Understanding committee members communication requirements	Communication format (content) + Audience information requirements
How do scientists communicate their research proposals?	Understanding scientists' communication norms	Communication format (content)
What are the committee members' communication preferences? What do they expect to see in a research proposal? What elements are more	Understanding committee members fundamental communication	Information requirements (content) for funding + Audience

Question Themes	**Insight Sought**	**Implications for Theory Generation**
interesting and intriguing or essential to make a funding decision?	requirements that trigger funding	
What is the scientist's approach to communicating a bid for funding during a committee meeting?	Understanding scientists' oral communication norms	Dramaturgy in science communication performance
What happens before, during and after the committee meeting?	Understanding scientists' communication interactions	Dramaturgy in science communication interactions

The above questions were answered when applicant scientists and committee members were interviewed in depth. The challenge to the success of these interviews was the willingness to reveal opinions and information. This challenge was overcome through the establishment of rapport. Applicant scientists and committee members need to feel that you are *'with them on the same boat'*. As researchers, we can relate to their situation. Researchers need to apply for research funds as well, so this mutual frustration was used as grounds for rapport building.

In order to fully explore the funding phenomenon, it is imperative to understand the perspective of committee members when making decisions. Committee members have an obligation to make good decisions about funding and therefore have a set of expectations of a research proposal, in which they use to make their decisions. Part of this research is to dig into a second data-set of funding committee members and find out what it is about a research proposal that eases a funding decision. The committee members were interviewed in order to generate data about their experiences of research proposals communication, i.e., understand what a committee member is looking for in a research proposal in order to proceed with a funding decision, with focusing on how they experience various parts of the communication and how those experiences are used in the evaluation process.

3.2.2 Participant Selection and Recruitment

The purpose of qualitative work is to recruit informative participants who would provide detailed accounts of the phenomenon being studied and hence provide the most insightful information (Buchanan, 2013). Purposive recruitment was devised for data generation as it allows for the identification of critical cases (Merriam, 2015) where storytelling could be of use when writing or pitching a research proposal. I will discuss below the dataset

that I have generated my research on, who the participants are and what are their roles. Participant recruitment was initially done through an announcement of the research that was circulated by email (email announcement is available in Appendix B). The announcement contained the project description, purpose, potential benefits and my contact details. Scientists who were interested in participating in the research had the free option of contacting me where they self-select to participate in the study at hand, which ensured fairness of opportunity by including all of KISR's scientists to participate. Since, each project level has a different panel of committee members, it was essential to devise a list of members for each committee and recruit participants from each group. Committee members ranking and speciality differ within each committee and interviewing these members answered the research question of how different audiences perceive storytelling in scientific proposals communication. From each project level a maximum of 3 committee members was optimal to explore this phenomenon (Creswell & Poth, 2016) totalling to a number of 9 members. This was done by utilising the idiographic approach, which demonstrates the requirement to work with a specific, low number of participants that are related to the phenomenon being studied (Buchanan, 2013). It was also important to select scientists applying for funds to interview from each project level in order to understand the extent of use of storytelling within the research proposal. Scientists from different backgrounds and different positions provided insights on their experiences with proposal application and committee presentations. Insights required from scientists are needed to provide a holistic overview of the proposal application and helped shape themes (Glaser & Strauss, 1967; Creswell & Poth, 2016) and inferences for the obstacles, hurdles and or success stories when applying for scientific funding.

A total of 5 scientists from each project level were selected for interviews (total scientists to be interviewed was targeted at 15). As an additional measure, snowball recruitment was used. Towards the end of each interview with the scientists, I asked if they know of a colleague who would be interested in sharing their similar experience. This allowed for increasing the number of participants and collecting more qualitative data. Obtaining at least one referral from the scientists would generate a list of an additional 15 scientists to interview. Interviewing as many scientists as possible would be very useful to explain the use of storytelling. Essentially there is a total of 14 committee members assigned for funding approval and scientists at the institute total to over 50. Initially,

interviewing 15 scientists would be helpful, and aiming for 30 scientists would be more optimal depending on the availability of scientists and their willingness to be interviewed. Due to the social nature of people in Kuwait, asking for referrals for participants was a feasible task. A snowball effect did occur when interviewing scientists, which I took to my advantage to obtain more participants for the study totalling to 37 participants. Therefore, in total, I interviewed 37 participants: twelve were committee members who had responsibility for evaluating and approving research proposals for funding, and 25 were scientists who were applying for research funding, which exceeded the intended targets.

3.2.3 Fieldwork

Data was generated from several sources such as in-depth interviews and analysing proposal documents, as well as evaluation forms to achieve trustworthiness **(**Lincoln & Guba, 1985). Data was collected over the course of 8 months. Interviews were conducted over a total period of 8 months from November 2020 – June 2021. Due to Kuwait being on the most extensive lockdown in the world, I was faced with the situation of not being able to conduct face-to-face, in-person interviews. I have conducted all of my interviews online via Zoom (approved by HBS ethics committee), which were recorded via video and audio and hence had the experience of remote meetings. With Zoom, I was able to video record (with the consent of participants) and that helped with the transcription phase as I was able to *'lip read'* if sound wasn't 100% clear and was able to see facial expressions while transcribing, which was very helpful to document emotional response. So, I was able to recall whether the interviewee was very excited or was being sarcastic. Also, organising Zoom meetings was convenient for myself as well as the participants who gladly gave me interviews from their office or from the comfort of their homes. It is important to note that interviews were conducted in English, while only 2 were conducted as in dual language of English and Arabic. The interviews with dual language were translated by myself into English to ensure context remains unchanged as I am a native Arabic speaker. Interviews ranged from 50 minutes to 2 hours, with a total of 40 hours in total. Some participants were difficult to talk to, while others were so intrigued by the topic that they spoke most of the time without me even having to ask questions.

Interviews were conducted with scientists and funding committee members. The purpose of choosing to do non-standardised interviews was to try to explore the funding phenomenon (Cooper & Schindler, 2008) as

much as possible from the point of view of the committee member to understand what influences their funding decision and how they act as an audience (Glaser & Strauss, 1967). Interviews were also used to understand how the scientists pitch their proposals in terms of science communication tools used. The purpose is to uncover how funding committee members come to approve or reject a research proposal as well as identify how scientists present their proposals to such an audience. An exemplar study that utilises in-depth interviews as a research method is Fournier (1998), who uses in-depth interviews to uncover how people create brand associations with different products. She achieved that by recording detailed accounts directly from the consumer in relation to their social behaviours towards the products such as emotions, values, beliefs, perceptions and preferences. I have chosen this method as one way to uncover insights about the use of storytelling in scientific research proposals to obtain funding. Interview objectives are described in further detail in the interview guides below.

Interviews allow the participant to describe in detail what they look for in a research proposal and what intrigues them as a reviewer. To do this, it was best to ask open-ended questions that allow the participant to provide accounts of their experiences in their own words where their own words can be quoted and themed for analysis (Strauss & Corbin, 1998; Langley, 1999).

The interview guide was structured into several sections. Firstly, committee members were asked about the proposals they received, how they engage and evaluate the proposal, what aspects of the proposal they are interested most in or drawn to and what happens during the committee meeting when the applicant presents the proposal to them in a live setting. Committee member questions included: tell me about the proposal, what was interesting to you about it, what makes a good proposal and what makes a bad proposal, what happens during the proposal review meeting. Secondly, scientists were asked about how they communicate within their research proposal, what they focus on communicating in particular and who they are communicating to. They were asked to describe who the committee members are and what their backgrounds are in and how they communicate with these specific audience members. Applicant scientists were also asked about the proposal review meeting experience to describe what happens before and during the meeting itself to draw insights on the communication that occurs live as opposed to the written proposal document alone.

Several interview themes were developed in order to obtain responses that will allow inferences to be derived that answer the research question. The approach is to understand what a funding committee member is looking for in a research proposal, which involved asking them about the research proposals they receive and understand what probes interest within the proposal. Furthermore, themes included whether a committee member engages with activity that may relate to aspects of storytelling and how this is experienced as part of the process (for example relative to the statistical and scientific data that may be included), but this was explored indirectly using probing questions about experiences including their emotional dimension for example, how did you feel about the proposal process, and what do you think was interesting about this proposal? Probing questions (Thornhill et al., 2009) about situations where the committee member remembers providing instant approval for a proposal were also used, i.e., what impressed them the most in a research proposal to understand why this particular element interested them. This helped explain what matters to a funding committee member when they approve a proposal, and what applicant scientists can do to improve their proposal for chances of obtaining approval for funding. I now explain the interview questions used in interviews with committee members and scientists.

3.2.4 Committee Members Interview Themes (Table 3.2)

Interview Sections and Questions Asked	Implication for Theory Generation
Interesting elements in a research proposal. What sparks interest in a research proposal? What makes an interesting proposal?	Storytelling (Content – information required)
Importance of research proposal format i.e., long/short, concise/elaborative, how is it read? What is the focus and what is ignored.? What puts a reader off? What do they like to see?	Storytelling (Content format) + Audience Preference
Importance of scientist's background i.e., degree, years of experience, number of projects completed or currently being managed	Dramaturgy – Trust in communicator & perceived roles
What happens when the committee member does not have the same scientific background of the proposal submitted?	Audience understanding + Dramaturgy – understanding roles

Interview Sections and Questions Asked	Implication for Theory Generation
Where does the committee member review a proposal?	Dramaturgy - backstage preparation

In order to develop a detailed understanding of funding decisions, applying scientists were interviewed as the second dataset to gain further insights from their perspectives (Glaser, 1978; Strauss & Corbin, 1998; Langley, 1999). The main idea is to explain the expectations of the scientist in terms of what needs to be done to receive funding and whether these expectations are in line with the funding committee members' perspective (Glaser, 1978; Strauss & Corbin, 1998; Langley, 1999). The purpose was to generate insight about scientists' experiences and together with data from committee members, try to establish an authentic inductive theory (Langley, 1999: p. 695; Merriam, 2015) grounded from the data (Glaser & Strauss, 1967) about what measures can be taken to achieve better chances of successful proposals that yield funding.

3.2.5 Scientists Interview Themes (Table 3.3)

Interview Sections and Questions Asked	Implication for Theory Generation
What they believe are the most important points to highlight in a research proposal and how they do it	Storytelling (Content – information required)
Their beliefs of how their proposals are evaluated	Audience influence
Explain committee meeting encounters positives/negatives	Dramaturgy – frontstage performance, impression management & interactions
What they do prior to a PRM	Dramaturgy – backstage preparation
What they do during a PRM	Dramaturgy – frontstage performance, impression management & interactions
How they receive feedback or what kind of feedback do they like/resent	Audience content preference and Dramaturgy – frontstage performance, impression management & interactions

I provided the scientists and the committee members with initial questions to be discussed prior to the actual interview in order to ensure credibility (Thornhill et al., 2009). I also asked the interviewees if they can supply me with approved/rejected concept notes/proposals in order to collect secondary data that can be analysed for content (Cope, 2014). This ensured data collected from interviews is trustworthy by establishing data source triangulation, where there are multiple sources of data that themes can be derived from (Lincoln & Guba, 1985; Begley, 1996). Scientists emailed me their proposals immediately after the interview was completed. Interviews were supposed to take place in participants' offices. This is where researchers spend most of their time in a comfortable setting. Also, most paperwork is kept in the office, which makes access to secondary data much easier and convenient (Anthony & Jack, 2009; Thornhill et al., 2009). However due to the pandemic, this was not possible as Kuwait was under lockdown, hence interviews were conducted online (in agreement with the participants) via Zoom (this has been concurred and approved by the HBS ethics committee). Interview questions can be found in Appendix C.

In order to protect participants identities, job titles were not reported on, nor exact years of experience. This information was coded as junior, middle or senior (Gilliam & Flaherty, 2015) in order to ensure anonymity if required by the participants due to the sensitive nature of the study. I have also concealed names by creating pseudonyms instead. Anonymity is crucial to this study as the work environment at KISR is sensitive and providing information that may not be desirable by higher management would be uncomfortable for employees. Therefore, anonymity created a more relaxed atmosphere for scientists to share information useful for this study. The following participant coding is used in the results section to conceal participant identities as well.

3.2.6 Participant Classification (Table 3.4)

Applicant Scientist	No. of Participants	Funding Committee Members/Reviewers	No. of Participants
Junior Scientist (up to 10 years' experience)	2	Initial Reviewer/Gatekeeper (Program Manager)	4 (are also funding committee members)
Mid-level scientist (11-24 years' experience)	12 (1 omitted)	Reviewer (Centre Reviewers)	4
Senior Scientist (25 + years' experience)	11	Funding Committee Members	4 (8 in total with program managers dual role)

3.2.7 Intended Observation and a Pragmatic Approach Due to Covid

Observation was intended to look at what actually happens during committee meetings. I wanted to assume the complete observer role (Merriam, 2015) where I would only take note of what is going on in the room (Gill & Johnson, 2002) and not participate in the committee presentation exercise at all. I intended to disclose the research intent to the participants, ensure their anonymity will be preserved, and have also obtained approval from KISR to attend the meetings according to HBS ethics committee regulations. No audio or video recording was intended to take place during observations, and I was only to take hand-written notes.

In order to avoid the observer effect, as indicated by Robson (2002), I intended to observe the committee meeting without interacting with participants. "Minimal interaction" helps create the sense of the researcher's non-existence, where participants may actually forget that I am there and proceed with their presentation and comments as they would normally do (Thornhill et al., 2009).

I intended to understand the unfolding *'drama'* of the committee meeting process. This would include how information is presented, noting interactions between committee members and the presenting scientist, problems, how they are overcome, what gets attention and what does not. I intended to be attentive to committee members' body language while the scientist is presenting and take note of agreement, frustration, interest or disagreement of committee members. I also wanted to observe presentation materials used, poise, confidence, tone of voice and gestures.

A reflexive exercise is important to take note of during or directly after the observation exercise is completed. I intended to note down my interpretations of the interactions between the participants and my feelings during the committee meeting experience. Therefore, generating three sets of observatory data (Thornhill et al., 2009), *primary*, what happened during the committee meeting, *secondary*, my interpretations and inferences of what happened, and *experiential*, my perceptions and feelings of what happened during the meeting. These sets of data help ensure data authenticity is captured and may provide more insights to the study. Optimally, KISR conducts committee meetings twice a year and getting access to 2-3 meetings would have been useful.

All notes taken from observations were intended to be transcribed on the same day to avoid forgetting valuable data. An exemplar study for the use of observation would be the paper by Gilliam & Flaherty (2015). The researchers observed storytelling within the sales pitch phenomenon by accompanying salesmen in the field when making direct sales pitches to potential prospects. This research through observation, uncovered how the use of storytelling creates a bond between the buyer and seller and can be used as a more appealing tool for convincing and persuading buyers to purchase a product. Therefore, using observation as a research method can be very insightful to understand how committee members react to scientists' proposal pitches.

Although observations were planned for and approved by the institute and the HBS ethics committee, unfortunately due to COVID-19, I was unable to conduct any observations as committee meetings were cancelled by the institute due to health restrictions. Being in an uncontrolled environment due to the pandemic, I decided not to give up but rather focus on probing questions during the interviews in order to cover the committee meeting experience as much as possible in detail. Therefore, when asking participants to describe what happens during a committee meeting, I also asked probing questions in order to understand dramaturgical inferences. For instance, if a participant told me that they would speed up the pace of their presentation because they could see that the committee members were bored, I would ask them to describe how they would know if a committee member was bored. These probing questions led to provision of visual accounts with a clear description of the use of body language, intonation and impression management, making the participants account what they observed and how they observed it rather than seeing it for myself. I tried as much as possible to improvise probing questions in order to gather as much accurate data as possible that would aid with dramaturgical analysis rather than not have any data at all. In this regard I was successfully able to understand what happens during a committee meeting where I have reported the findings in details under the results section.

3.2.8 Data from Documents

Secondary data collection was also essential to this study. Written documents allowed for data credibility and authenticity of interview accounts through establishing data source triangulation (Lincoln & Guba, 1985). I therefore examined data received and cross-checked data from in-depth interviews to see if they correspond with submitted written documents, recognising that they may differ from accounts of experience in ways that invite

new interpretations of interview data and written documents. Written documents were analysed to see how scientists communicate when writing proposals. Documents were analysed for the use of pure methodical scientific writing or whether there is significant use of storytelling. Such documents to analyse included concept notes, proposals, editing notes, and presentation materials. These documents were provided by the applicant scientists. The ability to analyse writing style is essential to the project in order to conceptualise whether the scientists follow a strict science communication regiment, use a narrative structure or use a combination of both. It was also important to understand the perspective (Glaser, 1978; Strauss & Corbin, 1998) of the committee members. Documents analysed included feedback notes or committee decision forms. These documents allowed for establishing more inferences of how the committee members observe the researchers and what kind of feedback they provide. The analysis included drawing inferences from the committee members feedback, whether focused on the science or whether they have commented on narrative.

3.2.9 Summary of Data Collected (Table 3.5)

Data Type	Method	Source	No. of Participants or Documents
Primary	In-Depth Interview	Applicant Scientists	25 (1 omitted)
Primary	In-Depth Interview	Committee Members/reviewers from 3 levels	12
Secondary	Secondary Data Collection & Interpretation	written concept notes/research proposals, committee members feedback forms	1 concept note 16 proposals 2 feedback forms

3.3 Data Analysis

Thematic analysis was be used to develop themes or constructs (Glaser & Strauss, 1967; Meredith, 1993; Homburg et al., 2000; Braun & Clarke, 2006; Creswell & Poth, 2016) that were derived from interviewing both scientists and funding committee members. Themes were categorised into sub-themes (Glaser & Staruss, 1967) until saturation from data was achieved using axial coding to develop a grounded theory that is derived from the data (Glaser & Staruss, 1967; Strauss & Corbin, 1998). I realised that I had approached data saturation when I

stopped hearing something new. Essentially, participants kept repeating the same information I had previously heard and that is when I decided that I had conducted enough interviews. For example, committee members had repeated that they wanted to hear a story because they wanted to read something interesting. Others kept mentioning that the objectives need to match the deliverables. It was also repeated that the proposal is a like a plan and all steps of the implementation approach should be well-written to follow a good plan. I will then narrate (Langley, 1999) the experience of the use of storytelling in the context of the participants to derive concepts from the real setting to allow for a detailed description of storytelling in proposal writing to obtain funding in the results section.

Thematic analysis was used to determine whether there are common themes/latent themes derived from the in-depth interviews (Glaser & Strauss, 1967; Braun & Clarke, 2006; Thornhill et al., 2009). This helped explain whether there are mutually agreed upon themes between both groups and identify where the differences are. These similarities and differences helped develop inferences as to why storytelling may or may not work in the context of scientific research proposals. Thematic analysis was used to analyse documents such as the written research proposals. These included both approved and rejected proposals in order to understand the structure of information presented in these documents (Herz et al., 2015) and have a look at the feedback received from committee members in writing, to uncover what encourages funding and what triggers rejection.

Given the complexity of the data, a total of 51 themes were identified in the 1st level. Initially, I developed a new theme every time I heard something new. However, with time and experience gained, I realised that participants were articulating the same idea, but in different words. For example, when scientists were saying that they needed to solve an existing problem I noted applied research as a theme and when a committee member told me the proposal needed to be beneficial, I noted benefits to society. This is when I understood that solving a problem and benefits to society were the same idea, which I labelled the societal story. Once I saw the overwhelming number of themes, I realised my second level of themes grouping, which were then narrowed down to the following 6 themes:

1- Audience

2- Societal Story

3- Scientific Story

4- Achievability Story

5- Preparation

6- Performance

However, while developing themes, I went back to the literature to understand how best to group these themes based on identified enabling theories (Glaser & Strauss, 1967). Going through science communication literature brought me to the realisation that there are three main concerns of science communication that also my participants were articulating, which are tailoring science communication to its intended audience, properly structuring written science communication to cater to audience needs, and finally the importance of the performance aspect of science communication, which is not heavily discussed in science communication literature. It is also important to note that an iterative process of referring back to my research questions was conducted to align the research questions, the literature review and final themes developed in this study to develop a grounded theory based on the data (Glaser & Strauss, 1967).

This process finally, enabled me to structure the findings according to the following themes:

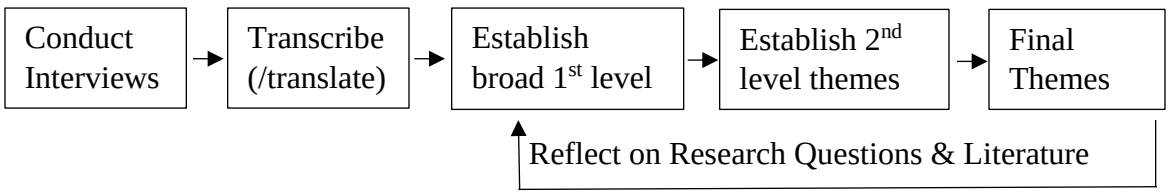
1- Audiences

2- Story Plots

3- Science Negotiation Performance

The following figure summarises the process of theme development and refining.

Figure 3.2: Theme Development and Refining Process



While analysing interview accounts, I have found that participants focus on telling a story that is catered to a specific audience. Literature in science communication focuses on developing stories that are relatable to an audience, which is why I focused on audience as the first theme. The second theme devised was story plots. Existing science communication literature focuses on communicating science via storytelling in a single plot, and I have noticed from participants that stories are indeed told, but are much more complex, which was evident in the emergent of multiple plots (I initially thought multiple stories) to be told within the research proposal. Finally, as applicant scientists at the institute perform their proposal pitches in front of an audience, and literature although does not thoroughly cover science communication from a performance perspective but rather discusses trust in the communicator, I devised the science negotiation (performance) theme, which takes participants accounts that explain how a proposal pitch is performed and how this performance influences funding decision making. This theme development phase is closely tied with the literature review phase. Developing themes requires a thorough understanding of the associated literature, which in my case became a reiterative process to construct a grounded theory (Glaser & Strauss, 1967). I went back to the literature to understand what theories talk about similar or related findings. And so, I was able to understand story development for specific audiences, story plots and their use in science communication, as well as identify dramaturgy theory which entails "impression management, front stage and backstage performance/preparation for performance interactions." My data essentially fed my literature search, which was how I was able to construct a grounded theory based on what I found in the literature after the themes were developed (Glaser & Strauss, 1967). Appendix D provides samples of how themes were developed using participant accounts.

3.4 Ethical Considerations

This project received ethical approval from the University of Reading. Each participant was informed about the purpose of the study and their rights at the beginning of the interview. They all signed a participant information sheet and consent form, which included information about the study, why they have been selected as participants and what their contribution to this study may potentially provide. I describe ethical considerations in terms of collected data, as well as bias and objectivity to ensure data protection as well as data authenticity and reliability.

3.4.1 Data Processing & Storage

Data was video recorded using Zoom. All video files were encrypted via assigned numbers for each interviewee. A separate encrypted file contains the actual names of the participants in correspondence to their assigned numbers. I have also concealed the names of participants by giving them pseudonyms, which were used in the results sections to ensure participant confidentiality. Video files were uploaded onto my laptop and instantly saved on the University of Reading cloud. Once video files were successfully saved on the cloud, I ensured to delete video files recorded on the laptop. Transcribed interview documents were treated the same. All documents were uploaded on the University cloud, are password protected and deleted from my laptop. All documents provided by KISR were uploaded on the University cloud and are deleted from emails, and the like.

3.4.2 Bias and Objectivity

There are several issues that may arise when collecting data from interviews. These include interviewee bias, which can be avoided by careful participant recruitment (Thornhill et al., 2009), i.e., I chose individuals that are willing to participate and share information or people who I have established rapport and trust with who will share information with me. Being a prior employee at KISR, getting access to data and gaining approvals for the study were relatively easier. Although I have established rapport with several researchers, I have left the institute for over 8 years to date and I was therefore able to distance myself (Thornhill et al., 2009) while conducting the interviews as all the topics talked about did not impact me in any way. Also, while working at KISR I was in a managerial post and wasn't a researcher, therefore I have not experienced the frustrations of applying for research funding there as I was not involved at all in this process and have no emotional connections to the phenomenon experienced by the interviewees.

I engaged with reflexivity upon completion of each interview in order to document any feelings that may arise from the interviews related to my objectivity. Reflexivity helps maintain data confirmability, therefore capturing thoughts and emotions from the researcher as well as the participant (Braun & Clarke, 2006; Cope, 2014).

Ensuring authenticity and trustworthiness of data is an issue often discussed in qualitative work. As identified above, I conducted interviews as well as secondary data analysis, i.e., analysis of written proposals and

feedback forms to authenticate interview accounts by corroborating what participants told me with what is actually written on paper. This analysis is also available in Appendix E to show excerpts from submitted documents that corroborate what was said during the interviews.

In summary, the aim of this study is to uncover whether the use of storytelling in pitching proposals for scientific research funding can have an influence on funding committees. Uncovering this phenomenon was examined using a case study approach to explore whether committee members are indeed intrigued by stories or whether they are only concerned with scientific facts and figures. The purpose of this study is to generate theory that would provide scientists applying for research funds with insights on how to improve their communication of proposals to secure funding. Findings from the research can be transferred for exploration in different contexts such as international funding bodies as briefly presented above who have similar funding allocation processes, thus initiating a more thorough discussion of the utilisation of storytelling that was not discussed prior to this research. In the following section, I describe the results obtained from this study.

CHAPTER 4: RESULTS

4.1 Fieldwork Introduction

Storytelling in a research funding setting is different from stories used in regular sales of goods or services (Gilliam & Flaherty, 2015), or even other forms of organisational storytelling (Boje, 1991). Participants draw attention to the complexity of the audience, where taking consideration of the backgrounds of different committee members, as well as the agenda of the funding body being applied to, are essential in the development of a successful research proposal. In terms of a research proposal, the narrative within the proposal itself is also considered especially complex by the participants in this study, in particular the need to include emotional elements in addition to technical detail. Finally, due to the need to present the proposal at a review meeting, the participants also shed light on the preparation and performance component of the proposal narrative in order to further explain what is required to secure funding through a process of negotiation. I therefore organise the results chapter in three main sections:

Audience Complexity: where I theorise audience roles that are considered in the construction of research proposals, noting there often complex and contradictory expectations and focus. Specifically, I note roles that deal with the science of the grant, the fit with funding agendas, and the broader goals of progress through scientific research. This section answers the questions who are the audiences of research proposals and what are the characteristics of audience roles that are involved in review of research proposals?

Complex Storytelling (Emotional Stimulation vs Methodical Writing): where I unpack the resulting implications for how stories are constructed, emphasising the tensions between engaging audiences on an emotional level, and satisfying demands for scientific detail and rigor. In addition, here issues of temporality emerge as significant, especially the complexity of telling stories about the future (what should and might happen as a result of the work undertaken within a grant). This section answers the question of how storytelling is used in research proposals by scientists, and how do committee members regard storytelling in their evaluations?

Science Negotiation Performance): where I consider the formal nature of funding storytelling, but also the backstage preparation, and subsequent negotiation of the story. This negotiation, I argue results from both the competing demands of audience positions, and from the necessarily speculative, future orientated nature of proposal stories. This section answers the questions what happens before the proposal is negotiated in the live meeting with committee members and how are stories presented during the committee meeting to multiple audiences? What happens during the proposal review meeting interaction when negotiating the proposal?

I now report on the first section of the findings, which identifies the different audience types in the study and the roles they pertain when making a funding decision.

4.2 Audience Complexity

Participants explained that there are different types of audiences that need to be taken into consideration when drafting a research proposal for funding. The first one consists of the committee members themselves, i.e., the committee members as individuals. Committee members revealed that they need different pieces of information based on their background and their capability to review. This means that different individuals possess different types and levels of knowledge in which they relate to in order to make a funding decision. As will be illustrated below, I reveal several types of audiences that are important in research proposals (1) *the Expert Scientist*, who is first drawn to the scientific section of the proposal and gives it major significance due to their possessed knowledge and related expertise, (2) *the Scientific Layman (Shifter)* who is a senior scientist but is not an expert in the proposed field and finally (3) *the Universal Audience* who is a non-scientist senior executive who is an expert in a management discipline such as economics who pays attention to logical execution and projected benefits. These audience members, in addition to their individual roles that are based on their background knowledge, also act as corporate custodians, where they seek the interest of their institute, the funder (if there is an external source for funding) and finally the interest of the country—the State of Kuwait. Therefore, the main role of the committee member is to ensure that the proposal is: (1) scientifically sound, (2) is valid in terms of corporate needs, funder needs and the country's needs, and finally, (3) is logically outlined in terms of execution

to ensure project success. In the sections below, I explain the diverse audience members, what each audience type looks for in terms of information and then how this information influences their funding decision.

Securing research funding requires an understanding of complex audiences that are diverse in terms of backgrounds and roles: (1) the applying scientists, are concerned with their own scientific discipline and area of expertise; (2) committee members who are senior scientists, and; (3) senior executives. The senior scientists can either be of the same scientific discipline as the applying scientist or be of a different discipline. For example, an applicant's proposal is about oceanography, but the committee member is an expert in petroleum studies. The senior executives may not have scientific expertise but may be experts in other disciplines such as economics.

Dr. Linda is a senior level scientist at the institute. She is also a mid-level manager of a research program and is the 'gatekeeper' for proposal approval, as she acts as the initial filter of proposals. Her department's proposals go through her for initial approval before being released into the institute's proposal cycle process. Dr. Linda depicts the need to acknowledge the differences in audiences when preparing a proposal:

> *You have to assure that the proposal is written in really scientific words and procedure that everyone can understand. If I bring only from my area, then whatever I write they will understand. It will not be difficult because they are from the same area I am talking about. But it is good to have people from other areas so that I know that my story is well written, they can read it and they can understand it, so they can have interest in it or are enjoying it you know, because we have people from economics, they are also reviewing our proposals and I am glad to see this… I have to cover all the things— everything. Sometimes at some points I have to go too deep in science and sometimes no, I have to keep it simple, so that they know. That's when I told you about the flow of the proposal the flow of writing the literature review, the flow of writing the background. First, I have to make it general then narrow, narrow, narrow until it is very specific for those specific people.*

She explains that the complexity of science will be understood by scientists and vice versa, non-scientific audiences will not be able to comprehend scientific details. This entails that the proposal contains parallel narratives. One that is purely scientific and detailed in science, and one that is less scientific that would be understood by all members of the audience. This makes the task of proposal writing very difficult on the applicant as there is a clear contradiction for the narrative to be *'scientific enough'* as well as *'palatable'* for everyone to

understand. She highlights that the presence of non-scientific experts allows for the proposal narrative to flow in a sense-making manner that allows for the audience to understand the proposal in a way that becomes enjoyable rather than completely full of scientific jargon. Dr. Linda describes the writing process as intuitive. Intuitively she knows when to write for broader or narrow audiences, how to zoom in and out of the research problem. The word "flow" also means that such process is not 'conscious', someone uses their gut feeling and experience when writing a proposal. There is no magic 'spaghetti recipe', which makes the process of proposal writing an acquired skill that is generated through experience.

Dr. Kevin is a senior scientist who does not have a managerial role. Dr. Kevin describes how he would explain a scientific element in his research proposal to a diverse audience:

> *Let's say it is like a table that has numbers, such as the pH of the desert oil is Alkaline. The pH of the desert oil in Australia is another thing, if I write it like that it will not be clear. But what I say is that the pH is different as per the country and also, I explain what is pH. The same regarding the figures, where I put items to explain them. If it is text, I would ensure to have a full paragraph, it would be in sequence in order for people to understand what I mean…We have a problem that we in a committee we bring one member from each centre, while we should not do that, we should see what is the topic and bring people who are specialised in it, regardless if they all come from one centre or a few centres, because those who are far from this topic they won't read and they will not be interested, and eventually they will fail to give the approval.*

He elaborates that in order to talk about a certain scientific element such as pH, it needs to be explained and simplified for audience members who are non-scientists. He also projects the concern of having such a diverse range of people within the funding committee, where members who are not within the same scientific discipline might not be interested in the research, because they do not fully understand it, and in consequence, will not approve funding easily. The notions of having two parallel narratives then becomes apparent as complexity is diffused through the use of a simpler narrative that can be more engaging as it is better understood by audiences with multiple levels of backgrounds. Dr. Kevin implies that communication within a research proposal is very intricate as it needs to address different individuals, hence the sequence of information presented as well as the complexity of information needs to take into consideration all audience types otherwise interest would be lost.

Dr. Jane is a mid-level scientist who is a proposal reviewer. Dr. Jane also pays attention towards the need to address all levels of committee members:

> *If we write any project, a person who is not from that area also should understand what we are writing. That's why I write all about the micro algae the shrimp and larvae, fish everything. So, even if there may be a person who is not from that area, even he should understand by looking into that. Even the common man, that is the mainly the entirety of the project.*

Dr. Jane acknowledges that putting the proposal into context for a diverse audience is a necessity to ensure they all understand her proposal. She acknowledges the segregation of audience members into scientists who are not within the same discipline (a person who is not from that area), as well as audience members who do not have scientific background (common man). It is important to distinguish that different audiences should be communicated to on different levels in terms of complexity and simplicity of information, and on the other hand, type of information each audience is looking for in order to approve a proposal for funding. Therefore, there are two parameters to audience communication when it comes to proposing a scientific research project that the communicator needs to pay close attention to: scientific relevance and simplicity of information.

As demonstrated in the quotes above, communication within a research proposal is viewed as complex, containing multiple narratives as well as acknowledging that there are different levels of audiences that need to be considered. Being faced with a unique context of diverse audiences, the funding committee members become a new subject of study in science communication. This uniqueness lies in not only the diversity of the audience being scientist and non-scientist members, but also consisting of scientists who are world-renowned experts in their scientific fields of either the same as the applicant scientist or from different fields than the applicant scientist. This in itself presents a communication challenge to the applicant as they need to become fully aware of the level of communication required when writing the proposal and when presenting during the committee meeting. The challenge presents itself as how a scientist should present to: (1) a committee member who is an expert in his field, (2) a committee member who is a senior scientist but is not an expert in his field, and finally, (3) a senior non-scientist executive who is an expert in an aspect of management. At the same time, the applicant

needs to ensure that those three different levels of audience are 'on the same page' and understand the research project being proposed. As mentioned by several committee members and reviewers, the task is indeed challenging and there are several expectations and approaches to consider when communicating to these different audiences. One of the main concerns that appears from the data is determining the level of complexity of information presented. Such information lies in the amount of scientific details given, how scientific experiments are presented and finally the level of details in tasks that needs to be shared with committee members, (see section 4.3 of the findings). In the section below, I identify different audience classifications from participant stories in order to shed light on the different audience segments that appear within the dataset.

4.2.1 The Expert Scientist Audience

The actors receiving the *'story'* of the research proposal are much more complex as they are specialised individuals, all in their areas of expertise. The first audience member genre discussed is the expert scientist. An expert scientist requires more detailed information to make an informed decision as will be illustrated below.

Dr. Michael is a funding committee member. Dr. Michael describes his natural tendencies of focus when reviewing a research proposal:

> *I tend to not focus initially on let's say the introduction or things like related to, like finance, etc. I tend to go quickly to the methodology, the scope, the objectives, the outcome. I think these are the most important elements of any proposal, then the others are just secondary.*

Dr. Michael emphasises the scientific elements of the proposal as the drivers of initial review, where he pays attention to scientific content. Therefore, making scientific content to a highly specialised audience, the most important section for consideration of funding. Dr. Michael confirms the view of two parallel narratives where the one he is initially drawn to is the detailed scientific narrative and the secondary narrative includes all other parts of the proposal.

Dr. Vincent is a mid-level scientist who reviews proposals and is also an applicant for proposal funding, which provided an interesting dual angle of perspective as he assumes both roles in the study's dataset. Dr. Vincent on the other hand describes the scientific objectives as the "heart" of the research proposal.

Yeah, the most important thing—it's like the heart of the proposal—is objectives. The objective should be like within two three lines or a small paragraph which completely summarises what you intend to do, what are the goals?

During our conversation he elaborates that more targeted and specific objectives cover the entire proposal and make it more understandable to a scientific reviewer as they answer a lot of questions. His emphasis is on providing more specific scientific details when writing objectives, which reduces risk due to highlighting in specific terms exactly what is going to be done in the proposed project, leaving no room for unanswered questions. Dr. Vincent as an expert scientist expects more scientifically targeted objectives to be written, which projects clear understanding of what the intended objectives are. So, if a scientist's objectives are clear and specific, there are no doubts that the scientist himself really knows what they are doing—i.e., perceived expertise. This also shows that an expert scientist is being cognitively stimulated by scientific content, which makes scientific methodical writing significant to an expert scientist audience member. However, this notion will be further explored in section 4.3 (complex storytelling) of the findings of the findings where I explain the different elements of the proposal's content, and how these elements stimulate funding decision making.

As will be described in detail below, I have found that an applying scientist needs to understand the dynamics of the audience member in relevance to their research topic prior to deciding on what type of information is required for each audience member. I have found committee members who are scientists can be viewed as a *'shifter'*. The *'shifter'* can be described in a situation where this member himself is as an expert in the same field as the proposed research and is therefore capable of understanding every scientific detail presented as they are an expert in the same field, or the exact same member can be viewed as a *'scientific layman'* who is a non-expert in the same filed and therefore needs to be communicated to in a simpler manner in order to carefully assess the proposed research and be able to make a sound judgement for funding.

4.2.2 The Scientific Layman (Shifter) Audience

As described above, the scientific audience looks for more complex information than the general public in order to approve funds for research, a unique perspective of the scientific audience emerged from the data in this study.

Dr. Sandra is a senior scientist at KISR. She emphasises the fact that even though she is a senior scientist and is highly regarded in her field on an international level, she admits that when approached by an individual who is not within her field, terminology becomes an issue as she in unfamiliar with terms that may be far away from her line of work:

> *Our language is very specialised in the fields. Even myself when an economist comes, I become illiterate to it as a scientist, I don't understand what they tell me because I didn't study the terminology they study. So, I become like a layman to a specialised person.*

Given that a research proposal is communicated to a diverse audience who are all experts, the area of expertise creates a communication challenge. As described by Dr. Sandra, each committee member is specialised in a specific area, such as oceanography studies, wastewater management, Sulphur reduction in oil production, economics, and even quality assurance. Being an expert in a specific area creates a challenge to comprehend research or scientific projects that the audience member is not an expert in. For example, Dr. Sandra is an expert in her own field, but she is not an expert in economics. As she clearly describes and states, a scientific expert who is not from the same discipline as the one being proposed becomes lost in the specialised jargon as they are unfamiliar with the terms used. She describes the experience of listening to an economist's terminology as being quite confusing because it is not within her field of study. And these terms make her *'shift'* from being an expert to a *'scientific layman'*, meaning an unspecialised person, while being a world-renowned expert. We can therefore conclude from this study that experts or senior scientists who are presented with a research proposal that is far from their field of study, should be addressed temporarily as a layman in order to ensure their comprehensive understanding of the project, despite the fact of them being experts. Proposal applicants need to be very careful with the *'layman'* term. When writing proposals aimed at scientists who could be from different disciplines, it is imperative for the applicant to realise that the intended audience (although is not from the same discipline) remains a senior scientist. This means that the applicant needs to be very careful in terms of the complexity of

information presented. What is actually required is to address the committee's major concerns such as the importance of the project, its relevance and benefits as well as how the scientist will manage the project in a professional manner. For example, Dr. Michael explains:

> *I think it was just a genuine mistake, because one of them, the idea was good, but the researcher started writing about basic scientific information, which one side ended up like reading a lecture from first year engineering school or first year science school. A research proposal should not cover fundamental theoretical stuff in details. Talk about the problem, talk about what people have done regarding this problem, highlight the importance of your research project, the methodology. But when you write a lot of pages covering, let's say, fundamental theoretical stuff, you will end up like going back to first year college. Just reading about all these lectures, you end up losing interest to be honest.*

Dr. Michael describes a poor proposal submitted that was too scientifically simple that it reminded him of a lecture he attended during his first year of college. He explains that an applying scientist needs to focus on the context of the problem, the importance of the project and the proposed methodology, which is a more relevant and engaging narrative. Being too scientifically basic is boring and leads the funding committee member to lose interest in the proposal. Therefore, putting the proposal into context should be taken into consideration with a *'scientific layman'* audience member rather than presenting a proposal that is too scientifically simple. He implies that some scientists genuinely do not know how to write a research proposal and think of it as a lecture, where they believe there is a need to teach about the topic at hand, while forgetting that the intended audience of a proposal are senior scientists. This lack of audience awareness leads to the development of a basic narrative that is frowned upon by funding committee members as it bores them and wastes their time.

4.2.3 The Universal Audience

Senior scientists or senior executives who are not within the scientific background as the proposal should not be mistaken for a general 'layman'. As described by participants, this type of audience although are non-experts in the scientific field, are all interested in several unified pieces of information. A proposing scientist needs to remember that this type of audience is there for a specific job—which is to determine whether the proposal is fit for funding by being highly critical of the information being presented.

As funding committee members are diverse audience members, it is imperative to think of these members as actors receiving a story. Each person's interpretation of the story however differs according to their background, which will be explained later in further details. Moreover, although these diverse actors interpret the proposal in accordance with their individual experience and interests, there is common ground that all committee members meet at. This common ground is essentially how the members view the proposal through a holistic lens that is part of a larger narrative that focuses on the development of the country, i.e., the proposed benefits of the project within the grander scheme of serving the national development goals, hence becoming an actor who is the custodian of funds that should be used to promote the country's growth, while safekeeping its best interests. The second area of commonality is that committee members focus on is the management aspect of the proposal, i.e., whether the researcher has optimised the budget, has identified the correct resources to be utilised, selected a competent research team, has a future research plan and shows further development of staff that would ensure continuity of the institute's business in the future. This leads us to the term of a *'universal audience'*, meaning what a diverse audience unanimously looks for in order to be able to make a funding decision regardless of their scientific background and experience. Therefore, an applying scientist needs to take into consideration, not only the specialised background of the funding committee members themselves, but also look at the grander general picture in which the committee members unanimously focus on, which is the real benefit of the proposal (which will be detailed later in this chapter) and the ability to well-manage a project, hence achieve the project as proposed.

As Dr. Sandra explains, a proposal is also reviewed in general where the funding committee does not only focus on scientific content.

> *As reviewers, we too will review in general and in specific. In general, we look at the project, is it worth doing? And does it really benefit Kuwait? Is it according to the strategic plan? (We have a five-year strategic plan). Is it in line with the work they do in terms of the objectives of the program? Or does it fall under another program? And we look up the national development plan of the country, if it provides support, these are your development goals as well. So, we look at it.*

Committee members focus on the grander picture of how the proposal is aligned with the institute's strategic plan, as well as how it fits within the objectives of its identified research programs and whether the proposed research support's the country's development plans. There is a much larger plot that the scientific research proposal fits into, which needs to be addressed by applying scientists. Dr. Sandra specifically mentioned that committee members do not only look at the proposal from the scientific point of view, but rather take a holistic approach and look at the proposal from several angles in order to make a decision. Therefore, implying that there are multiple narratives that committee members focus on, which I identify later as plots in section 4.3 of the findings. These angles include the relevance of the selected problem, importance or impact of the research on society, the scientific merit as well as the management aspect of the proposal. She therefore confirms the notion of multiple narratives that are being considered when making the decision to fund research that must be aligned with existing narratives i.e., of the institute, funding agency as well as the country's. These parameters are looked at holistically where emphasis on the sections is dependent on the audience member's background.

Dr. Adam is a mid-level scientist who has been appointed as an internal reviewer of proposals and has the authority to assess and provide feedback that would influence the approval or rejection of the proposal prior to entering the funding committee. He stresses that the proposed research projects should be relevant to the institute's strategic plan. He elaborates that due to limited resources and expertise, the institute is keen on utilising resources in the best ways possible, which is to ensure that research projects fit, or are in line with the institute's research agenda and available resources.

> *We'll see the significance of the work first, further relevance of the work is our strategy or the country's need, that is the most important thing. Because here, always, there is bindings that your proposal should be in line with the strategic plan of the Institute. So, the Institute mentions in these next years, we are going to do this thing. So, we are going to develop a feed or we are going to develop, or mass produce this fry of this species or we will develop the technology for culture of this way. So why not this proposal is related to this or fall under this point, then we go for this if it is outside this strategic program, then we directly say no this is not in line with the strategic program of the Institute or a program like this. If it doesn't fit within the studies, it is mentioned that if it is not within the case or strategic program, then we will not accept this. The scope is limited, the facility is limited, manpower is*

also limited. We cannot go for these other studies that are a wide field for doing fisheries or a couple of services, but it should be in line with the Institute or strategic plan so that this outcome will be of benefit to the Institute.

Dr. Adam also indicates that if the research is not aligned with the strategic plan, then the proposal will be rejected. What Dr. Adam actually means is that the proposal narrative is part of a grander narrative—the institute's existing story. The proposal therefore is regarded as an instrumental move for the institute to reach its set goals. In the illustration above, being a scientific expert, Dr. Adam indicates that one of the scientific expert committee member's roles is to act as a custodian of funds on behalf of the institute. The custodian's job is to ensure that the institute's best interests are covered as it invests in resources that are very expensive. Therefore, a proposal narrative must also focus on the institute itself, where the proposal narrative must fit within the institute's story in order to be approved for funding.

In order to establish data corroboration, I illustrate with an excerpt from an approved proposal submitted by one of the participants, which shows how alignment with the institute's narrative is written within the proposals:

The proposed project fits in the 8th strategic plan of KISR's Water Research Center (WRC); Energy and Building Research Center (EBRC) and Wastewater Treatment and Reclamation Technologies (WRC-WTRT) Program, under the solution area "Municipal Wastewater". The main challenge is to utilise XXX for energy generation using XXX. WRC and EBRC will conduct this research as a matrix project.

The scientist draws attention to the institute's narrative, which is the strategic plan, and how this proposal fits within the institute's story. He mentions the contribution to the identified solution area within the strategic plan where this project is intended to be used as a tool to fulfil the institute's promise of finding solutions for wastewater management. Therefore, a scientist must pay attention to existing stories and embed these stories within the proposal narrative to appeal to their audience's custodian role.

Funding Committee members who are not within the same scientific discipline (the scientific layman) are also concerned with other areas in which they are familiar with or areas that are general. These areas include proper utilisation of manpower and whether the suggested manpower is carefully selected. Dr. Adrian is a senior

scientist at the institute. He describes the management aspects of the proposal as being of importance to committee members whose expertise does not match the proposal:

> *Manpower utilisation, the structure of the manpower, who is taking care of the project and, who are the members of the project. We have the budget sheet, and we have future work related to this, maybe you end up with some of the recommendations is you have to do phase two of the project, so, this is the most important thing. And I have to mention here that normally, as I said, people from outside, if they are not within the subject, they are more concentrated in the manpower utilisation and the duration.*

Dr. Adrian emphasises that this type of audience is also concerned with the budget, time management and whether this project would yield future work, therefore highlighting the notion for the need of parallel narratives that address multiple audiences to receive funding. Being unaware of the science and being unable to judge the scientific narrative, committee members therefore judge what they are familiar with and what is deemed as *'logical narrative'*. Budget and manpower utilisation are relatively more logical and hence easier to judge given that the proper justification is provided, while scientific content requires scientific knowledge in order to be properly judged, which non-experts (scientific laymen) can't do.

Dr. Tina is a senior scientist and an applicant for funding. Dr. Tina expresses her point of view on how to address different committee member concerns within the proposal by using each section to highlight the problem, putting the problem into context of the world, then narrowing it down to Kuwait.

> *Introduction usually, I have to talk about the main problem that I saw, then I have to find out the solution that I think might help in the world, then I will go or directly talk about Kuwait or the Arabian Gulf, if it is studied before, or if it's going to be good for our environment or not. So first, I will give an idea about what I want to do, what is the problem? What for example, if I want to talk about the sulfur amendment? What is the sulfur amendment? What is the problem? Why I have to do this sulfur amendment? What is the use of this sulfur amendment? Why we need it in Kuwait, is it good, or it is just to waste our money in making this sulfur amendment? And is it easy to be done here, or is going to be costly than when we buy from outside? So, I have to describe the problem and give them the solution briefly—we'll talk about the world itself and the region here. That's my thinking, and sometimes we have to go for some literature review and some papers that makes my work more strong like majority opinion, opposite*

view. It's focused regarding this problem and we can develop this technique or we can develop the production of animals, for example, or … It depends on which project I will write, and what we expect to do, the forecasts are developed for the Institute for example, is it going to improve the poultry for example, if it's related to the animal or farm animal, is it going to develop commercialization of production for certain use, like amendment of certain products for providing a product like that. It depends on what's the aim of the project. Some people focus on how you have divided your tasks, whether the tasks are condensed or overlapping. Some people focus not only on the duration or the budget, but on the literature review. If you have done your literature review properly, you do not need to have task 3 or task 4 for example. All the parts complement each other.

Dr. Tina's main point is that all parts of the proposal are linked together and are highly dependent on what she believes committee members' interests are, therefore suggesting that different audience members have different information needs in order to make a funding decision. She also draws attention to using a grander narrative then focusing it down to be more specific to Kuwait, where being of a larger narrative puts her proposed project into context. She also indicates that she uses literature review as support for her project, where introducing previous narratives that are linked to her proposal helps justify the selected problem, that is her *"way of thinking"*. This means that Dr. Tina was not taught to include all of this information in the proposal, but is rather intuitively including information she believes would be important to her audience. When she says that some people focus on certain sections of the proposal and how that impacts her writing, she is referring to her own experience, from conducting committee review presentations, where she has realised from experience how certain committee members think and what they focus on. From her own experience, she amends her proposal writing by imagining what committee members' preferences are and tailors her proposal to meet these information preferences. This means that proposal writing is not taught but is rather guided by intuition and experience, which presents a communication issue where scientists do not have a clear guide on how to properly write proposals.

Dr. Robert is a mid-level scientist. As a proposal applicant, Dr. Robert emphasises on the need to understand client needs.

Yeah, the thing is, as I indicated earlier, we have been working with the oil sector clients in Kuwait, actually, and then we have been working closely with them, so we know their problems and what are the issues they are having

in the field actually, in their plants. So, we make a proposal suiting to the requirement, that is how we arrive at the proposal.

He mentions that proposals need to target problems or issues that are being faced by the client and that are of interest to the client in order to obtain approval. Meaning that as an expert scientist, his role is to also take the best interests of the client into consideration i.e., he acts as the custodian of the client's funds by making sure that the client will obtain most benefits out of their investment in the proposed research.

In order to illustrate alignment with the funder, I present an excerpt from an evaluation form of a funding agency in Kuwait that the scientists apply for. This form in particular provides insight on what a funding agency in Kuwait is looking for in terms of narrative alignment (KFAS, 2022), which corroborates with the interview accounts given by participants.

KFAS FORM:

Significance and Relevance to Kuwait and the KFAS Mission

- *If the aims of the project are achieved, how will scientific knowledge, technical capability, clinical practice and society be improved both in Kuwait and internationally?*
- *Does the proposed project include relevant plans for training young Kuwaiti researchers and end-users of the research results? How will the proposed study contribute to Kuwait's scientific community?*

The main concerns of this funding agency are for the proposal to demonstrate how it will benefit the generation of scientific knowledge and society locally and internationally. The funding agency is also interested in the development of skills for Kuwait's youth, hence contributing to Kuwait's scientific community. This form supports the notion explained above, where there is a need for a grander narrative in which the research proposal *'fits.'* Whether the narrative is concerned with societal benefits or training Kuwait's future generation of scientists, each funding agency has its own set of goals and objectives that a scientist must pay attention to and include in the proposal's narrative in order to appeal to their specific target audience/funder.

Dr. Maxwell is a senior scientist. Being a non-scientist committee member, Dr. Maxwell elaborates that he pays more attention to the relevance of the problem statement and how this problem benefits the Kuwaiti

industries in order to make a positive decision for funding. He explains that this is the focus of the funding committee in general.

> *In order to pass it, for me, first of all, the idea has to have the importance, the scientific idea. In Kuwait we mainly deal with the applied research, so I don't think anyone in Kuwait is prepared to do really basic research, meaning we cannot really go into the theory of things and advancing the invention part of things, no, mainly we deal with applied. So, we see what other people around the world are doing, and we try to apply it to the case in Kuwait. And it is similar with economics, so we study economics now, we know the tools such as economic tricks, the statistical tools and how they can be used, so we go to the case of Kuwait and we apply it, and this is basically applied research. So, I tried to see how he is using methods to raise the productivity of the crop in agriculture, and how valid is this idea around the world, so he has to prove it to me in the review of literature and say it has been used here, it has been used there and the results, how he matches it to the environment of Kuwait, in this harsh environment, with the lack of water and so on. If he proceeds with that, I think that's a valid idea, and it's a basic applied research, and it has a benefit for the agricultural sector and Kuwait, the farmers some way somehow should and can benefit from it. The view is that this project should have benefit to the country, to the sector, if it has to do with agriculture, what will they benefit from it, if it has to do with the fisheries, what authority has to benefit from it, or the environment has to benefit from it. The problem has to be stated in the introduction and clearly, quickly you should go to it, why did you do this research anyway, you have to identify a problem or an interest that might not be a problem, it might be any query or interest in scientific interest, and this is in general what we do in the committee.*

Dr. Maxwell is focusing on the parallel narratives of having a project that serves a purpose of solving an existing problem. He focuses on the socio-economic narrative as opposed to the scientific narrative, which is more engaging to him as he is a non-scientific expert. Dr. Maxwell indicates that if a proposal is not applied and is not beneficial to the country, then it would be highly subject to rejection, as applied research that benefits the country is seen as a good investment of funds as it guarantees benefits; hence emphasising the importance of the non-scientific narrative determining whether the proposed project would lead to approval or rejection, prior to looking at the scientific narrative. He refers to applied research as already proven to work elsewhere and so applying such science in Kuwait is a guarantee that the project will yield benefits as it has been proven to work elsewhere

therefore reducing the risk of investing. He also mentions that the problem must be mentioned clearly and quickly in the introduction, making it clear that reviewers don't have time and hence want to receive the most important information they are looking for quickly. This supports the notion above that a funding committee rather acts as the custodian of funds that should be potentially used to progress the country's development, giving committee members the overarching role of safeguarding Kuwait's funds to benefit its people, which is a huge responsibility. Committee members therefore act on behalf of the people of Kuwait, by maintaining the country's best interests—making them the custodians of research funding on behalf of the people of Kuwait.

To summarise this section, I have derived that a funding committee constitutes a complex audience due to the diversity of members' backgrounds as individuals. This finding adds to existing literature that mainly focuses on generic audience for science communication i.e., the general public or policy makers (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). Therefore, different audiences require different pieces of information in order to make a funding decision. Funding audiences as individuals in this study are classified as (1) the expert scientist audience, (2) the scientific layman audience and (3) the universal audience. An expert focuses on scientific aspects of the proposal as their expertise is the same as that of the proposed research, hence are capable of easily making scientific judgement without the need for elaborative background information. On the other hand, a scientific layman is not an expert in the field of the proposed research and hence elaborative background becomes a necessity to be able to make a comprehensive funding decision. This presents the argument that existing literature assumes that scientists are capable of communicating with fellow scientists, but a contradiction is clearly visible in this study's data. The universal audience depicts the role of all committee members, including management executives. Their role is to act as the custodian of funds who look for the best interest of the country–and the benefits to its people, the benefits of the potential funder/client and finally benefits to the institute itself. Therefore, all committee members are looking at a logical narrative in terms of the need for the proposed research and what benefits it would serve.

The committee members do not only judge a proposal based on their individual knowledge and background, but also act as custodian of funds, where corporate interests are taken into consideration in order to

achieve maximum returns on investment. The three audience types collectively become the custodians of (1) institute itself, (2) the funding agency and (3) the country –the State of Kuwait. The custodian role is a new term suggested by this study where it depicts that science communication audiences should perhaps be viewed from a different lens than only what their expertise lies in, but rather suggesting to pay attention to the roles and responsibilities of these audiences in addition to their scientific background—an idea that has not come across when reviewing scienced communication literature. A research proposal should therefore be framed in a manner that is closely *'aligned'* with existing organisational stories. The alignment concept allows applicant scientists to frame their research proposal in a manner that is intriguing to the funding agency and that is completely aligned with the funding body's motivations and mission, which will be clearly described in the discussion section. While framing is a term developed in the marketing domain by Kotler & Keller (2015) for the purpose of segmentation, this thesis suggests that framing can be used in a more complex form of utilising audiences' existing stories to present scientific information in a frame that is more aligned with their values, beliefs or motivations.

What this implies is that due to audience diversity as individuals and their role of custodians of funds, the proposal document as indicated by participants, needs to include multiple narratives in order to encourage funding. These multiple narratives however need to be very closely tied to audience interests and funders' existing stories. An issue that emerges from this finding is, how does a scientist address these different information needs within a scientific research proposal in a coherent manner that is easy to comprehend, and therefore aids in the funding decision. The answer lies in the use of storytelling plots, and methodical writing woven into comprehensive narratives that address the identified complex audiences. In section 4.3, I identify what these multiple narratives are, how they are structured according to participants, and how these narratives trigger different responses from committee members.

4.3 Complex Storytelling: Utilising Multiple Plots

As I have established in section 4.2, different audiences require different information in order to be stimulated for funding. I have also acknowledged that narrative alignment is required due to the committee members' funding custodian role, which implies that there are multiple narratives that exist within a research proposal that committee

members pay attention to. In this section, I: (1) explain how these multiple narratives are sectioned, how they stimulate funding behaviour and indicate how the proposal sections are put together to formulate an intriguing story to stimulate committee members into funding. (2) I also describe how the entire proposal document is formatted aesthetically, and how the proposal document format itself has an influence on funding behaviour. So, I explain how the story should be formulated i.e., *'told'* and then explain how the document should *'look'* aesthetically and how these two notions impact funding behaviour.

Storytelling in a research funding setting is different than stories used in sales of goods or services. During in-depth interviews, questions related to how scientists present information to committee members were used to outline whether storytelling concepts are present. On the other hand, committee members were interviewed to understand how they perceive a research proposal should be presented and whether they are influenced by storytelling. Probing questions were used to further explore how certain aspects of a proposal are communicated, what committee members find interesting and what they believe is irrelevant when making a funding decision.

As I have concluded in chapter 4 of the results, stories are indeed relevant to proposal writing and are therefore needed. In the following section, I highlight why committee members want to hear stories and I then present what information is expected and how it should be presented in order to achieve a *'good story'*.

As discussed in section 4.2 of the results, the proposal is a narrative-based document. It has been clearly identified by participants in this study that storytelling is indeed thought about by both applying scientists and reviewers/funding committee members, which I show below to corroborate the findings from chapter 4. The different types of participants described their views of proposal writing as being a story that needs to be told, or the committee members expressed that they actually wanted to hear a story.

As Dr. Linda's following quote describes, a proposal is required to be expressed in terms of a story that needs to be told.

> *Yes, for the objectives yeah you have to be specific and write them in bullets. But for a background a literature review no, you have to explain more and more in paragraphs and you have to see what others did and you write them in paragraphs. You cannot just say no. 1 person made this and this, and no.2 person made this and this, no.*

You have to write in paragraphs and you have to make it in some order like it's a story, you have to make it like you are telling a story… Yes, yes because you have to attract the reader.

Dr. Linda describes writing the research proposal in narrative format, by using paragraphs instead of bullet points. She elaborates that paragraphs help in creating a clear sequence of ideas (sequence of events in storytelling) and hence allow the reader to follow ideas with ease. What she means is that the use of narrative is more entertaining to read for reviewers/committee members as it stimulates connectivity with the story being told. She also mentions that objectives are written in bullet points, which indicates that there are sections within the proposal that follow a methodical writing format in which scientists are trained on, therefore proposing the need for multiple narratives and multiple writing formats within the proposal that serve different purposes, which I explain later in this chapter.

Dr. Bob on the other hand is also a mid-level manager but is a reviewer of proposals and is also responsible for passing proposals to the funding committee. He clearly describes his preference to receive information in narrative format in terms of a story:

Tell the story. So that's how I orient everything now. And I expect that, to tell a story. Make it interesting. Tell me why you're doing it. Don't just tell me you're doing it because… no, that doesn't mean how you're doing it. Tell me why you're doing it. Look, Kuwait has been suffering from, you know, burning oil for whatever for the past, you know, ever since it was in existence, and we're trying to diversify from that. Now, if we could remove that many barrels of oil from the whatever and put it towards, you know, I mean, give me some numbers, give me some facts. Tell me why it's important to take off x million barrels of oil, you know, to take them off the production line. Why is it important? What's it going to do to me though, tell me how you're going to do it. You're gonna remove the barrels and wanting to put them into whatever and you're going to export them and you're going to take whatever, okay, I get it. It's technical. But why is that important? You don't draw me in. Give me, tell me a story. Give me a moral to the story, right?

What is implied by Dr. Bob, is that stories are a means to grab the audience's attention, stimulate their imagination (draw me in) and keep them interested through drama. What he is interested in first is the drama that unfolds in the proposal's introduction i.e., he uses the words "Kuwait has been SUFFERING" this depicts interesting parts in the proposal should provide dramatic connotations to explain '*WHY'* this specific research is needed. Stories

also need to be relatable as the applicant needs to describe what's in it for the committee member as a member of society, therefore assuming multiple narratives that need to be considered when writing or pitching a proposal. How will this proposal contribute to society and what is the main reason why the identified problem needs to be solved are considered emotional stimulants.

A second observation for the need to tell stories is the issue of time constraints:

Dr. Bob continues:

> *When I took that advice, and I did my first ever committee meeting everybody was like, are you sure this is your first time because they couldn't believe that. I just decided was, just take advice. It's either you know, and I put them into the presentation, I presented it, and I told the story. I kept it short, sweet to the point. And I was like should this really work you know? I was a little sceptical at the beginning, but by the end of it, I was completely convinced that this is exactly what you need to do. So that's really what I'm looking for. I'm looking for getting the message across, because at the end of the day, you're saving yourself time, you're saving myself time. You think people in the pyramid really want to be there? There are always other things to do, including yourself. You don't, so just make it easier on them, then in case you are you carry on. You don't waste time.*

Temporality is an issue here in terms of time available for review and time to write, prepare and present for proposal pitching. Scientists whether applicants or reviewers are all consumed with their day-to-day work; hence proposals need to be communicated in a manner that is simple, comprehendible and less time consuming. The proposal narrative is therefore very important as a *'good story'* saves time and becomes more acceptable to funders.

Dr. Bob also talked about his experience as a younger scientist who has presented a research proposal to a funding committee and found that using a storytelling format managed to impress the committee, making them think that he was an expert communicator. What Dr. Bob indicates here is that as a scientist he is not trained on telling stories. He was very much used to a technical (scientific) approach to writing and presenting, which made him sceptical about the storytelling approach. Therefore, scientists are used to *'stiff methodical communication norms'*, but want to hear a story when put in a position to approve funds.

Therefore, good stories are enjoyed and enjoyment is key to a desirable funding decision. Also, good stories save time as they are more easily followed and therefore understood. The quotes above both present the case for the successful application of storytelling in scientific research proposals and that the use of narrative serves the function of conveying messages in a more interesting and clearer format to stimulate funding behaviour.

According to participants in the study, another issue with time is the proposal cycle is very lengthy and hence creates an obstacle in itself for scientists when working on obtaining funds.

Dr. Vincent is a mid-level scientist who is responsible for reviewing proposals at the initial stage of the proposal cycle and is also an applicant for proposal funding, which provided an interesting dual angle of perspective as he assumes both roles in the study's dataset. Dr. Vincent emphasised that the proposal cycle's most pressing issue is time required for final approvals as time becomes stringent to making research ideas either successful or obsolete:

> *Of course the time, because sometimes the reviewing process takes a really long time in Kuwait, especially in the funding agencies. Also, you submit a proposal now and the review process internally within the institute itself takes something like five to six months. You know, first it is submitted to the manager, and then if he or she is not processing it quickly, within a day or two, then it will have a lot of lag time there. And then it goes to upper management and then it is distributed to the reviewers and three, four reviewers will be reviewing it. And if one person is delaying it, it significantly delays the process further. And then it goes to the committee review. And then it goes to a funding agency and then funding agency will send it for international review. So, this review will be three, four levels. So, by the time you receive the comments from the reviewer, it will be almost like one year, and the topic is already outdated and you will see a publication from some other country, maybe China.*

He elaborates that due to time constraints, ideas may be taken on by different scientists across the world who would implement projects and publish sooner than the proposing applicant in Kuwait—making the proposal cycle a time management risk that needs to be addressed.

Although not optimised, the proposal cycle, as indicated by participants, requires adjustments in order to ensure scientific ideas and research proposals do not become outdated or obsolete by the time final approval is received, where time constraint is considered a risk that applicant scientists need to deal with. As explained by

participants, time sets the temporal limits of a story. Stories told in science funding therefore need to be current, up-to-date and need to be processed through for funding as early as possible in order to ensure that the story remains relevant by the time a funding decision is to be made. Scientists are in a rush to obtain approval as the ultimate outcome of a research project in terms of science validation is publication. If the temporality component of the research story is delayed i.e., old, it becomes irrelevant and is hence subject to rejection of funds as the research outcome has already been discovered and hence cannot be republished. Therefore, good stories need to be *'planned ahead'* i.e., written early to ensure that they remain *'new'* by the time the committee meeting takes place.

In the brief introduction above, I have presented the dilemma of the complexity of science communication and identified the main elements of *'good proposal stories*.' In the following sections, I will:

(1) first show how the story narrative is shaped within the proposal format in terms of information requirements i.e., complex story plots and how these plots influence funding decision making through emotional stimulation versus cognitive stimulation.

(2) Second, I describe the aesthetic format of the proposal and explain how the proposal format itself impacts funding decision making.

When interviewing participants and going through their previously written proposals, I have found that the storytelling element is indeed present, but there are several complexities that need to be highlighted and accounted for. The first complexity that was discussed in section 4.2 of the results, is the consideration of a complex audience. This means understanding who you are writing for in terms of their scientific background, experience, and alignment with the potential funder's existing stories. The second complexity arising from communicating science in research proposals is the information presented and its formatting. Due to the fact that I have a complex audience who is highly specialised, I have determined that each type of audience looks for specific information, and there are several commonalities that complex audience members all pay attention to. With that in mind, looking at the proposal in terms of a story allows for logically organising complex information in a format that is naturally accepted by all. As indicated in the literature review section, stories generally follow

a single plot, but when writing scientific research proposals, the case is different. Complexity of scientific proposals requires multiple plots due to the fact of having a complex audience. Specifically, each audience member needs to be addressed in a specific plot, while taking into consideration commonalities that need to be highlighted consistently throughout the proposal for all audience members. While taking into consideration the complexity of a funding committee audience, a scientist needs to cover multiple plots in order to convey a story that is ultimately understood by all members of the audience. The main ideas behind having multiple plots are identified as follows:

- **Validity:** Covering the importance of the research, meaning the need for this piece of research
- **Scientific Merit:** Identifying its originality i.e., scientific value and innovation
- and finally, demonstrating its **Achievability**. As mentioned earlier, due to the high perceived risk associated with scientific research, a scientist must elaborate on their capability to successfully complete the project in question, and show the ability to actually achieve what is promised.

The notion that information presented needs to *'fit'* the audience being addressed is clear in this study, but again is more complex due to the diverse range of audience members. In the plots sections below, I describe how story plots can be used to address each audience type and show how a story can achieve a more logically acceptable proposal format that would optimise chances for receiving funding approval. From interviewing participants, I have found that there are several sections that each audience member focuses on addressing. While some participants focused on the methodology section; others talked about the problem statement in the introduction. Some participants focused on novelty of the research, and others were concerned with the rigor of the literature review.

Dr. Adam, a proposal reviewer at the institute describes how a proposal is sectioned and also describes the weightage he grants for each section:

> *Actually, when one project comes to me for review, there are some guidelines there, instructions. So, firstly, it involves three major sections. First you see the scientific and technical merit of the proposal and how you can assign 40% of total score. And then the other section is mainly management and execution. And this evaluation*

consists about 40%? And finally, the other section is mainly for strategic value, that will cover 20%. So, you can base your score on these three sections. And they also specify some of the points, which you need to look into, like say, if the proposal is submitted, whether the review of literature is comprehensive or adequate. So, you need to see the whether this proposal has included the up-to-date review of literature relevant to his proposal, and also the methodology and work plan, whether these are adequate to achieve the technological or scientific objective of the proposal.

The quote above presents the argument for the need for multiple plots as the information required to make a funding decision is complex. Dr. Adam describes parallel narratives that need to be told in dual formats of story writing, which ties the entire proposal narrative together as well as methodical writing, which emphasises the scientific content of the proposal. There are several elements that reviewers and committee members take into consideration and these elements have further details that are described by the participants in this study. As corroborated with the interview accounts, I have suggested the emergence of the following main plots that comprise of a unique temporality, meaning plots are closely tied to either the past, present or future. These plots comprised of grouping the different proposal sections into *'story lines'* that address several concerns of funders such as:

a) Validity Plot (dramatical plot): A problem that requires solving in the real world, hence making the world a better place – real, believable story of the present, that is validated by the past (problem statement, problem progression: literature review, and current research gap)
b) Scientific Merit Plot: An innovative/novel solution that is partially proven (futuristic plot with evidence from the past)
c) Achievability Plot: Proof of ability to manage the project execution (past and present capabilities/resources to conduct the project in the future)

I have found that the proposal at heart is mainly focused on three different objectives that are all tied together to create a *'relatively new and believable story'* that reduces risk (all wrapped up in temporal elements) and therefore, encourages funders to approve the research being proposed. These sections however are written in different styles, which function on two levels: (1) narrative storytelling format, which is emotionally stimulating, and (2) scientific

methodical writing format, which is cognitive/analytical stimulating. The sections below will describe each plot separately while identifying its temporal elements along with showing sampled quotes from the data that support the ideas generated under each plot.

4.3.1 Plot 1: The Validity Plot

The validity plot entails (1) identifying and explaining the need for the proposed research project. It answers the following questions. What is the problem? How has this problem progressed? And why do we need to solve it? This plot introduces the research problem, takes the reader on the journey of the problem's progression, (2) identifies the research gap and finally, (3) describes the importance or benefits to society from solving this problem. The validity plot is complex and as stated earlier includes a temporal element. I explain in details below how the validity plot is formulated and how temporality affects its narrative.

When communicating within a research proposal, giving the amount of risk associated with scientific research, an applying scientist must consider communicating risk reduction elements within the story plots. As identified above, familiarity with a research topic can be addressed through extensive and related literature review, dread and catastrophic potential can be communicated within the seriousness of the identified problem and the risk it imposes if not solved, and the risk to future generations can also be communicated clearly in the validity plot. The validity plot therefore acts as the *'dramatical plot'* that narrates the history of the problem, communicates its risk understanding elements, and helps the audience understand the importance of the research through generating emotional interest and connection. I will describe how the validity plot is sectioned and what a scientist needs to focus on writing under each section to achieve a persuasive plot that describes the validity of a proposed research project to reviewers/committee members as follows.

4.3.1.1 The Problem Statement – The Real Need (our present)

One of the main concerns of committee members is that the research is valid, meaning that there is a real (believable) need for the research in question. This is described within research proposals as a prominent problem that has emerged in the real world—or a *'believable problem'*. A problem can be old, or new but is required to address a pressing, existing need. As described by participants in this study, a scientist's role is to *'help the society they live in'*, where they solve problems that will in turn *'make our world a better place.'* However, a problem

that is selected needs to be very realistic and needs to be very relatable i.e., is believable and is something we have knowledge of or are aware of. This means that scientists need to select a problem that would essentially be very useful to society if solved. A researcher cannot just select any problem of preference; a scientist needs to understand his society as being an audience: an audience that has specific problems that need to be solved. There are many problems all over the world, but that doesn't mean that the scientist has the freedom to choose any problem to solve. This has been clearly articulated in the audience theme in section 4.2 under *'alignment'*. The scientist therefore, needs to select a problem that is directly relevant to his own society or to the specific audience he is targeting. As explained earlier in the audience theme, alignment becomes very prominent in the problem statement. This is where scientists select a problem that is closely aligned to the targeted funder where the problem needs to fit the funder's objectives or the potential client's needs. The validity plot therefore highlights a *'real'* problem faced by a particular society or client that needs solving. This real problem portrays the need for '*believability'* in the story being told, where the first plot talks about a *'real-life situation'* faced by society that if solved, would produce a *'better tomorrow'*. Hence the problem statement in the introduction section of the proposal makes it concrete for the audience that a problem exists as part of our reality.

Dr. Mathew as introduced earlier is a senior scientist and a mid-level manager who is in charge of approving proposals that ultimately are reviewed by committee members. Dr. Mathew was able to provide insight on how he thinks as a proposal reviewer as well as add from his experience as an applicant for funding where he has been subject to several funding committee meetings and has had the chance to present his research to different levels of audiences. When asked about what he was mainly looking for in order to grade the proposal as a good proposal to pass onto funding he mentioned that:

> *What I need from scientists is to be very clear, what's the problem REALLY and what is his hypothesis and what he wants to do REALLY, what he will solve. And what is the impact of it in terms of economics and environment… I go through the background itself first. And, as I said at the beginning, to see what the problem is REALLY, is it worth to do a project?*

Dr. Mathew emphasises the importance of highlighting a *'REAL'* problem. What he means is that he would like to confirm whether the applicant has identified a serious problem that is noteworthy of being researched and of being solved. As indicated earlier, the problem statement must identify a solid, agreed upon problem that actually needs solving. In other words, a problem that if solved would indeed make a positive difference in the world we live in, thus making our world a better place. Therefore, setting the scene for emotional stimulation where the reviewer/committee member feels a strong connection with the problem due to its immediate relevance and close connection with the reviewers' beliefs. As agreed by participants, budget allocated for scientific research is very scare, therefore approving research projects for funding is a very challenging task. An applicant has to consequently ensure that the identified research problem is significant to society or to the funding agency/client i.e., showing relatability to society or to the funding agency/client, which connects us to our alignment results. The problem statement follows the alignment structure where the narrative is inclusive of the grander scheme of developing the country and contributing to the New Kuwait-2035 vision. If the problem is not realistic, the proposal will not be funded.

Dr. Alexander is a senior scientist. Being a committee member, there are several pieces of information that Dr. Alexander takes into consideration when making a funding decision. In relation to the problem statement, Dr. Alexander stresses the importance of selecting a problem that is highly relevant:

> *If they are doing for example, some study about the forest, we don't have anything about forests, or if they're doing something about manufacturing big cars or military things, so I believe it's not very important for us to study forest or to study big machines, or to study manufacturing, heavy materials, so it's not so important. But if you say about water treatment, I think it's very important. If you say about corrosion, it's very important for petroleum, I think it's very important. If it's not important in Kuwait, I think it's not important to do this work…The problem, if there's a problem in this area and the solutions and the procedure, if it is good procedure work, one two, obvious and clear procedure work. So, the problems, the work, there is a solution, I believe, especially if we find some good solutions, it will be very, very nice project, very good project… If the work is concentrating on something, not important thing for Kuwait, not also for KISR, like some proposals about astronomy, for example, maybe elsewhere it's important,*

but in Kuwait we don't have astronomy, so it should be something important, which should solve some problems, or at least some parts of the problem if not all the problem together, so that's what I believe it's a good proposal.

Dr. Alexander explains that a good proposal solves a relevant problem that is aligned with the institute's goals as well as a problem that is required to be solved in the country. I refer back to the alignment section in the audience theme where the data clearly shows how alignment is considered very critical when identifying problems for a research project as it creates a strong emotional connection due to shared beliefs. As described by Dr. Alexander, an identified problem needs to be relevant to the country, meaning selected problems have to be of industries that are currently present in the country. For example, Kuwait's main source of potable water is from desalination plants, hence making the selection of a problem within the water treatment field considered very important for the state of Kuwait. As oil is considered Kuwait's primary source of income, problems identified in corrosion of oil production facilities would be highly regarded by committee members as the problem targets the main sector in Kuwait, therefore making the problem highly relevant as it is very much aligned with the country's source of income. Dr. Alexander also mentions that identifying solutions makes a good proposal, which will be described in detail later in this plot.

To illustrate from an actual approved proposal, the below excerpt shows the use of narrative that conveys the identification of an existing problem in the state of Kuwait, in which the project is proposing to solve:

Currently, the rapid increase in population growth is becoming a serious issue. In 2018, the world population was around 7.5 billion and it is estimated to reach 10 billion by mid of the twenty-first century. Due to this growth, the demand for energy and natural resources is constantly increasing. Therefore, increasing the generated energy is essential to cope with the increasing demand. On the other hand, increasing the generated energy leads to increase the carbon emission. Kuwait obtains electrical energy from gas and liquid oil products, which considers as an unsustainable source of energy. Kuwait's population is almost doubled from 1990 to 2016, which doubled the demand for electrical energy. Presently, the electrical energy plants in Kuwait generate around 17 GigaWatt (GW). However, the demand for electricity is expected to reach 32 GW in 2030, which will increase the strain on the budget of Kuwaiti government.

What is interesting in the excerpt above is that the problem statement is dramatic. Drama is used in the first sentence where population growth is projected as "a SERIOUS issue". The use of strong language and adjectives to convey drama functions as emotional stimulation. What the applicant is trying to do is to attract the reader by drawing attention to a serious problem in Kuwait that is leading to increase in energy demand. He also uses the words "increase strain" on the government's budget. While the applicant could have just said that the demand will increase the budget, the use of the word 'strain' connotes dramatical implications to draw more attention to the problem at hand. Therefore, dramatical words stimulate emotion and emotional stimulation is used to grab the reviewer's attention.

The problem statement therefore requires to identify a real problem that is presently existing in terms of temporality in order to be approved for funding. The problem needs to be aligned with the client's beliefs, the client's needs and the unified mission of making our world or societies a better place. Finally, the problem statement needs to be written in a dramatical manner to stimulate emotional connection and grab attention. Because a scientific proposal's story is complex, the data shows that identifying a real-life problem in the first plot is not enough. As science in general always requires to be *'verified'*, the data shows another angle that needs to be covered in the validity plot, which can be described as *'structured proof'*. Structured proof entails that in order for research to be valid, it needs to have been tackled in the literature but where there can be areas for further improvement. This means that although this real problem has been addressed in the past, there is still room for further improvements. Hence the literature review section in a proposal. Literature review is the section that describes how other scientists have tried to solve a particular problem in the past. It is therefore '*a story of the past'*. Scientists here explain how others attempted to solve the problem, whether in failed or successful attempts. This *'story of the past'* provides *'validity'* that the applying scientist himself is aware of the research problem's field and is up to date with the latest developments in that field. Hence creating a sense of validity to the reviewer/committee member that the scientist is well aware of what others have done in the field, and that the proposed solution is not something that has already been covered. The literature review section also shows the evolution of the problem throughout the years, as well as the corresponding evolution of the solutions provided.

Hence, telling an interesting story of a sequence of events that happened in the past, that led to the present state of the problem. In the upcoming section, I explain the literature review portion and how its narrative is structured.

The literature review section within a research proposal serves as a temporal background element of the story or the beginning of the story. The beginning of the scientific research proposal starts with the *'dramatic'* problem statement, that is validated with the background literature review. The literature review is essentially the story of the past—the past related to the problem. For example, how did this problem arise, how have other scientists tried to tackle this problem, it this an old problem, or something new? As discussed by participants, the literature review part is very important in order to understand the magnitude of the problem, understand its development over the years and is also an indicator of the validity of the selected problem. For example, is it an important problem? Is there a pressing need to solve it? And how did other people attempt to solve it? The literature review section's role is to provide *'evidence'* for the validity of the research problem as identified by Dr. Natalie who is a mid-level scientist with experience in writing proposals for funding.

> *If you want to introduce any subject to anyone, it would be nice if you support yourself with evidence, telling them that this happened in this region. And they've done that and they found this. So why not? We might find the same thing in our place. Why don't we try it on our local species? So, if you just give them an example, giving an example by telling a story makes it easy so, you can deliver your idea easier to somebody. Explaining something which is more theoretical, it's not as easy as if you give an example. So, for me, if you write a literature review, you're like telling them a story of what's going on. So, makes it easy to deliver your idea and why you want to do it while you're focusing, why do you need this money to do this project? Because I'm giving you an example supporting my idea by evidence.*

She mentions that the literature review helps in supporting the research idea by providing evidence of what has been done related to the selected problem. This means that the literature review section serves as a justification for funds and therefore is a very important section within the research proposal document. The literature review therefore lays the foundation of the story in which the narrator provides context and justification for the proposed research project. What she is actually saying is that this story makes it easier to justify the need for her proposal

rather than writing in a completely scientific methodical format. Using narrative to provide examples makes it easier to comprehend the need for science as methodical writing is rather stiff.

Dr. Bob as identified earlier reviews proposals before processing them into the proposal cycle system. He indicates that the aim of a research proposal is to build on existing science and not to reinvent something that has already been done.

> *Did you do well on the literature review, where if I go into a background check, and do my own research to make sure that your research is sound? Am I going to find somebody that has pretty much done exactly the same thing? You don't, you're just kind of like trying to reinvent the mousetrap.*

According to Dr. Bob, another reason for the importance of the literature review section is for the committee to determine whether the proposing scientist is *'well-rounded'* with the past and current research being done in the selected topic/problem. What Dr. Bob means is that a sound literature review reflects professionalism and trust in the scientist's judgement of proper problem selection. This is important as reviewers and committee members stressed that scientists shouldn't propose ideas that have already been done, where he introduces the concept of novelty, i.e., *'new'* sells a research proposal.

Dr. Rowan is a mid-level scientist who applies for proposals at the institute. He explains the need to be up to date in the literature:

> *We should be up to date, meaning to cover literature up until March 2021, because for example if we have a proposal prepared as per literature of 2017, somebody in the committee will say this has already been done, where is your literature update, and so on…A good proposal should have a good concept, that is the most important thing, because we have to look at the world, at the technology advancements, and this is how we get a good proposal. Next step should be beneficial for us, for example, the technology has been outdated and we are simply spending our time. So, without a good project we are simply wasting our time, that is what I always tell my colleagues, we have to look for new technologies for the sake of the society. Only updated literature helps us in achieving that. So, writing a full proposal needs a regular updating of literature so we can cover all the latest technologies and development, without having to receive any bad comments from reviewers or the committee, so what I want to say*

is that technology is changing on a daily basis and we can't skip these changes, so we have to always be up to date in our expertise and knowledge, so that only effective proposals will come out from us.

Dr. Rowan means that a detailed literature review helps save time, to not work on a project that has already been done. A literature review also helps identify the latest advancements in available solutions that would be useful to apply or update. He also mentions that committee members will pick up on outdated literature review from his own experience, meaning that he fell into making this mistake prior and has learned from practice that updated literature review is important. It is important to note that time appears to be an issue not only in proposal review, but as implied from this quote, time is also important in project execution. What Dr. Rowan indicates here is that researchers should not be wasting research time doing something that has already been done, which means that time in research is a valuable resource that is highly taken into consideration from the proposal developments stage up to project implementation. Wasting time leads to funding rejection because doing repetitive work wastes the client's time and money.

We can therefore conclude that the literature review section has to be updated because it needs to describe the latest developments in the field, which validates the selection of the problem. The notion of the importance of temporality is clearly seen above as participants refer to time as being a very valuable resource that should not be taken for granted. The literature review also provides insight on how the progression of problem was solved in the past and where there could be areas for improvement, hence leading the reader to the present status of the intended research where the scientist is able to identify the research gap in which they intend to cover. The research gap will be explained in details below.

4.3.1.2 The Research Gap (Back to our Present)

Once the problem and its past have been clearly identified, the scientist moves on to identifying and explaining the research gap. The research gap is a statement made by the applicant that validates the proposed research. This statement is one of the most important parts of the proposal as it bridges a link between the past and what the applicant is proposing to do in the future. The research gap therefore, is literally an identified gap in previous work done in a particular field and describes what the applying scientist is going to do in order to close this gap and consequently lead to a contribution to the field. As identified above by participants in this study, the main

objective of the research proposal is to develop a project that is relatively *'new'* or having a *'new approach'* to solving an existing problem. If the research has already been done in the exact same proposed approach, the proposal will be rejected. Therefore, an important element of the research proposal is to ensure that the proposed research has a relatively new angle that is going to be tackled. The research gap is vital as it not only validates the reason why the particular project is selected for the proposal, but is also used as validation for the scientific merit plot, which will be discussed later in the scientific merit plot.

Dr. Richard is a senior scientist. Being a committee member entails having the responsibility of properly allocating funds to worthy research proposals. Dr. Richard who has vast experience in proposal review indicates that he requires evidence that the proposed project has not been done before as it provides strong justification for funding:

> *What are the references, and make sure they are recent references, don't put old references, so include very recent references in your reference list… Sometimes the reviewer will say that these references are not updated with the research. And also, maybe these old references do not cover some areas, so it is better not to include so you don't allow the reviewer to take a point against you, so put recent references. Even sometimes in the paper, you send the paper to the journal, so some reviewers may find that most of the references are old… Also, the difference between your idea or your project and what the others did, and the advantage of your topic of idea on the others and what they did before, so this is the most important to concentrate for the proposal, and the why, why they should fund you, meaning you should give them a good and strong reason in order for them to support you. And also, what you should do very good is why you are interested in the area, until you show them what others did and what they didn't do, so you are filling the gap, so this is the most important thing in the proposal. You should focus on the fact that this is a new idea and nobody did it before and it is very important for this area.*

Dr. Richard mentions gaining and losing points, which indicates that information presented in a proposal is scaled based on a system. Every mistake is accounted for, and every advantage is accounted for, which eventually add up to a final score. He also points out that *'new'* sells and adds that *'newness'* in itself is not enough, identifying something new has to yield benefit to the field as well. If something new is identified but does not propose a significant benefit to the field, the proposal could be subject to rejection. He also mentions that adding old

references or unrelated references deducts points. What he actually means is that putting irrelevant references is frowned upon by reviewers and will show incompetence. It shows that the researcher does not know how to essentially do proper research because he is incapable of doing a simple task of ensuring the literature search is up to date. This gives a negative implication to reviewers that the applicant is unaware of the field and hence is unworthy of being funded.

The research gap is closely tied to the literature review as an updated literature review leads to identifying what others have done and what they didn't do yet, hence identifying the research gap makes a strong case for funding proposed research.

The excerpt below from an approved proposal shows how narrative is used to articulate a story from the past (literature review) that leads to our present-day (research gap) that would address an identified problem:

> *The anaerobic digester has not been used in Kuwait; however, few studies regarding sewage sludge were conducted. S. Al-Muzaini et al. (1995) studied the selection of an effective sludge dewatering system for Kuwait. In this study, the optimum dosage of coagulants for thickening the sludge was determined [13]. In addition, S. Al-Muzaini et al. (2007) assessed the toxic effect of environmental pollutants associated with sewage sludge [14]. The study focused on identifying trace heavy metals, organic contaminates and toxicity in sludge at 3 wastewater treatment plants "Jahra, Rekka, and Umm Al-Hayman". On the other hand, sludge treatability was confirmed by conducting biochemical methane potential (BMP) test using sludge from Kabd wastewater treatment plant. The anaerobic digestion has been used for different application in wastewater treatment plants such as sludge [15], food waste [16], and industrial wastewater treatment [17]. Bacteria fermentation is the main process in the anaerobic digestion that leads to the breakdown of complex biodegradable organics. During the digestion of the organic matter, methane, carbon dioxide gases are generated. The AD has received attention as a promising option for energy recovery to compensate the shortage in energy. However, applying AD technology in Kuwait has been neglected due to the lack of information, data, and experience. Applying a pilot scale AD will help to assess the system for biogas production and energy generation.*

The scientist mentions that there have been studies in the past that manage sludge through an anaerobic digester with references from the literature therefore providing *'structured proof'* that this technology is promising.

However, he identifies a gap in the literature that needs to be addressed in order to apply this technology to generate electricity in Kuwait. The use of narrative in this excerpt is for the purpose of justification and persuasion. There isn't detailed scientific jargon or complex science usage in this section as it is mainly used to develop an argument for the need for this type of research, hence explaining research validity. Also, this proposal has been submitted in 2019. The latest reference dates to 2017, which demonstrates the importance of adding recent references.

Once the research gap is identified, the applying scientist states how this is gap is to be closed through the selected solution. This presents a futuristic approach within the validity plot where the applicant talks about how they intend to solve the identified problem. I discuss the selected solution part of the validity plot below.

Once the problem is clearly stated with its historical background and the research gap is identified, the scientist moves on to talk about the proposed solution, which is the *'futuristic pitch'* of how he proposes to solve the problem.

Committee members were very critical about not only identifying a proposed solution in the validity plot, but they also emphasised the importance of selecting a solution that matches the problem. For example, an applicant cannot propose any solution to the selected problem that doesn't make logical or scientific sense. The proposed solution first needs to match the selected problem in terms of proposed functionality and applicability. In other words, if you select a biology related problem, the solution needs to be biology related. And not only that, the solution needs to be partially proven. Meaning that in order for a proposal not to be rejected, the proposed solution needs to have shown some sort of applicability or success in the past in order for the proposal to be approved. This is what I call as *'validity from the past'* where a proposed solution has shown promise elsewhere and using the solution in a different context or *'tweaking'* the solution to fit the proposed context would have some logical promise for success. Committee members highlighted the importance of validity of the proposed solution as proposals come with the nature of being high risk. Therefore, selecting a solution that is past validated would reduce the risk to a funding committee member and encourage investment, i.e., the proposed solution would have a higher chance for success rather than proposing a completely new solution or a solution that has not

been previously validated. As explained earlier, research in general is stigmatised by high risk and rightfully, committee members - *as custodians of funds* - are in charge of making the critical decision of which projects to invest in and which ones to reject as funds for research—especially in Kuwait, are scarce. Therefore, it is imperative to make the right decisions for investment into projects that show higher promise for success.

Dr. Miles is a junior scientist at the institute. He mentions that he selects solutions that have not been applied in Kuwait and that would generate value as a derivative of previously identified solutions that he could modify:

> *Why don't we make a multi-layer floating breakwater? I searched and found that this solution may be better than a single-layer breakwater. I found that we have not done that. This study may lead to something better than having a one-layer floating breakwater, and so it is multi-layer. The idea is to say: why haven't they done this thing? Let's do it then. It is found that this idea would benefit us and save money. So, we, at Engineering, do the design and save money without damaging the environment. So, I ask: what exactly do I want? What do people want? What does society want? I look for ideas that have not been implemented before. Since the idea has not been implemented before, the question would be: Is it possible to apply this idea or not?*

Dr. Miles ties the selected solution by aligning it to society needs (alignment to client and country's vision). He also selects a solution that has worked elsewhere but can be modified. This solution has been previously proven to work, but the proposed modification can be better suited for Kuwait's conditions. He also indicates that the solution must yield benefits and not only be new. He also mentions that the proposed solution should be applicable, therefore indicating that even if a solution is new and beneficial, if it cannot be applied, then the proposal is subject to rejection. There is no point in funding a proposal that cannot be applied.

Moreover, Dr. Jane also brings to our attention that the selected solution should be viable in terms of utilisation of available resources:

> *And one more thing is compared to the plant and the micro algae. Here we have abundant seawater and light although the all the weather is not so convenient for the growth of algae but the sea water is there. Seawater cannot be used for agriculture purpose however, can be used for the micro algae growth. So that is the advantage. So that can be used and can be exploited.*

What she means is that although previous solutions for algae growth require several parameters, the resources available in Kuwait provide the scientist with an advantage to alter the solution in a manner that is more suitable to the situation at hand. Kuwait has abundance of sunlight and seawater; hence these parameters can be used as an advantage to develop a more viable solution that is catered to Kuwaiti conditions. This quote ties the alignment narrative identified in section 4.2 of the results where it is also used in the development of a solution that takes advantage of resources available in the country. This can be used as an advantage point within the proposal's narrative of the selected solution by showing available resources in the country that can be used as an advantage to develop a new solution.

Dr. Adam on the other hand discussed the consideration of the solution to be financially viable, meaning that the applicant scientist needs to consider the solution to be commercially viable prior to selection:

> *To make it viable, sustainable, you must consider the price also because you are going to evaluate or formulate a feed which is expensive compared to a commercial feed, then your feed is not viable because when you go for any production, you must consider the production cost and benefit. And if you developed a feed, if your feed is expensive than the commercially available feed, then nobody will buy your feed and even if you get good results that will not give you a good finding there. So, you must consider the economics of production also.*

As Dr. Adam explains, producing a solution that is more expensive than what is already in the market is a waste of money, effort and time and hence will definitely be rejected for funding. What he means is that scientists need to assume different roles when writing proposals. The first being a scientist and the second being a businessman. A scientific proposal is also seen as a business proposal where investment in research should produce commercially viable products. There is no point in investing money to produce an expensive product that cannot be sold due to availability of cheaper products. So, Dr. Adam brings a business perspective to proposal writing where a scientist needs to be aware of costs. He means that the selected solution needs to be viable and this can be done by understanding the dynamics of business such as product pricing.

As described by participants in the study, the selected problem needs to be aligned with a purpose or benefit. An applicant needs to describe the importance of the solution and its relevance. Dr. Alexander, who is a funding committee member explains the need to articulate the purpose of the selected solution:

I believe these solutions will help Kuwait or will have the area to solve these problems, especially if it was an environment or water treatment or even oil production. Because this solution will save a lot of money, and will save a lot of time, and at the same time it will enhance the environment. So, this is a very important solution.

Dr. Alexander also references alignment that I identified earlier, and he also draws attention to time, showing the importance of temporality also in the selected solution, which would be more advantageous with reviewers if it saved time. He also mentions saving money, which implies that the institute is in the business of science rather than on a quest for discovery alone. Therefore, developing solutions that are business oriented as well as scientifically contributing is more appealing for funding.

The excerpt below from a submitted proposal shows how a scientist proposes a solution that is validated of working in the past:

On the other hand, sewage is another type of waste that can be turned into a renewable energy resource since it can also produce methane. The potential for success of implanting anaerobic digestion technology for power production in Kuwait is high because it is a mature technology that's commercially available and the feed stock of sewage or other organic sources are a part of life and will ensure continuity of operation…The anaerobic digester can be a new source of energy for wastewater treatment plants in Kuwait, in addition to its ability to treat the sludge and reduce sludge pollutants. Furthermore, using anaerobic digester will reduce sludge volume which will help in reduce landfills area and reduce of greenhouse gas emissions. On the other hand, there are also financial advantages of using anaerobic digester such as saves waste disposal cost and Sales of by-products. This type of reactors may be suitable for upgrade many wastewater treatment plants in Kuwait, integrate into future designs of wastewater treatment plants in Kuwait, or simply use as stand-alone treatment units.

The solution matches the selected problem of handling sludge from wastewater and utilising it as an alternative source of energy, which was not covered extensively in the literature. The proposed solution is also described as financially viable as it also indicates available resources in the state of Kuwait that would provide a logical justification for applying such a solution.

We can therefore arrive at the conclusion that the selected solution not only has to fit the identified problem, the selected solution should also be exploiting available resources, is tentative to special circumstances

and conditions, is economically logical and has a clear benefit; making the narrative emotionally stimulating, scientific and business oriented, which is shown to be more favourable for funding. When talking about benefit, the scientist can move on to the benefits statement in order to finally tie together the validity plot in terms of problem statement, problem progression (through literature review) and selected solution that leads to an overarching benefit to society in the future. I explain the benefits to society part in the section below.

4.3.1.3 The Benefits to Society – A better future

Another central part of the validity plot is stating the benefits of the proposed research. Once the validity plot has a clearly identified problem that includes its historical background, and the proposed solution is stated, the proposing scientist needs to talk about the benefits of solving the problem. Hence the benefits statement. This statement identifies how the *'receiver'* will benefit from the problem being solved by showing the grander picture of the *'real impact of solving the problem'* in an emotionally stimulating manner.

Dr. Sarah as introduced earlier is a scientist who applies for research funding, she emphasises that indicating the benefits of the research narrative is of interest to funding committee members as well as potential clients:

> *Just to make my topic more interesting for them or to emphasise the importance of this, for example how big is the market or how much do you think Kuwait is importing shrimp, or how much is the production of shrimp culture in Kuwait. And then I answer it. But this is a start to let them think about this question because they come from a different field, so maybe put it in their mind and they get surprised that we have zero shrimp culture in Kuwait… Especially applied research always has a very good chance for funding. When you are solving one of the national concerns or problems. When you are filling the gaps in any research field it always makes it strong…I can say that I am very fortunate because the title or the field that I am working in touches all of the Kuwaiti community. Everybody understands what is shrimp and what is aquaculture, it is not very scientific. It is now more an overlap area between science and industry. So, it is very attractive when you talk to scientists or managers or colleagues or people form outside, they find it very interesting. I was fortunate because the subject is very interesting to most people. So, in this way I didn't get the NO. I always get yeah go ahead and apply…Usually, underground water is deficient in many minerals, so for the farmers to compensate they have to get lots of expensive salt. So, this is one of the things that I was thinking we need this project to be feasible, otherwise they cannot do it…how much the*

farmer can save to make their project profitable. But we have very nice weather suitable for shrimp that likes the hot weather of Kuwait. So, we have a very good chance for aquaculture. Then I start to talk about the advantages that we have—the quality of the water, the climate. Manpower, ok in Kuwait we don't have the manpower, but we can get them because the wages are good, reasonable. Electricity, we don't have tax. So, all these things I try to advantage how this project can contribute to the food security and how we can open or make a new industry, from these types of projects…But for another funding institute, something else, they focus on both, and I focus and try to show them the private sector is one of their clients as well. I always try to show them that how will this data be beneficial to the private sector, so they can share it with them in the future, or they have many departments that can also apply the same idea in other farms.

Dr. Sarah uses questions and facts to emotionally stimulate her audience. She uses facts such as zero shrimp culturing in Kuwait to stimulate the emotion of surprise. She also uses the word *'touches'* the Kuwaiti community, which also implies an emotional stimulus where Kuwaiti people are culturally known to favour seafood, hence her proposed project becomes emotionally tangled in the Kuwaiti culture, which according to Dr. Sarah stimulates emotional response as the projects becomes highly relatable to her funding audience. Her topic is relatable because everyone eats shrimp and the aquaculture industry in Kuwait is very much known, which makes the communication of her research topic relatively easier as the topic is familiar and does not require scientific elaboration. The topic is easily communicated through emotional connection and hence funders can relate to this narrative without requiring complex scientific information. From this quote Dr. Sarah indicates that there are at least 2 narratives that are clearly identified within the proposal, one being the generic introductions and benefits narrative and second the scientific narrative. In the case of shrimp culturing, what I understand from Dr. Sarah is the benefits narrative supersedes the scientific narrative as the topic is highly relatable making it emotionally stimulating, therefore assuming the notion that the validity plot could potentially be a more important and interesting story for securing funding, which scientists need to master.

The following excerpt illustrates how the benefits plot is written within a research proposal.

The AD has the highest biogas production capacity worldwide and the production of biogas is dependent on the sludge composition. As for Kuwait, anaerobic digestion has a great potential to be both a waste management

technology and a clean source of energy beside the solar energy. Both solar energy and anaerobic digestion are important to Kuwait. It is best to think in terms of diversifying the energy resources in the country, whether they are renewable or non-renewable, but at the same studying the technical and economic feasibility of each technology separately. Diversifying the renewable energy portfolio ensures that energy, in the form of electricity or heat, is always available and there are no disruptions in the electric grid. Anaerobic digestion is as important as solar energy for Kuwait because it adds to the diversification of energy resources and helps in managing the organic waste problem. The project is expected to have significant benefits for Kuwait and Arab countries, where the obtained data will improve our understanding of the beneficial of reused sludge. Reuse of the accumulated sludge will reduce significantly the operational cost of the treatment plants by generating energy from sludge. This technology can generate around 144,000-216,000 MWh annually from sludge. This project also explores new alternative technologies for electricity generation under Kuwait's conditions. In addition, using anaerobic digester will reduce sludge volume which will help to reduce landfills area and greenhouse gas emissions. On the other hand, Kuwait is considered as one of the highest per capita carbon emissions in the world. Therefore, finding new and clean sources of energy is essential to manage the increasing demand. Finding an alternative source of energy is important not only because generating energy is expensive, but also because of carbon footprint and it impacts on climate change, where Kuwait has agreed to reduce carbon emissions in the future.

The excerpt is written in a futuristic narrative that highlights the benefits of the proposed project in terms of providing a solution that addresses the problem in terms of energy requirements, carbon emissions reduction, which is part of Kuwait's mandate towards its international agreements and is also a financially viable solution that would save on expenses. This statement puts the proposed research into context of benefiting the world/country/society by making the real world we live in a better place. It is very important to emphasise that this statement is the heart of the first plot as it ties the *'past plot'* into talking about the following plot, which is the *'future/science fiction plot.'* Therefore, the standard sequence in a pitch is that: *'A problem that exists despite prior research, can be solved by us now, in order to make things better tomorrow'*, which creates emotional stimulation.

To summarise, I have identified the need for a plot that sets the scene of the story, which uses common beliefs and emotional stimulation, in order to achieve engagement with the intended audience. This plot concurs with existing science communication literature that presenting science in the format of a story leads to emotional stimulation (ElShafie, 2018; Joubert et al., 2019), however I add to the literature by indicating that temporality within the story has a function other than taking the audience through the story's journey from beginning middle to the end (Campbell, 1949; Tobias, 1993; Escalas, 2004; Kent, 2015). The validity plot therefore engages a generic audience as well as a specialised audience through stimulating the audience's imagination, memory recall and increases engagement and interest through the use of existing stories. In the following section I describe other part of the proposal that are more rigid in terms of writing format, which serve the purpose of *'cognitive stimulation'* within committee members to make a funding decision.

4.3.2 Plot 2: The Scientific Merit Plot

As I acknowledge the complexity of the research proposal story, I also acknowledge the roles of the funding committee members who are also senior scientists and senior executives whose job entails criticism in order to make a funding decision. I come to the realisation from the data that these participants also engage in what I identify as *'cognitive elaboration'*, meaning they need and seek more information that helps engage their analytical thinking in order to make a funding decision. A generic narrative on its own does not work with this type of audience as there is a lot of risk associated with science funding. The decision to fund science according to participants is relatively a difficult task due to the scarcity of funds, hence an applicant needs to present a proposal in a strategic manner in order to receive funds. I observe from the data that the following plots rely on information that promotes analytical thinking (cognitive stimulation) as well by committee members to make a cohesive decision.

While analysing the data, I have come to notice that scientific merit is articulated under two main objectives, which are (1) identifying the scientific methods – which is purely scientific methodical writing that scientists are trained on that explains how experimental work is to be carried out and what the experiments are and, (2) identifying scientific contribution – which is written in narrative format and is used to explain why these specific methods have been selected and how they would lead to scientific contribution in the field.

I therefore present the case of the need for both scientific methodical writing as well as narrative engaging writing under the scientific merit plot, which will be explained in details below.

4.3.2.1 Identifying Scientific Methods

An important point to take into consideration is the written format of the scientific merit plot. There are pieces of information that are written in bullet point format, while other information is written in narrative paragraphs. As indicated by participants, the objectives and deliverables in particular are written in bullet point format. As explained by Dr. Bob, objectives and deliverables need to match:

> *The most important thing, which I found from my experience and my colleagues' experience, you know, anecdotally, is that you have to have the objectives and the deliverables meet. Okay, you have three objectives, the odds are, you're gonna have to ask for your deliverables. Unless, you know, a report is the final deliverable. And you can encompass two or you know, two or more of those things, but there has to be kind of like a one-to-one relationship between the objectives and deliverables. That's the most important thing.*

The quote by Dr. Bob shows that the written format of objectives versus deliverables is scientific rather than narrative and hence illustrates the need to switch writing formats for specific audiences. This notion clearly indicates the need for elaboration which in turn induces analytical processing in a scientific audience. Dr. Bob explains that the objectives and deliverables are both written in bullet points as they need to be concise and to the point, in a manner that is easily understood and stands out within the document. This would be in a manner and format that is purely scientific, which is understood by scientists. He also stressed the importance of matching the number of deliverables against proposed objectives. Meaning that if a proposal has three objectives, there should be three deliverables, which again describes the specific writing format that scientists are trained on. Therefore, a scientific audience looks for clear and concise information within the methods section and this is reflected in the objectives and deliverables in a format that is agreed upon within the scientific community.

Also Dr. Samantha a senior scientist and research applicant, describes that a poor proposal does not reflect a well written methods section which needs to be linked in terms of the objectives and the required results:

The language of it, the way the researcher writes the proposal. You can feel it's weak. Like the objective doesn't reflect the method or the method doesn't reflect the objective. And you have a method but it will not give you the result.

Dr. Samantha explains that a proposal would look weak if the methods don't match the objective and hence will not produce the desired results, which in turn looks riskier to a scientific audience. As described earlier, format within a research proposal follows a narrative as well as methodical scientific writing structure. The presence of one does not negate the other as they both go hand in hand to present a convincing case. Dr. Samantha is actually saying that the methodical scientific writing is critical to a scientific audience when reviewing a research proposal as it provides an indication of whether the applicant is scientifically competent and whether the proposed project holds scientific weightage. Therefore, emphasis on written format in the methods section as well as cohesiveness is considered very important. She also implies that if a scientist writes the methods section in a proper scientific format that is clearly linked, it is an indication of yielding good results. Therefore, the methodical scientific writing format, if done properly, provides confidence that the applicant's project will yield good results. Hence, a well written scientific plot generates trust that the scientist is scientifically capable of obtaining scientifically significant results, which reduces risk to a funder in terms of quality of research outcomes.

The excerpt below illustrates how objectives and deliverables are written within a research proposal and how they are formatted in bullet points while embedded within the narrative of the proposal:

Objectives

The objectives of this project are addressing a very important research area related to the utilisation of inexpensive waste materials to produce products with high commercial values and to serve multiple sectors including the oil sectors.

The main objectives of this research project are the following:

- *To develop and optimise biological processes for producing PHA polymers from inexpensive renewable waste materials (municipal sludge and food industries wastewater).*
- *To characterise and evaluate the physicochemical, thermal, and mechanical properties of the developed PHAs in comparison to commercial PHA.*

Fermentation Process optimisation and PHA Separation: The experimental work will involve the development and optimisation of the fermentation process by using enrichment and sub-culturing consortia of mixed bacterial strands and also monitoring the efficiencies of PHA production. PHA separation and purification techniques from fermented products will also be developed. The production of (PHA) by activated sludge treating municipal wastewater will be investigated by studying the effect of 4 operational factors, i.e., concentration of carbon source, pH, temperature, and partial pressure of oxygen on the anaerobic and aerobic bacterial growth. Such operational factors enable quantifying exactly the rate of nutrient consumption, energy generation, and rate of synthesis of biomass and PHAs (Chen et al., 2015). The medium for activated sludge will be solely municipal wastewater. The sludge characteristics such as the carbon source (acetate) and the production of PHA will be monitored regularly. During the fermentation process, samples will be taken periodically from the batch to perform PHA characterizations, which include 1H-NMR and 13C-NMR, and FTIR spectroscopies.

Technical Approach, Fig 3: Experimental approach for the synthesis of PHAs, ...PHAs Physicochemical Characterization: The structure of the synthesised PHAs will be characterised by complementary spectroscopic and chromatographic techniques, such as 1H-NMR, 13C-NMR, FTIR and GPC. Chemical characterization of the PHAs is essential to establish the structure-property relationship of the new PHA in comparison with the commercial PHA.

Deliverables

The main technical output of the proposed project will be the following:

- *An optimised fermentation process for the production of PHAs from municipal sludge.*
- *Establishing the structure-property relationship of the newly developed PHAs in comparison with the commercial PHA.*

It is important to observe that in the above example, there are 2 main objectives and consequently, there are 2 matching deliverables, which corroborates the accounts made by the participants.

There is a pressing need to select a scientific method that fits the selected problem, denoting that the proposed method needs to make sense with the problem being tackled. As stated by participants, there is a clear concern about the data being collected for a proposed project. The source of data not only needs to be clearly identified, but there is concern about the data yielding good results and conclusions that would support the study.

This is a major concern as the uncertainty of data suitability needs to be addressed by the scientist in order to ensure that results and conclusions are viable.

Dr. Mathew (a proposal reviewer) explains how a scientist can overcome the uncertainty of data suitability by clearly identifying scientific experiments and providing details of the type of statistical analysis to be used:

> *As detailed as possible and when he's doing experimental design like doing experiments, they will say we will do a statistical analysis of our data. Okay, what kind of statistics do you want to use? Is it a T-TEST? Is it a NOVA? Is it regression? Is it a multi-regression? What do you want to do? You have to explain, you have to be clear. Some researchers come and they tell us: we want to do statistical analysis. Okay, but when you do your experimental design, you have to have your statistical package and it should be known, what kind of? How you will compare your like results? Your data of two experiments? T-Test, is it a NOVA? You have to explain all this information. Unfortunately, sometimes we are facing such problems.*

Dr. Mathew also explains the need to be very detailed within the experimental design, where mentioning the sample collection site, it's oceanographic parameters as well as type of equipment to be used are necessary in order to reduce uncertainty pertaining to data collection and quality of results. What Dr. Mathew indicates is that there is a methodical manner of writing, especially in the methodology, but scientists still forget to mention such details. This contradicts the notion that scientists are specifically trained in methodical writing as some scientists still miss writing such important details. The issue that arises is that scientists do not understand how to write a research proposal in a sufficient manner that yields funding:

> *Now the methodology I said should be tasks and each task should be their experimental design and schedule should be, and the resources, everything for each task should be very clear for us exactly what you want to do, how many sampling sites you want to do in Kuwait waters for example, and where is the samples and what is their depth and what is how you will collect your fish or your plankton or your samples, what equipment you want to use all this information it should be very clear for us.*

I therefore conclude from Dr. Mathew that the methods section is written completely from a scientific perspective and is very detailed i.e., is methodical in written format. This implies that the methods section stimulates analytical thinking as explained in the quote above where the reviewer analyses whether the details

provided in the selected method fits the objectives and deliverables, where the details in methods are an indication of reliability of produced results.

Dr. Adam expands on the importance of detailed methods in a more scientific manner. He explains the need to match the parameter with the selected methods. He mentions the example of aquaculture and feeding different types of fish:

> *Specifically, I look into the methodology he wanted to do, say if it is analytical things or that he is following the standard analytical set methods, which are usually say, if it is for fatty acid analysis. Whether he is going to use the best standard method for the fatty acid analysis or approximate composition analysis, is he using the standard method like LSE method, which is the worldwide acceptable method and if he goes for say, the ground trial, whether he is using the experimental tank design suitable to carry out this project or he has been using the sufficient number of replicates, so that he can do the statistics properly. And what will be his feeding method? Is it fixed breeding or is it unfitting? So, from fish to fish it varies: for some fish if you feed fixed feeding it is okay; but for some fish unit to like the carnivorous fish, you need to feed them with satiation. So, you feed them until they're satisfied, you don't need to feed three times. Even one or two times daily feeding is sufficient for carnivorous fish. But for herbivorous, or Indian middle carp or Asian carp, for those fish, you need to feed them more often, not like this fish. You can fix the amount, like 2%, 3%, 4% of budget, you can give them three times full time like this. But for this carnivorous fish, one time or two times feeding is enough, if you feed them to satisfaction, you can see whether the fish is taking feed or stops feeding faster, if they're not eating, stop your feeding. So, these are the things we look into for methodology. And also water: he is going to look into the water quality parameters properly, and how he is going to collect the data, what will be his sampling frequency; we also look into whether his proposal is original or repetition of other proposals. So, looking into the review, we give, since we have now a scope for looking into this thing through internet with this title and other key words, we can find out whether similar works are being done elsewhere or has been done. So, we can see there, whether it is a repetition of or a copy of other work. So, we can suggest on this basis, we can ask them that you can include a new parameter here or discard this part in order to repeat this thing, you can get data from there.*

Dr. Adam pays close attention to the need for selecting the correct parameters in a study to yield reliable results. He mentions the importance of understanding standard methods and when they should be used, versus the

introduction of new methods to obtain new data. Parameters are purely scientific and are considered critical to the success of the proposed project. Dr. Adam also emphasised the importance of ensuring the selected methods have not been conducted prior to the proposal as repetition is frowned upon and will not receive funding. The main objective of selecting proper controls is to ensure that the suggested methods are the most optimal to yield desired results. Also, the inclusion of novelty and updating existing methods provides confidence in the researcher. Properly citing and using agreed upon methods reduces risk to a reviewer/committee member as it provides some security that the selected methods will potentially lead to getting good results. Dr. Adam's criticality in identifying parameters is derived from his past experience. As stories stimulate transportation and memory retrieval, I suggest that a scientific merit plot stimulates reviewers or committee members into retrieving their own approach to selecting scientific experiments. Dr. Adam knows what standard methods are because he is already familiar with them from his own studies and he has used these methods himself. This is why storytelling is a very powerful tool for scientists to use because it stimulates transportation by memory recollection, which scientists can benefit from when writing the scientific merit plot of the proposal.

As risk is prominently visible in the methodology section, in particular objectives against deliverables and selection of scientific methods, an applicant needs to show *'method fit'*. The applicant needs to verify the selected methods will be used to produce what kind of data, and if that specific method will produce the required data. The applicant must also pay attention to experimental parameters i.e., whether they are suitable for the intended study. For example, if a scientist wants to solve a problem with desalinating cleaner water, reverse osmosis would be a matching proposed method. However, the scientific contribution to the reverse osmosis process would be to use a different or new material such as nano-materials to improve the reverse osmosis process. A second example for instance would be to cure a certain disease in finfish in aquaculture tanks, there are several vaccines developed for finfish, but the use of thyme within the vaccine formula for example hasn't been done before, but would have potential benefits because thyme has been proven to kill bacteria in the human gut. In this example, the proposed method *'fits'* the problem being studied and is backed up with proven science (thyme working for humans) so the chances of success for this proposed solution could be high.

Any scientific project in itself is considered high risk. Therefore, the risk of proposing something new becomes very high. In turn, proposals that are completely novel are considered sceptical and receive high resistance for funding. This is where the importance of proven science comes into play. In order to propose something novel, a scientist needs to highlight that this proposed novelty would have a high chance for success given past experiments that have scientific community consensus. Meaning that if a scientist is to propose a new scientific method, he needs to prove that a similar method has previously worked in solving a similar problem, but his proposed alteration would probably make it better, more advanced, or yield better results.

As Dr. Vincent reviews a large number of proposals throughout the year, he emphasises that the proposing scientist needs to provide complete information regarding the selected methods within the proposal. He stresses the importance of providing evidence that the proposed methods are scientifically accepted within the proposed research domain by using references as described in the quote below:

> *So, in a proposal, the reviewer will not have time or patience to go to that particular reference and then read and then see whether this makes sense or it is complete or is it validated all those things. So, basically, it's the project leaders who should provide complete information about the method and source information from where you are taking it, is it a validated method is any people you know, are there like references, people have used this particular methodology and it is well accepted in the public literature, public domain. So, that way you are convincing the reviewer that okay, you're using a fool proof method, which is solid and accepted by a lot of international reviewers and researchers and most importantly, is it an appropriate method…, and moreover, there are certain methods, for example, which are well accepted by the EPA or acquisition agencies. So, you should always look for those kinds of methods, ABC methods, like for analytical chemistry type of work.*

Dr. Vincent refers to time constraint where the reviewer or committee member does not have time to validate methods or perform an in-depth review. We see this issue earlier, which is amplified here, indicating that an applicant scientist is highly entrusted to develop a scientifically sound proposal—it is their responsibility. Responsibility implies pressure on the scientist to get the methods section right and prove that this method has high potential to work. This is done through proper citation and referencing, which provides strong evidence that this method has the potential to work. What Dr. Vincent is saying is that a research proposal is a very risky

investment as the outcome is unknown, therefore it is imperative for a scientist to select a method that can minimize this risk as much as possible by partially proving that it has worked somewhere else and hence has the potential to work here. Dr. Vincent underlines the importance of ensuring the selected methods are solidly accepted in the field as well as other agencies such as the EPA, especially when speaking about basic methods, he means that such entrusted institutes reduce risk as they are internationally accepted and validated, therefore providing additional trust that the method will potentially work and there won't be any issues with the quality of data generated. The scientific content in the methodology section is very important to committee members and reviewers because it shows the scientific competence of the entire project and the quality of potential results, which is heavily reliant on the selection of the most appropriate methods that would in turn lead to the proposed solution. Dr. Vincent also mentions that if the scientific method is presented in much detail with proof that it is agreed upon in the field, it shows that the applicant is scientifically solid—meaning they are trustworthy as they are well-versed in their scientific discipline. The methods selected should therefore be very detailed, appropriate and agreed upon within the proposed research field to establish trust and avoid risk of failure or production of unreliable results.

To achieve data corroboration, I have analysed a comments form received from one of the participants. The excerpts below illustrate what the reviewer/funding committee member commented on in terms of the proposed science in the proposal:

Comment by the reviewer:

> *There seems to be no method of assessing the degree of infection in the collected leaves; the data will simply provide presence or absence of particular alleles in the population. There is no mention of contingency plans in proposal; certainly, some data will be generated but it is unclear how much will be needed to allow meaningful conclusions to be drawn.*

The reviewer being a scientist, is clearly concerned with the methods, where the main comment is on the validity of the results to be obtained via the proposed method:

Scientist Response:

> *Consultant, Professor Dennis, X University has a long standing collaboration with the Kuwaiti group and assisted them with sequence diversity studies in the past. He will carry out detailed sequence analyses and evolutionary analyses of the TYLCV genomic sequences that will be generated in the proposed work and results will be provided to the project leader. Some of the sequence and evolutionary studies that will be carried out in Prof. Dennis's lab are described below.*
>
> *Nucleic acid sequences of known TYLCV isolates available in GenBank will be aligned using MUSCLE in MEGA7 (Edgar, 2004) or the more recent version, MEGAX. The maximum-likelihood phylogenetic trees of will be created based on the best modes. The heuristic method is nearest-neighbor-interchange (NNI) with 1000 bootstrap replications. TYLCV nucleotide diversity and DNA polymorphism, neutrality tests, genetic flow and gene differentiation were carried out using DnaSP software.*
>
> *Genetic differentiation within the populations of TYLCV isolates will be estimated using the DnaSP software. Parameters computed include nucleotide test statistics such as Ks, Kst (Kst value close to zero indicates no differentiation) and Snn (Snn value close to one indicates differentiation) (Ks, Kst and Snn: Hudson's statistic of genetic differentiation), and haplotype statistics such as Hs and Hst. DnaSP was further used to estimate statistic Fst (absolute value close to zero indicates free gene flow, whereas value close to one indicates infrequent gene flow, which indicates the extent of gene flow among the virus populations.*

The scientist responds with further scientific details that provide further scientific insights on the scientific method selected where they attempt to prove that the selected method matches the proposed results to be generated. It is important to note that such elaboration is purely scientific in which the justification for the selected method describes scientific lab-work. This scientific justification is embedded within the proposal narrative, which highlights the need for scientific elaboration for a reviewer/committee member to be able to make an informed funding decision.

Within the scientific merit plot, participants talked about working on a mini-study that would yield preliminary results. Being considered as a high-risk section as indicated by committee members and reviewers, scientific methods do not guarantee the success of the project, hence all of the detailed information required above. Participants indicated that they can mitigate this risk by producing a lab study that would provide a glimpse

of what would happen if the proposed project is to be approved. As indicated by Dr. Eric (a junior scientist), he was never rejected for funding because of performing these mini-studies:

> *I never got any type of proposal being rejected. And I think because of one key component here is that I try things out myself before writing a large-scale proposal. And if need be, I would start with this say a mini type of study. Just a quick mini study, probably in an order of two or three months, this puts me in in a great advantage. And shows the people that I did, let's say not homework, but then it's just beyond the homework is something that you do, I think it's very important to be attractive for the funders is to do something, you know, before you ask for big things.*

Dr. Eric brings to our attention that preliminary work yields preliminary results, hence providing a sense of assurance that the proposal has a higher chance of success. Data is therefore considered fundamental to making funding decisions as proposals are associated with risk, preliminary data provides a sense of reassurance that the scientist knows what they are talking about as the initial results show promise. Dr. Eric also describes preliminary work as going above and beyond what is expected of him to produce in a research proposal, which leads to the belief that doing extra work instils trust in the scientist's capabilities and is therefore attractive to funders. What Dr. Eric means is that embedding preliminary data, provides reassuring facts to funders that the proposed project will yield good results and hence makes funders make a better-informed decision by reducing risk.

In the above section, I have discussed methodical scientific writing in the scientific merit plot. This focuses on how the scientific aspects of the proposal are written in terms of objectives, deliverables as well as methods used, and how they stimulate cognition and critical assessment by reviewers/committee members. I have also reported on temporal elements within this methodical writing approach, which includes the use of referencing (old methods) to show potential success as well as the use of preliminary data to illustrate potential achievability. The methods section needs to be very detailed and well-written in order to *'save the reviewer's time'*.

4.3.2.2 Identifying Scientific Contribution

The second aspect of the scientific merit plot is identifying scientific contribution. Although the methods section indicates heavy use of methodical writing, scientific contribution shows quite the opposite, which is an intriguing finding. Narrative writing in the scientific merit plot describes why the research is considered novel and why this novelty matters.

Being a document of scientific nature, with a scientific audience, the next plot becomes apparent—the scientific merit plot. Although would seem apparent at first, I have come to find that the scientific merit plot involves more than just mentioning the science. A scientific merit plot describes all the scientific information required in a proposal. It identifies experimental work, justifies the selection of these experiments and highlights scientific novelty or innovation within the proposal document. This section is considered very important to committee members who have a specialised scientific background as science is at the heart of the institute and is the core reason why the institute is established. Participants who are reviewers or funding committee members stressed three major concerns, which are scientific novelty, i.e.,

(1) something new in the proposed solution or methods,

(2) the importance of proof of scientific method selected, and finally,

(3) the need for the scientific method to match the selected problem.

Committee members focus on either the development of a completely novel solution that no one has thought about before, or focus on a new approach in the scientific methods, for example, a process improvement, the use of a different material, or altering a part of an existing, agreed upon experiment. The prominence here is on the scientific contribution of the proposal itself, meaning how will the proposed project contribute to the scientific topic or area being studied? How will this project challenge intellectuals in the same field and how will this project contribute to the scientific field in question? I have also noted that the written format of this section includes both a methodical scientific writing structure as well as a narrative structure highlighting the need to differentiate between audiences when writing, which will be explained in detail below.

As discussed by Dr. Sandra who is a senior scientist, scientists need to present the scientific merit of the proposal very clearly, meaning that the outcomes of the research should not be basic and should have a clear impact:

> *Some scientists get very difficult comments and questions, especially if the scientific merit of the project is not clear, or there is something very simple. It's not a big problem that the country faces, or something like a basic knowledge.*

By mentioning that scientists receive very difficult questions about scientific merit, Dr. Sandra suggests that scientific merit is considered very important to committee members. After all, this is a scientific research institute, therefore there will be major emphasis on science. What she means is that the proposed project needs to show significant scientific contribution to the field, but she also ties it with the country's needs. This demonstrates that there are 2 major narratives being considered, which are (1) benefits to the country as well as (2) scientific merit. What Dr. Sandra is suggesting is that if one of these narratives is missing, the proposal is highly subject to rejection.

Moreover Dr. Bob, shows the mind of a scientist when reviewing. In the quote below, he recalls a very good proposal that he came across a while ago, but is only able to recall the proposed method for data collection:

> *But there was one that came across my desk, which dealt with like, drones, and using, you know, drones in order to … I don't remember when this was and what was the end result. It was using drones, I think, to map and to use that information in order to model something I can't remember the exact details. But that was a really cool, really interesting and a very poignant proposal, because it ticked all the boxes, you know, and of course, it was freshly dumped with drones. And it met the criteria that you're looking for, for not just history, but coins as well. But remember, it got to the drones and surveying and using that as an end result for something, for modelling.*

Dr. Bob being a scientist in nature, remembers the uniqueness of the proposed scientific method, which highlights that scientists' attention is heavily stimulated by novelty in the science. He does not recall when the project was proposed and does not even remember the end result of the project, which brings to our attention that the uniqueness in methodology stimulates a scientist's inquisition as it shows that the applicant was thinking in an innovative manner. The applicant proposes a new approach to data collection that was not implemented before, which makes the scientific discovery journey intriguing and interesting to a scientific audience. This is the main

reason why Dr. Bob is able to only remember the methods used, as a scientist by nature, he is interested in scientific content, therefore showing the need for elaboration through an analytical plot to further convince a scientist of whether a research proposal is worthy of funding.

Novelty in a research proposal according to participants is complex to identify as it requires a clear narrative. As described by Dr. Linda who not only submits proposals for funding but is also a reviewer, being different does not mean significant:

> *The scientists need to write what he is going to do differently than others. He cannot just write what others did and he will make the same thing. This is not a proposal; this is a copy and paste project. They have to mention what is new/novelty in their research and they have to describe it very clearly. They have to mention that this thing was done by others but I'm going to do it in a different way, I am going to use another technique, I'm going to use another way of preparation or another way or technique analysis. Something has to be different and has to be important. We cannot just make it different by a simple way, like when we are cooking a cake. Yeah, like in making a cake of course we need water, so I cannot say when I make a cake, I want to make with water that is 37 degrees temperature and I want to make it different then yes, I will make cake with distilled water or bottled water. You know this is not a big difference and it will not make a big difference to the research and who cares if you make it from filtered water, or bottled water or 37 degrees, who will taste it?*

What Dr. Linda means is that for the research proposal to be considered novel, a scientist needs to identify what they will be doing differently than previous studies, and that difference needs to have a *'significant impact'*. As she articulates in the cake baking metaphor, water is tasteless hence no one will notice the change. The change in the scientific methods therefore needs to be noticeable and one that makes a significant difference as it could lead to the generation of new data, new discoveries or better results and understanding. She also implies that if this significance is not clearly identified, the proposal will be rejected. Dr. Linda also suggests that a repeated project that is not clearly novel suggests scientific incompetence, where 'a copy paste' job is just frowned upon. It shows that the scientist lacks drive, imagination and does not exert any effort to contribute to the scientific community. What she means by saying "who will taste it" is who cares about insignificant changes? Scientific research in

essence is the function of new discoveries, if a project does not present new discovery, then there is no point in investing and wasting everyone's time.

Novelty is very important to the research institute. Dr. Rowan, a proposal applicant introduced earlier, expressed that novelty is included in the proposal format and is mandatory to fill. He stressed that scientific novelty is very important to committee members as well as clients/ external funders:

> *For us here, the most important section is the innovation, because if you don't have innovation and your technology is not new, there is no point to propose the idea, because this will bring down our reputation. So, we have to be at a high level and stand out and look at others, and we always need to have novelty in our ideas to stay highly competitive comparing to others. Unfortunately, I have seen some proposals that have skipped this section, but this section is very very important for the researcher as well as for the institute in order to compete with others and stay on a certain level…So lately we had a novel idea that was granted as US patent. When you include those ideas in a big proposal, it will surely make a difference. When we go to external clients, they will be happy with these technologies and they will never have second thoughts in funding this type of project. So, this is what we should do: first go for the innovation, do something new, then submit a good proposal.*

According to Dr. Rowan, some scientists fail to write this section and hence would have great impact on the approval of their proposals. He also indicates that the use of new technologies, especially ones in which they have obtained patents creates an attractive narrative for funding as it shows the institute being highly aware of latest developments and is up to date with its competitors. What he means is that patented technologies generate trust that the selected methods are novel as they have been validated by a trustful external body (a patent office), therefore providing higher value to the methods section among the funding committee members or clients. Dr. Rowan also means that patents provide prestige as patents are given to *'one of a kind'* technologies/discoveries, thus providing an elite status for the institute, which contributes to the institute's reputation not only on a national level, but rather on an international level as patent application is a global exercise. This international reputation provides trust with clients that the institute is capable of doing the proposed work as they will be using a technology that is already internationally validated by an externally expert scientific body, which makes this narrative attractive to funders. It is important to note that by mentioning that most scientists fail to write this

section or skip it altogether, Dr. Rowan is implying that scientists are not trained on this format of writing and therefore do not naturally think of proposal writing as narrative, therefore he means that scientists think in a methodical format that they are trained for in writing and hence do not understand the value and power of narrative because they have not been trained on using it. The narrative on the other hand is very attractive to potential clients and funders, hence suggesting the notion for the need of such narrative as it creates a powerful connection with potential funders.

Another importance of novelty in scientific methods is that novelty is interesting. According to Dr. Rebecca, new ideas are interesting to see to a scientist. Scientists are inquisitive by nature, they are here on a journey to make new discoveries, hence presenting a new idea for discovery is considered very interesting to a scientist:

> *If it is a new idea, what's really very, very nice to see is something new, an idea that's really different and you would never think about, you know, the subject is really unknown. So, it will show you that this person is really thinking out of the box and he is smart because I believe that we don't all have the same capacities and thinking, yeah this is different. Some people are saying we are born with the same level of intelligence and talking about if you are smart or not, but no, I believe that people are different. And the level of you know, it's genetic, in fact. So, some people are really brilliant. They give you an idea that you say, oh my God, how this person came to think about this thing?*

Dr. Rebecca emphasises that novelty makes the reviewer believe that the applicant thinks differently, and novelty can lead to admiration as novelty can create the perception of brilliance of an applicant. What she actually means is that *'new'* sells, but also the extent of *'newness'* implies that a scientist is intellectually brilliant. Hence, she is referring to novelty as a stimulant that can lead to admiring the scientist's mind or way of thinking and hence generates trust that this scientist is very smart and would be capable of solving the intended problem because of his innovative way of thinking.

Dr. Rebecca also mentions that a scientist needs to follow the scientific trend in the field when approaching novelty, as scientific trends lead to publication. When asked about what she believes is good science she

mentioned that working on trends is very important because it not only leads to publication, but stimulates collaboration:

> *I like to work on science that is a trend, because I like to see publication. You know, I like publications. And it's important for the visibility of the place and of the country. It will, it will drive collaboration. And this is I believe that collaborating with other lab having additional expertise, this is what will make also you would work good, why not? Yes, that he is aware of everything going on in this field, and doing something that has a trend, and it could be published, because I really like to see publication after the project.*

Dr. Rebecca believes that publications are what carry a positive reputation for the institute as it presents international status. Also, trendy topics are more widely searched, hence increasing exposure of the institute. She likes proposals that are trendy, because the research results will lead to higher citations and hence more positive reputation. Dr. Rebecca also means that if a publication is produced in a trendy topic, many like-minded researchers will access it, therefore there would be a high chance of contact for collaborative work. In a sense, novelty is perceived by Dr. Rebecca as the gateway to more interesting and wider-scoped future projects, which would be a good narrative to include within the scientific merit plot as it generates a positive reputation for the institute.

In order to achieve data corroboration, I include an excerpt from an approved proposal that shows how novelty is communicated within a research proposal:

> *The proposed research represents an innovative concept that will enhance KISR's image both regionally and internationally and is expected to result in Intellectual Property (IP) and several publications…The proposed project is the first phase of a comprehensive research work on the developing biodegradable PHAs from waste materials. This project is considered to be an initial proof of concept on using different waste effluents to produce PHAs with acceptable physicochemical properties and also to optimise the production parameters required for the scale-up process. The outcomes of this research project will be used to develop three other projects that are related to applications of PHAs in areas of strategic importance to Kuwait, namely, biodegradable agriculture films, food packaging materials (Fabra et al., 2014), and most importantly PHAs for use in oil sector related materials (Hong-Kun et al., 2013).*

The scientist uses narrative to articulate how the proposed project includes novelty and explains how this novelty will impact the institute. He explains that this project would lead to the registration of intellectual property for the institute, which will provide a positive reputational impact on a regional and international level, therefore appealing to reviewers and committee members by explaining the benefits that would derive from such novelty. He also explains the importance of such novelty to several of Kuwait's industries using references from published papers to make his novelty case stronger, hence suggesting the need for narrative in order to convince committee members of the importance of novelty derived from the project and its proposed benefits not only on the institute itself, but to Kuwait's industry as being part of a larger aligned narrative as indicated earlier in the alignment section.

To conclude the scientific merit plot, an applicant should take into consideration that this plot is intended for a specific audience—scientists. As scientists' natural way of thinking is analytical, the scientific merit plot includes scientific methodical writing. While data suggests that the scientific merit plot allows for analytical processing, there is still evidence of the presence of narrative within the scientific merit plot where narrative stimulates memory recall based on the reviewers' or committee members' own experiences. This memory recall presents a contradiction to existing literature, which suggests that narrative transportation is what leads to memory recall (Green & Brock, 2000). Within the justification for selected methods and the description of novelty and innovation I also noticed the need for proven science, where the selected method needs to have been successfully implemented in past research. This illustrates the temporality effect introduced earlier in the results and how this temporality impacts the funding decision, which has not been discussed in existing science communication literature. Proven science provides justification for the selected method as it eliminates risk and demonstrates potential project success as the data yielded will generate trusted results.

The story of the scientific research proposal however does not end at the scientific merit plot. Committee members and reviewers indicated that an applicant must show the ability to achieve the proposed project. Meaning there is no point in writing a valid proposal, with great scientific potential, if the project cannot be properly

executed. In the following section I introduce and describe the final plot of the proposal's story: the achievability plot, where I show how it is formatted, its importance as well as its impact on the funding decision.

4.3.3 Plot 3: The Achievability Plot

The final section of a research proposal involves the project execution, or what I call in my study, the achievability plot. This plot involves clearly laying down the foundations of how the project is intended to be executed. A scientist therefore identifies the research team, the tasks required, the sequence of tasks, i.e., when they will be implemented and completed, identifies facilities and available/required resources, risks and risk mitigation, quality assurance and finally, reporting. The achievability plot serves the purpose of clearly identifying how the project will be executed and what measures are taken to properly manage this execution. This plot acts as the guide for project implementation that the research team will follow in order to execute the project on time.

When a monetary value is associated with decision making—especially when funds are scarce as described by participants in the study—a committee member takes other elements into consideration when making a final decision. Applicants therefore need to take many components into consideration when writing the story of science. A convincing story is very much needed as the proposal is a *'pitch'* to funding agencies that describes why this particular proposal is worth receiving funds. With that in mind, a scientist needs to be very meticulous about what needs to be said in order to attract funders and ultimately convince them of the proposal's *'worthiness of their money'*. Dr. Mathew stresses the importance of the proposal itself and describes it as a legal contract between the institute and the client as follows:

> *This proposal is like an agreement. In an agreement for a client, we use this proposal as a legal paper, a document. We submit this proposal to a client, and the client gave me a grant, we signed the papers…this proposal is a commitment it will be a legal paper. And a commitment of the PI to do this work, not to miss some tasks. And at the end, you will say I did this experiment and I failed in six years? You didn't plan very well your experiment.*

The notion of risk in scientific research proposals is clearly evident from Dr. Mathew's quote as he describes the proposed research as a legally binding document that is essentially a contract between the institute and the client due to the monetary value that this associated with the proposal funding. Dr. Mathew describes the proposal as being a high-profile legal document that requires serious dedication and management. Hence the notion of value

of service over money spent, and the stigma of project failure due to project mismanagement. What Dr. Mathew actually means is that a research proposal is a serious commitment to the client that cannot be taken lightly as it is a risk towards the scientist as well as the institute's reputation. One has to make sure that the proposal is well-planned in order to avoid risks of failure and hence disappointing the client. Risk of failure would be a risk to the institute as there are legal issues implied. Therefore, a proposal needs to be well written and the scientist is expected to be fully responsible and accountable when working on an approved project, consequently a proposal needs to be well-planned in order to avoid risk of failure. In essence, Dr. Mathew is indicating that a research proposal should be written in a manner that is as sound as possible in order to convince funders, as well written proposals reflect a clear thought process and projects a positive image of capability in management. Capable management in turn provides confidence in project success, which is essential to the client. Addressing risk will be seen throughout the entire proposal document. As analysed from participant interviews. Risk is considered the major communication concern within a scientific research proposal as it is addressed throughout the entire proposal document.

In addition to clearly identifying scientific methods, a scientist must also consider the risk perceived from project implementation. Being of futuristic nature, the project management section of the research proposal is in itself perceived as a high risk. As indicated by participants who are either proposal reviewers or funding committee members, even if a research proposal is well written, where the identified problem or research gap are believed to be instrumental, if the proposed management of the project is not up to standard or is not considered achievable, there is a high chance for the proposal to be either rejected or subject to amendments, that would lead to further delays.

Dr. Spenser is a mid-level scientist who has vast experience in the application for proposals. As described by Dr. Spenser, the achievability plot is considered very critical as it provides a clear indication of project execution capabilities:

> *In my knowledge, the most important section is the technical approach, and then the project description, cause that is the heart of the project. The technical approach and the scope of work are the heart of the project, because based*

on them we can have a successful or failed project. This is the most important for me, because anyone can write the introduction section, anyone can write this and it is my opinion. While the technical approach, the scope of work and the project description cannot be written unless you really know the project and you are able to execute the project, otherwise you cannot execute.

Dr. Spenser shows that there is a very deep connection between the technical approach (methodology section) and the scope of work section (project execution), suggesting that these two plots need to be matching. He also interestingly contradicts prior accounts from participants, by stating that anyone can write an introduction, while clearly, previous participants mentioned that scientists fail to write good introductions. This shows that there is a variety of opinions on what constitutes a good proposal and all of these opinions need to be consolidated in order to achieve writing a good proposal. He also mentions that the technical approach and scope of work are the heart of the proposal, therefore giving emphasis on the importance of the scientific content and project management content of the proposal, where committee members focus greatly on analysing this content to ensure a proposal is well written and is deserving of funding. Reviewers and committee members alike look for information that would be supportive evidence of project achievability. This means that in order to ensure a proposal to pass, evidence of achievability should be clearly communicated. This evidence helps reviewers and committee members by eliminating doubts. As explained earlier, a scientist is trained to think in an inquisitive manner as they contemplate solving problems. In addition, a funding committee member's job is to critique, and hence is obliged to communicate any doubts they believe would jeopardise the research project. Therefore, it is considered imperative to include several pieces of information in the achievability plot that would aid committee members in making a funding decision. In the following section, I identify the information required as proof of achievability, which are (1) related manpower i.e., selection of an expert research team, (2) a cohesive management plan with logical order of tasks and clear management of resources and finally, (3) quality assurance and risk mitigation considerations that would solve anticipated problems and not hinder the project's execution timeline.

4.3.3.1 Research Team Selection (Expertise)

One of the pieces of information committee members focus on is the selection of the research team. Execution of a research project is dependent on the team. The selection of team members is considered critical to committee members. Dr. Michael is a senior level scientist who is also a funding committee member. Dr. Michael is meticulous about ensuring the management section of the proposal clearly supports reducing the management risk by ensuring achievability:

> *Yes, this is one of the things I do usually research, the scientists yes. It is very important to see that the researcher has, let's say, expertise in this field or not. For example, sometimes that researcher might propose, let's say, very high ceiling objectives, so give account of the researcher because you can make some analysis whether the researcher can, let's say, achieve this maybe or not, based on the whole picture I see in the proposal. I have to look at other things supporting this researcher, let's say who's the supporting staff? What are the objectives? Do they match the expertise and the skill and the background and the qualification, let's say of the researcher?*

He describes how selecting the research team by paying attention to each individual's skills-set in relation to the proposal's objectives ensures that the team can indeed achieve what is intended in the proposed project. Dr. Michael describes the need to ensure the staff selected to execute the project are well-versed and experienced with the tasks at hand, which in turn leads to trust of achievability of the project. By stating that he looks into the bigger picture, Dr. Michael iterates that the proposal is viewed as a grander overarching narrative, in which each section is tied to the other. This is not a standard scientific method of writing, but I see it as rather a connected narrative that is methodically analysed to make a well-rounded funding decision. This suggests the notion that communication within a research proposal is complex and making a funding decision requires complex analysis from committee members. It is not an easy task to write a research proposal, nor is it an easy task to review it. Accordingly, the management section of the proposal is considered very important by the committee members as emphasis is on ensuring achievability. Achievability in turn reduces anticipated risk and it is therefore imperative in a proposal to narrate how perceived risk from managing a scientific research project can be reduced in order for funding committee members to make better informed decisions. This can be achieved by ensuring the correct team members are selected where their expertise *'fits'* the identified tasks. This provides assurance to the

committee member that selected staff *'can do what they say will be done'* i.e., the selected team is has competent expertise to execute the project.

The excerpt below from a submitted proposal illustrates the importance of team selection and the narrative used as a justification for project management capability:

> *Project Leader's experience includes industrial wastewater treatment and sustainable energy. The project research staffs, professionals and technicians have the necessary experience in successfully conducting many wastewater research projects and the necessary qualification in the field- as well as laboratory-scale testing and analysis. With the proposed project team a sound study will be conducted.*
>
> *Relevant Project Experience*
>
> *Recently, renewable energy sources and energy generation from waste are getting attention worldwide. There are different applications of using anaerobic digester for energy generation around the world; however, similar systems have not been used in Kuwait. Similar researches were conducted by Montgomery and Benedict where wastewater was used to generate energy using anaerobic reactors (Microbial Fuel Cell). Furthermore, Montgomery and Benedict conducted a study to produce Hydrogen from wastewater using Microbial Electrolysis Cell.*

The scientist also mentions relevant projects that the proposed team has worked on in order to establish trust in the capabilities of the team to execute the project confirming to the funder that the selected team is indeed capable of delivering the proposed project as they have delivered similarly in the past. This shows the importance of the temporality factor I talked about earlier in the results and how the past is used to justify achievability of the future project.

4.3.3.2 Order of Tasks and Management of Resources

Reviewers and committee members also focus on the order of tasks to be executed. Presenting tasks in a logical and sequential manner is part of the scientific methodical format. Scientists write experimental work in a scientific format and also reflect how they will perform this experimental work in a scientific format. As indicated by participants, tasks are closely tied with the methods and research objectives. Ensuring that tasks reflect the objectives and methods is critical to the instil trust in achievability of the project. As indicated by Dr. Adrian (a

senior scientist and funding committee member), the project execution steps follow the objectives and these steps must follow a logical sequence:

> *Each task has to be related to the objective of the proposal. We have objective later to three, when we have output two, three, those the methodology, of course, normally they have the first task, which is mobilization, we call it normally preparation, if we need the equipment, you need material chemicals, formalities, and then you have the last one which is report writing. In between, each task has to reflect the objectives that you have. So, maybe task two, three is for objective one, task four, five is for objective two, and also the output rejected has to be related to output. For example, I want to say data, you have to generate data for a specific area, you have to say the output is data generated. Scientists' backgrounds is important to ensure different skill sets are used in the right task.*

Dr. Adrian addresses the need to match the proposed tasks with the research objectives and outputs, where the tasks are considered an extension or continuation of the research methods selected as they identify the persons who will be handling each task to its professional completion via their related competence. He also focuses on the need for a logical sequence of tasks, where he mentions the mobilization task as the one that is usually identified first, and reporting as the final task. When Dr. Adrian mentions the order of tasks and gives examples of the first task being mobilization and the last task as reporting, he is drawing from his own experience as a scientist who has written research proposals. This logical sequence is engraved in his brain from his own research and proposal writing experience as he is trained to write in a methodical format as a scientist, hence looks for this type of writing within the research proposal and analyses it in order to make a funding decision. This proves that plots within a research proposal follow a mixed format, which function as emotionally stimulating as well as analytically stimulating committee members into making a funding decision.

The excerpt below shows how the achievability plot is written within the research proposal where I highlight the project execution plan in terms of order of tasks.

> ***PROJECT EXECUTION PLAN***
>
> ***Scope of Work***
>
> *The project is composed of five tasks including mobilization, sludge collection and analysis, operation of anaerobic digester, data analysis, and reporting. Each of these tasks is briefly described below.*

Task 1: Mobilization (12 mo)

The process configuration of the anaerobic digester reactor (ADR) system will be conceptually based on the schematic diagram shown in Figure. A1 in Appendix A. The aforementioned pilot test unit will be designed and a technical tender specification for the unit will be developed during this task. Each part and component of these units will be especially designed, physically constructed, equipped, and instrumented for testing and handling sludge.

Task 2: Sludge Collection and Analysis (6 mo)

In this task, different sludge samples from three wastewater treatment plants (Kabd, Al-Riqqa and Umm Al-Himman) will be collected weekly for 6 months. The main aim of sludge analysis is to establish a database for sludge characterization in Kuwait. Two sludge samples from each treatment plants will be collected once a week for 6 months.

Task 3: Operation of Anaerobic Digester Unit (18 mo)

During this task, anaerobic digester will be operated to evaluate sludge treatability and the beneficial utilisation of sewage sludge for electricity generation. The operating parameters of the digester must be controlled to enhance the microbial activity and thus increase the anaerobic degradation efficiency of the system.

Task 4: Data Analysis (16 mo)

During this task, the obtained data will be used to assess the performance of anaerobic digester for sludge treatability and electricity generation. Gas volume and energy generation will be calculated, assessed and analysed.

Task 5: Reporting (3 mo)

Two annual progress reports will be submitted to highlight the progress and technical findings of the project. Final report of the project will be submitted at the end of the project to KISR and the funding agencies and will include description of the technical outcomes of the project, results obtained, recommendations and conclusion.

It is important to note that the execution plan is organised thoroughly in terms of logical sequential tasks. The first task is mobilization and the last task is reporting, which corroborates participant interview accounts of task order expectations.

As indicated by participants, the achievability plot is finally considered as a plan. This plan is a roadmap that demonstrates how the applicant will manage the proposal execution in terms of budget allocation, time management and availability of resources.

As Dr. Nicole (a proposal reviewer) describes, committee members and herself pay attention to many components within the management section of the proposal, the first being the budget. While the budget is presented in a technical budget sheet, according to the institute's format that has to be followed, Dr. Nicole mentions that the applicant must write a justification for each item requested in the budget:

> *Budget should be fair, it should not be like you have added a lot of money for the consumables, and you have missed money for the car rental without your car, how are you going to collect your samples. So that distribution should be even sometimes people put a lot of money for the manpower, which is also not justified.*

As mentioned earlier, the importance of format when writing a research proposal, we clearly see that the management section, especially within the budget sheet is split into both narrative as well as methodical writing (the budget sheet itself). As scientists are all trained on using the standardised budget sheet, Dr. Nicole then is able to draw from her own experience to understand whether the allocated budget is considered fair. What she means by fair is that she relies on the scientist's budget justification in order to understand why certain funds have been allocated for certain items, implying that fairness cannot be measure or standardised but is rather determined through proper justification that is narrated by the applicant.

She continues:

> *And then second place comes the technique and how are we going to achieve it? How realistic is the question and how realistic is the achievement of this project? To see project implementation is of course, very, very important. And it I will of course, consider this while making my decision, because sometimes some researchers, they will, you know, they will follow very uneven distribution, like they will give a lot of time for mobilization and the small tasks the pilot study or like that type of tasks, and the main core of the project and the main tasks they divided, they give it a very short time like one month. So, that is not a balanced way, you cannot achieve everything in just you know, one month's time. No, you have to be fair, you have to distribute it evenly. This is going to be a very important for me if to make a decision whether what they are mentioning is achievable within the same period of time or not. A*

plan means you know, like, all the tasks are well defined. How the first task for example, mobilization: how much time will it take for getting the chemicals and these things, the reagents, all these things then they had mentioned about their project team, which people will be working in it, who will be taking care of the technical part, who will be taking care of the managerial part who is going to participate in report writing. And for each experiment, also the tasks were well defined that the time period was well defined. So instead of simply just collecting all the information and putting it in paper and submitting it as a proposal, I would suggest to follow a proper plan.

Dr. Nicole also emphasises that managing time is important as it helps manage expectations of project execution timelines with clients. The ability to manage people's working hours by distributing workload also provides confidence that the proposal will be completed on time. She also stresses the importance of allocating proper time for each task to be completed. Because she is an experienced research scientist, she is able to recall from her own experience how much time is required for certain tasks. She explains that applicants sometimes miss the mark when it comes to time allocation especially in tasks that are known to either take a short or large amount of time and this is a mistake that cannot be made. This indicates that time management is an acquired skill that is learned based on experience in the field and is rather not taught to scientists, making proposal planning a challenge for scientists. Selecting realistic workloads and allocating correct durations for tasks then becomes essential when writing a research proposal as it develops trust of timely project completion and proper allocation of resources.

In terms of budget expenditure and providing detailed justification, Dr. Natalie (an applicant) mentions the need to include pricing for each and every component requested within the budget:

Tell them exactly what you are going to spend. I need, let's say for the service this much money, I need for the lab supplies this much money. So, you show them exactly, you break down your budget in front of them. So, it makes it easy to understand, let's say for traveling, when I say traveling that means you might need to go to a conference within this project, or you need to send some samples outside because sometimes if you don't have, of course, we don't have all the instruments at our institute so sometimes you need to do this outside. Or sometimes you need to do your quality control or quality assurance. So, you need to send your samples to somewhere else where they can just test the sample again. So, if you just break down your budget, that makes it easy.

Providing a detailed breakdown per item allows for clear justification of how the money will be spent and hence creates a sense of ease with the committee that the money will be spent in a sensible manner, this is what is meant by fairness. Providing details again is not something scientists are taught to do, but as Dr. Natalie is reporting from her own experience with committee members, she explains that this is what committee members like to see and what is comprehendible to them.

Dr. Nelson on the other hand is a mid-level scientist who has submitted several proposals and has been very successful in receiving funds. He highlights that reviewers comment on the budget due to their own experience in application for funds:

> *They will have an opinion whether the budget you are asking for is on the right spirit or are you asking for a very high budget for no known need? This also they will give opinion from the reviewer because reviewers are also doing a lot of other proposals, they know what is the cost of this particular the equipment or the software.*

Dr. Nelson uses the word spirit to explain his point about budget allocation. What he means is that there is no definitive format that is followed to justify budget allocation. Budget allocation is rather considered an estimation based on practice that later comes intuitively to a scientist as they become experienced with project execution and proposal development. The above quote from Dr. Nelson shows that scientists draw back from their recollection of experience when reviewing proposals for funding approval. Therefore, the narrative of budget allocation should take into consideration the analytical processing that a scientist goes through when evaluating a research proposal.

The following excerpt from an approved proposal will be used to illustrate how a scientist addresses managerial aspects within the proposal narrative:

> ***Corporate Capabilities***
>
> *The Wastewater Laboratory, WRC at Sulaibiya Research Plant (SRP) has all instruments necessary and the trained manpower to carry out the proposed laboratory analyses. Moreover, the trained manpower and equipment available at the WRC Shuwaikh laboratories can contribute also for additional tests for the collected samples when needed. Software like MS Excel, SPSS will be used for data analysis and graphical presentation of raw data and the analysis results.*

The narrative above explains the available resources in terms of labs and software to be used when analysing the data. This narrative is non-scientific and is used as a justification tool for ability to conduct the research via available resources:

Staff Qualifications and Role in the Project

Category/Name	***Expertise***	***Role***	***FY 2020-21 (MM)***	***FY 2021-22 (MM)***	***FY 2022-23 (MM)***	***Total (MM)***
Researcher						
[redacted]	*Environmental Engineering*	*PL, TL-4,5, TM-1,2,3*	*1.1*	*2.5*	*0.5*	*4.1*
[redacted]	*Mechanical Engineering*	*TL-3, TM-1, 4, 5*	*0.8*	*1.0*	*0.2*	*2.0*
[redacted]	*Environmental Engineering*	*TL-1, TM-2,4*	*0.3*	*0.5*	*0.3*	*1.1*
[redacted]	*Environmental Engineering*	*TM-1*	*0.5*	*-*	*-*	*0.5*
[redacted]	*Environmental Engineering*	*PI, TL-2, TM-4, 5*	*0.5*	*1.0*	*0.5*	*2.0*
		Total	***3.2***	***5.0***	***1.5***	***9.7***
Professional						
[redacted]	*Environmental Engineering*	*TM-1, 2, 3, 4*	*2.5*	*2.5*	*1.0*	*6.0*
[redacted]	*Mechanical Engineering*	*TM-1, 3*	*0.8*	*0.8*	*0.4*	*2.0*
[redacted]	*Environmental Engineering*	*TM-2*	*1.0*	*1.0*	*-*	*2.0*
[redacted]	*Microbiologist*	*TM-2*	*1.0*	*1.0*	*-*	*2.0*
		Total	***5.3***	***5.3***	***1.4***	***12.0***
Technician						
[redacted]	*Sampling and Analysis*	*TM-1, 3*	*2.0*	*1.0*	*1.0*	*4.0*
		Total	***2.0***	***1.0***	***1.0***	***4.0***
Operating Research Support						
[redacted]	*Chemist*	*TM-2, 3*	*1.0*	*2.0*	*1.0*	*4.0*
[redacted]	*Chemist*	*TM-2, 3*	*1.0*	*2.0*	*1.0*	*4.0*
[redacted]	*Microbiologist*	*TM-2, 3*	*1.0*	*2.0*	*1.0*	*4.0*
[redacted]	*Sr. Secretary*	*TM-1, 5*	*0.5*	*-*	*1.5*	*2.0*
		Total	***3.5***	***6.0***	***4.5***	***14.0***

PL: Project Leader; TL: Task Leader; TM: Team Member; MM: Man-Month

On the other hand, detailed technical resources are presented in a scientific format i.e., tables to show staff involvement, qualifications and roles to provide further elaborative details that are required for the funding committee members/reviewers in order to ensure trust in the selected team and make a funding decision. The budget section consists of two portions, the first being the budget sheet, which is the format used by all scientists at the institute and is the format that committee members as well as reviewers are used to reading. It is a standard form used at the institute that needs to be meticulously filled out. The second part however, is the budget justification, which follows a narrative format. I show excerpts of both budget portions and explain their use for funding decision making:

Project Budget

Description of Category					**KD / FY**			**Total (KD)**
					FY 1	**FY 2**	**FY 3**	
A. SALARIES								
Items	**MM / FY**							
	FY 1	**FY 2**	**FY 3**	**Total**				
- Researchers	3.2	5.0	1.5	9.7	[redacted]	[redacted]	[redacted]	[redacted]
- Professionals	5.3	5.3	1.4	12.0	[redacted]	[redacted]	[redacted]	[redacted]
- Technicians	2.0	1.0	1.0	4.0	[redacted]	[redacted]	[redacted]	[redacted]
- Administration	-	-		-	-	-	-	-
- Support Labor*	-	-		-	-	-	-	-
Sub Total	10.5	11.3	3.9	25.7	[redacted]	[redacted]	[redacted]	[redacted]
- Operating Research Support (ORS)**	3.5	6.0	4.5	14.0	[redacted]	[redacted]	[redacted]	[redacted]
TOTAL SALARIES (I)					[redacted]	[redacted]	[redacted]	[redacted]
B. OPERATING EXPENSES								
- Fuel					-	-	-	-
- Communication					-	-	-	-
- Rent & Leasing- Jeep [redacted]					[redacted]	[redacted]	[redacted]	[redacted]
- Repair & Maintenance Equipment					-	[redacted]	[redacted]	[redacted]
- Operating Fees					[redacted]	[redacted]	[redacted]	[redacted]
- Consultant Fees					-	-	-	-

Description of Category	KD / FY			Total (KD)
	FY 1	FY 2	FY 3	
- Software Fees	-	-	-	-
- Experimental Lab Supplies	[redacted]	[redacted]	[redacted]	[redacted]
- Printing, Advertising & Trans.	-	[redacted]	[redacted]	[redacted]
- General Supplies	[redacted]	-	-	[redacted]
- Travel & Transport	-	[redacted]	[redacted]	[redacted]
- Miscellaneous Expenses	[redacted]	[redacted]	[redacted]	[redacted]
- Publication Costs	-	[redacted]	[redacted]	[redacted]
- Capital items Return to Clients	-	-	-	-
TOTAL OPERATING EXPENSES (II)	[redacted]	[redacted]	[redacted]	[redacted]
C. CAPITAL EXPENSES				
- Research Equipment	[redacted]	-	-	[redacted]
- Machinery	-	-	-	-
- Vehicles & Vessels	-	-	-	-
TOTAL CAPITAL EXPENSES (III)	[redacted]	-	-	[redacted]
TOTAL DIRECT COSTS (I+II+III)	[redacted]	[redacted]	[redacted]	[redacted]
BR Name: **BR Signature:** **Date:**				

While the budget table shows all associated expenses of the project, applicant scientists also use narrative to justify certain amounts required within the budget:

Budget Justification

The total cost of the project is estimated to be KD XXX. About 21% (KD XXX) of the total cost goes to the capital expenses. In addition, about 46% (KD XXX) of the total cost goes for salaries, and 33% (KD XXX) for operational expenses.

Capital Cost: KD XXX exclusively for purchasing anaerobic digester pilot plant, gas detector and Gas Chromatography (GC), which is required for the gas analysis. Laboratory Supplies: KD XXX will cover the required chemicals for the sludge samples analysis and gas chromatography columns. Operating Charges: KD XXX will be used for installation the unit and external analysis. Repair & Maintenance Equipment Charges: KD XXX will cover the estimated cost of site preparation and mobilization. This includes mechanical, electrical, and

civil works to prepare a suitable space to accommodate the research facilities. Petty Cash cost is required to accelerate the processing of low-value purchases, which are not exceeding KD XXX per day, throughout the duration of the project. Two cars are needed for this project to collect sludge samples from three treatment plants (Kabd, Al-Riqqa and Umm Al-Himman).

Narrative as illustrated above is used to clarify why certain amounts are required by further explaining purchases in relation to the project execution requirements. For example, in the budget sheet, we only see a row for amount for equipment, but this row doesn't specify what type of equipment is required and for what purpose, especially given that the scientist had previously mentioned that there are labs available that would help in executing the project, so why is budget required for purchase of equipment? The scientist specifies that he needs to purchase a digester plant which functions specifically to serve gas analysis, which is one of the major tasks under his methods section. Therefore, narrative in the budget justification section is used as a persuasion tool to explain what certain amounts in the budget will be used for and is used to connect the scientific plot with the achievability plot.

4.3.3.3 Risk Mitigation and Quality Assurance

The final component discussed in the achievability plot is risk and quality assurance. As indicated earlier that proposed research in itself is perceived as uncertain participants in the study express this notion by highlighting the importance of clearly indicating risks within the proposed research and how the scientist plans on mitigating those risks.

Dr. Mathew addresses the inclusion of risk mitigation when writing a proposal:

Another important thing in proposals should be risk assessment. Risk Assessment means that they put good risk assessment that means this guy is a good planner. I see they thought about the risks and the execution of the proposal and these risks really make him aware, make him prepared, have Plan B in such a way that if Plan A is not working in that task, a particular task then he can use Plan B and he can inform me, the client and everybody in upper management. The risk is often supply of sometimes chemicals, sometimes breakdown of an equipment, or the maintenance or the lab is not maintained, it's not safe. It was under service and broken down and these are the risks that the researchers should be aware of. And most of researchers are not aware of it.

Dr. Mathew highlights the importance of understanding risk as it illustrates the applicant as a good planner. What Dr. Mathew actually means is he perceives the applicant as a good manager, one who is able to anticipate problems and will be ready to solve them in order to deliver the project on time as promised. Risk mitigation is used to show the ability to achieve by taking into account worse case scenarios and understanding how to mitigate them. Risk mitigation then becomes included in the narrative of timely submission and management of expectations. Dr. Mathew also draws to my attention the recollection of his own experience with one of his projects, which was delayed out of his own control. This recollection of events is now engraved in his memory and he recalls this experience when reviewing proposals, therefore emphasises the need for risk mitigation based on that experience. Risk mitigation becomes a reflection of not only the scientist, but also reflects on the institute being able to keep its promises to clients through timely project delivery.

Quality assurance is also an important element to consider as per Dr. Rowan's (a mid-level scientist) opinion:

> *Finally, each proposal should be prepared with a quality plan, and for this you need to have a laboratory with the highest standards, because then no one will suspect the calibration of the instruments, and all the methodologies we are adopting in the proposal will be based on those internationally acceptable standards, so every member will follow that protocol in the proposal.*

Dr. Rowan stresses that quality control within the proposal provides validation that the data produced form the proposed research will be reliable and up to par with international standards. Therefore, eliminating doubts about data generation and validity of research outcomes. The main aim of the institute then becomes to produce research that is of international quality and that is accredited. Quality is also considered a reputational element as it highlights the applicant as well-versed with international standards and hence reflects on the institute's international image, making it a reliable source of scientific research with quality output.

The following excerpt illustrates how quality assurance is written within a research proposal:

> *Quality Plan*
>
> *Laboratory analysis will be conducted at KISR-WRC SRP laboratories that are ISO 9001:2008 certified. The analysis will be conducted using standard procedures as outlined in the Standard Methods for Water and*

Wastewater Examination [24] and the American Standard Testing Methods [25]. All the necessary equipment are calibrated, inspected, and quality assured routinely. Parameters analysis methods are listed in Table 5. Calibration periodicity will be different for each parameter examination in accordance with requirements of applied method. Project activities will be delegated to qualified team members who have appropriate experience/training. Moreover, all reports will be submitted to reviewers for evaluation. Quality of the analytical results will need to be proved by monitoring proper quality controls values during analysis (as described in the reference method). Blanks and duplicate samples will be analysed and checked across outside laboratories to ensure data quality and precision.

The scientist explains how quality assurance is incorporated within the project. The main focus of the assurance is to ensure data quality and precision, hence ensuring that the proposed data is reliable and correct. By explaining multiple aspects of quality assurance procedures, the scientist shows thought into ensuring experimental work will yield reliable results, hence reducing perceived risk in quality of output.

To conclude this section, I have arrived at the understanding that the achievability plot is an indicator of the ability to achieve a research project as promised. The achievability plot also signifies competence of the research team in relation to their expertise hence eliminating risk by demonstrating competence to fulfil tasks. Existing science communication literature focuses on developing trust in the communicator (Lupia, 2013; Yuan et al., 2019; Battiston et al., 2021) by showing scientific authority (Lupia, 2013; Scheufele, 2013; Yuan et al., 2019), however my results build on this notion by suggesting that creating trust in the scientist is generated comprehensively by showing a well-planned project that is achievable. Achievability plots are also considered a detailed plan where scientists provide committee members details such as clear budget utilisation as well as allocation of time and resources in order to properly execute the proposed research project. Identifying risk shows the applicant's consideration of elements that need to be mitigated in order to deliver the project as per the agreed timing. Finally, quality assurance provides trust in the reliability and standards of work to be produced which ensures a positive image for the institute. The achievability plot is closely knit with the scientific merit plot as tasks are derived from the methodology section, therefore producing cohesive sections that are analysed critically by committee members. While I have discussed proposal content, participants unveiled a very contradictory characteristic that influences the funding decision. Regardless of content, proposal document format showed to

be of great importance to reviewers/committee members. According to participants, a proposal not only needs to present a good story that is supported by analytical sections, but also needs to be aesthetically pleasing in order to secure funding. I present this finding in the section below.

4.4 Aesthetics: 'Looks Matter'

The proposal format is an essential part of communication at the institute. As described by participants, each section involves a different parameter that is explained. Therefore, understanding the sections and figuring out what to say under each section becomes critical to the success of proposal writing. The complexity of information is also determined in the proposal format, while the applicant needs to consider their audience and complexity of information required for each member according to level of understanding and expertise of the committee members. This also applies to presenting scientific information or experimental design, how and where information is included within the proposal sections. Another aspect that is considered is the language used within the proposal in terms of spelling and punctuation. Paying attention to language use and the flow of the proposal as well as including the correct information are considered important as will be illustrated below.

Dr. Aron is a junior scientist and applicant for funding. As expressed by Dr. Aron, when applying for funding, explaining to a diverse audience requires simplification. He tries to simplify scientific terms by using diagrams and figures that can be easily followed rather than explaining in complex scientific terminology:

> *Let's say, as I mentioned that, sometimes when you just go and write in scientific form, scientific words, not every reader can understand what I try to say. But if you can simplify and write numbers, let's say that you can simplify or at least write a paragraph or draw a diagram or draw as a symmetric diagram. That simplifies what you want to say to the readers. That would be very good or very useful, very useful, useful ideas, to simplify it for the readers… I will try to simplify my idea. I don't want to use a very, let's say, a deep scientific phrase. I'm trying to simplify everything, I usually use figures, diagrams, to explain to them.*

Dr. Jane highlights the use of diagrams, which can help non-specialised audiences understand the proposed project more clearly:

> *Especially the schematic diagrams, they will help. If they are not from your area, then the pictures, will help because that will be more understandable.*

Dr. Aron and Dr. Jane express that complex terminologies can be difficult to comprehend to individuals are not specialised in their fields. Rather than using complex terminologies, they convert these into diagrams and pictures, which can explain the terms in a comprehendible manner that is easier to digest.

Dr. Beth on the other hand is a senior scientist who applies for funding. Dr. Beth uses the metaphor of marriage to explain that the proposal needs to be presented very well in terms of language in order to make a good impression on reviewers and committee members:

> *The material should be sound in terms of language. In a way, it's like someone who wishes to get married. You will see him taking care of his clothes, looks and everything in order to be at his best. What I mean is, everything should look at its best to reflect your work. If I present a good idea, but that idea is not well written, it will not reflect with the reviewers.*

What Dr. Beth means is that a proposal not only needs to be well structured in terms of content, it also needs to be very well presented in terms of professional language and aesthetics. If a proposal is aesthetically and linguistically appealing then it reflects professionalism with committee members, and hence would encourage the funding decision. In a manner, the proposal is a reflection of the applicant. If the applicant presents or writes in a well-structured manner that is aesthetically appealing, this generates confidence with the committee members that the applicant is professional. Metaphorically, we can say, a proposal acts as a first impression of its writer.

Dr. Eric—a junior scientist, believes that telling a story helps in making committee members clearly understand the proposed research:

> *A good story with nice figures. Yeah, I need that, certain simplified stories. Yeah, and the more technically complicated I think nowadays, that you can tell a story, really, really telling your story. And it's such a good thing that, if you can't explain it, simply, you will explain that you will do the complex, complicated part. If you can really explain simply, I mean, that's a really excellent proposal… I can serve you spaghetti on a beautiful plate, add the dressing and present it in a neat way. I am sure you will eat it with joy. But if I serve you spaghetti in a plastic plate in a haphazard way, you may not touch it, because you would go for the first plate. This goes to show that your acceptance of the well-presented plate will be much higher.*

Dr. Eric explains that being able to tell a compelling story that simplifies the complexity of the proposal produces an excellent document for the committee members audience as it is more appealing. He stresses that technical complexities are difficult to communicate, hence a story would help in getting important points across where models and figures are supported by strong narrative. Dr. Eric uses the metaphor of a spaghetti plate to explain that if a proposal is well presented in a format that is appealing, committee members would be more likely to accept the proposal. This is troubling because in essence what Dr. Eric is indicating is that a proposal needs to be aesthetically pleasing in order to get approved and proposals that don't *'look'* appealing are subject to rejection. Dr. Samantha—a mid-level scientist also indicated that using the correct font and font size gives an impression of capability to handle larger things and not doing so gives an unprofessional impression to reviewers:

> *Sometimes, they comment on not using the required font, page layout, as if to tell the researcher that he is not paying attention to the basics, so how are you going to get on with the big things. I have someone at the Institute who is a hard worker and conscientious. When she presented her presentation, I told her why are you not paying attention to these minor things despite your long experience with us. She used the wrong font and the wrong font size.*

Dr. Samantha brings to our attention that institutes have proposal formats that need to be followed. Compliance with formats shows professionalism via attention to details. This attention to details implies professionalism of the applicant himself, therefore providing a positive impression that the applicant will be detailed when it comes to the proposal implementation phase.

Dr. Maxwell, a committee member who is a non-scientist mentioned that although he doesn't understand the complex scientific aspects of the proposal, he is very decisive about the management aspect of the proposal. He also mentioned that he pays attention to the overall presentation of the proposal in terms of writing, length and aesthetics, meaning that the *'aesthetic'* part of the proposal is also important when developing a research proposal:

> *Is the project description long or short, does it, let's say the cosmetics, so unless we see something really that contradicts knowledge or basic science—that we can address. I try to focus on the quality of the writing, on the length, because I think a proposal should not exceed 10 to 15 pages, even though I sometimes see proposals that*

come in 60 to 70 pages, who will read them? I always say state the problem, what you are doing, and how you're going to address it, but don't give me a lengthy introduction, lengthy review of literature, that's what I focus on.

During our conversation, Dr. Maxwell explains that being of a non-scientific background, evaluating a proposal from a scientific perspective becomes a very difficult task as he cannot be well-versed with a scientific discipline under a very short period of time. This in turn makes the task of evaluating the scientific proposal in terms of suitability of methods selected difficult, but he might be able to identify issues related to basics of science. Dr. Maxwell rather focuses on the "cosmetics" of the proposal where he describes the adequacy of length of certain sections and whether the management section—as in the tasks are well thought out and are written in logical and coherent sequence.

Dr. Nicole is a mid-level scientist and is a reviewer of proposals. As a reviewer, she stresses the importance of having a cohesive proposal that flows:

First of all, the person who wrote was not very good in writing, or his English was very poor. So, whatever was written was making no sense. And they had literally mixed the technical part with the introduction part. I mean, everything was, you know, like very miserable. And there was, I mean, it did not follow a proper pattern, no introduction, no background, everything was mixed, that the person had given all the literature review in the methodology section. So no, this is not the way, you don't need to describe the literature or the background study in your methodology. So, it was not at all nicely written. It had no chance, I mean, it wasn't making no sense. I could not understand anything from it and I had to, you know, reject that…A bad proposal means it doesn't have a proper story, it doesn't have a proper connection… it will be poor if it is not having any structure, no background, no information, no budget, everything is simply you know, mixed, or simply just put in on paper because you just want to show that you are doing a proposal.

Dr. Nicole highlights the importance of language and order of content, emphasising that a well written proposal makes it easier to understand and follow. On the other hand, proposals that are not well written will have to be rejected.

Therefore, proposals that are visually appealing provide the perception of professionalism, regardless of whether the science is sound or not. Participants whether applicant scientists or committee members both agreed

that visually appealing proposals have higher chances of obtaining funding as they become easier to follow. Reviewers don't have time to *'fish out information'* i.e., they do not have time to look for information, it needs to be clearly organised and well stated in order to ease the comprehension process. A good proposal follows a format that is comprehendible and is succinct in terms of content and language as it allows the reader to follow the story in a manner that makes sense. The use of simplified descriptions, pictures and diagrams is also useful to simplify content for non-expert audiences. Proposals that are aesthetically pleasing and that follow a succinct writing format are more accepted for approval. This notion contradicts all sections (1) and (2) discussed above that focus on emotional and scientific content. If a proposal is (3) not aesthetically pleasing and not properly formatted it could be rejected regardless of the content. This creates a problem for applicants as proposal review appears to be very contradictory and attention to details such as proposal format, spelling, grammar and fonts have an influence on funding decision making.

To summarise this chapter, I suggest that due to the diversity and complexity of the audience of research proposals, there is a need for distinguished writing styles within the research proposal itself, which has not been mentioned in science communication literature. Although I view a research proposal as a story, the story is much more complex in nature and therefore requires further details that need to be addressed in a strategic format. Because the audience discussed has a unique responsibility of allocating funds, their job dictates the duality of being a scientist as well as a manager. These two distinctive roles make it imperative to include communication modes that address both roles in order for the funding committee member to be able to make a well-informed decision, which can be achieved by developing multiple plots within a research proposal that provide a cohesive story. As the story of research proposals is futuristic in nature. Results are presumed to be successful, but are not guaranteed. Due to this implied risk, temporality throughout the proposal document is used as a justification tool to support the applicant's decisions. The use of temporality as a justification tool is evident in all three plots, where literature review is used to justify problem and solution identification, temporality is used in the methods to justify methods selection and finally temporality is used in the achievability plot to justify team selection and allocation of resources and quality control and assurance. The proposal document then becomes a complex

narrative that is supported by temporality in order to reduce perceived risk and attract funding. The proposal format includes both (1) narrative as well as (2) methodical writing. (1) Narrative is used to stimulate emotional connection and beliefs that are aligned with the intended audiences, while (2) methodical writing stimulates analytical processing of information in order to ensure scientific content is acceptable and that proposal management leads to achievability. I also conclude that the proposal needs to be (3) linguistically and logically cohesive in a manner that flows and that is aesthetically pleasing. Although science communication literature discusses the importance of using language (Marlar, 2010; Banks & Di Martino, 2019) and the use of diagrams (Bigg, 2016) to simplify ideas for the general public or policy makers (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021), it assumes that expert scientists as an audience do not face an issue with language nor presentation, which is an argument presented by this study's data. This study also suggests that scientific content that is not aesthetically pleasing is subject to rejection as it constitutes issues of trust in the science communicator, which has not been detailed in previous science communication literature. As indicated by participants, proposals that are not well structured nor are aesthetically pleasing, have lower chances of obtaining funding. Therefore, the proposal document can be viewed as a well-structured story that ties together all proposal components into a narrative that is easily comprehended. Good proposals demonstrate (1) the proposal's validity, (2) its scientific merit, and (3) its achievability. Good stories are also enjoyed and enjoyment is key to a desirable funding decision because stories are more (4) engaging, are (5) more palatable in terms of structure and hence save time to go through. And finally, (6) a proposal needs to look aesthetically appealing in order to obtain approval.

As proposals are presented to committee members in this case study, in section 4.5 (the final chapter of the results), I discuss how proposals are presented in terms of science negotiation. How are presentations prepared? What happens during the committee meeting, and how does the *'proposal pitch'* influence the funding decision? These questions will be discussed below.

4.5 Science Negotiation Performance

In addition to developing a story that contains multiple plots, and that is aligned with its audience, a researcher presenting a scientific proposal as described by participants, is essentially participating in a *negotiation exercise*,

which depicts the use of performance theory, namely dramaturgy, in science communication. As will be further explained in this chapter, the applicant scientists are found to be (1) performing in front of this live audience of funding committee members depicting a clear *'interaction'* that needs to be maintained where the story is altered/reshaped based on this interaction, and (2) must prepare thoroughly for this performance in a *'backstage'* setting. In essence, scientists are performing the story to a complex audience, and in turn, prepare for that performance in a manner that helps to better articulate the story of their research to their subject audience. I have also found that the audience themselves also prepare for this meeting—meaning that the audience (being the recipient of the story) does not only wait to hear the story, but also prepares to hear the story in its live performance. Participants who are committee members described how they prepare for the meeting by thoroughly reviewing the written proposal, conducting an online search of the topic to be discussed, and preparing questions to be asked during the meeting, while also flagging issues within the proposal itself that would be clarified in person during the meeting. Therefore, preparation by the audience unveils that the audience themselves come into the meeting with a preconceived understanding of the story based on reading the proposal, which creates a challenge for the storyteller who needs to convince the audience of his proposal—live, when some committee members have preformulated opinions of the story that is about to be told. Finally, (3) the extent of the interaction and preparation create the tension of *'scientific authority'*, where committee members develop perceptions of the applicant as he is presenting, which creates the challenge of ability to negotiate with tough critics a burden on the applicant scientist. I detail the unfolding of *'science negotiation'* in the sections below to provide a clear overview of how a scientific research proposal story is performed, and how elements of that performance impact the funding decision.

4.5.1 Maintaining the Interaction: 'Reading and Being Read'

The use of dramaturgy in my case study is undeniable as the stage/ setting of the proposal presentation takes place in the board room. The implied social norms are quite formal or friendly and as described by participants causes nervousness or relaxation and hence reluctance or freedom to speak with ease.

As described by Dr. Michael (a committee member introduced earlier), a presentation allows for explaining ideas in a manner that is more easily understood:

I can say the idea, but the thing is that the person writing this idea has issues translating it on to the pages, then this is a problem. I always say it, sometimes you have stand-up comics, and usually, they don't write the jokes themselves, somebody else writes the joke for them and they just go to say the jokes on the stage. So, I was just discussing this matter with a friend, he was saying why these people that wrote the jokes don't just go and sit on the stage. I'm like, they don't have the charisma to stand on the stage and say the joke, although they know how to, let's say, write good jokes, but just saying that joke, they just don't have it…the idea could be great, but it's not really translated very well onto the pages. So, when you end the presentation, and you hear there are some missing pieces, if these are, you know, taken from here into there, the proposal would be way better. So, the proposal itself, the idea along with the presentation, it makes a whole big picture related to this research project, and eventually for the decision itself.

Dr. Michael describes the presentation as a tool that aids in the explanation process. He also emphasises that not all individuals are able to express themselves in writing as well as they express themselves verbally, therefore making the presentation an opportunity for idea elaboration and clarification. Presentation performance is an acquired skill that scientists essentially need to be trained on. As indicated above, some people have the ability to perform very well, but rather have difficulties writing their ideas and vice versa. Some scientists are good writers but cannot present well. The issue then becomes, that if a proposal is not well written, the performance helps aid in articulating the proposal. Performing stories in science communication is therefore regarded as a tool for further expression of the research idea as it allows for deeper explanations to be heard directly from the applicant, which negates misconceptions and allows for elaboration. A good performance therefore increases the chances of obtaining funding as it can positively influence committee members into changing their minds about the proposal.

Dr. Rebecca illustrates the communication gap between written and verbal communication in an example where she has sought funding from an external funding source outside of Kuwait:

I submitted a proposal, you know, to an external funding agent not from Kuwait. So, I sent them and they sent me back the proposal with rejection, saying that, you know, it's not novel, the idea is not novel, and that's it. And after that, I had the chance to meet the people that reviewed my proposal. They came to me said and we have some, you know, workshop or something. So, they said oh, it was your proposal that we reviewed? And I said yes, but you said

that it's not original. They said yes. And so, I explained to them what I meant, the idea. They said you didn't write that. And we didn't understand that this is what you wanted to do. We didn't know that it's not something existing in Kuwait and you want to initiate it. And this is not existing in the market so you need for sure to do it to initiate it to have the thing and start having the product here. So, you didn't write it how we will come to know, you know? When we are talking about the proposal it's like we are chatting together, when your friend comes and talks to you.

What the external reviewers mean is that they are not able to predict what scientists means if they are not articulate in writing. Therefore, written communication with peers is an issue that has not been discussed in existing literature. This suggests the notion of the need for training applicant scientists on how to write multiple plots within the proposal that address different information needs. Dr. Rebecca emphasises that this communication gap occurs in an international manner. The problem is with the scientists not being able to write down what they mean. This proposes the notion that scientists have a communication barrier not only with a generic audience, but also experience difficulties in communicating science to scientists as well—hence the advantage of oral storytelling, which allows for further expression and explanation that justifies the proposed project in a manner that is more comprehendible. When she says we are chatting as friends, she refers to the ease of verbal communication versus written communication, which is more rigid, therefore presenting the advantage of storytelling versus methodical scientific writing.

Other elements considered in a proposal presentation include the presenter's communication skills. During her interview Dr. Nicole (a reviewer and previous committee member) addresses several points regarding the scientist's performance. The first being ability to explain the research idea and translate it from written to verbal communication. To Dr. Nicole, verbal expression of the research provides a good indication that the researcher knows and understands their own project very well. Dr. Nicole expressed that she considers many elements of the presentation during the committee meeting:

I will also look at other factors, you know, like the body language, his vocabulary, his speaking skills, his eye-to-eye contact, the way he has done his presentation, the organisation of slides, all these things, I will look at it. See, as I said that if a scientist or a researcher is able to give 100% for all these things for sure you will accept the

proposal and you will use it. This gives like a positive impact, a positive feeling to you that yes, the person is capable and maybe is able to carry it forward.

She then pays attention to the scientist's body language. Body language gives a very strong impression of whether the applicant is capable to handle a research project as positive body language such as good eye contact gives of the impression of confidence, hence capability to complete the proposed project.

Then another thing I will look at is that whether the person was able to answer all the questions, the responses that were generated after the meeting, so how confidently the person was able to justify all the questions or the comments that were raised. So that will be my main focus, but how am I going to judge whether it is acceptable or not? So definitely, if they are able to answer all the questions this means that they have justified their proposal very well. Because, you know, questions, you know, they are positive remarks, but sometimes there are negative remarks also. And if the person is able to justify the negative remarks in a good manner, then also, I mean, it's worth accepting, you should carry forward with accepting the project.

On the other hand, Dr. Nicole underlines that one of the main items considered to make a funding decision is the scientist's ability to answer questions arising from the meeting—especially negative ones. What she means is that the ability to negotiate especially negative questions shows that the applicant has thought through the project very well. Ability to justify therefore is associated with good negotiation skills and the ability to convince committee members of the project being discussed. Good negotiation skills provide a sense of confidence that the applicant is fully aware of the project's concerns and is capable of mitigating future problems that may arise.

Dr. Sarah (an applicant introduced earlier) describes her experience during the committee meeting:

Sometimes it depends on the committee, if they are interactive and it depends on my myself, because when you get inside the meeting sometimes it's a little bit stressful. So, although all of the information is in your mind and you know the question, but you forget to explain it. And sometimes they are so friendly in a way that you want to tell them everything. But in any way if they ask, I will have the answer. And if they didn't then it's not important and they skip it. So, so I also… (laughing indicating that she stays quiet and skips it too).

What Dr. Sarah means is that she reads her audience and responds accordingly. If her audience is stiff and does not express willingness to interact, she becomes nervous and could even forget the question she was asked. Vice

versa, if her audience is friendly, she becomes very relaxed and is willing to explain everything, however she holds back, and answers only if asked. This entails that scientists are cautious when presenting even if the committee members seem friendly as there is a fear of *'shooting themselves in the foot'*, where providing too much information is feared to stimulate unnecessary discussions and hence is avoided. What scientists are actually avoiding is being asked questions that they do not have the answers to and hence would make them appear incompetent in front of the committee and therefore impose risk on getting funded. The negotiation of science then becomes a *'live-interactive storytelling exercise'* where scientists elaborate on the story based on the interaction received by the audience and stay quiet and proceed also based on the audience's reaction.

Dr. Sarah expresses her committee presentation experience and what she pays attention to when presenting as follows:

> *If we are in the same room, then I can read their faces so I can see if I am doing well or not. I look at them if no one is sleeping or not yawning then I am fine. If they are still focusing you can read their body language, how they are acting, they smile. For example, if you give the objective and they start (she nods a lot) like you can see their faces like it's a good idea, then you feel more confident and then you can give more.*

Dr. Sarah analyses committee body language as an indication of her performance. What she means is that the committee meeting is interactive and this interactivity affects how she tells the story of the research proposal. Understanding committee member gesturing—especially when they are positive, gives Dr. Sarah a confidence boost and allows her to speak freely and elaborate more on her proposed idea. This gives a clear indication that when a scientific story is performed, the body language of the audience is important and it reflects on the performer and hence can better enhance the narrative.

The experience of a committee meeting allows scientists to take advantage of oral storytelling to strengthen their persuasion of committee members to provide funding. Therefore, training in oral storytelling/presentation skills is essential to become a more proficient science communicator.

Dr. Beth (a senior scientist and a proposal applicant) expresses her concerns with maintaining the negotiation during a committee meeting as follows:

It seems that this guy did not study the proposal and he just wants to put a comment. So, you need to answer him in a way that will not embarrass him, but sometimes they were rude. I have no problem to answer any comment, and I tell the person who raised the question: Thank you for this comment. I will put it in mind, but the most important thing is that you talk to them in a respectable manner… You have to be diplomatic in your answers …When someone asks you something, it is not a matter of giving the right or the wrong reply. How you deal with somebody who is attacking you matters a lot. You are responsible for the proposal. If that person addresses you in an impolite or improper manner, you have to remain cool-headed and know how to deal with the situation…You should convince them that you will be a good project leader.

Dr. Beth is talking about self-control because she wants to ensure that this interaction can continue. Being diplomatic is important as she is in need for approval, and this approval is in the hands of the questioner. If the questioner feels offended, ego is triggered and hence the funding decision might turn personal, which would not be in favour of the scientist. She proposes to conceal anger and frustration from *'silly questions'* in order to appear relaxed and in control and show capability of answering questions, which would impress the committee members. Being political and maintaining self-control gives the impression of confidence, and therefore the perception of being a good leader. A good leader is therefore capable of handling problems as they arise and a negative comment from a committee member during the presentation is seen as a metaphor to overcome problems that may arise during the execution of the research proposal. The review meeting in essence becomes an imagined setting of the proposal execution going through turmoil that needs to be overcome. Questions from reviewers are seen as obstacles and the reactions to these questions become the solutions that the scientist offers. The more calm and collected the scientist is, the more confidence the committee members have in the scientist being able to solve future problems as they may arise. I can conclude that the setting of the proposal presentation becomes very sensitive, and being political is important as it can have the potential to negate the entire content of the research proposal and turn into a personal argument, hence affecting the funding decision greatly. Rude presenters have a very low chance of getting funded, even if their proposal is good because bad attitudes indicate poor management and poor management means that the proposed project has the risk of not being completed therefore impacting the reputation of the institute amongst its clients.

Another element scientists focus on during the meeting is building rapport with the audience members even if the scientist does not agree with the comments raised. Dr. Linda expresses this in the quote below.

> *I said oh thank you! Good idea! Yes, yes, I thought about it, but I was not sure about how to add it, yeah thank you! I make them so confident that they found something then it goes smoothly and you know you have to gain the reviewers in the meeting. You have to gain them, to gain their interest, to gain their passion, you don't want to make them enemies, you have to gain their friendship.*

Dr. Linda uses mechanisms to build rapport with committee members in order to ensure continuity of the interaction and giving a good impression. Dr. Linda also mentions self-control when faced with unnecessary questions, but she adds that she makes the person who asks this question feel appreciated as she wants them to gain confidence and hence be more relaxed with her i.e., less critical. She essentially manipulates the committee member into thinking that they have contributed to the conversation in order to gain their approval/confidence and avoid conflict. What she actually means is that the committee members are comprised of diverse audience members, and some of these members have no understanding of her proposal, she is then faced with an attitude problem with some members because their egos are not fulfilled due to them knowing that they cannot contribute much to what is being presented, hence not performing in the critical manner that is expected of them.

> *You know one of my presentations I brought a quiz. And I told them if you solve this quiz, I will give you a dinar. And one of the committee reviewers, she said this is unethical to give 1 dinar you are trying to bribe us? (laughing) Noooo (laughing again), I felt they were lost in how big is the nanometre. It was the beginning of nanotechnology and I remember I asked them and only 1 Dr. he answered. I gave them the quiz in the beginning, and in the end, I said is there anyone who can answer? And then only 1 could answer the question. Yes, it was pure mathematics. I told them the way that the nanometre is 1/10 to the power 9 and how many kilometres or how many nanometres in 1 kilometre, like this I don't remember the exact question but he could solve it and it was nice. Intentionally I brought this quiz with me.*

She also uses rapport building to calm herself down before presenting. This is evident in establishing *'small talk'* or using quizzes to gain the committee members' attention.

And sometimes I felt uncomfortable because you know the committee are a variety of people and sometimes you know they are tough and you cannot gain them easily. So, I start chatting or sometimes I ask: should I close the door or keep it open? Or yeah, I was discussing this with my kids since I practiced this presentation on them and I just try to chat with them to make myself comfortable first, and to gain their attention and to get involved with them before the presentation.

What Dr. Linda means is that she uses rapport building as a *'humanizing tool'* tool for self-calming as well as grabbing the audience's attention. She wants to appear as a familiar colleague rather than keep the setting too formal/robotic, which would lead to a more relaxed atmosphere in hopes of receiving less harsh comments.

I know the deep science questions I really appreciate them I really need them and I always tell them YES- this is what I need YES and thank you for this and I write them. And they tell me don't bother in writing because you will get them and I say no I have to write them because I have to stick them in my mind. And I also thank them. THANK YOU VERY MUCH for this question you really made my day much way better.

Dr. Linda on the other hand shows deep appreciation for comments that are scientific and that benefit her proposed work, therefore building rapport through appreciation of bad and good comments is used as a necessary defensive mechanism to ensure continuity of the presentation and hence receiving the desired outcome of funding approval. The issue then becomes an issue of professional appearance of the committee member rather than critiquing the proposal fairly in order to make a sound funding decision. In order to avoid such issues, presenting scientists make the effort to establish rapport by showing appreciation, being relatable, or even breaking the mood with humour in order to make committee members feel like they are a part of the scientist's journey and hence become less stressed about looking like a professional critic. Therefore, one main issue in the performance of science in front of the committee, is to see committee members as being under pressure to seem knowledgeable, because this is implied by their role even if they have absolutely no professional knowledge in the science being presented. Committee members therefore ask questions even if irrelevant to avoid feeling embarrassed or to avoid looking unprofessional to show that they have power. The presentation then becomes an exercise of power rather than being a fair critique and the presenting scientist needs to understand this notion in order to mitigate the situation to their own favour if faced.

The section above covered what occurs during the meeting itself. I have illustrated how scientists perform in front of a complex audience, how they maintain the interaction and how the negotiation should be mitigated. In the section below I describe the preparation process of the performance where I shed light on the efforts made before the presentation actually happens.

4.5.2 Preparation: Role Play & Mock Presentations

Applicant scientists brought to my attention a preparation aspect prior to the committee meeting, which adds another layer of a pre-negotiation phase that occurs prior to the negotiation itself. Dr. Linda mentioned reading her own proposal beforehand in preparation for the committee meeting:

> *You know generally I have to read my proposal again just like a new book I am reading. This is not my proposal I say to myself. I didn't write it so, I have to read it and understand it again, open my eyes again on the work. And sometimes you know I find mistakes yes, I swear, this is a good thing and I read it and then I prepare myself for the presentation.*

What Dr. Linda means is that she assumes a different role—the role of an outsider. She *'acts'* as if she has never come across the proposal and that she is going to read it for her first time. This acting puts her in a different state of mind, not as a presenter but as a critic, which is the essence of a funding committee member's job. Dr. Linda expresses that reading her work as an outsider allows her to gain more perspective on her own work. Thoroughly reading a proposal allows for a different set of eyes and therefore the ability to find mistakes. Being critical of her work and fixing her own mistakes gives Dr. Linda confidence and this confidence translates into her presenting. What she means is that the setting of the presentation performance is very stressful because of the nature of critique that is expected of committee member. This sets expectations for the presenter also to be very precise and professional, hence the need for thorough preparation.

Being of complex nature, the funding committee audience varies in comprehension of levels of complexity within a research proposal, making them at times laymen and at other times specialists. When asked about how to prepare for a committee meeting, participants emphasised the need to practice in front of a *'fake'* audience. For example, Dr. Linda describes presenting to her children:

I prepare the slides and practice the presentation first on my kids at home. Yeah, I practice my presentation and then I go… you know the main aim is I want to know if they could understand me or no. Because they are awaaaay from that area! So, if they could understand me then I know that I will do well. Because I don't want to practice in front of my group. First, I don't have time I am always busy, busy, busy. I don't have time to present in front of my group, otherwise I will be lucky if I presented. But in presenting in front of my kids, even in my PhD I presented in front of my kids, they are good reviewers really my kids. Yes, because they are discussing with me ah we didn't understand this, ah you can say this in that way. The youngest one my daughter she is now 18 and the oldest he is 26 even in my PhD they were 6 years old to 18 years old. They are a good audience.

When presenting to children, Dr. Linda presumes that the audience has the lowest level of understanding of science, and therefore gets the feel of whether her presentation is understandable if children understand what she is talking about. The children therefore assume the role of the committee members (the Universal Audience), and provide Dr. Linda with feedback if they had understood the proposal or not. This strategy of presenting to children is mainly used to cover understanding of the validity plot. If children can understand what the problem is and what the benefit of solving that problem entails, then any adult would be able to understand as well. Due to lack of time, presenting to children (least mature audience) ensures that a more complex audience would understand. What Dr. Linda is saying is that children don't think like scientists. Children are rather seen as a less mature general public, who would give an indication of whether the purpose of the project is understood. Scientists, as indicated in the results above, write and think in a complex manner, and therefore practicing with them would be good for the scientific part of the proposal, while children provide insights on whether the project is understood at a simpler level.

On the other hand, participants also mentioned that they conduct a mock-presentation amongst their peers. This mock is considered as a professional rehearsal in order to provide feedback on the presentation as explained by Dr. Rowan (a mid-level scientist who applies for funding):

We have a good initiative set by our director; we will prepare a committee meeting rehearsal before going to the final meeting. So, in this rehearsal, we will have the different managers, as well as the director of science and technology, and director or operations, who give their expertise on the proposal presentation and how we present.

This is really beneficial, and it really helped me to successfully get the approval after the committee meeting. For example, this morning, we had a rehearsal, and even though the committee meeting is not new for me, but I may still miss some points. So, in the rehearsal they will point it out, like they say: you see in this section you took a lot of time explaining the introduction for instance, then an important thing like methodology, you did not give it enough time and explanation, and this is not good. So, things like that will help me to be mentally prepared for the presentation... and usually before the rehearsal we do practice by ourselves, and this will give us a good opportunity to improve and provide better slides and addressing any issues in the presentation.

During the Mock-presentation, peers assume the role of committee members, the entire experience turns into acting, where the presenter believes he is performing the real presentation in front of actual committee members due to the roleplay assumed by his peers. Dr. Rowan mentions that his peers comment on the presentation content as well as the performance, which concurs my finding that science negotiation performance is considered important. He then elaborates about the importance of time management when presenting. Spending too much time on a section and less time on another is very much considered by committee members. He mentions that spending less time on the methodology section is not considered good. What he means is that if he doesn't thoroughly explain the methods used, his presentation could come across as scientifically weak. Hence spending enough time to explain the science is considered important to obtain funding as it shows scientific competence. He also mentions that the mock-presentation allows him to prepare mentally. This indicates that negotiation is a very stressful exercise, which can be eased by thorough preparation.

As I discussed preparation of the presenter, I also noticed that the committee members themselves prepare for the meeting, which creates a tougher situation for the performer as usually the storyteller performs in front of an audience whose role is only to receive the story. In my case, committee members have the complex role of evaluating proposed research with the intent to fund, making the preparation experience much different. Committee members critically read the proposal prior to the meeting, have a significant understanding of the story they are about to hear and therefore are prepared with their questions. I have also noted that the committee members prepare beyond only reading the submitted proposal document as discussed by Dr. Spencer (an applicant for funds):

I will read the proposal 2 to 3 times, I will read especially for the Metro rail project, the latest one, I will read the latest newspapers available online in GCC, because Metro rail is successful in the UAE, and the Saudis started it in 2015 or 2016, so I can obviously expect questions from them about that, they may ask what is happening in the UAE, how are they doing with that, how much they are getting economically, whether this project is viable to Kuwait, so I need to know how much we will be getting in Dinars like the Emirates are getting in Dirham or the Saudis are getting in Riyal. So, I collect some articles and keep them with me. In energy reduction also, I can get some things from the UAE and Saudi Arabia, and also same kind of work, same kind of project, whether there are new things at the time, because when it comes to the committee, we have to complete and submit the proposal six months prior to the meeting… So, the committee members are so smart, they will always search Google and find something, so they will come with new things. So, in that regard, I include any new thing in the presentation, and will tell them that it is not included in the proposal which is already submitted, that's because these are new.

Dr. Spencer mentions that because the proposal goes through a lengthy cycle, by the time the presentation date is set, there would definitely be updates to the project. He mentions that committee members are smart, what he actually means is that committee members are very detailed, and out of their knowledge of the length of the proposal cycle, they know that there ought to be recent updates and hence, search online for those updates in order to ask the presenter about them. What the committee members are actually doing is seeing whether the presenter is well prepared by being updated with the latest developments concerning their proposal. Being updated with latest developments provides a sense of reliability and trust in the presenter and also provides confidence that the presenter is capable of achieving as they are aware of the latest developments in the proposed field. What committee members are also doing through this preparation is maintaining their self-image in which they would want to come across as competent to the presenter by knowing what is the latest in the presenter's field. What is implied is that committee members acknowledge that the proposal cycle is long, hence a proposal update is expected by all members, it is something that all committee members anticipate.

4.5.3 Scientific Authority: 'Appearing Believable'

I have also concluded from participants that a committee audience form a perception of the performer before deciding to listen to their presentation. This means that the credibility of the presenter plays a role in perceived

trust, hence has an impact on the audience's willingness to listen to the story being told. Dr. Eric who is a junior scientist, describes how he prepares his slides to face this dilemma during a funding committee meeting:

> *I would use pictures. So, you would let someone take a photo of you when you're doing your budget, clearly, I am asking for a million funding to get this. But if I'm asking for a million, and I have a series of pictures from previous projects that I can present in two slides. We did this, and now we are doing this, it will affect the decision…So, if you present this, it will have an impact. And it will really have an impact in the beginning this person we trust him if I showed the committee and that I'm capable. Fiona has done 15 projects, and she's in her 20s let's say, as an example. How can she do 15 projects? This means someone else did it for her or she hired someone to do it for her. I am not doubting that out of the 15 she did 3 really on her own. How you show this? Pictures. Fiona was at the lab and this is her picture holding the analysis in her hand, or appearing in the picture with a certain person, etc. etc. The photo sends a strong message for our request, it will send it learn that lots of people think people fake things in the market. If someone sees me and tells me that this guy is faking something I will not believe best I think if I had that little percentage scale, I would let's say 60% believe him than someone who's not senior saying the same sentence about the same person. I would believe the senior person because the senior had experience and knows what is possible and what is impossible.*

What Dr. Eric is actually saying is that using visual photos strengthens the narration of the story and builds trust and credibility in the scientist, especially when they are young. Being a younger scientist means that Dr. Eric has less scientific authority than a senior, hence making his job of convincing the committee more difficult due to perceived lack of expertise that comes from being younger. He also states that he himself would believe a senior scientist over a younger one which shows that authority is an issue when presenting to committee members. However scientific authority can be overcome by using photos as evidence, which Dr. Eric benefits from.

Scientific authority however is also considered in the review process. Dr. Rebecca who is a mid-level scientist and a reviewer of proposals indicated that as a scientist who reviews proposals, it is very important to acknowledge that not all proposals can be reviewed fairly if the reviewer holds a different scientific discipline than what is discussed in the proposal.

In general, I review a little bit different also than the other reviewers and if I receive any proposal, paper or something to review from anybody, I look at it. If it's not my field, if I'm really not aware of this thing, I decline. In fact, I say that it's not my background, I will not be able to do it, really. Because sometimes I am saying that I'm different because sometimes I received comments from reviewers for my proposals and my papers and really, really, you will say: he's serious? What is he talking about? You see immediately that even the names of the things …, if you are in the field, no way you were right. The spelling would be like this, you will say: is he serious asking this question? So, I really make sure.

She explains that if she receives a proposal that is too far from her field then she rejects reviewing the proposal all together as she explains that she wouldn't be able to provide a just nor useful review of the proposal and hence won't be able to judge the scientific merit or be able to make a sound decision as expressed in the quote above. Dr. Rebecca means that she cannot assume the role of an *'expert scientist'* when reviewing a proposal that is not within her scientific discipline and therefore declines the review as it would not be fair. As suggested in my analysis of audiences, although Dr. Rebecca is a highly specialised scientist, when given a proposal that is not within her scientific field, she becomes a *'scientific layman'*, meaning that she cannot thoroughly understand the scientific elements of the research, and is therefore unable to make a fair judgement of whether the proposal should be funded or not. She also wants to make sure that she is able to critique thoroughly as asking the wrong questions would make her seem unprofessional, which becomes a self-image issue that she does not want to project. Dr. Rebecca would rather reject reviewing a proposal than being perceived as incompetent, making scientific authority a review issue as well.

Dr. Mathew on the other hand, faces the same issue with reviewing proposals that are not within his field of specialty:

Another discipline, which is now expanding is oceanography. I'm not an oceanographer, I have basic oceanography but I have not experienced it. So, we start off by just helping me, and Dr. Valerie is the discipline leader and really helping me. And because of Valerie what do I do? I read the projects, the idea and if it's clear to me, I pass it to Dr. Valerie to because she's more experienced than me in oceanography. And if she passed it, then I tell the guy to

prepare the proposal and I send it to Dr. Valerie and then two other referees later and I take the clarifications, comments and suggestions as a basic proposal.

When Dr. Mathew has to go through a proposal that is not within his scientific discipline, he also assumes the role of a *'scientific layman'*. He elaborates that he only tries to understand the idea, meaning the validity plot which is what a *'universal audience'* is attracted to. Dr. Mathew expands on the notion of a scientific layman not having the background to review proposals not within his discipline by sending the proposal to someone who does have the background. Dr. Mathews is not an expert in oceanography; hence he does not have the scientific authority to make a sound judgement of the proposal. He sends the proposal to Dr. Valerie who is an expert in oceanography, and therefore has the scientific authority to judge the proposal based on her expertise and experience in the oceanography field. What he means is that if Dr. Valerie reviews the proposal, then he won't get into arguments with applicants as Dr. Valerie is highly regarded in her field and hence her comments would not be questionable. Once a proposal is fully developed, Dr. Mathew also sends the proposal to other expert reviewers who have the scientific authority to critique the proposal and then uses their feedback. This shows that scientific authority and trust do not only occur between the general public or policy makers as suggested in existing literature (Lupia, 2013; Scheufele, 2013; Yuan et al., 2019), but also occur within a professional scientific community, especially when making decisions about funding proposals.

4.5.4 Setting

Applicants should be tentative about the time scheduled for presenting as it has an influence on the committee's attention. Therefore, preparing the presentation content is done strategically as described by Dr. Spenser:

Normally, we are used to conducting committee meetings after 1:30 pm, between 1:30 and 2:30, so most of the people are coming to the meeting after lunch. So, the maximum time they can listen to something is 5 to 10 minutes, they will be bored.

Content development in scientific proposal presentations is also important in order to attract committee members. Dr. Spencer therefore also assumes the role of a committee member when preparing content and describes the importance of realising the effect of the setting on committee members during the presentation. What he means is that committee meetings are conducted towards the end of the day. This timing of day impacts the committee

members' attention span as they would be tired after having a long day of work. He also mentions that people would be back from lunch, which also shows that he thinks about his audience's state of mind before presenting. Being back from lunch, especially if the meal was quite heavy, makes committee members probably drowsy, hence not in a state of mind to receive heavy loads of information.

He continues:

> *So, if there are pictures, they will look at the screen and watch, otherwise they will look into their mobiles, and that is the normal habit of people, so it is better to keep them attracted to you, through some animations. This is what I did in one proposal, I have put some animations showing how that project will change things, so pictures and bullet points keep them attracted, otherwise if I put a paragraph, they will not look because they have already read it since they had the proposal submitted to them in advance. So, copying same things from the proposal will make them feel bored, that is why it is better to show them something new, that is why I am preparing in that way for the meeting.*

Dr. Spencer uses aminations and pictures, in an attempt to show committee members something *'new'* that would not bore them and grasp their attention. Copying from the proposal document is considered a bad presentation, especially knowing that committee members have come prepared, so putting new things in the presentation slides is more attractive and can boost the chances for funding.

The assumption of roles does not only take place in the preparation phase. Dr. Rebecca explains that she assumes the role of a reviewer when writing her research proposal:

> *The important element to succeed in writing a good research proposal is when we write, is to stand and imagine ourselves as reviewers. And because I am a reviewer, I think the way the reviewer does. In fact, so when I write, I'm always, and it happens so many times. In fact, sometimes there's some lack and something that I don't want to show, but I'm always telling the team, you know, I think probably that if he's good enough in the field, he would ask about this thing…And this happened so many times, in fact, so we got those questions.*

She elaborates that in order for a scientist to write a successful proposal, they need to imagine themselves as a reviewer. She explains that because she is a reviewer herself, she has the mental advantage of being able to anticipate what questions would be asked, and therefore embeds narrative that would address these questions beforehand. What Dr. Rebecca means is that scientists are not trained to think like a reviewer. Reviewers have

certain criteria they focus on when critiquing a proposal. Mastering what information reviewers critique and addressing their concerns beforehand within the proposal allows for greater chances for funding.

To summarise the results, I have concluded that although storytelling in science communication is considered an important communication tool, there are further complexities that have not been discussed in existing literature. The nature of this study being of a complex audience who is required to perform the complex action of approving/disapproving research proposals for funding purposes, entails that storytelling is much more complex than what exists in the science communication literature. The format of the story of a research proposal is much different that a regular scientific story due to complexity of the audience, which explains the need for multiple plots that cover different audience requirements. By classifying audiences and identifying their communication needs using the multiple plots approach, I came to realise that stories function differently when influencing my study's type of audience. I have also found a performance component within communicating research proposals, which entails paying attention to what happens during the performance of a proposal pitch in terms of the presenter as well as the receiving audience. Performance elements found include active engagement in *'impression management'* and *'preparation'* from both the presenter as well as committee members as well as the importance of *'scientific authority'* which entails that committee members take into consideration whether the presenter can be trusted based on their experience. All of these elements need to be considered when negotiating science for funding, which have not been thoroughly explored in existing science communication literature.

In the following chapter, I discuss the findings of this study in link with existing literature and later present a figure that shows the theoretical implications of the reported results.

CHAPTER 5: DISCUSSION

In this chapter I highlight the implications of these findings for knowledge of organisational storytelling, and the for the development of funding proposals. The discussion chapter follows the same logical sequence as the results where I first discuss audience parameters, then move on to storytelling inferences and finally, I discuss how the results expand on performance theory through dramaturgy application during science negotiations.

5.1 Complex Audience Classification

Previous studies identify the general public or policy makers as audiences for science communication (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). The focus in science communication literature is how to simplify communication with these two types of audiences to stimulate supportive action (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). In this thesis, the findings reveal complex audiences that include individuals of diverse backgrounds and roles. Specifically, these audience types comprise of a panel of scientists and managerial executives who are highly regarded experts in their fields, which provides an original contribution as this dataset has not been rigorously studied in existing science communication literature. This panel of diverse individuals creates a communication challenge for applicant scientists.

I expand knowledge on audiencesS in science communication, by identifying several audience types. For example, I reveal audience types such as: (1) *the 'Scientific Expert Audience',* who are scientists that are expert in the field of the proposed research and can therefore be critical of the science being discussed as they possess the required knowledge and expertise, (2) *the 'Scientific Layman (shifter) Audience'* who are experts in fields that are different from the proposed research and therefore cannot make a sound scientific judgement of the proposal as they do not possess the required knowledge of the field and hence look for other information to make a decision and finally, (3) *the 'Universal Audience'* type that comprises of management executives who are non-scientists, and although they lack scientific knowledge, they use their expertise in management to understand the proposed project's success in terms of execution (for example, timely execution, order of tasks, budget, and selection of research staff). While all three audience types are primarily drawn to their related interests, this study also unveils that these audiences have an overarching role of being the custodians of research funding, and therefore carry the

responsibility of ensuring these funds yield the best return on investment as will be described below under the term *'Alignment'*.

While studies have examined how best to communicate science to generic audiences such as the public or policy makers, studies in audience segmentation for scientific communication are still lacking (National Academies of Sciences, Engineering & Medicine, 2017). Communication of a scientific research proposal involves various actors: the applicant scientists, and the funding committee members and proposal reviewers who are the audience. As indicated in the literature, audience segmentation is a necessity and creating tailored messages are required (Slater, 1996). Due to the diverse backgrounds available in funding committees, an applying scientist must pay attention to two main concerns. Firstly, the background and discipline of the committee member is important i.e., whether they are a scientist from the same discipline as they are, a scientist from a different discipline or whether they are non-scientists. Identifying the background of the audience members determines how best to create messages that would address everyone's interests. The second concern is the type of information required for each audience, which is a derivative of the identified background of the committee member. This means that once the background of the audience member is identified, the applying scientist needs to determine what type of information each group of individuals is looking for to present a compelling proposal that would persuade them into granting funds.

Previous research indicates that scientists are trained to write in a methodical format (Fischhoff & Scheufele, 2013; National Academies of Sciences, Engineering & Medicine, 2017; Suzuki et al., 2018; Banks & Di Martino, 2019), where they are used to systematically identifying methods in their research, test their ideas through lab work and fieldwork, then report their findings in the format of results (ElShafie, 2018; Green et al., 2018). Scientists therefore are used to writing for their '*peers'*, which entails a technical approach to writing, hence making their communication *'stiff'* and systematic, but easy to comprehend among peers as it is the communication norm (Green et al., 2018). The notion of technical or systematic writing for peers is challenged as I uncover that a complex audience of senior scientists and senior executives want more than systematic, technical writing when presented with a research proposal. For example, committee members want to see the

identified problem and understand its magnitude and importance in context of the country's needs. They want to understand the benefits of solving this problem not only in terms of scientific contribution but in terms of benefits to the State of Kuwait. Committee members are looking for a grander narrative in addition to scientific content, which is a new finding this study uncovers. I will explain proposal content in terms of methodical and narrative story writing formats later in this discussion chapter and show how these writing formats influence funding decision making. Proposal content will be further dissected and explained, where I illustrate that participants *"want to hear a story".*

This study also uncovers that senior scientists in charge of funding also turn into an interchangeable audience when faced with topics not within their main line of expertise, hence telling a *'good story'* becomes an essential element in communicating the research proposal to them to secure funding. I therefore classify this interchangeability through identifying audience terms such as the *"Scientific Expert Audience",* the *"Scientific Layman Audience"* and the *"Universal Audience"* to help describe the interchangeable stances of this complex audience set and understand what type of information is required by each individual audience member, which is summarised in table 5.1.

Audience Type Versus Information Required (Table 5.1)

Audience Type	Review Capability	First Information Required	Content Type Focus
Expert Scientist Audience	- Expert in proposal field, able to comment immensely on the science	- Objectives - Deliverables - Methodology	Scientific
Scientific Layman Audience	- International Expert in their own field - Non-expert in the proposal field - Generic review	- The identified problem - Background information about the problem - Fit with country's vision - Fit with institute's research strategy - Project execution (achievability)	Valid for Institute, Client & Kuwait Logical Execution
Universal Audience	Non-Scientist	- The identified problem - Background information about the problem - Fit with country's vision - Fit with institute's research strategy - Project Execution (achievability)	Valid for Institute, Client & Kuwait Logical Execution

While there is an ongoing discussion about the need for simplicity and generation of interest in science communication for the general public or individuals who are non-specialised scientists (Montgomery, 2017; ElShafie, 2018; Green et al., 2018), this thesis adds a new finding of the need to see a scientific audience as a general audience due to the complexity of the funding decision needed to be made. There is lack in existing literature that addresses scientists as receivers of information, but there is great emphasis on the lack of scientists' communication capabilities and experience in communicating their work to different audience segments (de Bruin & Bostrom, 2013; Montgomery, 2017; Banks & Di Martino, 2019). Montgomery (2017) although speaks about writing for journal articles and the need to ensure required formats are met, only touches lightly upon what a scientist is expected to do in terms of 'weeding out' an expert versus non-expert audience through the use of more simplified and interest generating language as opposed to technical language. However, this thesis sheds light on the importance of not only understanding audience information needs, but rather also highlights the influence of the *'audience's role'* and its effect on proposal writing. This thesis in particular reveals that a funding panel although consisting of highly specialised scientists, do not only want to see methodical writing but rather are intrigued by emotional *'interest generating language'* in order to make a funding decision due to their *'role as custodians of funds'*. The implications of this custodian role are discussed below.

5.2 Narrative Alignment for Custodian Role

As identified in section 4.2 of chapter 4, narrative within a research proposal needs to appeal to the audience's funding custodian role. I have therefore developed the term *'Alignment'*. Alignment metaphorically refers to understanding the background of the audience and therefore aligning the line of thought considered in the proposal to the line of thought of the intended audience, much like the term framing (Bray et al., 2012; Kotler & Keller, 2015; Martinez-Conde & Macknik, 2017), which is also used in management studies to shape specific narratives catered to different audience segments. Frames as discussed in the literature address the audience's specific beliefs (Bray et al., 2012; Kotler & Keller, 2015; Martinez-Conde & Macknik, 2017). For example, framing a scientific topic in terms of a problem that needs to be addressed in order to reduce public health hazards. Frames become a form of tying audience beliefs in communication and thus presents scientific information in a format that is more

familiar to the intended audience's beliefs (Kotler & Keller, 2015) and creates an emotional attachment with the audience in order to formulate an opinion and stimulate action (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019). Although frames have been discussed in science communication literature, the audience specified in this study has not been explored. This study unveils that framing required in research proposals is more complex than framing aimed for communication with the general public. The committee member turns into a rather selfless actor whose main concern is not on their private beliefs or agendas, but rather she or he becomes self-aware of others' beliefs that need to be taken into consideration instead of their own agendas through their custodian role. Being a custodian of funds, this role implies that committee members have multiple identities that they represent, meaning that the committee member turns away from fulfilling their individual information needs into ensuring that the institute, the funder as well as the country's needs (their agendas, strategies or goals) are addressed within the proposal. This in turn stimulates multiple frames that need to be developed within the research proposal - in an *'aligned'* manner - to create a comprehensive narrative that is appealing. Therefore, an applicant scientist needs to be aware of what these agendas are to incorporate them into the proposal narrative using *'Alignment'*, which would lead to increased chances of funding. In the sections below, I present the details of how *'Alignment'* occurs in science communication for funding decision making purposes by explaining narrative alignment.

As illustrated by participants, the main objective when writing a research proposal is to make the narrative relatable to the audience in order to generate interest that would stimulate a funding action. Three audiences project a more corporate role in addition to their individual backgrounds. The audience's role metaphorically enforces them to act as custodians of funds on behalf of: (1) the institute itself, (2) other targeted funding agencies/clients, and (3) the State of Kuwait (the government - a funding source for flagship projects). The committee member can therefore be viewed as an investing actor, who is interested in the return on investment provided by the proposed research. The applicant scientist needs to take into consideration the overarching role of the audience when writing a research proposal to appeal to these individuals not only according to their preferred individual interests based on their background knowledge, but must also appeal to their investor role, which will be explained as follows. I describe alignment under three levels as analysed from participant

interviews, where they have described the importance of the proposed research being internally aligned with *'their institute's'* story on the first level. On the second level, the proposed research needs to be aligned with the *'funder's'* story, and finally in the third level, the proposed research should be aligned with the *'country's vision'* story.

5.2.1 Internal Alignment with the Institute

Different audiences have different interests and it is important for a scientist to realise that writing a research proposal is not revolved around what the scientist believes is beneficial or important alone, especially as we are currently in a time that requires applied research to solve real, existing problems that would benefit the societies we operate in (Joubert et al., 2019). As described by participants, research institutes invest heavily on research whether through providing manpower salaries, or operational resources such as laboratories and equipment. This implies that the institute itself acts as an investor where return on investment is expected to be provided through approved research projects. In order to show this return on investment clearly, a proposal applicant is expected to weave a story narrative that is closely tied to the existing institute's story. This provides context for the committee members as it directly relates to their role as custodians of the institute's funds, meaning the main idea behind including the institute's story is to demonstrate benefit to the institute by creating a project that helps the institute in completing its set goals. Hence, one of the proposal's implicit objectives becomes helping the institute to achieve its plans and in turn, generate trust of accountability, where set goals that are completed provide a sense of accomplishment by the institute in helping it achieve its promise to society. The proposal narrative is part of a larger story that is targeted towards the overarching objectives of the institute. This means that the proposal itself becomes part of the institute's story and therefore becomes a tool to further this story by making it achieved rather than just hopeful wishes. As the institute is lacking in resources, and is therefore investing heavily by providing internal funding i.e., equipment, labs, manpower salaries, etc., projects with direct impact in helping the institute achieve its goals are the ones considered for approval as they provide a clear return on investment. The committee member's role is to act as a custodian of funds on behalf of the institute. The custodian's job is to ensure that the institute's best interests are covered as it invests in resources that are very expensive. Therefore, a proposal

narrative must also focus on the institute itself, where the proposal narrative must be part of the institute's story in order to be approved for funding.

Research is seen as an extended arm of aid to businesses, governments and legislators alike to help in the mitigation of global concerns (Hering et al., 2012; Joubert et al., 2019). The research institute I have focused on has set research goals, objectives, mission, vision and strategic plans or research agendas. The mission of the institute is to contribute to the State of Kuwait's development through research (KISR, 2022a). This suggests that the committee members act on behalf of the institute, which depicts itself as a hero that is on a mission to make Kuwait a better place for its inhabitants through research. The heroic tale provides emotional connotations that the institute is here to serve a higher purpose, not only the purpose of discovery. This higher purpose is translated into the institute's values and hence its programs that are identified to solve Kuwait's most pressing problems (KISR, 2022a). The common values of the committee members lie in the values of the institute itself, which are projected in the institute's story. As discussed in the literature, common values create emotional connections (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019) therefore, the institute's narrative is seen as an emotional stimulant. For example, why are we here, and what are we meant to do? What is the main objective of the institute itself? These questions have produced the five-year strategic plan of the institute, which is essentially the scientific roadmap that is closely aligned with the country's development plan. The institute's strategic plan is a five-year research plan that is oriented towards solving societal concerns, which fit into the county's vision. This in essence, is the emotionally stimulating (Siegel, 2017; ElShafie, 2018; Joubert et al., 2019; Bloomfield & Manktelow, 2021) organisational story of the institute being studied in this thesis where the institute becomes the hero who goes through turmoil to solve Kuwait's problems. However, incorporating this narrative in the proposal depicts the scientists themselves and the committee members as enabling co-characters of the story, who are here to make a significant contribution in making Kuwait better. Therefore, including the committee members as co-acting heroes, becomes the emotionally stimulating narrative used within the proposal to stimulate funding action.

The five-year strategic plan takes into consideration the resources available such as facilities and manpower expertise that in conjunction would be used to solve national problems. The strategic plan includes all

research programs of focus, which identify exactly how each program will solve or address an existing issue that requires extensive research. Therefore, a scientist must pay attention to these plans prior to writing a research proposal as there is a need to be aligned with the institute itself while understanding that any piece of research does not operate in silos, but is part of the bigger emotionally stimulating organisation story. The five-year plan identifies research areas where research programs are devised to solve national problems. These solutions in turn contribute to the development of the country and lead to public welfare. Therefore, alignment with the institute's five-year plan within a research proposal establishes an agreed upon common interest (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019) that would lead to better opportunities of persuasion for funding. As mentioned by the participants in this study, committee members and applying scientists both stressed the importance of realising that the proposed research needs to be in internal *'Alignment'* with the institute itself, meaning that the scientist must select a proposal that fits clearly under the research program and that addresses the institute's five-year strategic plan, which can show the institute as the hero it wants to be. According to participants in the study, linking the proposed research project to the five-year plan also shows that the scientist knows not only their purpose, but the purpose of the institute itself, which makes the scientists as well as the committee members enablers of this unified purpose of being the hero that saves Kuwait's future. The researcher's social identity is in turn aligned with that of the institute as they become unified to solve national problems and contribute to the country's welfare. Therefore, a requirement for an applicant is to read the institute's five-year plan, which is the institute's existing story and so that she or he are able to align the narrative of their proposed research project with this story.

This finding contradicts the notion that science without consensus (Battiston et al., 2021) becomes revolved around individual's perceptions from their long-held views and self-motivations (Sujan et al., 1993; Kahan et al., 2009 cited in National Academies of Sciences, Engineering & Medicine, 2017). Instead, I reveal that although committee members have diverse backgrounds and therefore cannot agree on all proposal parameters (e.g., the science), due to the *'custodian role'* imposed on funding committee members, setting aside self-motivations becomes an imposed individual responsibility. The focus on the benefit of institute, the funder,

as well as the country, become the main motivations for funding approval, which is a notion that all committee members agree on regardless of their backgrounds. Therefore, in proposal application, scientific consensus in terms of proposal pitching is not considered a main element for stimulating funding action. The consensus becomes on fitting the organisational stories into a single mission of making Kuwait a better place by *'aligning'* all investing parties' existing narratives into the proposal's narrative, which presents a larger story.

5.2.2 Alignment with the Funder/Client

Knowing that even prior to writing the proposal, a scientist must choose a problem to tackle or an area of research that fits within the research institute is not enough to gain approval for funding, it is rather the stepping stone into telling the story of the proposal. A research proposal must also be aligned with the funder/client. Therefore, a proposal for the sake of research alone, would not be considered satisfactory to the client and hence the need for close alignment with the client's needs in order to develop useful projects. Identifying client problems makes the client see the institute as a problem-solving tool, where these problems are seen as a headache that the client (s) needs to get rid of. Hence touching upon existing problems, and proposing solutions is seen as providing benefit to the client, who then becomes more accepting of the proposal.

Participants also draw attention to the need to ensure that the proposed project is not only aligned with the client but is also fulfilling to the institute's objectives and strategic plan, which in turn leads to a more aligned story between the institute and the client. An applicant has to realise that a research proposal is part of a *'whole'* where the proposal's story fits into the grander narrative of the institute as well as the client. Therefore, the committee members also act as the custodians of funds on behalf of the institute as well as the potential client (funder).

For Campbell (1949), stories revolve around heroes. These heroes go through a journey, facing turmoil that ultimately leads to overcoming difficulties and returning with boons to society (Campbell, 1949; Kent, 2015). The aim of any research project is to go through a series of challenges that may have major turmoil and hopefully will produce a solution that benefits society (Joubert et al., 2019). Scientists become the heroic character that is going through this journey to develop solutions that would aid the institute in making our world a better place (ElShafie, 2018; Green et al., 2018). In this thesis, the main aim for alignment with the funder is to essentially

make them a co-actor in a heroic tale, where the funder joins in the quest for research to solve the problem at hand. The story is now growing into a grander scheme where there are several actors working together to solve a grand challenge that will save or positively impact people's lives in an emotionally stimulating narrative that is derived from the required *'narrative framing'*. With that schematic in mind, it is important to note that committee members act as custodians on behalf of funding agencies who also have their own set of strategic goals and research agendas. An applying scientist must therefore comprehend the notion that science needs to be viewed through a more expanded scope, meaning that the scientist must realise that there are different levels of telling the story of a research proposal and these levels need to be aligned to obtain funding. This means that the applying scientist needs to conduct some research on the funding agency/client itself prior to choosing the research problem. That search would include looking at the research interests of the funding agency/client, their research focus areas, strategic plans and past projects. These would indicate what type of research is required and under which areas, making the scientist more focused on developing a proposal that is in *'alignment'* with the client's interests and therefore co-contributing to the client's strategic objectives and helping them achieve their research goals. Being in alignment with the funder/client builds a stronger arguable case that the researcher is not only revolved around his self-interests for research but is rather aligned with the funding agency and therefore creating a win-win situation for all. The scientist is therefore seen as a contributor to the funder/client and a participant in its corporate story by helping the funding agency/client in achieving its promises and fulfilling its objectives.

Existing literature focuses on the development of framed narratives (Bray et al., 2012; Kotler & Keller, 2015; Martinez-Conde & Macknik, 2017) that is closely knit with the audience's existing beliefs (Kotler & Keller, 2015) to stimulate action (Cohen, 2011; Martinez-Conde & Macknik, 2017; Torres, 2019). Organisation management literature also explores the use of audiences as co-contributors to story development "to facilitate business opportunities and create partnerships" (Castellani et al., 2019: p. 211). In NGOs charity donations studies, emphasis is on the use of personal stories that should stimulate emotions and lead to donations (Siegel, 2017; McInerney, 2018). The notion of involving stakeholders as co-actors in research idea development through stakeholder management has also been explored in existing science communication literature (L'Astorina et al.,

2015; Talgorn et al., 2022). Scientists have approached stakeholders to understand their needs when developing research projects and these needs are embedded into research projects to show utility to the industry (Talgorn et al., 2022). However, this thesis brings attention to potential funders' existing stories, not only their problems (such as missions, visions, strategies or focus areas) and the need to weave these stories into the proposal without necessarily meeting the potential funder/client to secure funding. I reveal the importance of embedding existing organisational/corporate stories to stimulate funding action—i.e., there is no need for creating a new story. The applicant scientist is required to identify existing funder/client stories and *'align'* these stories with the institute's existing story as well to create a *'multiple-framing narrative'* within the proposal document. Funding action is therefore regarded complex as it involves monetary investment, which needs to show clear returns on this investment. The committee member therefore acts as a custodian of the funding agency's resources and so needs to see a clear return on investment by ensuring the proposal fulfils the funding agency's specific strategies and objectives, which becomes the custodian role of all three audience types mentioned herein. In science communication literature, funding action is not thoroughly discussed, hence this thesis provides an original contribution by showing the involvement of the investor through embedding their own stories into the proposal narrative. Once that is established, the importance of a higher level of alignment with the country's objectives is introduced, making the proposal's narrative part of a much larger scheme of the country's vision, which becomes the ultimate custodian role that takes into consideration the county's best interests. I will explain the third level of alignment in the section below.

5.2.3 Alignment with the Country's Vision

The role of scientific research is to solve society's most pressing problems (Joubert et al., 2019). This leaves us at the third level of alignment, which is alignment in the grander scheme—being in alignment with the country's vision. This grander scheme can be bigger than the country i.e., global concerns, but for the purpose of simplifying, I will describe alignment with the country's vision.

When writing a research proposal, participants pointed out the importance of *'aligning'* the proposal with not only the institute and the funder, but ensuring to tell the *'story'* of participation within the country's growth vision—New Kuwait 2035 vision. The aim is to show how the proposed project contributes to the country's vision

and therefore *'tells the story of co-involvement of the institute and the funder'* as they would also be contributing to the country's vision if the proposal is approved and funded. Therefore, an applicant's proposal needs to contribute to the New Kuwait 2035 vision, with a project that makes a real difference that brings the 2035 vision to life, making the proposal narrative part of a larger emotionally stimulating story that fits into the country's development narrative that already exists. Most scientists do not pay attention to the *'alignment'* levels described above. Scientists' natural communication behaviour is narrow focused on the *'science'* and are therefore naturally exerting effort on the technical aspects of the proposal, i.e., the methods. Being in such a focused state narrows a scientist's mind from writing what their anticipated audience is looking for as information within the proposal that would aid in encouraging approval for funding. Moreover, in order to obtain approval for funding, a scientist must be aware of the required alignment that is to be mentioned in the proposal. Such alignment includes the strategic value of the proposal as its importance towards contributing to achieving the country's *'national goals'*. Scientists intuitively focus on methodical scientific writing and are unaware (not trained) on acknowledging grander narratives, which is problematic as scientists do not understand that there is a need for multiple narratives to obtain funding. In essence, committee members of all three audience types act as custodians of the country's funds and ensure that Kuwait receives substantial return on investment in research, which makes this a universal concern that all audience members look for in a research proposal. Therefore, alignment with the country's vision is considered the ultimate goal for a scientist to consider when selecting a problem, as the story of science as described above, is considered of a more complex audience. Especially when applying for funding—given the magnitude of competition for funds and the scarcity of funds, a scientist must be aware of the need to address the complexity of audience levels in order to ensure *'fit'* within the grander scheme, which would ultimately lead to better chances for funding.

There is a grand narrative that scientist don't pay attention to due to being stuck to their methodical communication norms (ElShafie, 2018; Green et al., 2018; Siebert et al., 2018; Banks & Di Martino, 2019; Mannino et al., 2021), which creates a fragmented story within a research proposal to funding committee members who do not understand what the grander purpose of the proposed research is. Existing literature on science

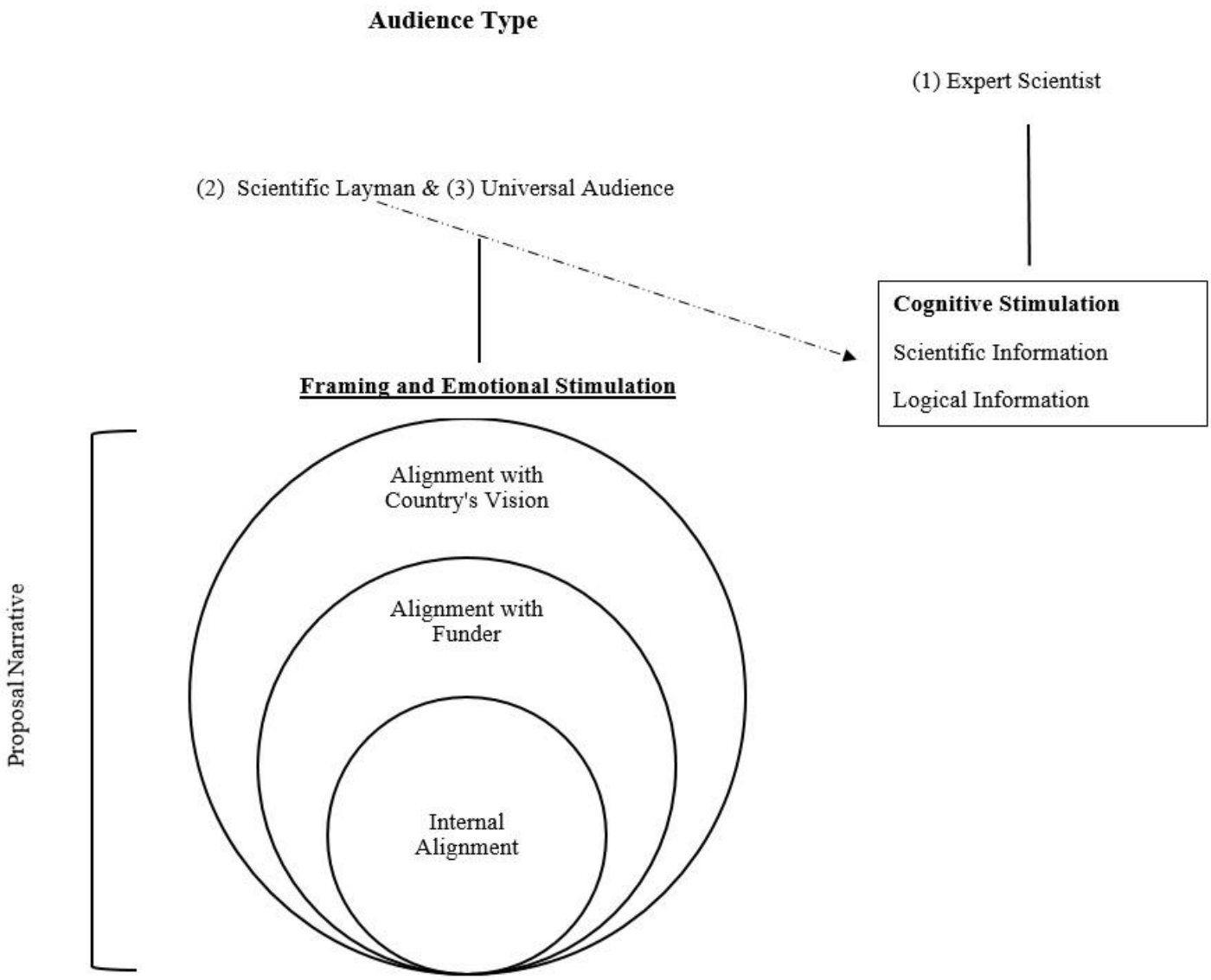
communication emphasises that "scientists seek cognition, produce new knowledge and are mostly interested in what exists and is observable" (Talgorn et al., 2022). Yet, this study uncovers that scientists whose job is to approve funding, are also interested in an *'aligned narrative'* which produces a unique finding in the science communication domain. This required narrative includes multiple actors who are on a single mission. The multiple actors being the proposing scientist, his institute and the client/funder. These actors are all on an aligned mission to make their society a better place—in my case developing the State of Kuwait. Therefore, alignment acts as a frame (Elshafie, 2018; Banks & Di Martino, 2019) that focuses the project on the grander scheme of contributing to the country's development, making all involved actors viewed as heroes (Campbell, 1949) that are going to uplift the State of Kuwait into its optimistic future story. This optimistic story's role is to stimulate emotions (Burke, 1966; Fisher, 1985; Siegel, 2017; ElShafie, 2018), where the reader is emotionally intrigued to believe that the proposed project is going to be of actual benefit to the country and that themselves, the institute and the funder are all heroes (Campbell, 1949; Kent, 2015) that will bring boons to society (Campbell, 1949; Kent, 2015).

As discussed in the literature, non-for-profit organisations that use personal stories create a stronger emotional connection with an audience, which encourages donations by establishing connections with people rather than an entity (Siegel, 2017; McInerney, 2018). In this study, the term *'alignment'* is used to incorporate other entities' stories in the proposal narrative to make them personal. Personalization of stories therefore occurs on a more corporate-country specific level rather than a personal story that is based on individuals alone. This shows that science communication in research proposals becomes more specialised as it takes into consideration the complexities of the funders' existing stories and incorporating these stories in the proposal narrative to create appeal. Personal stories in this thesis are therefore targeted towards the committee member's role (to the custodian) rather than the committee member as an individual, which is a very important finding. Pitching a research proposal for a *'role'* generates a very different story than one that is targeted towards an individual's beliefs, which is a finding that applicant scientists need to understand in order to develop proposal narratives that suit a funding audience.

The following figure shows the information needs of the three different audience types, the three levels of alignment and their interconnected relationship to each other. I show how these alignment levels become integrated into a bigger goal or objective of ultimately contributing to the country's development vision, which is the emotionally stimulating frame created for committee members.

Figure 5.1 shows the different audience levels and how they are initially engaged with the proposal content. The *'Scientific Expert Audience'* (scientific discipline related to the proposal) seeks scientific information first, which coincides with existing literature as scientists search for facts and hence are cognitively stimulated (Talgorn et al., 2022). However, scientists also look for an emotionally stimulating narrative, which is reflected by the *'Scientific Layman Audience'* who are senior scientists that are highly specialised in their own scientific disciplines (not related to the proposal). These scientists are interested in a narrative that addresses higher level concerns, or *'Alignment'*. Alignment is a term derived from using existing stories and aligning these stories to the proposal's narrative in order to generate interest and create emotional appeal. Alignment on the three mentioned levels as described by the participants increases the chances for funding as the story being told becomes focused on the grander goal of contributing to the noble cause of benefiting society (Joubert et al., 2019), in which all institutes strive to contribute to. As demonstrated in the figure, internal alignment with the institute itself becomes the first level of aligning the proposal narrative with that of the institute's objectives. As the institute depicts itself as a hero, the applicant must show how the proposal enables the institute to carry forward its heroic job. This is done through the utilisation of the existing corporate story, which outlines the institute's objectives, mission and research programs. The second level of alignment is related to the funder. In order to achieve believability in the proposal and stimulate emotional connection, the applicant needs to find and communicate common values between the institute itself and the funder (in cases of external funding).

Figure 5.1: Narrative Alignment



For example, in this study, the institute itself contains the Environment & Life Sciences Research Centre. The Centre has The Desert Agriculture and Ecosystems (DAE) Program, which "safeguards the health and safety of Kuwait's population by developing techniques to enhance the quality and availability of locally produced agricultural products" (KISR, 2022b). On the other hand, one of the institute's funders—KFAS, has "food security" as a research interest (KFAS, 2022). These similar goals provide an opportunity for narrative alignment, where these existing stories can be woven into the proposal to generate interest. Furthermore, one of Kuwait's governmental focus areas is "enhancing food production" (Kuwait Voluntary National Review, 2019). As mentioned in the Kuwait Voluntary National Review (2019: p. 34), "a special area was dedicated for productive

and sustainable agriculture during the period 2012 – 2016… in realisation of the lack of sufficient natural freshwater resources and the need to bring in dry land urban agriculture and adequate technologies as well as other necessary resources and skilled labour to enhance food production". This story on a national level shows how food security is important to the State of Kuwait. Scientists are required to realise that these stories first exist, and second can be utilised in an aligned manner to generate a more appealing story for funding. Alignment creates an opportunity to present an appealing narrative as both entities have similar aims and goals, which can be communicated in an effective manner by showing the institute and the funder as co-contributing heroes to further research in the food security domain. Therefore, instead of presenting the proposal as an individual initiative, the story becomes multiply-framed and inclusive of co-actors as a collective that are striving to help the society/country in an emotionally stimulating narrative that consists of common values and goals. This becomes the framing narrative of the proposal, which the applicant writes in the beginning to attract funders as well as committee members by introducing common goals and interests that show the projected benefits of the research by utilising existing organisational stories that the proposal becomes part of. On the other hand, expert scientist committee members focus on the scientific content of the proposal first, which indicates that there is cognitive stimulation that occurs with experts who look for scientific methodical writing first in order to make an initial judgment of the proposal. The final aspect is that all audience member types want to ensure that a proposal is logically structured, which also draws attention to scientific methodical writing requirements.

In conclusion, different audience types unveil the requirement for different narratives to be included in the proposal, while also suggesting the notion of viewing the proposal as a story. On the other hand, this chapter also draws attention to the need for scientific methodical writing as it appeals to audience interests based on their types i.e., the scientific expert audience looks at the scientific sections first (methods), which are very technical in nature. This brings me to the following section of the discussion, which describes the proposal's format in details, while showing its emotional elements as well as its cognitively stimulating elements, therefore depicting the complexity of proposal narrative and how it should be written to address different audience needs. I discuss

the required writing formats and how audience-oriented information structure impacts funding decision making below.

5.3 Storytelling Influence on Funding

Key to this thesis is that a proposal should be viewed as a specific story form with an expansive narrative that spans the past and is projected into the future. The format includes (1) a problem statement (the beginning), a series of past events, which are included in the literature review, (2) a research gap showing the progression of past series of events related to the problem and where it stands in our present time (middle), and finally (3) a proposed research agenda intended to solve the problem in the future tense (end/future). The complexity of a research proposal as a story further lies in its use of complex plots that appeal to different audiences. Both of these make funding stories different from, and more complex than, many other forms of organisations' storytelling. As does the high risk that the story 'fails.'

The temporal effect in the story of the scientific research proposal cannot be simply described as a beginning, middle and end, but is rather comprised of complex temporality that shapes how an evaluator comprehends the story to make a funding decision. Although storytelling is a natural form of communication, telling the story of science is different. Telling the story of science is complex, but the arising challenges from telling scientific-based stories is that scientific research is associated with high risk (Scheufele, 2013; National Research Council, 1996, 2008 cited in National Academies of Sciences, Engineering & Medicine, 2017; Banks & Di Martino, 2019). Moreover, risk becomes a burden on the storyteller to reduce via efficient selection of the problem, proposed solution and methods, as well as properly articulating how a research project will be managed.

Telling a (science) story entails using the basics of storytelling which is a plot that includes a setting, main character, outcome and resolution (Bower, 1976) in a dramatic manner of highs and lows known as Campbell's (1949) "dramatic arc". The story takes the audience through the character's series of events that have their tensions, i.e., cause and effects to grasp the audience's attention (Cousineau, 2020). While current literature focuses on the use of Campbell's (1949) dramatic arc, this thesis shows that science communication for the purpose of funding follows a more convoluted story format due to information requirements from a complex

audience. Also, science communication literature emphasises on the use of Tobias's (1993) identified plots for science such as the mystery, discovery and rescue plots (Elshafie, 2018; Green et al., 2018) in the standard dramatic arc (Campbell, 1949) format in order to formulate a *'good story'*. However, when communicating the research proposal, a scientist needs to think about what the most critical information to share that is required to tell a *'good story'*. Previous research identifies the story of science as the narrative of communicating problems and obstacles and how these obstacles would be solved (ElShafie, 2018; Green et al., 2018). Essentially the story of science is a story of discovery, with the character's ups and downs, and challenges they go through to find a solution that would benefit mankind (Green et al., 2018). However, this thesis suggests that the essential elements of a story are indeed required, but due to the nature of scientific research proposals being surrounded with ambiguity, the story needs to be more complex. Also, because the audience is unusual - not the usual general public presented in previous research - addressing such a complex audience structure needs to be done through a more complex story format.

The diversity of audiences in this study leads to the variety in the proposal's information content as well as format of writing. These pieces of information have been found to be written in narrative as well as scientific methodical format, which shows the complexity of communication within the proposal document itself. As discussed in the literature, storytelling allows the recipient to be transported in the narrative (Green & Brock, 2000; Van Laer et al., 2014), hence creating a strong basis for emotional connection (Olson, 2009; Olson et al., 2013; Siegel, 2017; ElShafie, 2018) through stimulating imagination (Gerrig, 1993; Green & Brock, 2000). This narrative transportation stance is believed to immerse the reader in the story and hence negate the need for analytical processing in the brain (Green & Brock, 2000) as the recipient is believed to be heavily submerged in the story narrative and therefore pays less attention to analytical arguments. However, in my study, I have found a contradiction to this notion. The different audiences for a research proposal react to stories in a more complex manner. In the case of funding decision-making, due to the complexity of the story as well as its associated risk, I found that although reviewers and funding committee members do become immersed in the narrative and emphasised its value, they were also meticulous about the proposal format in terms of methodical scientific

writing. Methodical scientific writing as described by participants and as seen from the submitted proposals, follows a particular structure.

Previous research indicates that scientists are trained to write in a methodical format, where they are used to systematically identifying methods in their research, test their ideas through lab work and fieldwork, then report their findings in the format of results (ElShafie, 2018; Green et al., 2018). Scientists therefore are used to writing for their peers, which entails a technical approach to writing, hence making their communication *'stiff'* and systematic, but easy to comprehend among peers as it is the communication norm (Green et al., 2018). The notion of technical or systematic writing for peers is challenged in this research as I uncover that a complex audience of senior scientists and senior executives want more than systematic, technical writing when presented with a research proposal. According to committee member participants, they *"want to hear a story".*

This study also uncovers that senior scientists in charge of funding also turn into an interchangeable audience when faced with topics not within their main line of expertise, hence telling a *'good story'* becomes an essential element in communicating the research proposal to them in order to secure funding. Keeping in mind that people tell stories naturally and receive and process information better through story narrative, (Green & Brock, 2000; Kent, 2015; ElShafie, 2018; Green et al., 2018) it has been clearly identified by participants that storytelling is indeed thought about by both applying scientists and reviewers/funding committee members when communicating a research proposal for funding purposes. However, understanding the different classifications of audiences brought me to the conclusion that there is a need for more complex plots in order to thoroughly narrate a research proposal.

Applicants are trained on scientific-methodical writing and reviewers based on their own experience as scientists also are trained on this type of writing. Therefore, reviewers become analytical to ensure the scientific writing makes *'scientific sense'*. This differs from prior research which entails that narrative transportation and analytical processing occur separately (Green & Brock, 2000). In this study, narrative transportation and analytical processing occur together as they become a part of the funding committee member/reviewer's decision-making process mechanism. I call this process as *'narrative elaboration'* where the recipient engages both their

emotions and their analytical thinking in order to make a funding decision. This shows the complexity of communicated proposed research as well as the complexity of the required decision itself, which both require a well-structured story, as well as analytical information that feeds into the requirements of the diverse audience. While I have proposed the need for both narrative and methodical writing, the format of writing becomes very difficult for scientists to comprehend. Applicant scientists talked about the difficulties faced when writing, as proposal format is seen as requiring writing skills as well as intuitive skills. Writing skills are needed to ensure language is correct and that ideas are well written. On the other hand, scientists use their intuition to devise a proposal narrative that flows in terms of ideas. A proposal that "flows" well is considered a good proposal because reviewers can follow the sequence of idea development and are able to establish a connection or link with those ideas in a logical, sense making manner (Escalas, 2004) as well as creating an emotional connection (Burke, 1966; 1968; Fisher, 1985) with the reader and stimulating memory recall (Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007). Scientists are not trained on narrative expression, and while being trained on scientific methodical writing, it is clear that scientists also struggle with the scientific sections within the proposal itself, which was indicated by committee members and reviewers who mentioned that applicants do not match objectives with deliverables. The solution to these writing format issues and alignment with different audience needs lies in the development of multiple plots that are narratively structured, and inclusive of scientific methodical writing as will be described below in the multiple plots discussion.

As explained by Tobias (1993), scientific research fits into a much larger plot of being a hero—a hero that is here to save/help society. Green et al. (2018) describe the plot of a scientific story as a mix between a discovery, rescue and a mystery in which a scientist explains the journey of identifying a problem and describing the tension of working on ways to find solutions to the problem and finally reporting the discovery or results, which is depicted in a science communication "dramatic arc" (Elshafie, 2018). The scientist becomes the main character and the narrative used should depict their struggles and turmoil in arriving to the solution or final discovery. The scientist also describes why this research is important within the rescue plot and shows the benefits of research for society (Green et al., 2018; Joubert et al., 2019). What is different here is the audience and the required

action/outcome—funding. When the audience and the desired action are different, the story becomes much different than what is discussed in the literature. A scientific research proposal cannot focus on a simple dramatic arc because the audience is not a general public. In my case, the complexity of the audience urges the applicant to develop a more complex narrative in order to address funding committee members' concerns. When a monetary value is associated with decision making—especially when funds are scarce as described by participants in the study—a committee member takes other elements into consideration when making a funding decision. Therefore, the use of a discovery plot is distorted as the story of a research proposal lacks the description of implementation in the lab as it has not yet occurred, and consequently there aren't any results to report. The challenge that arises then is what would the structure of the story be like, if the story we are going to tell is hypothetical, futuristic in nature and is in turn very risky?

I have found that the story of a scientific research proposal follows **three major plots** which have the specific purpose of emotional stimulation as well as cognitive stimulation. (1) the **Validity plot**, which highlights the importance of the research through identifying an existing, important problem, providing an innovative solution and emphasising the societal benefits from solving this problem. (2) the **Scientific merit plot**, which identifies scientific methods, experiments and scientific contribution. And finally, (3) the **Achievability plot**, which demonstrates thorough project management and the corresponding execution plan.

These three plots contain all narrative and elaborative elements required by the identified complex audience in order to help make a sound funding decision. The above plots follow a sequence and written format as explained earlier as they follow the logical sequence required by committee members. The results also show that temporality in the narration of the story is highly visible and is used as a means of evidence to strengthen the narrative by reducing risk. For example, in the validity plot, literature review i.e., stories from the past, are mentioned to validate why the problem was selected and to explain the progression of the problem, therefore providing evidence and basis for the research gap to be explored. Temporality is also prominent in the scientific merit plot where scientists are required to reference their selected methods in order to prove that these methods are agreed upon within the scientific community and hence will yield reliable results. Finally, temporality is also visible in the

achievability plot as it is used to validate the selection of the research staff by identifying their past experience in related past projects to prove that these members can execute the project based on their past track record.

5.3.1 The Validity Plot

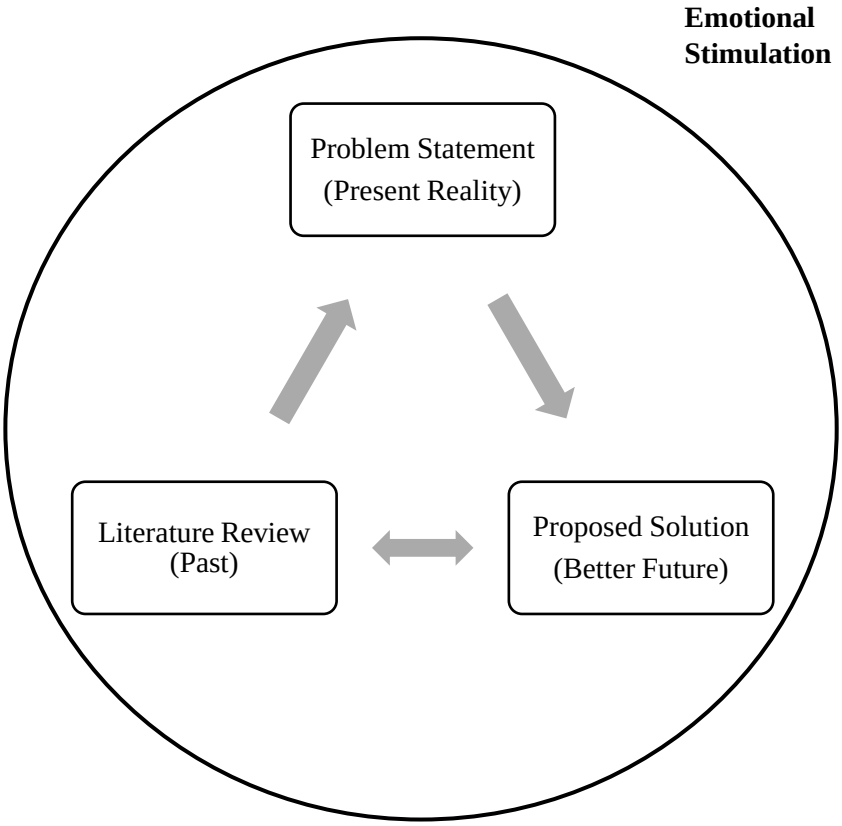
In reference to the audience, the validity plot is rather used as a *'framing'* tool to present the topic of the research proposal in a manner that is familiar to the intended audience. The validity plot is highly dependent on emotional connotations, i.e., presents risks and benefits of the proposed research in a dramatic manner. The validity plot is also *'aligned'* in terms of identifying a problem that is tied with the institute's five-year plan, client/funder needs, and is also in line with the country's *"New Kuwait - 2035"* development plan. This is clearly described by participants who highlighted the importance of selecting a research problem that is under the research focus areas stated in the five-year plan, as well as making sure that the selected problem fits within the scientific research programs available at the institute. An applying scientist would use this information in a story format to frame their proposal in terms of benefits to Kuwait and the contribution of the project to the institute's five-year plan, thus fulfilling the institute's mission of being '*the research arm for the state of Kuwait'* whose main function is to contribute to the country's development through focused, applied research. The validity plot's framing mechanism creates an emotional attachment with the audience as the information presented is tied to the audience's values and beliefs such as mentioning specific benefits to the client, funding body or the institute. This suggests that individuals are in agreement with the beliefs presented within the story and are therefore transported in the story's narrative (Green & Brock, 2000).

The validity plot is therefore used to fulfil the *'alignment'* finding in section 4.2 of chapter 4. Committee members/reviewers, want to hear a story, as they look forward to understanding the importance of the problem, its magnitude and effect on the environment or society. The validity plot therefore functions as an emotional guide towards stimulating feelings of the audience in order to understand the risk attached to not solving a problem through drama, and creating positive emotions from imagining how the solution would lead to potential public benefits. Within the validity plot, the applicant is trying to establish empathy from the committee members by making them involved in the contribution towards the benefits to society. The main objective of the validity plot is to engage the committee member into believing that they have a critical part in co-creating a better life for the

public as highlighted in the audience section of this discussion. As the use of stories develops emotional connection, emotions are then reflected into feelings of empathy and therefore encouraging funding behaviour.

I have also identified how temporality affects the narrative in the validity plot where the validity plot acts as the *'setting'* of the story (Cohen, 2011). The data in my research gives emphasis on temporality as an important element that can be used to increase trust and reduce uncertainty of the proposed research project. Temporality therefore serves as a function of providing evidence to support the research idea, as well as generating trust in the information presented, which translates into the applicant's research capabilities rather than a mere sequence of events, which is a new finding in the science communication field. For example, the literature review uses stories from the past to explain the evolution of the selected problem. It provides evidence of the significance of the problem at hand and how others have attempted to solve it (beginning). Background information within the proposal also provides context to the validity of the problem i.e., why it is considered important to solve, and how this problem has *'dramatically'* impacted society up to date (middle). Finally, the research gap statement is used to describe what is yet to be done, which is again supported by evidence that this problem needs further investigation, which is presented in a futuristic narrative (possible end). Therefore, temporality serves as *'story-based evidence'* to support the proposed research rather than the simple beginning, middle and end sequence of events (Campbell, 1949; Tobias, 1993; Escalas, 2004; Kent, 2015) that is showed in existing storytelling literature. The figure below shows how the validity plot uses temporality as evidence, while stimulating emotional connections to the story narrative.

Figure 5.2: Validity Plot



In summary, the validity plot is used to stimulate emotions, where the applicant takes the reviewer on the temporal journey of identification of the problem, exploring its past solutions and showing how the proposed solution will yield benefits to society by making our world a better place in the future. The narrative is relatable as it takes into consideration motivating factors of the intended audience, as found in the alignment narrative discussed above. The funder then becomes part of the discovery and heroic journey by essentially being a hero that contributes to their society (Campbell, 1949). The validity plot supports the narrative transportation theory devised by Green & Brock (2000) as participants clearly showed the need for emotional stimulation. What this thesis uncovers however is that narrative alone does not suffice the information needs of a complex funding committee audience and this is a very important finding. Due to their *'custodian role'* discussed in the audience section above, committee members become analytical of different proposal sections. While I have found that three plots are indeed prominent in the proposal's narrative, it is important to note the complexity in the proposal format. Hence, the writing method within these three plots is very detailed and varied. As reported by participants,

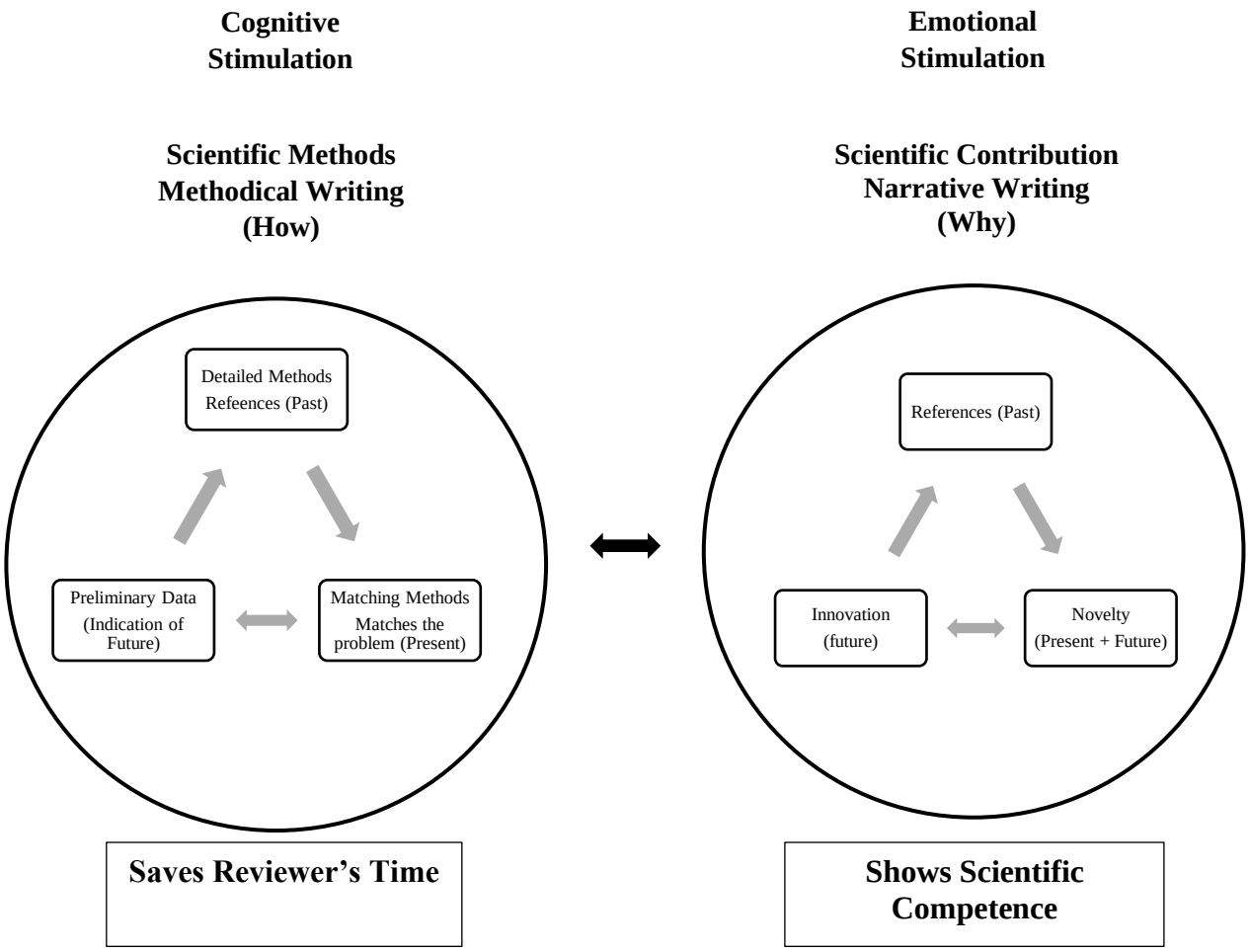
it is clear that a proposal needs to be written in a cohesive narrative format, but it also includes methodical scientific writing that is complimented by narrative. The methodical manner of writing is prominent in the scientific merit plot where the format itself is judged. For example, matching the number of objectives with number of deliverables. Methodical writing is also present in the achievability plot, where order of tasks needs to be scientific and logical. For example, the first task being mobilization and the last task being preparation of the final report. With that in mind, although storytelling is used in the proposal, it needs to be supported with methodical scientific writing in order to address the information needs and concerns of the more complex scientific expert audience. This suggests that prior studies that focus on narrative transportation (Green & Brock, 2000) usage alone to stimulate understanding and action towards scientific research (ElShafie, 2018; Green et al., 2018) does not fit with the more complex audience that reviews research proposals. Instead, narrative transportation along with analytical stimulation, which I refer to as *'narrative elaboration'*, work simultaneously to encourage a funding decision as both are needed to make a sound judgement of the research proposal at hand. One does not negate the other, but they work hand in hand to develop clear judgement of the proposal and hence encourage making a favourable funding decision. I describe the analytical plots and how they influence funding decision- making in the sections below.

5.3.2 The Scientific Merit Plot

The scientific merit plot targets the *'expert scientist'* audience. Expert scientists as detailed in the audience section possess the knowledge in the proposed discipline and therefore have the capability to review the science in a thorough manner as they are regarded as *'direct peers.'* The writing format in the scientific merit plot is considered methodical science. Methodical format in the scientific merit plot is used to *'identify selected methods'* and writing down the experiments. This means that scientists should be able to write this section with ease as they are trained as scientists to write in scientific methodical format (Green et al., 2018). However, an important finding is that although scientists are trained on methodical writing, some still do not grasp how this formatting functions and what its details are, some examples include: matching the number of objectives with number of deliverables, making sure that the selected method matches the problem and would yield the desired results. Clearly identifying selected methods and writing them in the expected format, according to participants saves time for reviewers,

meaning that reviewers do not have the time to engage in ensuring the format is correct, but rather want to read a section that is as per the expected format. Following an expected format in turn leads to trust in the applicant's scientific competency, which leads to trust in the selected method. This finding contradicts existing literature (Green et al., 2018; Siebert et al., 2018; Banks & Di Martino, 2019), which denotes that scientists are used to their methodical norms of communication and therefore are not good communicators with non-scientists only, and communicate well with their peers. Instead, I highlight that scientists - when faced with a scientific audience whose job is to decide on research funding - also cannot communicate in a sufficient manner. This occurs not because applicant scientists do not know how to write methodically, but rather they do not understand the technicality in how each section should be written and what purpose it serves. Therefore, scientists who do not understand scientific methodical writing format do not communicate in an efficient manner with peers and hence lose trust in their scientific competency, which could lead to proposal rejection. I have also found that the scientific merit plot although mainly concerns a strict scientific regiment of *'identifying scientific methods'* that are written in a pure methodical format, also includes a narrative writing format that is used to describe *'scientific contribution.'* The scientific contribution's narrative involves writing a *'new story'* that highlights how the proposed research contributes scientifically to the field. The main function of scientific contribution is to provide a reputational element, which encourages emotional attachments to prestige and status in the scientific community due to the potential of publication, which is a shared value and goal by scientists all over the world. Therefore, scientific methodical writing alone is not enough to convince a complex funding audience of expert scientists to make a favourable funding decision, but instead should be amalgamated with narrative writing in order to stimulate an emotional connection as well to encourage funding. The figure below demonstrates scientific-methodical writing while showing its temporal elements and how the scientific merit plot functions in terms of cognitive and emotional stimulation.

Figure 5.3: Scientific Merit Plot



The scientific merit plot primarily stimulates cognitive-analytical response (Escalas, 2004) but also includes emotional stimulation from the reviewers/committee members due to the shared value (Gough et al., 2014; Hajdu & Simoneau, 2020) of novelty leading to scientific contribution and elite-status publication. Science is analysed in terms of objectives, experiments and scientific contribution. Writing in the correct methodical format saves the reviewer's time and highlighting novelty and innovation demonstrates the applicant's scientific competence, which leads to trust (de Bruin et al., 2007 cited in National Academies of Sciences, Engineering & Medicine, 2017). The purpose is to slightly modify existing methods to yield new data in an innovative manner. Showing innovative thinking leads to admiration of the applicant, where they are seen as "thinking outside of the box" and hence are regarded as *'eminent thinkers.'* Therefore, creating a positive impression of the applicant with the committee member/reviewer. The idea behind scientific merit is to show something *'new'*, while providing

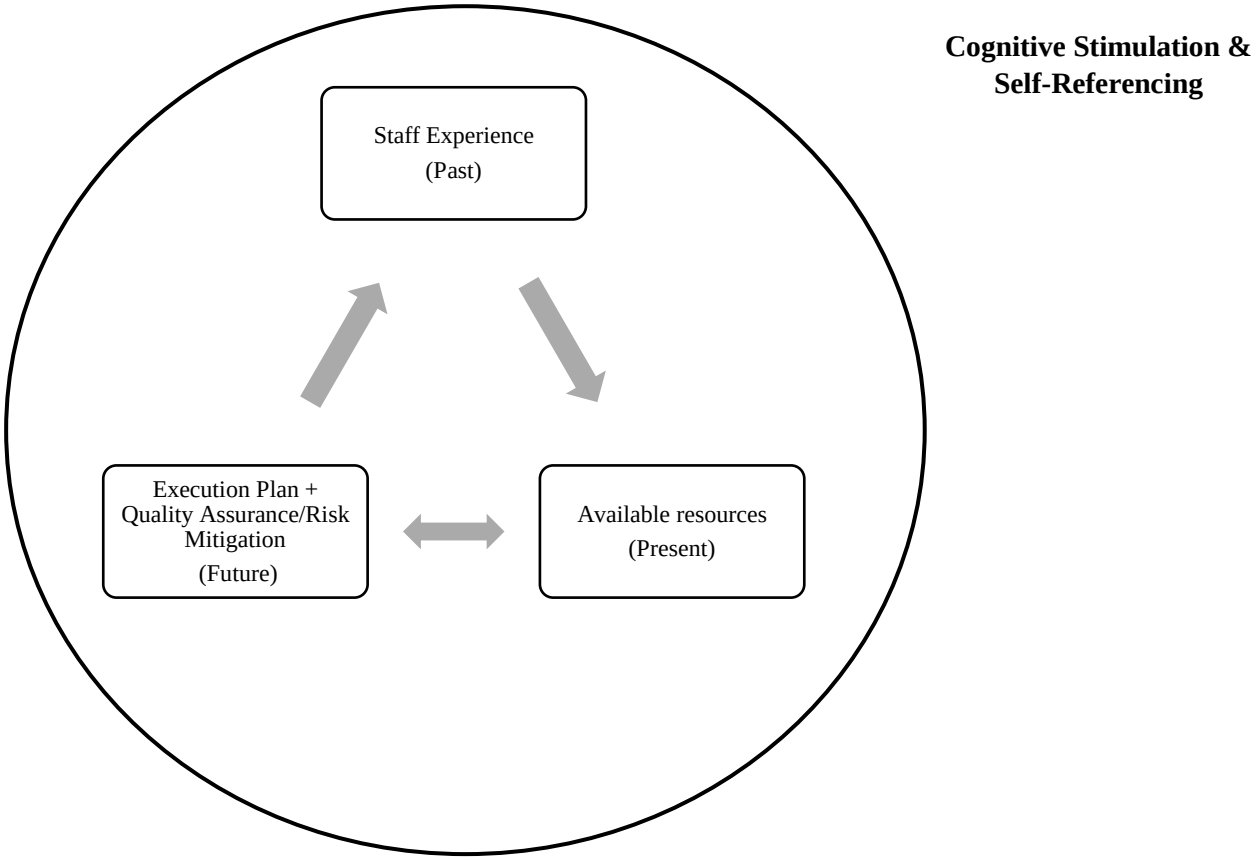
'evidential support' from past experiments. This is where temporality in this study is also found to function as *'evidence'*. Temporality in the scientific merit plot uses referencing old methods (past) to support the selection of methods and experiments. Preliminary data also helps in supporting the notion that the selected method would yield promising results (present to promising future). And finally, mentioning innovation and scientific contribution provides the futuristic narrative of the scientific novelty plot. The story plot of a proposal therefore expands more than what existing literature suggests, i.e., standard experimental work in the lab (ElShafie, 2018; Green et al., 2018) but is rather extended into novelty and scientific competence with temporal evidence as a guide to ensure the tackled problem can be solved.

5.3.3 The Achievability Plot

The final plot to be discussed is the achievability plot. Although the proposal is regarded as a story, its achievability is seen as a well-thought plan. The plan needs to be secure as much as possible as the proposal document is considered a legally binding transaction with the funder/client. This new finding implies that a proposal is viewed as a business transaction, which needs to be fulfilled as promised. One of the main concerns of committee members is to ensure that the proposed research can actually be achieved, which is an analytical response (Escalas, 2004) rather than the transportation response (Green & Brock, 2000) we see from the use of stories. Methodical writing in the proposal is prominent within the suggested project implementation section (i.e., approach). However, unlike published research in science communication (Jones, 2014; Dahlstrom, 2014; Kwon & Nelson, 2016; Lidskog et al., 2020), results have not yet occurred. Therefore, articulating benefit and scientific merit alone does not suffice. Another important finding in the achievability plot is also the use of temporality as *'supportive evidence'*. The achievability plot has its analytical connotations where committee members/reviewers analyse the approach used to solve the problem, i.e., the suggested tasks and matching them to the methods used, staff experience who will be handling the project, budgeting and quality and risk mitigation. I have found that committee members/reviewers use self-referencing and memory recall (Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007) to analyse whether the proposed plan is achievable—meaning they analyse order of tasks and their relation to methods, budgeting, staff experience and utilisation of resources based on their own experience as scientists. Committee members are researchers, hence they are trained professionals, so they know

or have expectations of order of tasks, ensuring tasks match deliverables. They have prepared budgets themselves, hence know how to write them and have expectations of what needs to be calculated and what needs to be justified based on their own experience. This contradicts the existing storytelling literature, which suggests that narrative transportation alone induces narrative self-referencing (Sujan et al., 1993; Levy & Peracchio, 1996; Escalas, 2007). Instead, I suggest that analytical processing in the case of research proposals, especially in the achievability plot stimulates self-referencing as well. Another important function of the achievability plot is to instil trust in the science communicator, meaning that achievability shows integrity, dependability and competence, which are the three elements of trust as indicated by Hon and Grunig, 1999; Rahn and Transue, 1998; Roduta-Roberts et al., 2011(cited in the National Academies of Sciences, Engineering & Medicine, 2017). Being scientists themselves, committee members are trained on writing the scientific approach i.e., the research plan and therefore look for specific information to ensure the proposed research is achievable in a logical manner. Logical experience is supported by temporality within the research proposal as demonstrated in the figure below.

Figure 5.4: Achievability Plot



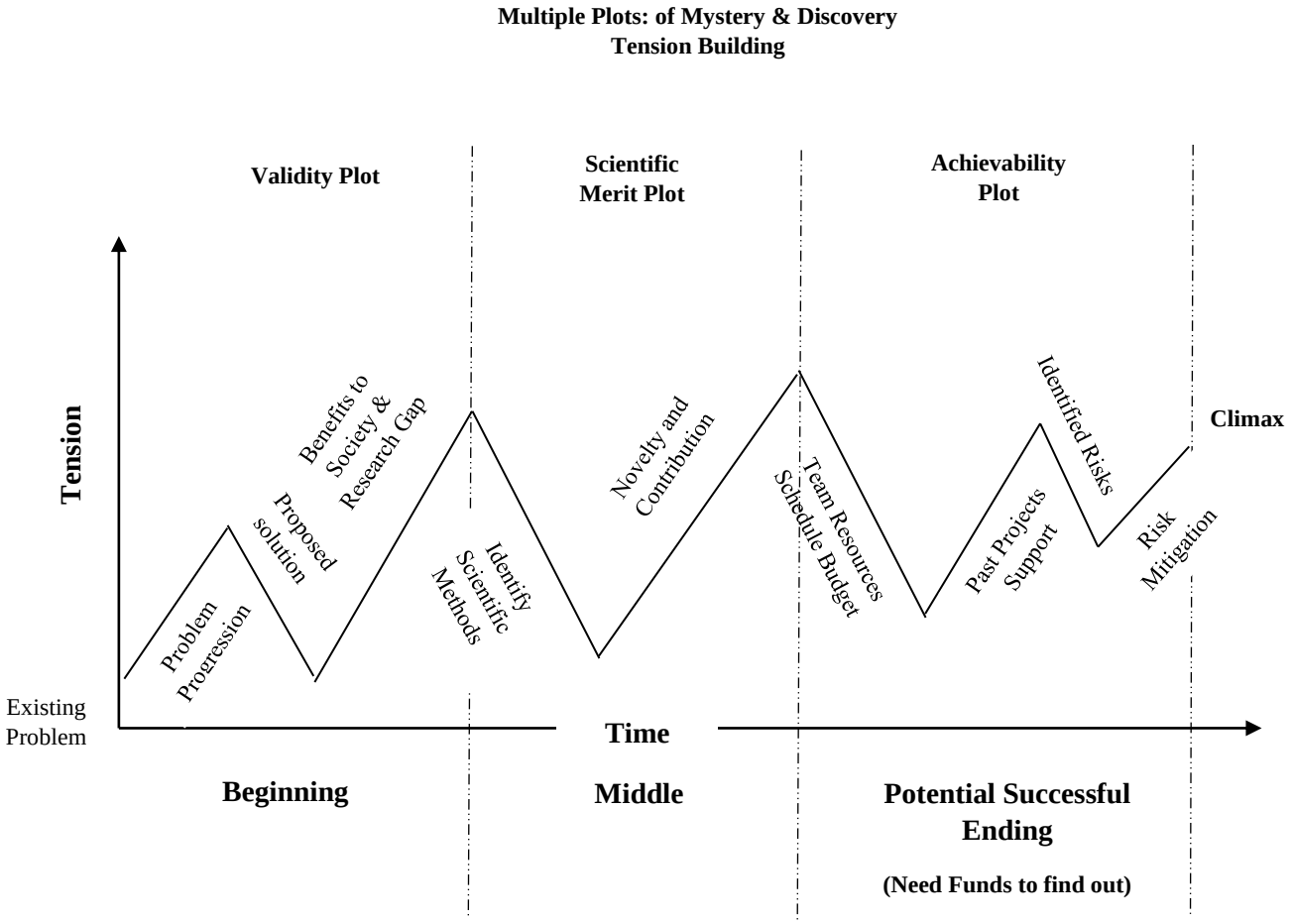
The achievability plot's main function is to stimulate cognitive response, where the reviewer/committee member is triggered by their own experience as scientists/research applicants and in turn analyse the applicant's approach to execute the project. The objective of achievability is to instil trust in the applicant where the achievability plot shows that the applicant scientist is reliable, dependable and competent i.e., they are capable of completing the project, have the required expertise to do so and are fully aware of future risks that they are capable of mitigating to ensure quality output. This plot is also supported by temporality as it uses past, present and future connotations where staff experience (past) supports the selection of the appropriate research team to solve the problem. Discussing available resources such as facilities, labs, chemicals (present) are considered contributors to the project's success. Finally, risk mitigation and quality assurance (future) show future-forward thinking by the applicant, where they are engaged in ensuring quality output by showing the understanding of potential hurdles that they plan on mitigating. Therefore, the use of temporality in the achievability plot is to provide *'supportive evidence'* that the applicant has thought about all risks associated with the project and can therefore provide reassurance of the capability to implement the project within the suggested timeframe to fulfil their promise to the funder. In the section below, I explain how all plots come together in a dramatic arc format that ties together the story narrative from beginning to its end.

As a story narrative follows a dramatic arc format (Campbell, 1949), in the context of this study, I present the case that a regular dramatic arc approach does not work with funding committees, as the decision for funding is very complex. In this context, I have developed an updated dramatic arc figure, which captures the need for multiple plots that would address the concerns of such complex audience when making a funding decision as follows.

The updated "dramatic arc" takes temporal components of each plot into consideration as the story narrative progresses into its potentially successful ending. The figure describes the progression of the plots as it increases and decreases in tension throughout the 3 plots. The arc therefore consists of multiple plots that lead to a climax of a potentially successful ending that needs to be supported with temporal evidence in order to encourage a funding decision. It is important to note that the following updated dramatic arc only explains the

elements of a successful proposal story's plots format. A fully comprehensive figure that depicts all theories and concepts discussed in this chapter will be provided later as a conclusive theory to successfully obtain funds.

Figure 5.5: Dramatic Arc for Scientific Proposal Story



The updated dramatic arc above draws attention to the unique function of temporality (Time) in research proposals, where the specific temporal elements identified in each plot serve as structured evidence to support scientists in their pursuit of funding. This tension in temporality and its function is unique to this study and has not been discussed in previous literature. Also, endings in Campbell's dramatic arc are known, however in the case of research proposals, an ending is unknown, but is presented as potentially successful by the applicant through the support from the temporal elements within the 3 identified plots. The 3 identified plots present critical information that funders look for to make a favourable funding decision, which is an addition to existing science

communication literature that implies the use of a single (mystery/discovery) plot when telling the story of scientific results.

As discussed by committee members, reading a proposal that flows in terms of sequence is not enough. The proposal document itself needs to look appealing in order to encourage reading as will be discussed below.

5.4 Aesthetics

Aesthetics have been discussed in previous literature pertaining to the use of charts and diagrams to help simplify scientific content to different generic audiences (Bigg, 2016), and this study also supports existing literature in expressing the need to use such diagrams to simplify complex scientific content also to expert scientists. However, this thesis provides greater emphasis on the value of aesthetics to reviewers/committee member audiences when making a funding decision. The final theme from this section therefore may seem to present a contradiction the entire discussion mentioned thus far, which is *'aesthetics matter.'* How a proposal *'looks'* is considered very important to committee members/reviewers. They pay attention to details such as font used, font size, spacing, and clear headings and margins. A proposal that looks aesthetically pleasing leaves a positive impression on the reviewer/committee member, by creating a sense of *'organisation.'* Hence, a proposal that is aesthetically pleasing, gives an indication that the applicant is well-organised and would be able to handle project execution in an organised and timely manner. Proposals that are not well-organised have the risk of being rejected for funding as the information becomes hard to follow, and committee members/reviewers as indicated above do not have time to *'fish out'* information, therefore rejection becomes a more compelling action. This finding creates a contradiction that good proposals are only well written in terms of clear plots, but I rather found that good stories also need to be well-presented in order to be appealing to read in the first place. Therefore, *'good science'* may as well be rejected if it is not *'well presented'*, which is problematic.

To summarise the discussion so far, a scientific research proposal can be viewed as: (1) a complex story with multiple plots and formats that; (2) needs to be prepared for a complex audience that has diverse interests, which means that the plots in the story being told need to match the interests of the intended audience in order to

convey a more convincing story, and finally (3) a proposal needs to look *'aesthetically pleasing'* in order to encourage the reviewer/committee member to read it as well-organised proposals save the reader's time.

Moreover, another component of the funding application process in my study is: (3) performance, where the applicant scientist meets the committee members and pitches the proposal in an attempt to persuade them to fund his/her research. The proposal pitch is in essence an orchestrated negotiation that a scientist should intricately prepare for in order to achieve a convincing performance that best articulates the complex story to receive funding. I highlight that research proposals are considered a *'Science Negotiation'*. I discuss how science negotiations are performed and how performance parameters affect the funding decision process. In the section below I discuss my third theme: Science Negotiation—the performance of the proposal pitch.

5.5 Science Negotiation and Dramaturgy Theory

The final part of the study relates to the negotiation of the scientific proposal story and I theorise this through dramaturgy theory. Before discussing dramaturgical implications on science communication, it is important to note that existing science communication literature does not introduce this type of analysis. Existing literature on educational communication highlights oral storytelling (Marlar, 2010) and how scientists can derive such concepts as the use of language and presentation skills (Yoder & Kowalski, 2003) to improve their communication of science. Therefore, this study suggests that the application of dramaturgy concepts would aid applicant scientists in their performance of science negotiations to obtain funding. Dramaturgy implies that the storyteller is an actor performing a story on a stage in front of an audience (Goffman, 1959). The setting of telling a story and receiving it is considered an interaction. Actors take actions when telling a story in order to maintain this interaction and ensure its continuity. Also, the storyteller and audience members both have assigned authorities depending on their roles. For example, a scientist may be assigned authority due his experience and age, while committee members have a more serious authority due the nature of their role as gatekeepers of funding. The act of storytelling itself is considered a "front stage performance" (Goffman, 1959) and the preparation for the performance is considered the "backstage" (Goffman, 1959). The institute being researched subjects the applicant scientist to a meeting with funding committee members, in which the applicant attempts to negotiate their proposal

to a diverse audience in order to receive funding. As highlighted by Lenhart et al. (2020), oral communication is different than written communication. Oral communication has the advantage of using language that would be more easily understood by the audience, which would then "enhance interest and comprehension" (Lenhart et al., 2020: p. 339). I observed that committee members favour face-to-face interactions as they provided a means for elaboration. As expressed in Marlar (2010), oral performance provides means of using language for expressive elaborations. As indicated by committee members, the presentation is actually viewed as a platform for further elaboration and explanation of the proposed idea as it allows for interaction and therefore better understanding.

Findings pertaining to performance of a science negotiation are discussed as follows: (1) the Frontstage where impression management and continuity of engagement processes take place to ensure the meeting continues. (2) Backstage, where preparation and identification of audience roles impacts the content of science negotiation. And finally, (3) Scientific authority, which describes how applicants are perceived by committee members and hence are heard and describing how committee members comment based on their background knowledge of the proposal's topic.

During the negotiation performance, scientists engage in impression management (Goffman, 1959), where they try to sustain the performance as much as possible in order to achieve the desired funding outcome. Scientists put on their frontstage persona (Goffman, 1959) in order to reflect the impression of confidence on committee members. This is done through clear explanation of the project and being able to thoroughly answer questions, especially irrelevant ones in a form of science negation. Maintaining a controlled self in front of committee members as well as rapport building gives the impression of confidence to committee members. A controlled-self in turn leads the committee members to believe the applicant scientist is trustworthy (de Bruin et al., 2007 cited in National Academies of Sciences, Engineering & Medicine, 2017) in the ensuring the timely execution of the research. This makes committee members feel that a scientist is a leader and is therefore capable of executing the project and is able to handle any obstacles that may appear at the execution phase. A scientist also engages in rapport building in order to establish a *'front face'* that is friendly, and appreciative of the committee members'

time which eases the negotiation process. The experience of a committee meeting allows scientists to take advantage of oral storytelling to strengthen their persuasion of committee members to provide funding.

The second part of the performance is the amount of preparation that happens before the negotiation performance takes place. As described in dramaturgy theory (Goffman, 1959), actors who are engaged in storytelling have a different persona within the backstage, where they are more relaxed and are their natural selves. In the context of my study, I describe backstage as the preparation phase in which an applicant takes several measures to prepare for their performance. Preparation is neglected in science communication literature. I have found that scientists as well as reviewers/committee members engage in roleplay when preparing. Presenting scientists imagine themselves as the reviewer/committee member when writing the research proposal itself as well as when preparing for the presentation. Writing as a reviewer allows the applicant scientist to understand the requirements of his audience and therefore translates these requirements into the proposal's narrative. Applicant scientists follow the same procedure when preparing for the personation. They assume the role of the committee member to anticipate what type of questions are going to be asked by different audience members, which provides advantage when negotiating science. This supports my classification of audiences, as different audiences look for different types of information in a research proposal and hence will ask different questions. Much like role-play in theatre where actors immerse themselves in the role they are trying to portray (Newkirk, 1995; Da Silveira et al., 2013), a scientist must become an actor and portray the role of the reviewer in order to present information from the perspective of the reviewer who will be making the decision on whether to pass the proposal for funding or not. The applicant scientist therefore assumes the roles of a *scientific expert, a scientific layman*, as well as a *universal audience* in order to write a compelling proposal or presentation that will address all audience levels of the funding committee.

Realising the different classification of audiences also is taken into consideration as scientists rehearse their presentations to different audiences such as their children or amongst their peers. Presenting to children allows the scientist to understand whether their project's benefit is clear, concise and comprehendible, which is pertinent in the validity plot where the problem, solution and proposed benefits are communicated. On the other

hand, presenting to peers allows to derive inferences on whether the presentation is comprehendible, is logically formatted, is scientifically sound, and whether project execution is succinct, which is evident in the scientific merit and achievability plots. The mock-presentation therefore strengthens the story being told as well as strengthens the storyteller's ability to tell the story due to thorough practice and receipt of valuable feedback. A mock-presentation therefore encourages reflection (Green et al., 2018) and helps improve the presentation by managing the narrative in a more understandable manner with the intended audience.

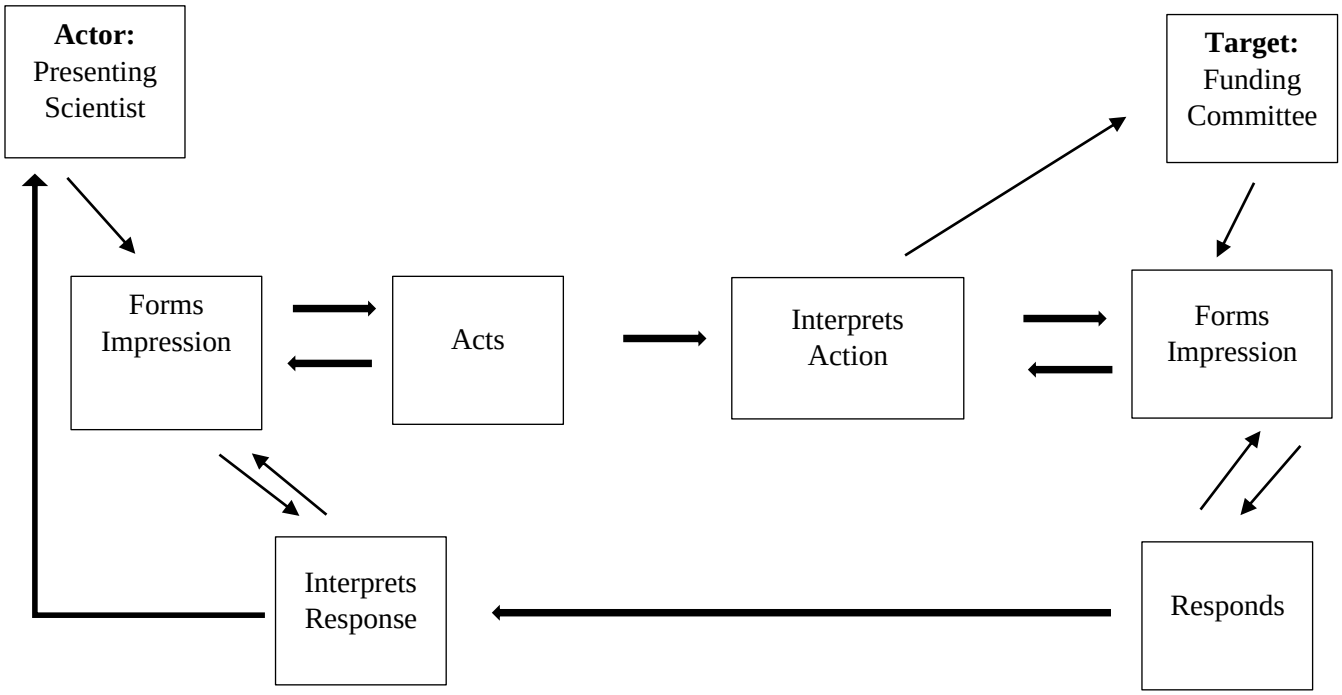
However, the important observation to understand is that an audience makes a perception of the storyteller before deciding to listen to the story (Yoder & Kowalski, 2003). This means that the credibility of the storyteller plays a role in perceived trust of the storyteller, hence has an impact on the audience's willingness to listen to the story to be told due to established rapport (Yoder & Kowalski, 2003). Once rapport is established, the storyteller is able to communicate their future vision, beliefs and values in a manner that stimulates the audience's attention (Yoder & Kowalski, 2003). This entails that credibility of the storyteller as well as their storytelling skills have a great influence on the audience.

Thirdly, although scientific authority in existing literature suggests that the general public listen to scientists who have perceived expertise in the scientific topic in order to be viewed as a trustworthy expert in the field (Lupia, 2013), my findings suggest that scientific authority may be viewed differently by reviewers of research proposals. Reviewers perceive themselves as having scientific authority based on their own expertise. This means that they pay attention to the field of study in the proposal before doing the actual review. This phenomenon has been uncovered from participants in the study who are proposal reviewers. They explain the difficulty in being able to review proposals that are not within their own scientific discipline, which is manifested in scientific authority required to be critical of research proposals. I found that reviewers themselves will not critique proposals that are not within their scientific discipline as they believe they do not have scientific authority to do so. Therefore, reviewers either decline to review such proposals in order to ensure fairness in decision making or rely on expert peers, who have the scientific authority (scientific expertise and experience) to provide professional feedback. One of the main concerns of this decline to review is also to *'save face'*, where the reviewer

does not want to give off the impression that they are not knowledgeable about the subject and hence gives a negative impact on their self-reputation as described by participants in the study. Hence declining to review becomes a *'defence mechanism'* (Goffman, 1959) exerted by the reviewer in order to maintain their positive self-image.

The figure below summarises how the social interaction cycle works in the proposal presentation setting.

Figure 5.6: Based on Erving Goffman's General Social Interaction Cycle



The figure shows the actor, being the presenting scientist presenting to his target audience: the committee members. The social interaction is captured where the actor forms an initial impression about the committee members, which was explained by participants as being tentative to their body language as an indication of interest. The presenter then acts, i.e., presents to the members. He then interprets his own actions by being tentative to the committee's responses. As the scientist presents, the committee members form an impression about the presenter by interpreting his actions as well as his response to the committee's reactions. This cycle of action and reaction feeds into the actor as he alters his performance of the science story to fit his target audience's responses, which is the science negotiation mechanism used to convince committee members of the worthiness of the proposal for funding. Therefore, one of the most important findings in this study is that the act of science

negotiation symbolises an interactive story, that is manipulated and changed based on the recipient's response. This means that the recipient of the story may have an influence on the alteration of the story as opposed to listening and receiving the story only, which presents a new finding in the science communication field. Science is generally communicated for the purpose of sharing knowledge or stimulating the general public or policy makers to take related action (Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021). During this type of communication, the generic audience only receives the story, i.e., the story is not altered as it is being communicated. However, in a funding setting, the story being communicated is being constantly altered in an attempt from the applicant to convince the committee members of the worthiness of their proposal through the process of science negotiation.

Finally, the common component that is linked the issue with *'time'*. The main problem faced with communicating a research proposal is its link to time. Time spent on proposal development, submission, review and acceptance is considered critical as delays in the aforementioned lead to the proposal being obsolete. Proposal development is essentially regarded as a *'race'*, where scientists all over the world are looking into solving similar problems, and the *'race'* becomes of who is able to get funded first, and consequently execute and report on findings first. Being first to publish is the main target and publishing leads to elite status amongst the scientific community. The object of time is also an issue with reviewers and committee members who have to review lengthy proposals in detail, while also being obliged to fulfil their other daily duties. This has an impact on the proposal format, where proposal length and clarity of presented information must be considered in order to encourage review. Shorter proposals are therefore preferred where the three plots are clearly communicated and well written. Another component of time is considered during the performance of the proposal pitch, as the setting of the proposal meeting is done later during the day, where the presenting scientist needs to take into consideration the mental state of committee members late in the day. This entails that committee members' comprehension is impeded from their strenuous daily work throughout the earlier hours of the day, hence making their attention span very limited. Therefore, presenters need to take this consideration in mind when preparing the presentation content and when performing in order to grasp committee members' attention as quickly as possible through

'simplification' and presenting *'new'* pieces of information rather than repeating what they have already written in the proposal.

In summary, I have introduced the concept of *'narrative alignment'*, which acts as a story frame for diverse audience members. Alignment is explained as aligning existing stories of the institute, funder and the country in the proposal narrative in order to create emotional stimulation by presenting similar values and interests. I also highlight three types of audiences: *the scientific expert, the scientific layman* and the *universal audience* who are influenced by different pieces of information first when making a funding decision.

This study unveils that the proposal document should be viewed as a complex story with multiple plots namely: validity, scientific merit and achievability. The format of a proposal includes both storytelling narrative format as well as methodical scientific format that serve different functions, which highlights the complexity of science communication for the purpose of funding. I hence introduce the term *'narrative elaboration'*, where the function of the written sections of the proposal depicts stimulating "narrative transportation" as well as "cognitive elaboration" in parallel when making a decision to fund. *'Narrative elaboration'* suggests that the reviewers/committee members begin the immersion process in the story through the validity plot, but look for supportive evidence within the analytical plots i.e., scientific merit and achievability, which stimulate cognitive thinking as well as memory recall to make a sound decision about the proposal. Finally, this study highlights the importance of the performance of science where I explain the different parameters to consider during the negotiation of science and the new finding of scientific authority presented by committee members who refuse to review proposals not within their areas of expertise.

In the following section I consider how to address proposal audiences, how the proposal story should be woven and how sections within the proposal function to aid in the funding decision-making process.

5.6 Theorization

This section explains how the findings expand on existing storytelling theory in the context of proposal application for funding. I explain narrative transportation versus analytical processing theory, and how they function in terms of persuading committee members of diverse backgrounds, whose job entails being custodians of funding.

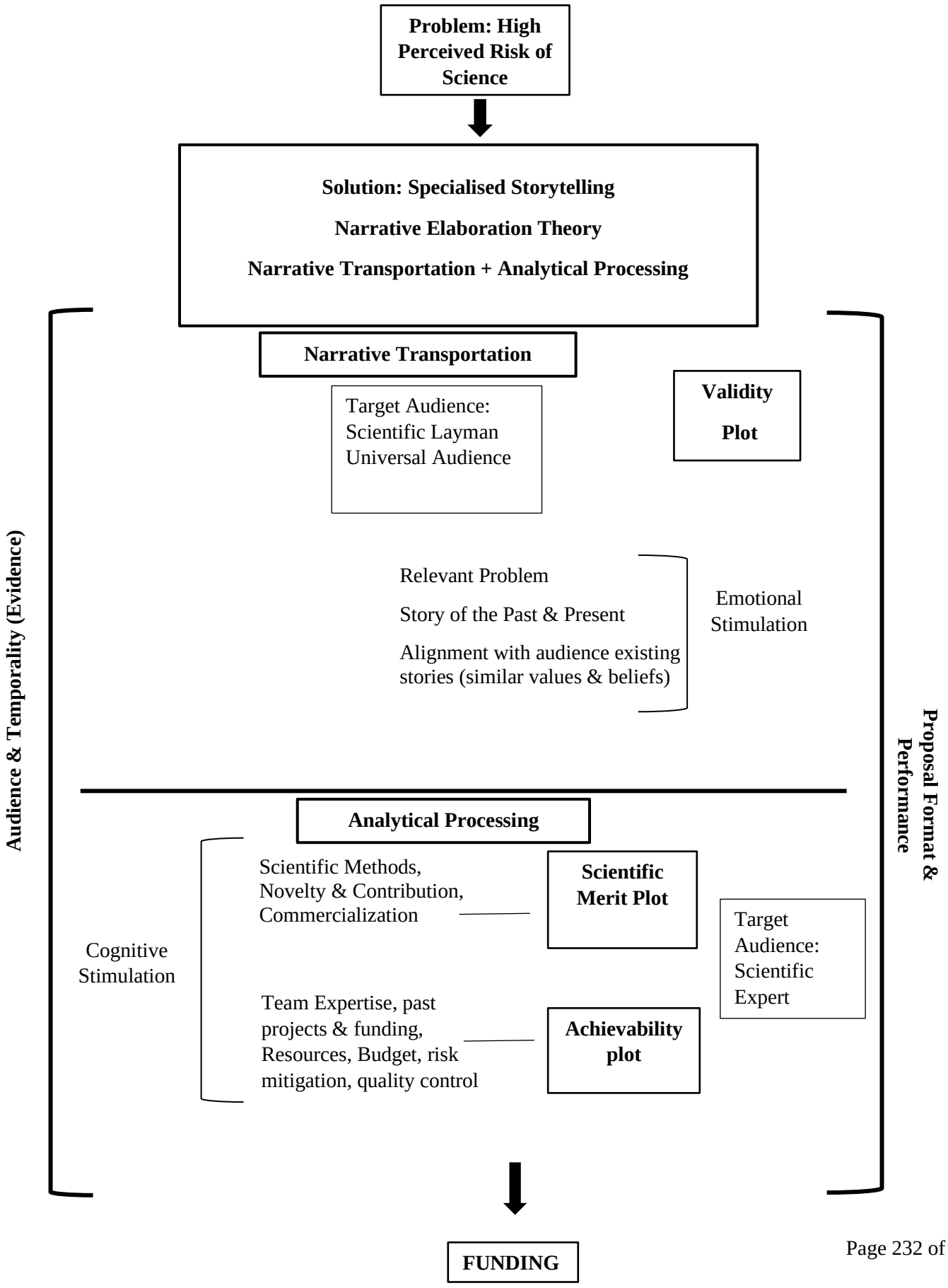
5.6.1 Enabling Storytelling Theory: Narrative Transportation Versus Analytical Processing

The above discussion chapter emphasises paying attention to different audience types as well as their corresponding information requirements to optimise science communication for the purpose of funding. However, the proposal document needs to be viewed as a complex story. This complexity lies in the document's information requirements and format where sections in the proposal have been found to serve different persuasion functions due its narrative and methodical scientific writing components. As the proposal document includes complex information that is targeted towards a specific complex audience, simplifying how a proposal document is constructed in terms of a story would aid applicant scientists in their mission to sway funding action. Therefore, constructing a proposal document in terms of a story with multiple plots becomes the proposed solution in this thesis. Each plot serves a purpose in the decision-making process where the first plot—the validity plot functions as a *'narrative frame'* that is *'aligned'* with the intended audience's existing organisational stories. The validity plot therefore shows the benefits of the research in contrast to the selected problem and highlights the research gap intended to be covered. The validity plot stimulates emotional appeal as it stimulates action through the process of "narrative transportation" (Green & Brock, 2000) where values and beliefs are aligned with that of the committee, the institute, the funder/client and the state of Kuwait. However, due to the nature of scientific research institutes being concerned with the science and funding of proposed science being very risky, emotional appeal alone does not serve persuading specialised committee members. Hence the requirement for the inclusion of specialised information that stimulates analytical processing becomes a necessity. Analytical stimulation therefore occurs in the scientific merit and achievability plots, where applicant scientists show the technicality of the proposed research methods as well as its thorough execution plan. Although existing science communication research emphasises the importance of the use of storytelling as a communication tool, it fails to mention how

stories are used for specialised audiences such as funding committees and how sections within the story function to serve persuading them. In this thesis, the major finding highlights the need for both narrative transportation as well as analytical processing to achieve a favourable funding decision. One does not negate the other, but they rather work hand in hand to convince committee members to fund.

In this context, I have suggested a *narrative elaboration theory*, which highlights how telling the story of a research proposal is in essence a story that follows three main plots. The plots are used for specific target audiences where their separate and unified needs are addressed. The figure below shows the need for both narrative as well as methodical scientific writing formats that work together rather than in silos to encourage a funding decision. The figure also highlights that the formats as well as plots are tied around risk reduction narrative as well as good performance that would encourage committee members to make a favourable funding decision as a proposal is seen as a risky investment.

Figure 5.7: Narrative Elaboration Theory



While I have clearly established the need for storytelling when communicating a research proposal, telling generic stories does not suit the intended audience nor required action pertained in this study, which is the approval of funds. I identify the key audiences for a proposal, and how these audiences change based on their backgrounds and assigned roles and responsibilities. Understanding the different audience types also unveils what information they would be interested in, hence the need for a more tailored story that takes a complex audience into consideration. The story of a scientific research proposal is more complex than telling a story of completed science as the results are not guaranteed, hence making outcomes of a proposal seem risky due to ambiguity. The narrative throughout the entire proposal requires reducing the risk of ambiguous outcomes by using specific plots and writing formats that allow for presenting clear information that aids committee members to make a funding decision. This lies in the establishment of three main plots that guide reviewers/committee members into comprehensively understanding the proposed work in terms of valid benefits, scientific merit and achievability. These are the three main concerns to address for a proposal to be considered successful. As the identified audience and funding action required are complex, I have found that information presented within the proposal follows two main formats, which are narrative as well as methodical scientific writing. This entails that different audiences look for different types of information within the proposal in order to make a sound decision. Audiences on the other hand explained how narrative guides them into making an emotional decision that is tied to providing solutions to existing societal problems. This guidance is described in the literature as narrative transportation (Green & Brock, 2000), which is found prominently in the validity plot. However, the methodical writing within a research proposal also suggests that communication within a research proposal is more complex, as narrative alone does not suffice to make a funding decision. As indicated in the results above, expert scientists who review research proposals, in addition to being transported in the narrative, become highly analytical of the scientific merit and the achievability plots written within the proposal. This is evident in the analysis of methods used, ensuring objectives and deliverables are matching, and ensuring all management aspects are thoroughly covered within the achievability plot to ensure successful project execution. While methodical writing is used in the scientific and achievability plots, it is important to note that they are both justified by narrative, hence making us

return to a transported stance within these two plots as well. The findings above therefore suggest that a research proposal is rather a complex story that includes analytical components in order to support funding decision making. The absence of narrative or analytical components can both negate funding, meaning both written components work hand in hand rather than separately to guide the funding decision.

While I have deployed narrative transportation versus analytical processing as my enabling theory, participants explain that they do need validation from past experience in order to make funding decisions. This notion appears in multiple areas within the detailed plots above, which have been explained under temporality. Narrative transportation occurs within a dramatic arc that shows regular temporality of a beginning, middle and end, however in this thesis, temporality is required with an evidence function as the end in unavailable due to research being futuristic in nature. Therefore, temporality in a research proposal does not function normally as it would in a regular story, but is rather used as an analytical tool to reduce perceived risk of the proposed research and aid committee members in making a decision to fund. Participant responses indicated this idea in the validity plot through the use of literature review i.e., stories from the past to validate the problem statement and proposed solution, the methods being proposed by the applicant in the scientific merit plot, where it is important to mention methods that are mutually agreed upon in the field as well as indicating exactly what type of methods are being proposed for use. Participants also indicated that they refer to their past experiences in order to make a funding decision, where they have indicated that they are experienced in writing proposals themselves, so they understand the process of writing and the importance of writing clearly. Participants who are reviewers and who write proposals also indicated that they anticipate what needs to be written in a research proposal for example in the achievability plot due to their review as well as proposal writing experience and hence the notion of cognitive elaboration is embedded in their decision-making process, making ***'narrative elaboration'*** an essential part of information processing from the proposal's narrative. Being aware of this cognitive elaboration, means that the applying scientist is required to focus on plots that feed analytical thinking as well as achieve narrative transportation, in order to satisfy this type of complex audience due to the nature of the committee member's job.

I now present the practical implications and final recommendations that would be of use to applicant scientists as well as funding institutes that would benefit from this study. I also discuss transferability, limitations and future studies required to further this research work.

CHAPTER 6: CONTRIBUTIONS, IMPLICATIONS FOR EXISTING THEORY AND FURTHER IMPLICATIONS

6.1 Contributions

The topic of exploring how science communication could be enhanced for funding purposes in itself has not been thoroughly explored in science communication literature, which presents a new case-study that brings new insights to the science communication field. This study seeks out a real-life problem in its natural setting (Glaser & Strauss, 1967; Meredith, 1993; Langley, 1999; Robson, 2002) that is socially constructed from the data. Through social interactions with participants in this study, I was able to draw insights on the information required by committee members/funders who review scientific research proposals to make a funding decision directly from participant accounts (Glaser & Strauss, 1967; Meredith, 1993) to develop the grounded theory of *'narrative elaboration'*. Although this study does not provide a completely original theory, it builds on existing theories from marketing (Slater, 1996; Kotler & Keller, 2015), science communication (Elshafie, 2018, Joubert et al., 2019; Yuan et al., 2019; Lidskog et al., 2020; Mannino et al., 2021) storytelling (Green & Brock, 2000; Gabriel, 2004; Anderson, 2010; Kent, 2015; Martinez-Conde & Macknik, 2017) and dramaturgy (Goffman, 1959; Manning, 2008; Schreyägg & Häpfl, 2004) to help achieve successful application for funding of scientific research. Therefore, contributions in this thesis are viewed in the prominent arguments as follows:

1) **Audiences of Science Communication:** Audiences for science communication identified in existing literature focus heavily on communication of completed science (ElShafie, 2018; Joubert et al., 2019), while assuming that scientists communicating amongst peers is unproblematic. I draw from marketing theories developed by Kotler & Keller (2015) that pertain to audience segmentation (Slater, 1996) and framing marketing messages to cater to specific audience segments and define new audience segments for science communication. This thesis has therefore identified a more complex audience set of expert scientists as well as expert management executives who possess the unique role of approving funds for scientific research consisting of the *'scientific expert, the scientific layman and the universal audience'*. Each of these audiences focus on their own information requirements first when making a decision to

fund. The scientific expert first looks at the scientific content as they are experts in the proposal's field, hence are first analytically-stimulated (Escalas, 2004) when making a funding decision; meaning that they tend to skip the narrative altogether first. The scientific layman is a new audience category introduced by this thesis, where I identify the shifting stance of an expert scientist into a scientist who is unfamiliar with the scientific field being discussed in the proposal. This audience type pays attention to the proposal's narrative in which the focus becomes on the validity of the proposed research in terms of benefits to the institute, the funder and society as a whole, therefore narrative transportation (Gerrig, 1993; Green & Brock, 2000) is achieved at the beginning of the funding decision, which supports existing literature that stories in science communication are a beneficial tool to use to explain science. The universal audience—consisting of expert management executives however, are first drawn to the proposal's project approach section, where they examine the achievability of the project in terms of a well-thought-out plan. The universal audience in turn is also analytically-stimulated first when making a funding decision. In addition to identifying new audiences for science communication and their information triggers to make a funding decision, this thesis also underlines the importance of addressing the audience's role in addition to their expertise. This means that the identified audience needs to be viewed from the lens of *'the custodian of funds'*, which is an additional responsibility implied by their role to approve funds for scientific research. *'The custodian of funds'* role suggests that this type of audience is obliged to ensure the best interests of the institute they work at, the funder as well as the country. Audience segmentation (Slater, 1996) and framing theories (Kotler & Keller, 2015) suggest that communication and messaging should be catered to the specific interests of audiences to achieve persuasion leading to a purchase. My thesis supports this notion by using framing to encourage funding decision making rather than a purchase where applicant scientists need to understand the different audience segments that review their proposals in order to present information that is catered to their interests. However, this thesis adds to framing theory in that the custodian role implied on committee members/funders imposes the need to not only present information catered to each audience's requirements but to indulge the custodian role with existing stories that fit the

custodian levels mentioned herein (institute, funder and country levels). With that in mind I have identified the importance of using existing stories of the institute, the funder and the country to be embedded within the proposal story to emphasise validity, i.e., express how and why the proposal is important and beneficial. This type of audience dissection is relatively a new finding in science communication literature that scientists applying for funding would benefit from acknowledging when writing their research proposals. I now move on to explain the second contribution of how presenting information for such a diverse audience can be achieved within a proposal's narrative.

2) **Viewing the Proposal as a Complex Story (with 3 major plots):** the second prominent contribution this thesis presents is viewing the scientific research proposal as a complex story with 3 major plots. A proposal document with all of its sections and information requirements is considered an overwhelming document. This thesis presents the idea of viewing the proposal as a story that covers the funding audience's 3 major concerns in 3 plots. These plots are 1) validity, 2) scientific merit and 3) achievability. While existing theories in science communication acknowledge the use of storytelling when communicating research results, I draw attention that using a single plot does not suffice when persuading a complex audience for funding. Existing literature focuses on a mystery or discovery plot (Tobias, 1993; Kent, 2015; ElShafie, 2018; Joubert et al., 2019) yet this thesis presents the argument that due to the complexity of the funding decision and the variety of its audience's information requirements, communicating science in a research proposal rather requires 3 plots to encourage a funding decision, which is a new finding I introduce to the existing science communication literature. I now explain the functionality of these plots in relation to existing theories and my own contributions.

   A) **The Validity Plot:** supports existing literature in which narrative stimulates emotional connection and hinders analytical thinking through stimulating imagination that leads to emotional attachment (Gerrig, 1993; Green & Brock, 2000). However, in this case study, narrative transportation alone cannot be depended on solely to persuade for funding. Scientists and management executives due to

their *'custodian role'* are obliged to think analytically when making a decision to fund as funding a research project with an unknown outcome is considered a very risky investment according to participants. Hence this thesis presents the argument that narrative transportation as well as analytical processing are required to stimulate a favourable funding decision. While the validity plot works to achieve narrative transportation that sparks interest in the proposal for further review, the following 2 plots: scientific merit and achievability are used to support analytical-processing by providing critical information required by committee members/funders to make a sound decision.

B) Scientific Merit Plot: explains the scientific contribution of the research proposal thereby addressing the expert scientist audience's information needs. This plot provides reassurance of the selection of the correct method that matches the problem being discussed in the proposed project and signifies contribution to the field. The scientific merit plot promotes analytical processing with the reviewers/committee members by making them analyse and judge the scientific content of the proposal. However, I add to the literature by suggesting that the scientific merit plot not only promotes analytical processing, but also stimulates memory recall. Memory recall is said to be a derivative of narrative transportation where people relate to the story and recall their own experiences in an empathetic manner, which would stimulate action (Sujan et al., 1993; Levy & Peracchio, 1996; Green & Brock, 2000; Escalas, 2007). However, in the case of making a funding decision, memory recall is also stimulated in expert scientist audiences as reading pure scientific methods stimulates them to recall their own experience as scientists, and helps them retrace the thought process of the applicant from their own experience of being scientists themselves.

C) Achievability: the achievability plot describes the project execution. Funders/committee members emphasised the importance of analysing this plot's information as it provides a guide on whether the project can be completed. The participants indicated that a proposal is considered a legally binding document, which implies that the risk of not completing the project as stated would lead to legal

complications, which is a risk in itself that the achievability plot helps mitigate. Like the scientific merit plot, I add to existing literature which states that narrative transportation achieves memory recall (Sujan et al., 1993; Levy & Peracchio, 1996; Green & Brock, 2000; Escalas, 2007) by stating that the achievability plot with its complicated forms/sheets (e.g., detailed budget sheets that depend on calculations) also stimulate memory recall. Proposal reviewers/committee members are also scientists and management executives, hence draw from their own experience when reviewing budget sheets or manpower distribution tables. These sheets and tables do not include narrative however stimulate memory recall, which is an addition to science communication literature that mentions the use of stories to create memory recall and emotional attachment to stimulate action.

D) **Temporality function in all 3 plots:** existing storytelling literature describes temporality in a story of functioning to organise the story's events to take the listener through the story from its beginning, middle to its end (Bruner, 1990). My thesis adds an important function to temporality, which is using temporality as structured proof from the past, which leads to the present and takes us into the future. Temporality as structured evidence is suggested in all 3 plots where it adds to the tensions of the story to attract the attention of the reviewers/committee members audience through analytical information that would aid in their funding decision.

E) **Aesthetics "Looks Matter":** while existing literature states that the use of diagrams and charts facilitates understanding of complex science (Bigg, 2016) as they are aesthetically more acceptable than methodical scientific writing, in my study I add that a proposal document is required to look aesthetically pleasing in order to be considered for funding, which is a notion that has not been explored in science communication literature. The issue with this finding is concerning as participants implied that even if the suggested science in the proposal is outstanding, a proposal could be rejected based on its aesthetic looks. Therefore, a good proposal consists of 1) a good story that 2) addresses different audience roles and information needs, and is 3) aesthetically pleasing. I now explain the next

theoretical contribution in this thesis where I view science negotiation performance through dramaturgy theory application.

3) **Dramaturgy in Science Negotiation Performance:** existing literature discusses improving the performance of science communication in terms of drawing from academic oral storytelling (Marlar, 2010) and the use of language as well as mastering presentation skills (Yoder & Kowalski, 2003). This thesis rather suggests that the successful performance of science negotiation performance would greatly benefit from the use of dramaturgy concepts (Goffman, 1959), which was not thoroughly discussed in science communication literature. Viewing the world as a stage and the communicator and recipient of the scientific performance as actors who engage in front-stage, back-stage and impression management (Goffman, 1959) suggests that scientists can benefit from thorough preparation, understanding how to put on a front-face as well as well-managing their impression on committee members during a proposal review meeting to be successful at pitching research proposals. I add that these concepts allow the applicant scientist to mitigate the risk imposed in trusting the communicator (Lupia, 2013; Yuan et al., 2019; Battiston et al., 2021) in a much deeper interpretation that is currently described in science communication literature. In the following section, I explain my own theory, which has produced a comprehensive framework for communication of scientific research proposals for the purpose of obtaining funds.

4) **'Narrative Elaboration' Theory:** As grounded theory is a qualitative method that enables to study a phenomenon and develop new theories that are based on the collection and analysis of real-world data (Glaser & Strauss, 1967), the theories proposed in this research are not completely new. I rather identify existing theories and modify them collectively in a new framework that can be applied to enhance the proposal application process. For example, 'framing' is a theory used in marketing studies to tailor communications to a specific audience segment (Kotler & Keller, 2015). I modify framing while exploring the audience for science communication in proposals for funding purposes. As I found that funding audiences have their *'custodian role'* motivations, values and interests at heart (Fanning, 1999; Green &

Brock, 2000; Gough et al., 2014; Hajdu & Simoneau, 2020), which are translated into their institutes' existing stories, I draw from the existing framing theory and modified it into *'narrative alignment'* where framing is altered to include existing stories to stimulate emotions and show validity of the proposed research project. Other theories I have built upon in this thesis are the theories of narrative transportation vs analytical processing (Green & Brock, 2000; Escalas, 2004). I have added to these theories by exploring whether senior scientists and senior management executives base their funding decision if transported by story narratives alone or if scientific methodical content alone is what encourages their decision. The results suggest that funders want to hear a story, hence would be transported in narrative, but they also look for analytical content to make a funding decision. Hence the development of my *'narrative elaboration'* theory where I bring together narrative transportation and analytical processing in a plotted story format that can encourage the decision to fund. Also, story plots have been used in science communication literature, however I add to the literature by identifying the complexity in plots required for the proposal's story, given its unique nature. Therefore, instead of using a single plot, I introduce the 3 plots: 1) validity 2) scientific merit 3) achievability that encourage narrative elaboration as reviewers/committee members are drawn by the narrative in the validity plot and then are analytically stimulated by the information provided in the scientific merit and achievability plots, which elaborate on the proposal's scientific contribution and execution management. I finally contribute to science communication literature by introducing dramaturgy analysis into science communication performance to add a live dimension to the communication of research proposals, which has not been talked about in previous science communication literature. To conclude, grounded theory implies establishing a theory that is new or unthought of, however in my case, I have identified theories from marketing, storytelling, science communication and performance/dramaturgy, put them in a more functional framework for the case of application for science funding, and have built my own theorization that is intended for use by my audience: scientists applying for funds and funding committee members when reviewing proposals.

6.2 Practical Implications and Recommendations

I will present recommendations and practical implications for applicant scientists according to the following: (1) considering diverse audience members, (2) successful proposal structures, and (3) science negotiations.

6.2.1 Considering Diverse Audience Members

As indicated in the discussion chapter, committee members consist of a diverse audience of different backgrounds. Based on these backgrounds, the capabilities of review become different as the knowledge related to the proposal topic becomes the driver for review capability. For example, the expert scientist holds expert knowledge in the topic being discussed in the research proposal and is therefore capable of reviewing and critiquing the science being discussed. This finding indicates that each audience member is first drawn to specific information within the proposal. For example, the *'scientific expert'* audience is first drawn to the methods section as they are capable of critiquing the science itself. The *'scientific layman'* and the *'universal audience'*, however, are not experienced in the scientific domain being proposed and hence cannot make sound judgement of the proposed topic but act as the custodian of funds on behalf of the institute, the funder and serve the best interests of the country. In consequence, these audience types are first drawn to the *'alignment narrative'*, which is the frame used to judge whether the proposal is in line with the institute, funder and country's existing stories. Therefore, an applicant scientist needs to take two audience parameters into consideration: (1) understanding the audience in terms of their experience and background knowledge of the topic and (2) understanding the audience in terms of their custodian role of funds. Once an applicant scientist understands the backgrounds of the funding committee panel, they are required to balance the information required to suit each audience's information needs. I provide practical implications when framing a research proposal as follows:

> **A) The Expert Scientist Audience:** Present scientific information in a very specialised manner for the scientific expert, with as much detail as possible. This implies that the methods section as well as the experiments need to be written in a *'peers professional'* standard that is directly appealing to a specialist in the discussed scientific domain.

B) The Scientific Layman Audience: Explain scientific information in a generic manner, but ensure that it does not turn into a *'101 lecture'* as this audience is still an expert audience. The scientific layman audience is first drawn to the proposal's validity in terms of alignment with the institute, the funder and the country's existing stories. Therefore, a framing narrative is required, which shows benefits to the institute's research agenda, benefits to the client and how they can both act in serving the best interests of the country by fulfilling the country's vision.

C) The Universal Audience: This audience type is not concerned with the science as they do not hold the required knowledge to judge the scientific value of the proposal topic. Therefore, this audience is mainly concerned with their *'custodian role',* being responsible for funds and ensuring that the proposal is valid in terms of alignment with the institute, the funder and the country's benefits. As discussed in point B above, a framing narrative is required, which shows narrative alignment with the existing stories of the institute, client/funder and the country.

The audience finding implies that there are two formats of communication required within a research proposal. First, a technical format that stimulates cognitive thinking (especially for the expert scientist audience) and second, an emotionally stimulating format of narrative, which provides a frame for the proposal and expresses potential benefits. In the following section, I provide recommendations and implications on how to structure a successful research proposal's story according to audience information needs in order to create tailored appeal and stimulate approval for funding.

6.2.2 Successful Proposals Structure

Understanding the proposal format and the functions of its various sections becomes a critical element in writing a successful proposal. A good proposal stimulates both emotions as well as analytical processing from reviewers/funding committee members. With that in mind, applicant scientists need to understand how to shape the proposal's narrative to serve these two functions. Therefore, applicant scientists need to write a good story that is supported by analytical information to receive funds as follows.

1) **New Story:** *'Good stories'* in science funding are: *'new stories.'* Research applications need to show that the proposed research should not be a repetition of existing work as the purpose of research is to gain *'new*

knowledge.' Funders are investors and they are looking for *'new discoveries.'* Repeated work is considered a waste of time and money. Therefore *'new stories sell.'*

2) **Plots:** A good story in a research proposal is complex as it takes into consideration three main concerns that are grouped into plots (information themes). Committee members/reviewers do not have time and therefore focus on three main areas they believe make a good proposal. A good proposal therefore focuses on:

A) **Validity:** show the selection of a *'real problem'* that is *'aligned'* with the institute, potential funder and that shows benefits to society/country. This plot stimulates emotions where the applicant scientist needs to highlight the problem's impact as well as align the values of his institute, the funding agency and dramatically show how solving this problem would help the society we live in.

B) **Scientific Merit:** show the selection of adequate methods that matches the proposed problem and that would yield the desired solution, which displays the applicant's *'scientific competence.'*. The applicant also needs to show scientific contribution within the field. For example, new knowledge generated would lead to elite publication. In this plot, there is high emphasis on being detailed in methodical writing as these details are analysed by the *'scientific expert audience.'* An example of methodical writing details would be matching the number of objectives with the number of deliverables.

C) **Achievability:** show a *'logically'* well though-out execution plan. The execution plan takes into consideration the selected team and their technical experience that needs to match the selected methods. For example, a method in biology needs to be implemented by a biologist. The order of tasks is important because reviewers/committee members are also scientists who have written proposals, therefore know and pay attention to what task comes first. A logical sequence of tasks can start with mobilization and ends with reporting. This is standard methodical writing that is analysed by reviewers/committee members and also stimulates their memory recall. Therefore, committee members should be viewed as like-minded scientists who know how to write a research implementation plan and will notice mistakes from their own experience in writing.

3) **Linked Narrative:** the three plots are very much linked and dependent on each other. For example, methods selected need to reflect the identified solution. Tasks need to reflect how methods will be achieved efficiently. When writing a proposal, the applicant needs to take into consideration that each section it related to the other to develop a cohesive story.

4) **Temporality:** good research proposals use temporal (past, present, and future) *'evidence based'* stories to provide support for the information provided in all three plots as follows.

A) **Validity:** use literature review to show research validity by providing evidence from the literature that highlights the importance of the problem (past), it's progression up to date, leading to the research gap (present) and finally, explaining what benefits the proposed solution would yield to society (future).

B) **Scientific Merit:** use referencing (past) in the methods section as evidence for old methods that worked as scientific consensus shows scientific competence of the applicant. Meaning that the applicant has analysed existing methods and is able to justify their selection based on what has been proven to work in the past. Develop preliminary data by conducting some lab work (present). Preliminary data provides *'temporal evidence'* that shows promise (future) in the selected methods and reassurance of the applicant's scientific competence.

C) **Achievability:** use staff past experience and related projects (past) to show staff capabilities to execute the project. Tasks are to be matched with related staff experience. For example, a biology experiment should be conducted by a biologist. Highlight existing facilities and resources (present) to show availability and current readiness to execute the project. Finally, highlight quality assurance and risk mitigation measures (future) to tackle anticipated future challenges that would affect project progress. The main objective is to show preparedness to handle any challenges that may arise and hence not severely affecting the execution timeline.

5) ***'Looks Matter'*:** successful proposals are easy to follow as ideas are well structured. A well-structured proposal that flows saves the reviewer's time. The use of diagrams and flow charts can be an easy format to present ideas that can break down complexities in an easy to digest format. Formatting is very important

such as following the correct font size, font, spacing etc., as it shows that the applicant scientist is detailed, which reflects on their impression of capability through attention to details. Therefore, following the required format is essential to present a *'good proposal.'*

6.3 Science Negotiation Performance

In the following section, I provide recommendations to scientists on how to enhance their performance during proposal review meetings.

1) 'Roleplay' - Think about audience needs: Applicant scientists must think of the committee presentation as a performance for science negotiation. With that in mind an applicant needs to think with the mind-set of a reviewer in preparation for anticipated questions.

2) Rapport Building and Impressions: Build rapport with humour or small talk prior to the presentation. This creates a more friendly setting and encourages committee members to be more lenient by encouraging them to help rather than critique.

3) Appreciation: verbally express appreciation for critiques and comments. Verbal expression of appreciation creates a sense of involvement of the committee members where they are seen as an aid rather than a critic, which encourages them to provide better scores due to feeling appreciated.

4) Attention Grabbers: Present something new in your slides to grab attention – use animation and don't copy from the proposal. Committee members come to the meeting having read the proposal before hand, which makes redundancy in slides frowned upon and boring.

5) Mock Presentations: Prepare thoroughly for the committee presentation by presenting to children and to peers. Children provide a sense of whether the idea is clear and understood in terms of the problem and its benefits. Peers provide feedback on whether the science components and execution plan are adequate and also provide feedback on whether the flow of information is sufficient to cover committee member requirements.

6) Scientific Authority and Trust: Use pictures of yourself in the field when introducing past work experience (especially for younger researchers). The use of such pictures shows undeniable scientific authority and can be used as proof of working experience.

7) Presentation Setting: Change the presentation time to earlier in the day so committee members are more tentative to the applicant. Setting impacts the committee members' mental state and hence can have an impact on the quality of their review and critique.

8) Oral Storytelling Training: training applicant scientists in oral storytelling/presentation skills is essential to become a more proficient science communicator.

6.4 Recommendations for Research Institutes

I now present recommendations for research institutes in order to help enhance the proposal application process, especially in terms of the need for extensive training for scientists to explain the proposal format as well recommendations that would make the review for committee members easier.

1) **Training for Applicant Scientists**: applicant scientists require training on how to write the proposal sections in both methodical and storytelling formats. Training should not only be on how to write each section, but rather applicants should be taught how each section functions and how each section when written technically, can stimulate funding action. For example, storytelling components of the proposal stimulate emotional engagement by linking the story to the institute, the potential funder and showing how they would contribute as heroes in creating a better future for society. While in the methodical sections, applicant scientists need to be taught exactly how methodical writing is expected to appear and how this writing stimulates cognitive analytical engagement from reviewers/committee members. For example, matching the number of objectives with the number of deliverables is important because that would lead to the desired quality results.
2) **Clear Review Rubric:** reviewers/committee members on the other hand do not have time to review. Therefore, reviewers/committee members need to be trained on how to review critically. This means that the institute needs to develop a clear review rubric to be used by reviewers/committee members. The

rubric could potentially be shared with applicants as well so both committee members and applicant scientists are on the same page in understanding what information requirements are needed in a proposal document. This could lead to a clearer understanding of information requirements and hence the development of a better proposal that addresses these information needs directly.

3) **Shorter Proposal Format:** since time constraint is an issue at the institute, considering to shorten the proposal document size would be a solution to this problem. The institute could ask for a more concise document with a smaller number of words and more clear direction on what critical information is needed. This would reduce writing time as well as review time and hence improve the proposal cycle period, as well as eliminate the risk of the proposed research being obsolete with time and published by someone else.
4) **Time to Review:** also review time is an issue during the proposal cycle. Therefore, giving reviewers/committee members more dedicated time to review or outsourcing the review to external reviewers who are highly specialised would be a solution that saves time and would provide more detailed feedback.

In the following section I show how this research can be transferable into different contexts. I also discuss this thesis's limitations and potential future studies.

6.5 Transferability

Although case studies cannot be generalised as each case is unique to its natural setting, they can generate analytical generalisation of the specific theory being explored (Pratt, 1994). A case study should be looked at in the form of an informative and insightful narrative, that provides detailed context to the research problem being investigated (Flyvbjerg, 2013). Understanding the impact of storytelling persuasion has not been researched in the context of obtaining funds for scientific research. As humans are perceived as natural storytellers (Fisher, 1984, cited in Lund et al., 2018), understanding human response to stories implies more than developing basic inferences through quantitative data. Quantitative methods cannot capture to what extent a committee member is influenced by storytelling nor explain how he was influenced as these are all indicators of social behaviour that

need to be explored using qualitative methods. Therefore, in this research, I have established an inductive theory (Merriam, 2015) behind the effectiveness of storytelling in terms of scientific research proposals in order to help scientists understand the communication techniques needed to obtain funds. The context of the scientific research funding dilemma is shared across the world, where implications derived from this research can be transferable to all those applying for funds in scientific research, whether academic or non-academic. This thesis uncovers how scientists can optimally communicate their research in order to potentially secure funding, which can then be explored within different datasets of international applicants as well as international funders. This covers the applied science perspective that scientists from different disciplines can benefit from. In terms of an academic perspective, participants mentioned that the proposal writing and proposal presentation experience reminds them of their PhD experience. They described the amount of thought, stress, writing, dedication to completing a research proposal and presenting to committee members, as factors that are common with writing their PhD dissertation as well as defending their thesis during the final VIVA. This comparison presents a new dataset in which storytelling impact could be explored, which are PhD students and VIVA examiners. Rather than obtaining funds for scientific research, exploring the use of storytelling in PhD dissertations and VIVAs can be explored. Given that the participants interviewed have studied abroad (some in the UK and USA in particular), the comment of remembering their PhD experience becomes highly relevant as it is not confined to the experience in Kuwait. Other areas of transferability include the submission of research articles for publishing. All periodicals have certain topics of interest as well as specific audience targets. For example, the journal of consumer behaviour covers topics that analyse how consumers think and react when making a purchasing decision, while the journal of nursing research focuses on nursing related studies. However, assuming what a journal wants by its title alone does not suffice. If an article is to be published, there is more thought and attention required to be successful. Similar to a research proposal and developing a framed story (Bray et al., 2012; Kotler & Keller, 2015; Martinez-Conde & Macknik, 2017), we need to understand what topics of interest the periodical is aiming towards in this particular year, what are the current topics the periodical has published and who are the potential review panel members. Therefore, understanding the periodical's existing story that has its own agenda, understanding who

the review members are and what their information interests could be as the reviewing audience, and finally ensuring these both are in *'alignment'* with the article being submitted could be a potential application for my study. The articles submission and publishing process would be a potentially useful topic to explore using this thesis' **Narrative Elaboration Theory**, which would help in understanding how to be successful at publishing—a struggle shared by researchers across the world.

6.6 Limitations and Future Studies

While my study suggests that narrative transportation in scientific research proposals is a necessity to obtain funding, one limitation of this research is that it does not describe the degree to which committee members become transported within the narrative. Committee members emphasise that absence of narrative leads to ambiguity and difficulty of understanding, and at the same time, they require elaboration for further information in order to make a funding decision. Future research can be conducted using the Green and Brock (2000) narrative transportation scale to measure the degree of transportation and how that influences the funding decision. There is also great potential for action research studies (Baskerville, 1999; Brydon-Miller et al., 2003) that can experiment with proposals that include narrative versus purely scientific proposals in order to confirm understanding that narrative is required to influence a funding decision. Action research recognises that knowledge is constructed in a social setting, hence including members of the social interaction being studied in the exploration process in order to further describe the phenomenon and produce a practical solution (Carr, 2007). Another example of action research studies conducted to understand the influence of the use of storytelling on purchasing behaviour are the studies conducted by Escalas (2004; 2007), where she examines if prospects are influenced to purchase by a story on packaging and if so, what information is retained from the narrative that led to this influence. I therefore propose to experiment with narrative in order to further understand what part of the narrative has greater influence than others and how scientists can therefore hone their narrative in order to encourage funding.

On the other hand, due to COVID-19 health restrictions, I was not able to conduct the intended observation portion of the methods in order to gain direct insight into the drama that unfolds during funding committee meetings, therefore imposing a limitation on the study that can be explored in future research. Scientists' lack of

communication performance skills is clearly discussed and indicated by participants as is supported in the literature (The Royal Society, 2006, cited in Besley & Tanner, 2011; Yuan et al., 2019). Further research is required in terms of uncovering science communication performance parameters in order to devise science communication programs targeted toward a funding audience. In turn, this would help scientists craft more interesting stories and perform those stories in a means that would help them receive funding. There is not sufficient evidence in the literature about science communication having influence on behaviours and actions, which is why further research on this topic is required (National Academies of Sciences, Engineering & Medicine, 2017). The issue with science communication underlies the diverse and multiple contexts faced by the complexity of science in itself, therefore the need for case studies and detailed research is required (National Academies of Sciences, Engineering & Medicine, 2017). While I present a new dimension of communicating science for the purpose of funding, I acknowledge that this case study cannot be completely transferable as there are many elements that influence science communication, one of which holds great importance is cultural differences (Kahan et al., 2009 cited in National Academies of Sciences, Engineering & Medicine, 2017). On the other hand, I see cultural differences as well as difference in contexts as opportunities for growth rather than limitation, in which I believe that a further understanding of multiple cultures and context will allow for comparison and contrast, that would later help in finding commonalities. The only approach to finding common grounds is to endeavour further research that would uncover best practices of science communication, which can then be collected, sorted and generalised. We can never find out what works best without finding out what is actually happening to begin with. This is only a starting point for continuing research where I see endless opportunities for the growth of the science communication domain.

References

Aaker, D., 2018. *Creating signature stories: Strategic messaging that persuades, energizes and inspires*. Morgan James Publishing.

Akerlof, K., Lemos, M.C., Cloyd, E., Heath, E., Nelson, S., Hathaway, J. and Timm, K., 2018. Barriers in communicating science for policy in Congress. In *Association for Education in Journalism and Mass*

Communication, 2018 Annual Conference (Washington, DC:). [Retrieved from: https://www.aaas.org/sites/default/files/2019-09/2018-Barriers-in-Communicating-Scienece-for-Policy-Akerlof.pdf*]*

Anderson, K.E., 2010. Storytelling. Retrieved from Rutgers University Libraries: [https://scholarship.libraries.rutgers.edu/esploro/search/outputs?lang=en]

Anthony, S. and Jack, S., 2009. Qualitative case study methodology in nursing research: an integrative review. *Journal of advanced nursing*, *65*(6), pp.1171-1181.

Aristotle, G.A., 1991. Aristotle on rhetoric a theory of civic discourse. (G. A. Kennedy, Trans.). New York: Oxford University Press.

Baskerville, R.L., 1999. Investigating information systems with action research. *Communications of the association for information systems*, *2*(1), p.19.

Banks, D. and Di Martino, E., 2019. Introduction: Linguistic and discourse issues in contemporary scientific communication. Aspects of communicating science to a variety of audiences.

Battiston, P., Kashyap, R. and Rotondi, V., 2021. Reliance on scientists and experts during an epidemic: Evidence from the COVID-19 outbreak in Italy. *SSM-population health*, *13*, p.100721.

Bauer, R.A., 1960. Consumer behavior as risk taking. In *Proceedings of the 43rd National Conference of the American Marketing Association, June 15, 16, 17, Chicago, Illinois, 1960*. American Marketing Association.

Beckers, T., Woodrow, M., Filmer, P.E., Gianesella, S.M., Klenner, L.G., Klink, C.A., Tourrand, J.F. and Weingart, P., 2007. Communicating science to the media, decision makers, and the public. *Communicating global change science to society: an assessment and case studies*, pp.45-52.

Begley, C.M., 1996. Triangulation of communication skills in qualitative research instruments. *Journal of advanced nursing*, *24*(4), pp.688-693.

Bentley, P.J., Gulbrandsen, M. and Kyvik, S., 2015. The relationship between basic and applied research in universities. *Higher Education*, *70*(4), pp.689-709.

Besley, J.C. and Tanner, A.H., 2011. What science communication scholars think about training scientists to communicate. *Science Communication*, *33*(2), pp.239-263.

Bigg, C., 2016. Diagrams. A companion to the history of science, pp.557-571.

Bloomfield, E.F. and Manktelow, C., 2021. Climate communication and storytelling. *Climatic Change*, *167*(3), pp.1-7.

Boje, D.M., 1991. The storytelling organization: A study of story performance in an office-supply firm. *Administrative science quarterly*, pp.106-126.

Bonell, C., Michie, S., Reicher, S., West, R., Bear, L., Yardley, L., Curtis, V., Amlôt, R. and Rubin, G.J., 2020. Harnessing behavioural science in public health campaigns to maintain 'social distancing' in response to the COVID-19 pandemic: key principles. *J Epidemiol Community Health*, *74*(8), pp.617-619.

Bormann, E.G., 1972. Fantasy and rhetorical vision: The rhetorical criticism of social reality. *Quarterly journal of speech*, *58*(4), pp.396-407.

Bower, G.H., 1976. Experiments on story understanding and recall. *The Quarterly Journal of Experimental Psychology*, *28*(4), pp.511-534.

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), pp.77-101.

Bray, B., France, B. and Gilbert, J.K., 2012. Identifying the essential elements of effective science communication: What do the experts say?. *International Journal of Science Education, Part B*, *2*(1), pp.23-41.

Brophy, J., 2009. Connecting with the big picture. *Educational Psychologist*, *44*(2), pp.147-157.

Bruner, J.S., 1990. *Acts of meaning* (Vol. 3). Harvard university press.

Brydon-Miller, M., Greenwood, D. and Maguire, P., 2003. Why action research?. *Action research*, *1*(1), pp.9-28.

Buchanan, W., 2013. The Phenomenological Experience Of Narrative Transportation. Electronic Theses and Dissertations, 2004-2019. 2515.

Bucchi, M. and Saracino, B., 2020. Italian-citizens-and-covid19. *Public Understanding of Science Blog*, *19*.

Burke, K., 1966. *Language as symbolic action: Essays on life, literature, and method*. University of California Press.

Burke, K., 1968. *Counter-statement* (Vol. 143). University of California Press.

Burke, K., 1969. *A grammar of motives* (Vol. 177). University of California Press.

Campbell J. 1949. The hero with a thousand faces. 1st ed. New York (NY): Pantheon.

Carr, W., 2007. Philosophy, methodology and action research. In *The Quality of Practitioner Research* (pp. 29-42). Brill Sense.

Clark, T. and Mangham, I., 2004. From dramaturgy to theatre as technology: The case of corporate theatre. *Journal of management studies*, *41*(1), pp.37-59.

Coen, E., 2019. The storytelling arms race: origin of human intelligence and the scientific mind. *Heredity*, *123*(1), pp.67-78.

Cohen, S.D., 2011. The art of public narrative: Teaching students how to construct memorable anecdotes. *Communication Teacher*, *25*(4), pp.197-204.

Cooley, C.H., 1902. Looking-glass self. *The production of reality: Essays and readings on social interaction*, *6*, pp.126-128.

Cooper, D.R. and Schindler, P.S. (2008) Business Research Methods (10th edn). London: McGraw-Hill.

Cope, D.G., 2014, January. Methods and meanings: credibility and trustworthiness of qualitative research. In *Oncology nursing forum* (Vol. 41, No. 1).

Copeland, M. (1923), "Relation of Consumers' Buying Habits to Marketing Methods," Harvard Business Review, 1 (April), 282-289.

Cox, D. F., 1967. Clues for advertising Strategists. In D. F. Cox (Ed.), Risk Taking and Information Handling in Consumer Behavior. Boston: Harvard University Press, pp. 112-1-51.

Courtemanche, C., Garuccio, J., Le, A., Pinkston, J. and Yelowitz, A., 2020. Strong Social Distancing Measures In The United States Reduced The COVID-19 Growth Rate: Study evaluates the impact of social distancing measures on the growth rate of confirmed COVID-19 cases across the United States. *Health Affairs*, *39*(7), pp.1237-1246.

Cousineau, M.J., 2020. A Blumerian approach to storytelling. *Symbolic Interaction*, *43*(4), pp.721-738.

Creswell, J.W. and Poth, C.N., 2016. *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Dahlstrom, M.F., 2014. Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the national academy of sciences*, *111*(supplement_4), pp.13614-13620.

Dahlstrom, M.F. and Scheufele, D.A., 2018. (Escaping) the paradox of scientific storytelling. *PLoS biology*, *16*(10), p.e2006720.

Da Silveira, C., Lages, C. and Simões, C., 2013. Reconceptualizing brand identity in a dynamic environment. *Journal of Business Research*, *66*(1), pp.28-36.

de Bruin, W.B. and Bostrom, A., 2013. Assessing what to address in science communication. *Proceedings of the National Academy of Sciences*, *110*(Supplement 3), pp.14062-14068.

Escalas, J.A.E., 1996. *Narrative processing: building connections between brands and the self*. Duke University.

Escalas, J.E., 2004. Imagine yourself in the product: Mental simulation, narrative transportation, and persuasion. *Journal of advertising*, *33*(2), pp.37-48.

Escalas, J.E., 2007. Self-referencing and persuasion: Narrative transportation versus analytical elaboration. *Journal of Consumer Research*, *33*(4), pp.421-429.

ElShafie, S.J., 2018. Making science meaningful for broad audiences through stories. *Integrative and comparative biology*, *58*(6), pp.1213-1223.

ERC: European Research Council. 2022. *Facts and figures*. [online] Available at: <https://erc.europa.eu/about-erc/facts-and-figures> [Accessed 27 February 2022].

European Commission, European Research Council Executive Agency, (2021) *Annual report on the ERC activities and achievements in 2020*. Publications Office. https://data.europa.eu/doi/10.2828/789744

Fanning, J., 1999. Tell me a story: the future of branding. *Irish Marketing Review*, *12*(2), pp.3-15.

Fawkes, J., 2015. Performance and Persona: Goffman and Jung's approaches to professional identity applied to public relations. *Public Relations Review*, *41*(5), pp.675-680.

Fisher, W.R., 1984. Narration as a human communication paradigm: The case of public moral argument. *Communications Monographs*, *51*(1), pp.1-22.

Fisher, W.R., 1985. The narrative paradigm: An elaboration. *Communications Monographs*, *52*(4), pp.347-367.

Fischhoff B, Slovic P, Lichtenstein S (1982) Lay foibles and expert fables in judgments about risk. Am Stat 36(3b):240–255.

Fischhoff, B. and Scheufele, D.A., 2013. The science of science communication. *Proceedings of the National Academy of Sciences*, *110*(Supplement 3), pp.14031-14032.

Fischhoff, B. and Scheufele, D.A., 2014. The science of science communication II. *Proceedings of the National Academy of Sciences*, *111*(Supplement 4), pp.13583-13584.

Fischer, D., Selm, H., Sundermann, A. and Storksdieck, M., 2020. Storytelling for sustainability: A definition and its implications for education and communication. In *Storytelling for Sustainability in Higher Education* (pp. 38-51). Routledge.

Fiske, S.T., 1993. Social cognition and social perception. *Annual review of psychology*, *44*(1), pp.155-194.

Fiske, S.T., Cuddy, A.J. and Glick, P., 2007. Universal dimensions of social cognition: Warmth and competence. *Trends in cognitive sciences*, *11*(2), pp.77-83.

Fiske, S.T. and Dupree, C., 2014. Gaining trust as well as respect in communicating to motivated audiences about science topics. *Proceedings of the National Academy of Sciences*, *111*(Supplement 4), pp.13593-13597.

Flyvbjerg, Bent (2011). Case study. In Norman K. Denzin & Yvonna S. Lincoln (Eds.), The Sage handbook of qualitative research (4th ed., pp.301-316). Thousand Oaks, CA: Sage.

Fournier, S., 1998. Consumers and their brands: Developing relationship theory in consumer research. *Journal of consumer research*, *24*(4), pp.343-373.

Fredheim, K., 2011. *Star Wars as modern myth: a comparative analysis of George Lucass Star Wars and Joseph Campbell´ s The hero with a thousand faces* (Master's thesis, Universitetet i Agder; University of Agder).

Gabriel, Y. ed., 2004. *Myths, stories, and organizations: Premodern narratives for our times*. Oxford University Press on Demand.

Gabriel, Y., 2013. Researchers as storytellers: Storytelling in organizational research. *Narratives in academic and professional genres*, pp.105-122.

Giesler, M. and Fischer, E., 2018. IoT Stories: The Good, the Bad and the Freaky. *Marketing Intelligence Review*, *10*(2), pp.24-28.

Gerrig, R. J., & Prentice, D. A.,1991. The representation of fictional information. Psychological Science, 2, 336-340.

Gilbert, D.T., Tafarodi, R.W. and Malone, P.S., 1993. You can't not believe everything you read. *Journal of personality and social psychology*, *65*(2), p.221.

Gilliam, D.A. and Flaherty, K.E., 2015. Storytelling by the sales force and its effect on buyer–seller exchange. *Industrial Marketing Management*, *46*, pp.132-142.

Gill, J. and Johnson, P. (2002) Research Methods for Managers (3rd edn). London: Sage

Glaser, Barney G. & Strauss, Anselm L. (1967). The discovery of grounded theory: Strategies for qualitative research. New York: Aldine Pub. Co.

Glaser, B.G. (1978). Theoretical sensitivity. Mill Valley, CA: Sociology Press.

Green, M.C. and Brock, T.C., 2000. The role of transportation in the persuasiveness of public narratives. *Journal of personality and social psychology*, *79*(5), p.701.

Green SJ, Grorud-Colvert K, Mannix H. 2018. Uniting science and stories: perspectives on the value of storytelling for communicating science. Facets 3:164–73.

Gregrich, R.J., 2003. A note to researchers: communicating science to policy makers and practitioners. *Journal of Substance Abuse Treatment*, *25*(3), pp.233-237.

Goffman, E., 1959. *The presentation of self in everyday life*. Anchor.

Goffman, E., 1967. Interaction ritual: Essays on face-to-face interaction.

Gomez-Barris, L., 2017. Storytelling for organizational impact and sustainability. *unpublished master thesis, University of San Francisco*.

Gough, P., de Berigny Wall, C. and Bednarz, T., 2014, March. Affective and effective visualisation: Communicating science to non-expert users. In *2014 IEEE Pacific Visualization Symposium* (pp. 335-339). IEEE.

Hajdu, M. and Simoneau, C., 2020. Communicating Science in a Policy Context to a Broader Audience. In *Science for Policy Handbook* (pp. 166-179). Elsevier.

Hering, J., Hoffmann, S., Meierhofer, R., Schmid, M. and Peter, A., Assessing the societal benefits of applied research and expert Consulting in Water Science and Technology. Gaia. 2012; 21 (2): 95–101.

Herz, A., Peters, L. and Truschkat, I., 2015. How to do qualitative structural analysis?/The qualitative interpretation of network maps and narrative interviews [52 paragraphs]. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 16, No. 1).

Homburg, C., Workman, J.P. and Jensen, O., 2000. Fundamental changes in marketing organization: The movement toward a customer-focused organizational structure. *Journal of the Academy of Marketing Science*, *28*(4), pp.459-478.

Institute of Medicine. (2010). Bridging the Evidence Gap in Obesity Prevention: A Framework to Inform Decision Making. Washington, DC: The National Academies Press.

Jones, M.D., 2014. Communicating climate change: Are stories better than "just the facts"?. *Policy Studies Journal*, *42*(4), pp.644-673.

Joubert, M., Davis, L. and Metcalfe, J., 2019. Storytelling: the soul of science communication. *Journal of Science Communication*, *18*(5), p.E.

Keaveney, S.M. (1995). Customer switching behaviour in service industries: an exploratory study. Journal of Marketing, Vol. 59, No. 2, pp. 71–82.

Kent, M.L., 2015. The power of storytelling in public relations: Introducing the 20 master plots. *Public Relations Review*, *41*(4), pp.480-489.

Kotler, P. and Keller, K.L., 2015. Marketing Management 15th Edition–Global.

Kołakowski, L., 1972. Positivist philosophy from Hume to the Vienna Circle.

Kuter, B.J., Offit, P.A. and Poland, G.A., 2021. The development of COVID-19 vaccines in the United States: Why and how so fast?. *Vaccine*, *39*(18), p.2491.

Kuwait Foundation for the Advancement of Sciences, 2020. *KFAS Annual Report 2019*. [online] Kuwait: Kuwait Foundation for the Advancement of Sciences, p.27. Available at: <http://file:///C:/Users/Lenovo/Downloads/KFAS%20Annual%20Report%202019%20-%20En%202019.pdf> [Accessed 27 February 2022].

Kuwait Institute for Scientific Research. a (n.d.). *Welcome to the Kuwait Institute for Scientific Research*. About Us. Retrieved August 1, 2022, from https://www.kisr.edu.kw/en/discover-kisr/about-us/

Kuwait Institute for Scientific Research. b (n.d.). *Desert Agriculture and Ecosystems Program*. Programs. Retrieved August 1, 2022, from https://www.kisr.edu.kw/en/program/14/

KUWAIT VOLUNTARY NATIONAL REVIEW 2019. [online] Available at: <https://sustainabledevelopment.un.org/content/documents/23384Kuwait_VNR_FINAL.PDF> [Accessed 5 January 2022].

Kwon, H. and Nelson, D., 2016. Communicating research to help influence policy and practice. *Prevention, policy, and public health*, p.303-328.

Langley, A., 1999. Strategies for theorizing from process data. *Academy of Management review*, *24*(4), pp.691-710.

L'Astorina, A., Tomasoni, I., Basoni, A. and Carrara, P., 2015. Beyond the dissemination of Earth Observation research: Stakeholders' and users' involvement in project co-design. *Journal of Science Communication*, *14*(3), p.C03.

Lenhart, J., Lenhard, W., Vaahtoranta, E. and Suggate, S., 2020. More than words: Narrator engagement during storytelling increases children's word learning, story comprehension, and on-task behavior. *Early Childhood Research Quarterly*, *51*, pp.338-351.

Lidskog, R., Berg, M., Gustafsson, K.M. and Löfmarck, E., 2020. Cold science meets hot weather: Environmental threats, emotional messages and scientific storytelling. *Media and Communication*, *8*(1), pp.118-128.

Singer, D., Aaker, J. and Smith, A., 2011. The power of storytelling: What nonprofits can teach the private sector about social media. *McKinsey Quarterly Retrieved from http://www. mckinseyquarterly.*

com/Marketing/Digital_ Marketing/The_power_of_storytelling_What_nonprofits_can_teach_ the_private_sector_about_social_media_2740.

Lincoln, Y.S. and Guba, E.G., 1985. *Naturalistic inquiry*. sage.

Lund, N.F., Cohen, S.A. and Scarles, C., 2018. The power of social media storytelling in destination branding. *Journal of destination marketing & management*, *8*, pp.271-280.

Lupia, A., 2013. Communicating science in politicized environments. *Proceedings of the National Academy of Sciences*, *110*(Supplement 3), pp.14048-14054.

MacInnis, D.J. and Folkes, V.S., 2017. Humanizing brands: When brands seem to be like me, part of me, and in a relationship with me. *Journal of Consumer Psychology*, *27*(3), pp.355-374.

Manning, P.K., 2008. Goffman on organizations. *Organization Studies*, *29*(5), pp.677-699.

Mannino, I., Bell, L., Costa, E., Di Rosa, M., Fornetti, A., Franks, S., Iasillo, C., Maiden, N., Olesk, A., Pasotti, J. and Renser, B., 2021. Supporting quality in science communication: insights from the QUEST project. *Journal of Science Communication*, *20*(3), p.A07.

Marlar Lwin, S., 2010. Capturing the dynamics of narrative development in an oral storytelling performance: A multimodal perspective. *Language and Literature*, *19*(4), pp.357-377.

Martinez-Conde, S. and Macknik, S.L., 2017. Finding the plot in science storytelling in hopes of enhancing science communication. *Proceedings of the National Academy of Sciences*, *114*(31), pp.8127-8129.

Martinez-Conde, S., Alexander, R.G., Blum, D., Britton, N., Lipska, B.K., Quirk, G.J., Swiss, J.I., Willems, R.M. and Macknik, S.L., 2019. The storytelling brain: How neuroscience stories help bridge the gap between research and society. *Journal of Neuroscience*, *39*(42), pp.8285-8290.

Matei, S.A. and Hunter, L., 2021. Data storytelling is not storytelling with data: A framework for storytelling in science communication and data journalism. *The Information Society*, *37*(5), pp.312-322.

McCormick, D.W., 2007. Dramaturgical analysis of organizational change and conflict. Journal of Organizational Change Management, Pp., 1102-1125.

McInerney, M., 2018. How Nonprofits Can Use Storytelling and Engagement Metrics to Improve How They Share their Philanthropy Narrative. [Available at: https://cpb-us-

w2.wpmucdn.com/usfblogs.usfca.edu/dist/9/244/files/2016/05/mcinerneymary_5745095_64623483_2018-Capstone-McInerney-1-1gou38s.pdf]

McKee R. 2010. Story: style, structure, substance, and the principles of screenwriting. 1st ed. Harper Collins. Merriam Webster. 2015. Merriam Webster. Online dictionary.

Meyers-Levy, J. and Peracchio, L.A., 1996. Moderators of the impact of self-reference on persuasion. *Journal of consumer research*, *22*(4), pp.408-423.

Meredith, J., 1993. Theory building through conceptual methods. *International Journal of Operations & Production Management*, *13*(5), pp.3-11.

Merriam, S.B. and Tisdell, E.J., 2015. *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Montgomery, S.L., 2017. *The Chicago guide to communicating science*. University of Chicago Press.

Morris, T. and Wood, S. (1991) 'Testing the survey method: continuity and change in British industrial relations', Work Employment and Society, Vol. 5, No. 2, pp. 259–82.

Myers, T.A., Maibach, E., Peters, E. and Leiserowitz, A., 2015. Simple messages help set the record straight about scientific agreement on human-caused climate change: The results of two experiments. *PloS one*, *10*(3), p.e0120985.

National Academies of Sciences, Engineering, and Medicine. (2017). Communicating Science Effectively: A Research Agenda. Washington, DC: The National Academies Press. doi: 10.17226/23674.

National Research Council. (2012). Using Science as Evidence in Public Policy. K. Prewitt, T.A. Schwandt, and M.L. Straf (Eds.), Committee on the Use of Social Science Knowledge in Public Policy, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Newkirk, T., 1995. The writing conference as performance. *Research in the Teaching of English*, pp.193-215.

Nguyen, D.T., 2015. Charity appeal story with a tribal stigma anti-climax twist–consequences of revealing unanticipated information in storytelling. *Journal of Strategic Marketing*, *23*(4), pp.337-352.

Olson R. 2009. Don't be such a scientist: talking substance in an age of style. Washington (DC): Island Press.

Olson R, Barton D, Palermo B. 2013. Connection: Hollywood storytelling meets critical thinking. Los Angeles (CA): Prairie Starfish Productions.

Olson R. 2015. Houston, we have a narrative: why science needs story. Chicago (IL): University of Chicago Press.

Olson, S. ed., 2018. *The science of science communication III: inspiring novel collaborations and building capacity: proceedings of a colloquium*. National Academies Press.

Pennington, N. and Hastie, R., 1988. Explanation-based decision making: effects of memory structure on judgment. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *14*(3), p. 521–533.

Pratt, M.G., 1994. *The happiest, most dissatisfied people on Earth: Ambivalence and commitment among Amway distributors*. University of Michigan.

Robson, C. (2002) Real World Research: A Resource for Social Scientists and Practitioner-Researchers (2nd edn). Oxford: Blackwell.

Schank, R.C. and Abelson, R.P., 1995. Knowledge and memory: The real story. W: SR Wyer Jr (red.), Knowledge and memory: The real story (s. 1–85).

Schank, R.C., 1995. *Tell me a story: Narrative and intelligence*. Northwestern University Press.

Schank, R.C., 1999. *Dynamic memory revisited*. Cambridge University Press.

Scheufele, D.A., 2013. Communicating science in social settings. *Proceedings of the National Academy of Sciences*, *110*(Supplement 3), pp.14040-14047.

Schreyägg, G. and Häpfl, H., 2004. Theatre and organization: Editorial introduction. *Organization Studies*, *25*(5), pp.691-704.

Siebert, M.W., Krell, R.K., Gore, J. and Harris, J., 2018. The science policy field tour concept: a new platform for communicating science for public policy. *Journal of Integrated Pest Management*, *9*(1), p.25 (1-9).

Siegel, A.A., 2017. Nonprofit Storytelling: Framing the Message for Compelling Communication. *Steeplechase: An ORCA Student Journal*, *1*(1), Article.13.

Slater, M.D., 1996. Theory and method in health audience segmentation. *Journal of health communication*, *1*(3), pp.267-284.

Slater, M.D. and Rouner, D., 2002. Entertainment—education and elaboration likelihood: Understanding the processing of narrative persuasion. *Communication theory*, *12*(2), pp.173-191.

Söderlund, M. and Sagfossen, S., 2015. The consumer experience and the absorbing story. *Nordic Journal of Business*, *64*(2), pp.103-118.

Solja, E., Liljander, V. and Söderlund, M., 2018. Short brand stories on packaging: An examination of consumer responses. *Psychology & Marketing*, *35*(4), pp.294-306.

Somerville, R.C. and Hassol, S.J. 2012. Communicating the science of climate change. American Institute of Physics, : Phys. Today 64(10), 48 (2011); doi: 10.1063/PT.3.1296

Spiller, L.D., 2018. Story-selling: Creating and sharing authentic stories that persuade. *Journal for Advancement of Marketing Education*, *26*.

Stake, Robert E. (1995). The art of case study research. Thousand Oaks, CA: Sage.

Stake, Robert E. (2006). Multiple case study analysis. New York, NY: Guilford.

Strauss, A. and Corbin, J., 1998. *Basics of qualitative research techniques*. Thousand Oaks, CA: Sage publications.

Stryker, S. (1981), Symbolic interactionism: themes and variations, in Rosenberg, M. and Turner, R.H. (Eds), Social Psychology: Sociological Perspectives, Basic Books, New York, NY

Sujan, M., Bettman, J.R. and Baumgartner, H., 1993. Influencing consumer judgments using autobiographical memories: A self-referencing perspective. *Journal of Marketing research*, *30*(4), pp.422-436.

Suzuki, W.A., Feliú-Mójer, M.I., Hasson, U., Yehuda, R. and Zarate, J.M., 2018. Dialogues: the science and power of storytelling. *Journal of Neuroscience*, *38*(44), pp.9468-9470.

Talgorn, E., Hendriks, M., Geurts, L. and Bakker, C., 2022. A Storytelling Methodology to Facilitate User-Centered Co-Ideation between Scientists and Designers. *Sustainability*, *14*(7), p.4132. https://doi.org/10.3390/su14074132

Tammi, T., 2009. The competitive funding of university research: the case of Finnish science universities. Higher Education. doi:10.1007/s10734-008-9169-6

Thornhill, A., Saunders, M. and Lewis, P., 2009. *Research methods for business students*. Prentice Hall: London.

Tobias, R. B. (1993). 20 master plots (and how to build them). Cincinnati, OH: Writer's Digest Books.

Torres, D.H. and Pruim, D.E., 2019. Scientific storytelling: A narrative strategy for scientific communicators. *Communication Teacher*, *33*(2), pp.107-111.

Tversky, A. and Kahneman, D., 1974. Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. science, 185(4157), pp.1124-1131.

U.S Department of Health and Human Services. (n.d). NIH Data Book. National Institutes of Health. Retrieved November 20, 2022, from https://report.nih.gov/nihdatabook/report/20

Van Laer, T., De Ruyter, K., Visconti, L.M. and Wetzels, M., 2014. The extended transportation-imagery model: A meta-analysis of the antecedents and consequences of consumers' narrative transportation. *Journal of Consumer research*, *40*(5), pp.797-817.

Wilson, M.J., Ramey, T.L., Donaldson, M.R., Germain, R.R. and Perkin, E.K., 2016. Communicating science: Sending the right message to the right audience. *Facets*, *1*(1), pp.127-137.

Yamey, G., Schäferhoff, M., Pate, M., Chawla, M., Ranson, K., Hatchett, R. and Wilder, R., 2020. Funding the development and manufacturing of COVID-19 vaccines. *The Center for Policy Impact in Global Health., Duke Global Working Paper Series*, (20).

Yin, Robert K. (2014). Case study research: Design and methods. Los Angeles, CA: Sage.

Yuan, S., Besley, J.C. and Dudo, A., 2019. A comparison between scientists' and communication scholars' views about scientists' public engagement activities. *Public understanding of Science*, *28*(1), pp.101-118.

Yoder-Wise, P.S. and Kowalski, K., 2003. The power of storytelling. *Nursing outlook*, *51*(1), pp.37-42.

List of Appendices

Appendix A - University of Reading, Graduate School Reading Researcher Development Programme

Certificate of Attendance (14 June 2022)

6/14/22, 11:05 AM

https://www.risisweb.reading.ac.uk/si/sits.urd/run/SIW_POD.start_url?CA099E2CC2364737_Q0vxNxdgiXHk

oORDsZGA31…

https://www.risisweb.reading.ac.uk/si/sits.urd/run/SIW_POD.start_url?CA099E2CC2364737_Q0vxNxdgiXHk

oORDsZGA31EMf0MVlBcOgdFeJG… 1/1

Graduate School

University of Reading

Old Whiteknights House

Reading RG6 6AH

www.reading.ac.uk/graduateschool

email gradschool@reading.ac.uk

14 June 2022

GRADUATE SCHOOL

READING RESEARCHER DEVELOPMENT PROGRAMME

CERTIFICATE OF ATTENDANCE

Student **Fajer Y S A S H M Alhusaini** ( ) attended the following Graduate School training sessions at the University of Reading:

RRDP - How to get Published 2021/12/08RRDP - Boost motivation and maintain your productivity 2021/11/25

RRDP - Postgraduate Funding: Considering the Alternatives - Webinar 2021/11/16

RRDP - How to Stop Procrastinating (or The Secret to Getting Started) 2021/11/11

RRDP - Introduction to Public Engagement 2021/11/11RRDP - Doctoral Research Conference - pre-recorded film 2021/06/16

RRDP - How will employers interview you? 2021/05/18

RRDP - Questionnaire design 2021/05/11

RRDP - Open access for research publications 2021/05/17

RRDP - Effective CVs for doctoral researchers: How to impress both employers within and outside HE2021/05/05

RRDP - Interview structures & techniques 2021/05/26

RRDP - How to write a thesis 2019/11/28

RRDP - How to avoid plagiarism 2019/11/27

Professor Adrian Williams

Dean of Postgraduate Research Studies & Researcher Development

https://www.risisweb.reading.ac.uk/si/sits.urd/run/SIW_POD.start_url?CA099E2CC2364737_Q0vxNxdgiXHkoORDsZGA31EMf0MVlBcOgdFeJG…

Appendix B: Email Announcement Sent to KISR Scientists

Appendix C – Interview Questions

Committee Member Interview Questions:

	Objective
Section 1.	**Rapport Building**
Tell me about you. Tell me about your career and previous jobs. What stands out to you from your previous workplaces? Tell me about your current work; how did you get into this sort of work?	
Section 2.	**Committee Member Insights**
What are you looking for in a research proposal? What are the main elements you are looking for in a research proposal?	
When a written proposal is submitted to you what is the format you expect to read?	
What do you look for in the scientists' background information? Is this important to you?	
What elements do you look for in a PRM presentation prior to making a funding decision?	
During a PRM, what influences your decision? What matters to you when a scientist gives a presentation during a PRM?	
Can you give me examples of proposals that stand out? Were there proposals that impressed? Tell me more about these. What was about the proposal that you liked? In your view, what makes a good proposal?	
Can you think of a proposal where you completely lost interest? What was it about the proposal that made you not like it? What was the outcome in the case of that proposal? In your view, what makes a poor proposal?	
When a submitted proposal is not within your scientific background, what do you look for in order to make a decision?	
Where do you usually like to review proposals?	
When providing feedback for a submitted research proposal, what elements do you focus on? How do you provide feedback?	

Is there something you believe should change within the proposal cycle? What are your proposed changes?	
Section 3.	**Closing & Additional Information**
End of interview. Looking back at the interview what stands out for you? Would you like to add anything else about the proposals you evaluate, that you did not have a chance to talk about? Any final reflections? Can you recommend a colleague who would be willing to share similar experiences? Can I tell them that you referred them to me? Thank the interviewee for their time.	
Probing Questions	**Elaboration**
Tell me more about that?	
Can you give me another example that illustrates this?	
Do you remember talking to other colleagues about this proposal that impressed you?	

Scientists Interview Questions

No.	Objective
Section 1.	**Rapport Building**
Please introduce yourself, tell me about you	
Section 2.	**Scientists' background**
Job title/designation. What does your job entail? How did you get into this sort of work? What did you do prior to this job?	
Section 3.	**Scientists Insights**
Tell me about proposals you submitted, and how these came about. Who did you work with?	
Tell me about your approach to develop a research proposal? How do you come up with the idea and then how do you go about writing it? What are the main elements you focus on when writing a proposal? Can you give me specific examples?	
Do you follow a specific format? Please explain	
What do you believe is the most important element in a research proposal, and how do you write that part in particular? Can you give me a specific example from a research proposal you wrote?	
Who do funding committees consist of? Scientists of similar/different disciplines? Executives with no scientific background/some scientific background?	
How do you approach these different types of committee members in a PRM?	

How do you prepare for a PRM? Is there something you do before going into your PRM appointment? For example, a couple of days before. Describe these days for me, what do you do?	
Are you aware who the committee members are prior to entering a PRM? Is there something you do when you know who these people are before entering a PRM?	
Tell me what you think is most appealing about a proposal?	
How do you write a research proposal if you are aware of who the evaluator is? How do you think a research proposal is evaluated?	
What kind of feedback do you look forward to receiving?	
What kind of feedback were you disappointed in receiving?	
Tell me what you think makes a good proposal. Have you been successful when applying for funding? Tell me about that experience, and in your opinion, what was it about your project that was appealing to evaluators?	
What do you think makes a poor proposal? What lessons have you learned from applying for funding?	
Section 4.	**Closing & Additional Information**
End of interview. Looking back at the interview what stands out for you? Would you like to add anything else about the proposal application process, that you did not have a chance to talk about? Any final reflections? Can you recommend a colleague who would be willing to share similar experiences? Can I tell them that you referred them to me? Thank the interviewee for their time.	

Appendix D: Theme Development Sample

Final Theme: AUDIENCE

2nd Level: Alignment	Committee Member/ Individual Interests	Simplification for Diverse Audience
P1: I would emphasise on the providing the food security and Kuwait the participation in the Kuwait Development Plan 2035 that this work has to positively and effectively participate in applying this vision to make it come to reality. P1: Well, yes, definitely, each part of the proposal is very important, because later on when it's submitted to the evaluators, for me as a developer of the work, I'm a believer in my work, I believe in the idea. But it doesn't mean that other people when they read the proposal, they will get the same passion, or will be well supported. So I have to write it really carefully, but for me, the most important part, it will be the two sections, three sections, in fact: one is the introduction, because I need really to put everything I had in there, everything that is going on in the world. So ensure, shows the how, how deep I am in my work. The second thing will be the benefits to Kuwait, because if the proposal is written really in a nice way, but by end of the day, it doesn't benefit the country, or the community or the research and the world, it has no value. So I have really to be careful in writing the benefits. And innovation, of course, if that has innovation in the work pg8	**Detailed Methods objectives-tasks-matching deliverables and matching the problem statement** **Methods need to be well cited**	**Reputation (Recognition)-Novelty + Publication**

P1: And when you do your objectives, what do you mainly highlight as as objectives? What do you focus on?

A: the deliverables that I'm going to have by the end of the work, for example, my, if we take this project as an example, again, it will be to establish and develop the heart rate techniques for the species and the species on this patent to develop the design parameters for the project. Okay. So it will be the deliverables, the main deliverables of the work, not the experiments themselves pg7

P1:How this work will raise Kuwait's image by developing new technology that nobody else in the region has developed for example, and how this is going to raise the Kuwait image internationally by developing publications or by participation in international conferences? were the results coming out of this project? pg8

P1: Now, yes, in fact, it's developing new systems, or technologies or culturing new species for the first time in the world or to modify the methods available in the world. Using new systems, new products, we could manage to have some patents in Kuwait and in KISR. Yeah. So this is really important because the scientific institution like the one I work for at the moment, the main goal of having this institution is to develop new technologies, not to mimic what's going on in other ways, other locations of the world pg8

Final Theme: VALIDITY PLOT

2nd Level: Problem Statement with context around the world- first

P1: a very brief background. So it will be like I try to bring to their attention that fisheries collapse. Only 15%. Okay, I tried to add to attract their attention that there is a problem, huge problem pg20

P1: How do I get the idea simply, we're having lots of problems in the world, especially in the aquaculture with lots of obstacles. Pg2

P1: To start with for example, if the evaluator is questioning for example, I've submitted culturing sheem , sheem fish, okay. Sheem fish it's very popular in Kuwait, very expensive, it's gonna disappear from our oceans pg14

P1: So usually, I emphasise on the fisheries in Kuwait, I show them Oh, my God, a graph developed by Dr. Messer Lessini and his group that predicted if the collapse continue until 2050, and market demand continues to increase. How much are we importing? Okay. And aquaculture should be that applied should be the answer for this increase and the salaries or the the prices? Okay? The market prices are crazy. Not everybody can eat fish anymore. Okay. And so, usually I emphasise on that pg16

P1: It should. One of the good part, the good things happened to me during one of my PRMs. In fact, it's a shame the threats and fish which is threatened globally. Okay, vulnerable listed on the IUCN Red List. And one of the committee members. In fact, the head of the Committee told me this information because my target was going for culturing the fish because it's good because it's disappearing from our water, because

Importance/Benefits with supporting statistics as well - second

P1: And I try to keep that under the limited number of words: 300. So very simple, concise, and direct to the point with the identifying the problem, identifying the benefit, and then identifying the solution pg20

P1: So before entering the committee I knew that they're gonna ask about the 50 years, that KISR spent millions of dinars, millions and millions of dinars, developing the techniques for the other local species. Okay, why am I looking at this species? What is the need for it? So usually, I prepared my homework very carefully before entering the meeting. If I see the evaluator is distant from my field, and he doesn't understand what's the difference between the sheem and Zubeidi and more or any other fish species, I start informing him why did I select this fish simply it requires it's fast growing fish, it requires less time and the tanks high market value pg14

P1: Well, in fact, it is, it has to be paragraph all that I've mentioned before, it has to be in paragraphs except for the deliverables and then the objectives. So usually under the benefits to benefit Kuwait I try to emphasise on for example, if this proposal is for, of course as agriculturist I'm using my skills under aquaculture to benefit the environment, for example, to eliminate the minimize the pollution or to participate in conservation of the marine biodiversity. So it depends if the project aims to the development of the aquaculture industry,

P1: Again, the Kuwait development plan, that we need to have, the aquaculture industry to start as fast as we can. And this was before the COVID-19 problem. So I was in my

Proposed Solution (needs to be economically viable as well, it needs to fit)- third

P1:And this is the solution. This is my hypothesis, this is my idea. I'm going to do, briefly what I'm going to do. Pg20

it's very valuable, good commercial application later on and he went like: I think you should have the IOC and international support before you go even further. So this was really amazing comment from PRM Committee pg19

presentation, I was informing them. Why did they select this? Why is it really a profitable commercial? future plan for it for the private sector? Why should we do it as the government initiative or government project that can benefit the private sector? pg15

P1: Well, a bad proposal is the one that is just investigating something for the sake of investigation, only that it will have dark application, or it won't have any added value to the research and KISR for example pg19

Final Theme: SCIENTIFIC MERIT PLOT

2nd Level: Detailed Methods objectives-tasks-matching deliverables and matching the problem statement

Methods need to be well cited

P1: And when you do your objectives, what do you mainly highlight as as objectives? What do you focus on?

A: the deliverables that I'm going to have by the end of the work, for example, my, if we take this project as an example, again, it will be to establish and develop the heart rate techniques for the species and the species on this patent to develop the design parameters for the project. Okay. So it will be the deliverables, the main deliverables of the work, not the experiments themselves pg7

Reputation (Recognition)- Novelty + Publication

P1:How this work will raise Kuwait's image by developing new technology that nobody else in the region has developed for example, and how this is going to raise the Kuwait image internationally by developing publications or by participation in international conferences? were the results coming out of this project? pg8

P1: Now, yes, in fact, it's developing new systems, or technologies or culturing new species for the first time in the world or to modify the methods available in the world. Using new systems, new products, we could manage to have some patents in Kuwait and in KISR. Yeah. So this is really important because the scientific institution like the one I work for at the moment, the main goal of having this institution is to develop new technologies, not to mimic what's going on in other ways, other locations of the world pg8

Final Theme: ACHIEVABILITY PLOT

2nd Level: Scientist's/Team Background + Related Past Projects- Shows client confidence in management capabilities - reduces risk

P1: when I started thinking of developing a new treatment for the diseases, the aquatic animal disease, instead of using the harmful chemicals and antibiotics, I'm not a pathologist, but I got the idea. So I had to team up with a pathologist, an aquatic animals pathologist. He helped me in developing the methods, how can we test this hypothesis? I started searching for the, for example, the oils, the essential oils, from plant origins, that what can we use as treatment? So I had the idea, and he developed the methods, he helped me in developing the methods for it pg3

Execution Plan & Resource Management:

Task Schedule (order of tasks) + Resources + Knowledge Transfer & Learning + Budget + Feasibility + splitting projects into phases

P1: Okay. And the expected outcome, budget and duration.

P1: I've tried my best to convince them. Okay. And then we had to do focus on
money when you were convincing pg15

P1: In general, they cost a lot. But I do my mathematics really, really carefully. And they count every single dinar pg15

P1: So, less expenses less duration equals less expenses equals high profit and profitability and production from the commercial venture pg14

Quality Assurance (linked with

scientists background also)

2nd Level: PREPARATION

1st Level: WRITING SKILLS

Written Preparation - Needs Skills

time, Clear Concise to the point organised flow Updated Lit. Review

PRESENTATION SKILLS

Presentation Preparation (Presenting to others based on their background and history + slides content

P1: no. I just wait and stress my work and prepare myself for the presentation because I'm a little bit shy with interviews, you know them, okay. And so I tried to stress my work just to prepare myself for any question. I try to prepare myself if according to the person's background, okay. pg13

P1: : Well, as I told you, I try my best to protect myself by preparing all the possible questions in my mind. Okay. What would they ask what would they emphasise on specially? pg13

P2: First, I read the proposal regarding the title. And when I go through a proposal phase, I don't want I don't look like a long, long, meaty proposal, for the scientists or the reviewers will get lost there, especially in background and introduction. pg 2

P2: The researchers who do young promoted to as researcher, and when you become a researcher, that's mean you have to submit a proposal, right in front your proposal may execute the project, they cannot, they cannot. And that's why we have the they told them we could we call them between us as a PR manager, Deadwood, okay. Really they cannot defend they cannot write a proposal, but we have researchers, they help them to write a proposal. And after a lot of confusion, we would go backward and forward with them until I approved this project. But they cannot defend it. They defended through PRM after a long time. And now one of them called me last night and came first they said, I cannot answer the papers. You have to defend. He's scientifically weak. And his background is weak. He wants to do fisheries. But he is very weak in fisheries, because he has no basics in fisheries. He cannot understand fisheries. p4

P2: So, we have to see all the parts of the proposal. They, they wrote it in an very smart way, and very comprehensive and understandable, for the people who can read it, and understand it directly without going and reading and reading and they don't know what he wants to do, really, and how he got the idea. pg 3

P2: I think subheadings will do fine. If there is many statistical procedures or analysis they can put it in bullets, okay. It depends on really how. We usually leave it for the researcher himself. To put it in a way which will be clear for us, even in paragraph will be okay. But should be clear for us. It doesn't matter to be in bullets in or paragraphs or whatever p4

P2: The researchers who do young promoted to as researcher, and when you become a researcher, that's mean you have to submit a proposal, right in front your proposal may execute the project, they cannot, they cannot. And that's why we have the they told them we could we call them between us as a PR manager, Deadwood, okay. Really they cannot defend they cannot write a proposal, but we have researchers, they help them to write a proposal. And after a lot of confusion, we would go backward and forward with them until I approved this project. But they cannot defend it. They defended through PRM after a long time. And now one of them called me last night and came first they said, I cannot answer the papers. You have to defend. He's scientifically weak. And his background is weak. He wants to do fisheries. But he is very weak in fisheries, because he has no basics in fisheries. He cannot understand fisheries. p4

P2: So, in PRM presentation, they are telling always telling the project leader put a diagram explaining your idea. What is it about okay. Output pictures, okay. make them understand comprehend what is your idea? Yes. The presentation. The first 10 minutes of the presentation is very critical for the PI to present his idea and the proposal idea itself the idea itself here any what is important or what is the only give one or two slides the background and key and what is the wants to hit want to solve and what is the problem and how he will solve it. Okay. Okay, through diagram, I want to do this and this to solve that such a problem through doing the experiment pg 15

Final Theme: PERFORMANCE

2nd Level: Selling/Negotiation- Confidence, good presentation skills (shows capability and trust)

P1: Yeah. And again, lots of experience so I can answer very strongly if it's related to the "scientific" value of the work. Because I've developed the proposal myself, I do everything myself. It makes me strong in defending my proposal. Okay. And in fact, I love being in such committees because if the person and for the evaluator doesn't understand the, the slides or the idea behind my work, I can convince them pg14

P1: Comments, sometimes the comments are from Jupiter, but you have answers to their questions and to convince them that you are capable of conducting the work pg11

P1: I think you didn't leave anything that doesn't interfere with the science promotion, the science, my marketing and I mean KISR how to talk to sell the proposals that we are developing. Okay. I think we've covered everything starting from satisfying the reviewers and KISR to selling our product and getting the funds from the client pg21

Interactivity: Articulation and Discussion (telling the actual story maybe not written)

P1: it depends on the again on the evaluator when I had the second evaluation by the head of the Supreme Council. It was a debate and when it was convincing him and according to his point of view and his questions, I was able to get his approval. So it depends on fact about the evaluator himself. Yes. Okay, evaluators in front of you, how they're responding with your presentation, how their questions, what is the interest? So usually I would try to do my best and I will reply to their needs and their questions pg16

Appendix E – Proposals Content Analysis Sample

Final Theme: AUDIENCE

2nd Level: Alignment

P30: The outcomes of this research project will be used to develop other applications of PHAs in areas of strategic importance to Kuwait, namely, biodegradable agriculture films, general packaging materials (Fabra et al., 2014) and most importantly PHAs for use in oil sector related materials (Hong-Kun et al., 2013). pg9

P30: The main drive of this multidisciplinary project is to address a very important research area related to the utilisation of inexpensive waste materials from renewable resources, to produce environmentally friendly products with high commercial value and to serve multiple sectors including agriculture and oil industry in Kuwait, which is clearly aligned with Kuwait Institute for Scientific Research's 8th strategic plan. pg12

P30: The research work will be discussed with Kuwait Municipality and procedures of selected food and dairy products after the initial proof of concept stage. The aim is to submit this research proposal to Kuwait Petroleum Corporation (KPC). pg13

Simplification for Diverse Audience - but still scientific

P30: A PHA polymer molecule is typically made up of 600 to 35,000 (R) – hydroxy fatty acid monomer units. Each monomer unit harbors a side chain R group, which is usually a saturated alkyl group but can also take the form of unsaturated alkyl groups, branched alkyl groups, and substituted alkyl groups, though these forms are less common. Depending upon the total number of carbon atoms within a PHA monomer, PHA can be classified as either a short-chain length PHA (3 to 5 carbon atoms), medium-chain length PHA (6 to 14 carbon atoms), or long-chain length PHA (15 or more carbon atoms). They are also classified as homo-polymer or hetero-polymer (co-polymer) depending on whether one kind or more than one kind of hydroxyalkanoate is found as the monomeric units. The molecular weight of PHA differs depending on the micro-organism, conditions of growth and method of extraction, and can vary from about 50,000 to well over a million (Bugnicourt et al., 2014). A wide variety of C-sources like oils, whey, glucose, sugars, bagasse, lignin, etc. have been used for the production of PHA commercially and for research purpose (Rana et al., 2013). The physical and mechanical properties and biocompatibility of PHA can also be changed by blending; modifying the surface or combining PHA with other polymers, making it suitable for a wider range of applications (Jacquel et al., 2008). pg10

Final Theme: SCIENTIFIC MERIT PLOT

2nd Level: Detailed Methods objectives-tasks-matching deliverables and matching the problem statement

Methods need to be well cited

R19: The objectives of the study are as follows:

- To predict the extreme wind speed for return periods of 10, 25, 50 and 100 years from different directions for many locations in Kuwait.
- To prepare an extreme wind Atlas for Kuwait
- Project Outputs
- Extreme wind speed for return periods of 10, 25, 50 and 100 years from different directions and for the locations indicated in the objectives.
- A book on Extreme Wind Atlas for Kuwait pg22

Reputation (Recognition)- Novelty + Publication

P22: This project considered as a unique project, where an anaerobic digester will be used for the first time in Kuwait to generate energy from sludge. There is no real innovation in this project however, it is a need due to the massive amount of sludge in Kuwait which is accumulated in wastewater treatment plants without any treatment. The output of this project will help the decision makers to assess the use of an anaerobic digester for energy generation in Kuwait. In addition, this will contribute significantly to KISR's image and position as a credible leading institution capable of finding relevant wastewater solutions. At the end of the project, the obtained results, analysis and conclusion can be distributed through scientific journals and international conferences. pg12

Final Theme: ACHIEVABILITY PLOT

2nd Level: Scientist's/Team Background + Related Past Projects- Shows client confidence in management capabilities - reduces risk	Execution Plan & Resource Management: Task Schedule (order of tasks) + Resources + Knowledge Transfer & Learning + Budget + Feasibility + splitting projects into phases	Quality Assurance (linked with scientists background also)
P22: Project Leader's experience includes industrial wastewater treatment and sustainable energy. The project research staffs, professionals and technicians have the necessary experience in successfully conducting many wastewater research projects and the necessary qualification in the field- as well as laboratory-scale testing and analysis. With the proposed project team a sound study will be conducted. Relevant Project Experience Recently, renewable energy sources and energy generation from waste are getting attention worldwide. There are different applications of using anaerobic digester for energy generation around the world; however, similar systems have not been used in Kuwait. Similar researches were conducted by Almatouq and Babatunde [21] where wastewater was used to generate energy using anaerobic reactors (Microbial Fuel Cell). Furthermore, Almatouq and Babatunde [22] conducted a study to produce Hydrogen from wastewater using Microbial Electrolysis Cell. Previous Work for Client KISR and the WRC staff have conducted many research projects	P22: The Wastewater Laboratory, WRC at Sulaibiya Research Plant (SRP) has all instruments necessary and the trained manpower to carry out the proposed laboratory analyses. Moreover, the trained manpower and equipment available at the WRC Shuwaikh laboratories can contribute also for additional tests for the collected samples when needed. Software like MS Excel, SPSS will be used for data analysis and graphical presentation of raw data and the analysis results. pg14 P22:The process configuration of the anaerobic digester reactor (ADR) system will be conceptually based on the schematic diagram shown in Figure. A1 in Appendix A. The aforementioned pilot test unit will be designed and a technical tender specification for the unit will be developed during this task. pg17 P22: Schedule The project is expected to be completed in 30 months. The task schedule is provided in Table 3. pg22 P22: Budget Justification The total cost of the project is estimated to be KD XXX. About 21% (KD XXX) of the total cost goes to the capital expenses. In	P22: Quality Plan Laboratory analysis will be conducted at KISR-WRC SRP laboratories that are ISO 9001:2008 certified. The analysis will be conducted using standard procedures as outlined in the Standard Methods for Water and Wastewater Examination [24] and the American Standard Testing Methods [25]. All the necessary equipment are calibrated, inspected, and quality assured routinely. Parameters analysis methods are listed in Table 5. Calibration periodicity will be different for each parameter examination in accordance with requirements of applied method. Project activities will be delegated to qualified team members who have appropriate experience/training. Moreover, all reports will be submitted to reviewers for evaluation. Quality of the analytical results will need to be proved by monitoring proper quality controls values during analysis (as described in the reference method). Blanks and duplicate samples will be analysed and checked across outside laboratories to ensure data quality and precision. pg24

on wastewater technological and operational issues supported by Kuwait Foundation for the Advancement of Science (KFAS). A few of these projects are listed below. pg12

P22: Key Technical Resources
Table 2 shows the involvement of the staff members.
Table 2. Staff Qualifications and Role in the Project pg21

addition, about 46% (XXX) of the total cost goes for salaries, and 33% (KD XXX) for operational expenses.
Capital Cost: KD XXX exclusively for purchasing anaerobic digester pilot plant, gas detector and Gas Chromatography (GC), which is required for the gas analysis. Laboratory Supplies: KD XXX will cover the required chemicals for the sludge samples analysis and gas chromatography columns. Operating Charges: KD XXX will be used for installation the unit and external analysis. Repair & Maintenance Equipment Charges: KD XXX will cover the estimated cost of site preparation and mobilization. This includes mechanical, electrical, and civil works to prepare a suitable space to accommodate the research facilities. Petty Cash cost is required to accelerate the processing of low-value purchases, which are not exceeding KD XX per day, throughout the duration of the project. Two cars are needed for this project to collect sludge samples from three treatment plants (Kabd, Al-Riqqa and Umm Al-Himman). pg24