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A New Approach for the Prioritization of Information Overload: A Risk-Informed Systemization for Communication (R.I.S.C.) to assess COVID-19 Publications

How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19

Joel Tyler Alba

Preface

Upon arriving in Norway, I had no idea what the future may hold for me. At the time, a hopeless romantic, I made the decision to up and leave an established job, moving to a country in hopes of finding what the world had to offer, and, more importantly, what I had to offer the world.

Perhaps, hope was all one could find, perhaps, hope all is one should find…

Alas, when speaking of hope, it would be remiss of myself not to reflect on the hardships that my grandparents and father went through, as they made the decision to leave Mexico, to immigrate to the United States in hope of a better life for their themselves, and their future generations. Enduring the trials and tribulations of systemic racism, culture misappropriation, all in search of a better life -- those lessons have been imparted on me, making me…nay, who we are.

While my journey may not be comparable in that exact sense, I still believe that there is an existential linkage of leaving what is known, heading into the void of uncertainty, with the promise of something different, something more.

And for that, I dedicate this thesis to my family: my grandparents, both my Abuelito and Abuelita, Nana and Tata, my Mom and Pops, my one and only brother, Alec, and lastly, the rest of the Alba family, mis hermanos-primos, Tias y Tios -- through the hardships that arose living in a foreign country, to enduring our first (and hopefully last) pandemic…I know that, together, as a family, anything is possible.

And, for that, **and more**, I love you.

Additionally, I would like to especially thank my supervisor, Professor Frédéric Bouder, and of course, the rest of the professors at UiS who continually believe and guide me. Professor Bouder has not only encouraged me to attack any and all possibilities, but has more importantly, challenged me on what it means to be an academic researcher, providing me with opportunities aplenty, whilst strengthening my resolve and tenacity. To him, I endlessly thank.

I hope to make you all proud.

I look forward to continue the journey of challenging the academic world and myself.

Que Sera, Sera

Abstract

The COVID-19 pandemic has shaken the foundations of every institution of the world. Current risk communication and decision-making paradigms have been confronted and challenged, and it has been made ever so insidiously clear, that a new era of decision-making and risk communication is upon us. Hence, the establishment of the Fourth Era of Risk Communication, where decision-makers, experts, and the public alike, must acknowledge that the speed and magnitude with which data and publications are disseminated, overbears the current risk communication and governance frameworks employed. Therefore, this thesis attempts to convey that a risk governance paradigm emphasizing a newfound focus on the prioritization of risk-informed input, and public risk perception, provides the necessary wherewithal to address information saturation. As such, we posit the research question: *How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19.*

To accomplish this, a multi-tiered study was conducted to provide the data for the research. A six-month SRA study, published by the author, provided the bulk of the data, supplemented by six, Delphi-style-inspired interviews, providing the researcher the opportunity to delve deeper into the issues raised in the SRA study.

The purpose of the research is to provide decision-makers, stakeholders, experts, and the public, with a key understanding of how input selectivity affects the decision-making process, and ultimately, society as a whole. Hence, the proposal of the Risk-Informed Systemization for Communication (R.I.S.C.) framework.

The R.I.S.C. framework is yet but the budding of an idea, a spark to ignite the discussion; establishing a mediative-participatory regulatory style, intent on risk-informed input prioritization, is the first priority. Inducing a political culture that resides around the systemization of risk-informed input is a task that requires great political will, trust, time, and resources. The reinvigorated focus of risk-informed input prioritization must be the foundation with which the new era of risk communication frameworks operates. Ensuring the information entering the decision-making process follows the main tenets of R.I.D.M., provides the decision-makers with a streamlined, unified route of risk-informed information to better create a risk-informed, risk communication strategy. Accomplishing such a feat, provides a transparent, credible, and two-way, participatory governance paradigm, thereby establishing trust, credibility, and honesty, between the public, decision-makers, and experts.

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Acronyms (Alphabetically Listed)

ALARP:	As Low As Reasonably Possible
BAT:	Best Available Technology
CBA:	Cost-Benefit Analysis
CDC:	Center for Disease Control and Prevention
E[NPV]:	Expected Net Present Value
EuX:	Expected Utility
ICAF:	Implied Cost of Averting a Fatality
PRA:	Probabilistic Risk Analysis
QRA:	Quantitative Risk Assessment
RAC:	Risk Acceptance Criteria
R.I.D.M.:	Risk-Informed Decision-Making
SARF:	Social Amplification of Risk Framework
SoK:	Strength of Knowledge
SRA:	Society for Risk Analysis
WHO:	World Health Organization

1. Introduction

The COVID-19 pandemic has strong-armed the scientific community to embrace an 'Open Access' digital strategy, where knowledge dissemination is of foremost concern, where otherwise competitive, corporate, and/or national interests restricted the movement of information (Belli, 2019). The complexity, ambiguity, and uncertainty of COVID-19, combined with the politicians' compellation to mitigate the publics' heightened risk perception, has led to an inundation of information flooding the porous lines of communication (Hudson, 2020, p. 43). Due to this influx of non-reviewed publications, the opportunity for misinformation to influence decision-making exponentially increases.

Extrapolating on this, and building on Covello and Slovic's four problems of risk communication (Covello et al., 1986), we hypothesize that there is indeed a fifth problem of risk communication, in that of: information saturation (Coglianese, 2009, p. 537). While transparency is a key tenet of successful risk communication, it has been evidenced to inhibit effective risk communication as well (Löfstedt & Bouder, 2014, pp. 6-7). Therefore, unconditional transparency does not correlate to efficient risk communication, and thus must be framed through a discourse-laden, two-way, risk management paradigm, committed to risk-informed input prioritization.

As of now, there exists no known risk-informed approach with which to overview and scrutinize the burgeoning of COVID-19-related publications. Information saturation has the potential, and has been evidenced, to have negative effects on risk perception, and as a byproduct, erode established risk communication avenues and trust between authorities and public (Löfstedt & Schlag, 2016, p. 14). This further exacerbates the post-trust/risk society that we are currently enduring, and undermines any productive communication strategies employed in the past (Löfstedt

E., 2005). To combat the ‘anti-intellectualism’/ ‘individualization’ movement, we must attack the source, ensuring that risk-informed quality over quantity is a main staple throughout the various risk communication channels (Beck, 1992). Accomplishing such a feat requires a risk-informed approach that can mitigate the ‘infodemic’, i.e., quantity over quality, that is contaminating the decision-making process (Ahmed, 2020, p. 6). This consequently provides a route where risk-informed articles are the source for risk-informed decision-making, thereby naturally supplying the risk-informed, risk communication strategies with information that has been vetted through the risk-informed tenets of risk management.

The aligned axis of an ambiguous, complex, and transnational risk event, e.g., COVID-19, underpins the necessity to ensure the risk messages communicated, are done so in a methodological, transparent, and risk-informed manner. Unfortunately, high-risk, transnational risk events will not dissipate in the near future; contrarily, man-made natural disasters will only intensify in lethality and frequency (Wisner et al., 2004). It is thus the utmost priority of not only the experts and decision-makers, but as well as the public, to induce a culture that resides around two-way, proactive information sharing, established within a risk-informed governance paradigm.

Indeed, there have been a multitude of studies, models, platforms, and communicative frameworks that have been propositioned and implemented in the past; some with much success, others failing remarkably (e.g., smoking rates in United States; e.g., disposal of high-level radioactive waste) (Kasperson, 2014, p. 1243). However, we are currently in the midst of a new era of risk communication, a fourth phase of risk communication, where the number of publications disseminated, overbears the current risk communication frameworks employed. A change of the times therefore requires a change of how we understand and address how information affects the

risk perception of the modern citizen, incorporating the globalized risk society, social media, and the actors whom communicate risks (Ahmed, 2020, p. 5).

This project aims to establish a provisional, holistic approach that will, in theory, provide the initial foundation for a framework that aims to refocus the need to prioritize the information input of risk-informed decision-making. As an initial pilot study, the author recognizes that such an approach will not be the ultimate panacea, nor is it intended to be. However, there are optimistic hopes that through a reexamination and reapplication of decades of past research, this research may shed light on the importance of input prioritization within risk-informed decision-making (R.I.D.M.).

Therefore, in an attempt to address the oversaturation of information in the new era of risk communication, we posit the research question:

How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19

While there have been numerous studies published on risk communication strategies, our research is a refocusing of the risk-informed tenets of risk management, to propose a pilot risk communication approach to cope with the information overload of COVID-19 publications.

2. Theory

An in-depth literature review analyzing the existing risk science literature and gaps in research has been conducted to assess the potential efficacy of a framework to vet the influx of COVID-19-related publications. This chapter emphasizes the innate intricacies of the risk discipline, with a particular focus on risk-informed decision-making, risk communication, risk perception, and risk governance, as the central catalysts in how varied input can affect the decision-making process.

2.1 Risk

Akin to the evolution of society, the concept of risk has transgressed both spatial and temporal dimensions, remaining an integral *force d'esprit* in both the individual and social consciousness. This evolution has occurred in tandem with the rise of socio-technological advancements, and the economic and political revolutions of various epochs, for risk is an intrinsically pervasive element in all disciplines, of every society (Lupton, 1999, p. 44).

Initially originating as an 'Act of God', striking with celestial impunity, the concept of risk evolved to be framed as an expression of mathematics, resigned to a measure of probability and happenstance (Aven T. , 2012, pp. 36-37). In such a broad conceptualization, a plethora of definitions have arisen[1]:

1. Risk is a measure of the probability and severity of adverse effects (Lowrance, 1976)

[1] The author has purposely produced a selective list of risk definitions, which is, by all means, not intended to be exhaustive in its evaluation and characterization of the risk concept.

2. Risk is equal to the triplet (si, pi, ci), where si is the ith scenario, pi is the probability of that scenario, and ci is the consequence of the ith scenario, i = 1, 2, …, N (Garrick & Kaplan, 1981)
3. Risk is a situation or event where something of human value (including humans themselves) is at stake and where the outcome is uncertain (Rosa, 1998)
4. Risk is uncertainty about and severity of the consequences (or outcomes) of an activity with respect to something that human's value (Aven & Renn, 2009)

While there appears to be a chronological and linear progression of the aforementioned definitions, the concept of risk is hardly linear in nature. Contrarily, the risk concept runs adjacent, and sometimes paradoxically, to the fluctuations of each discipline within their sociopolitical-academic standing, and is thus dependent on the temporal ontological and epistemic conceptualizations. Aven and Renn (2011) state that while they, "…. have not taken a stand on what is the preferred definition and perspective of risk…", that there can be, "…a structure for characterizing the definitions based on three categories: (a) risk as a concept based on events, consequences and uncertainties; (b) risk as a modeled, quantitative concept; and (c) subjective risk description" (Aven et al., 2011, p. 1078). Furthermore, due to its innate, interdisciplinary fluidity, concurrent with the ever-globalizing nature of sociopolitical and economic communications, risk has transgressed the quantitative bounds with which it was first realized. As a result, the risk concept is defined within a socially constructed paradigm, and is therefore pedagogically redefined in accordance to the adhered discipline.

While a vast number of risk interpretations have been proposed, there still resides a void to be addressed: in that of the dissemination of articles and journals abiding by the risk-informed tenets by which decision-makers institute policy -- herein referred to as 'input prioritization'. In today's

environment, technology, and by proxy, the lines of communication, are exponentially increasing by orders of magnitude unknown to past societies. This thus implies that the number of publications, and the speed with which science travels, outpaces the methods policy-makers have constructed to filter information (Bostrom A. , 2003, pp. 556-557). As such, a reassessment of the decision-making process, with a key focus on the prioritization of information selectivity, requires one to reevaluate the systemization of information in the decision-making process. It is imperative to establish a concept of risk that works concurrently with the concept of *effective* input prioritization, understanding the integral facets of risk perception, and decision-making under uncertainty, whilst abiding by the tenets of risk-informed decision-making.

2.1.1 Risk Theory, *Incarnate*

For the sake of brevity, we have decided to utilize Aven's definition of risk, where, "…risk has two dimensions – consequences and uncertainties- and a risk description is obtained by specifying the consequences and using a description of uncertainty *Q.* The most common tool is probability *P* (subjective probability… referred to as…knowledge-based probability) (Aven T. , 2015, p. 14). This definition is predicated on the notion that the aleatory and quantitative Probabilistic Risk Analysis (PRA) to solely define and assess risk, are not a sufficient means to assess the intricacies of risk. To ascertain the most complete formulization of risk, one must acknowledge the truism: risks are a future event, and the consequences, with respect to something humans' value, are unknown (Aven T. , 2020). As such, there lies an innate uncertainty that must be expressed, which requires the assessor to expand their concept of risk outside of the established stochastic quantitative risk assessment. That is, from the form of an *(A, C, U)* conceptualization, to one that integrates the uncertainty of a future event, including the subjective probability, probabilistically

described as, (C', Q, | K) (Aven T. , 2015, pp. 13-14). However, while this latter risk description provides a much broader characterization of risk than that of the PRA characterization, Aven stresses the importance of conducting a knowledge-centric litmus test, i.e., a 'Strength of Knowledge' (SoK) test.

Whilst conducting risk assessments, there arises a number of variables one must ensure are adhered to, in particular, the judgement of the SoK. The shift from a PRA-focused risk characterization, to one that incorporates a subjective, knowledge-based probability, requires one to delve into the basis with which the knowledge, (*K*), is founded upon. Askeland et al. (2017) state, "The background knowledge, (*K)*, includes data, information and beliefs, with the latter often formulated as assumptions…the probabilities alone do not capture all the relevant features" (Askeland et al., 2017, p. 197). To further elucidate the importance of the SoK test, let us construct a thought-experiment utilizing a basic risk matrix: two risk assessors conduct a risk assessment, where both obtain a probability of 0.5 that a risk event will occur. However, while both assessors obtain a probability of 0.5 that a potential event will occur, one assessor (See Figure 1), has a strong background knowledge (*K*- assuming *K* is data, information and beliefs), while the other has a weak background knowledge (See Figure 2) (Askeland et al., 2017, p. 197).

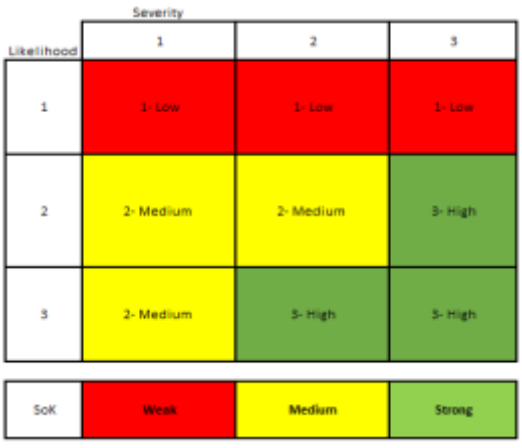


***Figure 1**: Basic Risk Matrix, Risk Assessor 1*

***Figure 2**: Basic Risk Matrix, Risk Assessor 2*

To the untrained eye, the probability of 0.5 from both assessors may appear reliable, however, when incorporating the SoK, one realizes that there is an indelible difference between the two. As a decision-maker, one must evaluate the SoK to better understand the full grasp of the risk situation, as the assessors' 'input' difference may either cost hundreds of millions of dollars, and/or hundreds, or thousands of lives. Hence, the reason for a SoK test, for there must be a strategically thorough assessment of the validity and reliability of the assertations made (i.e., knowledge obtained), all of which coincides within the risk perspective administered [i.e., (C', Q, | K)].

To further explicate the importance of testing the reliability of the knowledge ascertained, there must be a systematic ranking of the SoK. Aven and Flage (2014) argue that, "…because the probabilities of the risk assessment are by definition subjective… we can have $P(A|K_1) = P(A|K_2)$ for vastly different background knowledge bases K_1 and K_2…" (Aven et al., 2014, p. 1199). In essence, the difference between K_1 and K_2 can be likened to the aforementioned thought experiment, where one expert has a weak SoK, while the other has a strong SoK. Therefore, the criteria with which to judge the SoK has been articulated in that if the following conditions are met, then the SoK is strong;

> "The assumptions made are seen as very reasonable; large amounts of reliable…data are available; agreement among experts; phenomena well understood; models used are known to give predictions with the required accuracy; knowledge *K* has thoroughly been examined" (Aven T. , 2020, p. 129).

Naturally, the antithesis of such a description would lead to a weak SoK, and any cases classified in between the two would be labeled as medium SoK. The SoK test is conducted to validate, expose, and give credence to the knowledge that is ascertained by the experts, and is thus thoroughly vetted through a rigorous cross-examination against the stated criteria.

However, the SoK test is not the ultimate solution, as one must acknowledge that, "Just being precise and consistent in terminology and aware of the boundaries and limitations of the tools…are not enough… we acknowledge that any tool we use needs to be treated as a tool. It always has limitations…" (Aven T. , 2012, p. 42). While the models, frameworks, and abstract quantification are limited by the very nature of their existence, the SoK tests are predicated on the invaluable purpose of testing the input against itself. Therefore, the input differentiation, or SoK, that separates Assessor 1 from Assessor 2, has the potential, and has been evidenced to have ill-effects on the decision-making process if one doesn't assume that "…the knowledge can be more or less wrong and even erroneous" (Aven & Kristensen, 2019, p. 7). Thus, within every aspect of the decision-making process, a stringent adherence to the thorough assessment of the input that buttresses the decision should be conducted, ensuring the risk-informed tenets are adhered to.

Instituting SoK tests across the multiple actors' knowledge involved in the risk assessment must be the baseline with which the risk-informed decision-making (R.I.D.M.) process operates. The problem is: when publications are permitted to enter the decision-making process without abiding by the risk-informed tenets of risk management, they vehemently go against the nature of R.I.D.M., and risk-informed communication strategies. While politics is hardly ever in unison on any one topic, that does not excuse that the input utilized in decision-making mustn't abide by the R.I.D.M. tenets of risk management. Proposing an approach to assess the validity of the risk-informed tenets and input valuation, with respect to Aven's risk concept, provides a natural route to potentially better engender a unified, and more efficient risk-informed communication strategy.

At its core, risk is a science about decision-making; as such, each decision has the same genetic makeup of requiring 'input'. However, while input is a consistent factor across the decision-making spectrum, the selectivity of which input comprises decisions varies based on the

interactions of that individual and/or institution, perceptions, values and sociopolitical influences. As such, this multi-dimensional process is further complicated when facing decision-making under uncertainty-- a common situation in the ever-evolving, globalized world.

2.2 Decision-Making Under…Certainty, or Uncertainty?

Reflecting upon the ongoing COVID-19 pandemic, and the handling of the situation in terms of risk management, the foci of governments seemed to have been primarily reactionary, as if they were experiencing a 'black swan' event (Taleb, 2010). However, COVID-19 was not a black swan event; in fact, in a 2004 report, published by the United States Director of National Intelligence, explicitly stated, "Some experts believe it is only a matter of time before a new pandemic appears, such as the 1918-1919 virus that killed an estimated 20 million worldwide" (National Intelligence Council, 2004, p. 30). Thus, the question arises: if the background knowledge was medium-to-strong for the potentiality of a foreseeable future pandemic, what type of risk-informed policies were implemented, if any at all? Further, and perhaps most importantly, even if there is a semblance of *certainty*[2] within a faction of experts, external sociopolitical forces and internal psychosocial processes and values, can and will influence decision-making.

Building on these inquiries, the following discussion will overview the main tenets of risk-based, and risk-informed decision-making, emphasizing the facets that provide the backdrop for risk management strategies in the decision-making field.

[2] The author utilizes the term *certainty* to represent a degree of probability with a strong vote of confidence, not that there was a 100% certainty, with zero room for error, that COVID-19 would occur within this specific timeframe. Hence the inclusion of *certainty* within the inherent uncertain decision-making process title.

2.2.1 Risk-Based Decision-Making

Risk science in the petroleum field has been largely dictated by the 'production over protection' mantra, thus the field operated under the methodologies of: Cost-Benefit Analysis (CBA), As Low As Reasonably Possible (ALARP), Vision Zero (Abrahamsen, et al. 2019), Implied Cost of Averting a Fatality (ICAF), Risk Acceptance Criteria (RAC), Expected Utility (EuX), etc., (Aven & Ersdal, 2008, pp. 199-200). These principles and methodologies operated primarily on the usage of expected value computations. Expected value-based equations frame risk as a stochastic probability, in an attempt to weigh the costs and benefits of an operation, to deem if the operation is at an acceptable, or unacceptable risk level. Abrahamsen and Soerskaar (2017) contend that the production over protection methodology of expected-value-driven CBA is known as the, "…extreme economic perspective…" where, "…risk and uncertainty are not sufficiently considered if the sole focus is on E[NPV]" (Expected Net Present Value) (Abrahamsen & Soerskaar, 2017, p. 642). Therefore, returning to the aforementioned risk science strategies, the extreme economic perspective falls under the risk-based strategy, and is still widely used in today's decision-making processes. However, while CBA methodology is still systematically used in a number of industries, there resides a number of 'unsystematic uncertainties' when solely utilizing CBA methodology.

Inherent in the extreme economic perspective are internal and external constraints that affect the decision-making process. When dealing with high-risk operations, one is continually constrained by the Best Available Technology (BAT), limited time and resources, government and corporate policies, political decisions, sales agreements, etc., most of which can be subsumed under the notion of 'systematic risk' (Abrahamsen E. et al., 2004, pp. 348-349). Systematic risks are risks/uncertainties that are generated by general market forces, whereas unsystematic

risks/uncertainties are those that cannot be determined through the movement of general markets, e.g., black swans, accidents, etc. (Abrahamsen E. et al., 2004, p. 351). To cope with both systematic and unsystematic risks, there is an imperative need to have an input prioritization process that regulates and informs the decision-maker. However, exclusively accounting for one dimension of input, say systematic risks, or only using a risk-based perspective, completely negates an entire dimension of risks, i.e., unsystematic risks. Therefore, inhibiting oneself to one particular methodology, or input selection, solely based on expected values, limits the nature and scope with which risks are assessed and understood. Alas, due to the fact that models are but simplifications of the real world, we must systemize, and refocus our prioritization of the background knowledge and input selected, thereby requiring a broader characterization of risk, and as such, requiring the R.I.D.M. paradigm (Aven T. , 2020, p. 266).

2.2.2 Risk-Informed Decision-Making (R.I.D.M.)

The concept of risk-informed decision-making is hardly a nascent term, but its' incorporation in the risk governance framework of nation-states has yet to come to complete fruition. As the risk science field begin to broaden their view of risk, and the inherent uncertainties of decision-making, there soon began to be a refocusing on societal betterment, environmental risks, and future generations' livelihoods (Abrahamsen E. B. et al., 2004, pp. 351-352). While the 'portfolio theory', law of averages methodology, is consistent with a focus on profits and development, society argues that there are negative externalities that come with the production of high-risk operations and decision-making (Abrahamsen & Aven, 2017, p. 50). As a result, a questioning of the sole usage of risk-based methodology soon arose within the risk science field. In this questioning, there arose the need to incorporate subjective judgment to the uncertainty of risks, risk perception, knowledge-

based probability, SoK tests, sensitivity analysis, etc., to create a more consistent and transparent decision-making process (Abrahamsen et al. 2011, p. 76).

Accordingly, due to the large unsystematic risks that are at stake, and with consequences potentially causing major socioeconomic and environmental harm, i.e., something humans' value, the inherent uncertainty within expected values prompts cautionary tactics (Abrahamsen & Soerskaar, 2017, pp. 640-641). Hence, when facing 'unsystematic uncertainties', the precautionary principle is invoked. The precautionary principle expresses that, "…if the consequences of an activity could be serious and subject to scientific uncertainties, then precautionary measures should be taken, or the activity should not be carried out" (Aven T. , 2020, p. 269). Therefore, following the methodology of DNV GL and Menon, one can overview the R.I.D.M. process as a fluid, oscillating hybrid between the risk-based, and risk-informed methodology. That is, integrating facets of both strategies to create a more robust foundation with which to assess risks.

The DNV GL and Menon model emphasizes the importance of a, "…broader evaluation of uncertainty in the analyses…", which is, "…fully flexible and contributes to ensuring that the decision-maker can choose to apply either an extreme economic, or an extreme safety perspective, or an in-between perspective" (Abrahamsen & Soerskaar, 2017, p. 643). The purpose of the uncertainty analysis is to frame the risk tolerance levels between the alternative options available; should the uncertainty exceed a level of risk tolerance for Alternate 1, i.e., performance commitment for performance measure 1, then Alternate option 2 will be chosen to proceed (Refer back to Figure 1 and 2). Naturally, should the uncertainty analysis provide results which convey the possibility of serious consequences, or subject to scientific uncertainties, then a committee will adjust the scope of the project, deliberating on whether or not to proceed with the plan (thereby invoking the precautionary principle).

However, one is still utilizing an uncertainty analysis that is dependent on expected values, and therefore converting all units of the risk event into a singular unit, thereby disregarding the negative externalities, and the unsystematic risks, of the risk operation. Moreover, the transition of human lives, environmental effects, and the livelihood of future generations, do not straightforwardly convert into a singular unit, as there are multiple understandings, perceptions, and values that come into play, all of which require subjective interpretations of their value (Abrahamsen E. et al., 2004, p. 355). Furthermore, such, "…analyses have to be viewed in light of the background knowledge…and acknowledge…. Risk assignments are judgments made by someone, expected risk values do not provide the full picture of risk, people's risk perception provides information about risk" (Abrahamsen E. B. et al., 2004, p. 356). Therefore, the departure from risk-based strategies requires the broader assessment of risk. That is, building off the PRA foundation that establishes the risk probability, but incorporating the risk perceptions, dialectical deliberation, and values that are inherent in the decision-making process.

Insomuch as the need for uncertainty analysis, there is a further need to include the deliberation of alternatives with the residing committee, for there is no purpose in having alternatives, if there is not *requisite variety* within the committee to overlook all possibilities (See Figure 3) (Reason, 2016, p. 80). While requisite variety provides the committee with a comprehensive and multi-disciplinary variety of members with which to adjudicate the nature of the risk at hand, the need for deliberation mustn't override the goal of progress. Namely, there must be a process invoked that assures the deliberation process does not paralyze decision-making, for 'a no-decision' stalemate could very well be the worst decision. Kasperson (2014) states, "…sharing everything that experts know about risk uncertainty may be highly counterproductive for decision-makers and publics…uncertainties lodged in the value systems of those who will bear the risks need to be

brought…into the assessment and management processes" (Kasperson, 2014, p. 1236). The inclusion of stakeholders, experts, public interest groups, and authorities, potentially positions the decision-making process in the cross-hairs of a managerial stalemate, or even worse, perceived as incompetent to the public.

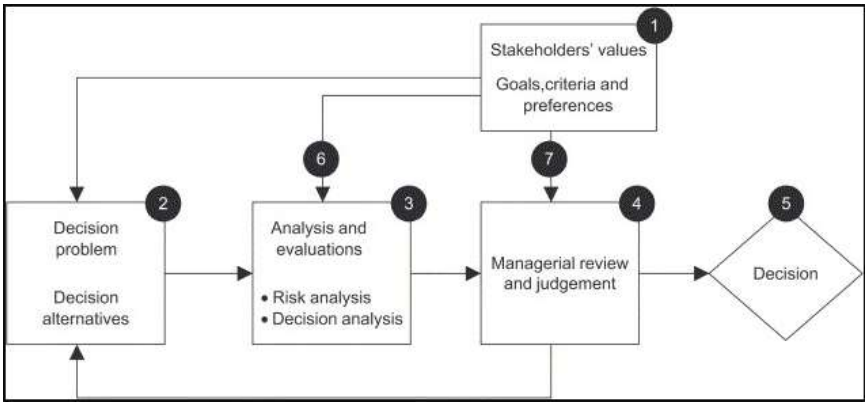


***Figure 3**: Risk-Informed Decision-Making Model (Aven & Ersdal, 2008, p. 201)*

However, Renn (2008) argues, that, "…participants…actually demanded that the best technical estimate of the risks under discussion should be employed…", and that, "…other dimensions apart from expected values should enter the deliberation process" (Renn, 2008, pp. 330-331). The falsified notion that: by integrating the public into the management process, their *inability to comprehend* technical information will dilute the decision-making process, is unfounded. Instituting a risk-informed model of decision-making requires one to include the risk perceptions of the public, for their perceptions provide an ulterior risk perspective that has its' own epistemological basis. This can also be interpreted as a measure of the selectivity of the input information that is chosen. One must include a broad, yet selective measure of which inputs to include, while not solely restraining oneself to the quantitative measures of PRA.

When faced with a high-risk, complex, ambiguous, and uncertain events, e.g., COVID-19, there must be a resolute emphasis to ensure the quality of information is on par with the risk communication strategies employed. Simply stated, ensuring the information entering the

decision-making process follows the main tenets of R.I.D.M., provides the decision-makers with a streamlined, unified route of risk-informed information to better create a risk-informed, risk communication strategy. The benefits of creating a transparent, two-way, R.I.D.M. process, complementing the risk-informed, risk communication strategy, establishes a consistent line of credibility and trust, for both the citizen and authorities. Hence, is the importance of ensuring the publics' risk perception is included in the decision-making process, for therein lies an invaluable element of risk that cannot be attained through quantitative expression.

2.3 Risk Perception

"Don't let us forget that the causes of human actions are usually immeasurably more complex and varied than our subsequent explanations of them."
Fyodor Dostoevsky, *The Idiot* (Dostoevsky, 1869, p. 301)

As the risk concept builds onto itself in the varying logical expressions of quantitative and qualitative formulation, there occurs a third dimension with which risk orients itself within the social arena: the individuals' risk perception.

To further elucidate this concept, and as per the 'paradox of objectivity' (Kuklinski H. & Sigelman, 1992, pp. 829-830), there occurs a similar paradox of how perceptions become a vital facet of societal and individual risk, manifesting themselves in the form of mental heuristics (Slovic & Peters, 2006, p. 323). Constructing the 'Psychometric Paradigm', Slovic (1990) states, "…psychometric research demonstrates that, whereas experts define risk in a…technical way, the public has a… more complex view, that incorporates value-laden considerations such as equity, catastrophic potential, and controllability" (Slovic, 1990, p. 41). There thus occurs a rift between expert technical assessments of risk, and the perception with which the public *realizes* risks. In

essence, the public are internalizing the technical risk assessment through a prism of psychological, cultural, institutional, social, and personal perspectives, thereby, in a sense, distorting the 'objective truth'[3]. Furthermore, Slovic (2010) argues that, "…people look to their positive and negative feelings to guide their evaluation of an activity's risks and benefits", and "…feelings serve as an important cue for benefit/risk judgements and decisions" (Balog-Way et al., 2020, p. 2248). As such, Slovic's theory of 'risk as feelings' and 'risk as analysis' gains additional credence through Kahneman's theory of System 1 and System 2 thinking.

In his seminal work, *Thinking Fast and Slow*, Daniel Kahneman offers an introspective perspective on the individuals' cognitive abilities to interpret messages. Kahneman (2012) states, "I have…presented System 2 as active in deliberate memory search, complex computations, comparisons, planning and choice…System 2 is more of an apologist for the emotions of System 1 than a critic of those emotions…" (Kahneman, 2012, p. 103). The basic premise lies in the notion that the cognitive abilities of the individual are delineated into two, co-opting, oscillating 'Systems'. System 2 conducts the more 'complex' management of risk problems, while System 1 is primarily a heuristic, emotional response; say, for example, the fight-or-flight synapses that occur instinctually when faced with life-or-death situations. As such, there are intrinsic parallels between the 'Psychometric Paradigm', to that of Kahneman's System 1 and System 2 theory. The heuristics with which individuals' instinctually rate, assign, or determine the level of threat from risk, i.e., System 1, can be likened to that of the Psychometric factors of risk interpretation (e.g., sense of dread, voluntariness, threatens future generations, etc.) (Slovic, 1990, p. 69). Whereas

[3] The author uses the term 'objective' in the same manner as per the 'paradox of objectivity' in the sense that there is no one *true* objective truth, as each individual perceives a different 'reality' than that of the other.

System 2 qualifies the risk assessor's thinking as the more complex of the two segmentations, a 'risk as analysis' type, thereby linking the two together.

Inherent in the paradigm of risk perception is the need to mitigate not only the amount of information, but more importantly, instill a culture that promotes the quality of information. However, there will always be a clash of risk perception, with that of the risk messages, for no two individuals have lived the same experiences, and therefore perceive various data and risks through different lens. So, how would an approach work to establish a consistent flow of risk communication in light of the formidable chasm of risk perception and risk messages? For one, one mustn't neglect the fact that risk perception will never parallel that of risk messages; rather, one must embrace that notion, and work on the quality of communicated information in tandem with those whom are affected. The construction of an approach that works to establish a prioritization of risk-informed information, emphasizing qualitative and quantitative risk assessments, all the while focusing on effective risk communication goals, will serve to better streamline the R.I.D.M., and communication processes.

2.4 Risk Communication

In theory, risk communication has always been a part of society. Whether that be in the form of a simple warning to tribe members of an imminent threat, or a rise of radiation level due to an exposed nuclear leak, "The field of risk communication…can be understood as systematically historically situated in a temporal sequence of events and processes" (Balog-Way et al., 2020, p. 2244). As the complexities and uncertainties of the sociotechnical world become ever-more omnipresent to the peripherals of the public, there is an increasing need to further delve into the construction and dissemination of, "…message content, sharing processes, and communication

aims and objectives", to better resolve the gap in communication between experts and the public (Boholm, 2019, p. 158). Hence, is the need for a rejuvenated, restructured streamline of two-way communication and decision-making. One that is defined within the paradigm of evidence-based narratives, and risk-informed decision-making, focusing on the tenets of transparency, consistency, participation, trust, and credibility.

In a 1989 report commissioned by the U.S. National Research Council, defined risk communication as:

> "…an interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management" (U.S. National Research Council, 1989, p. 21).

When dismantling the above definition, three specific aspects are noteworthy: messages/risk messages, individuals/institutions, and risk communication/risk management. Furthermore, we can extrapolate these three aspects with respect to what Leiss describes as the, 'Three Phases of Risk Communication'. Leiss (1996) states, "Phase 1 emphasized risk…stressed the quantitative expressions of risk estimates.... Phase 2 stresses communication…messages intended to persuade a listener of the correctness of a point of view…" while Phase 3 focused on, "…public and private sector institutions increasingly are recognizing their responsibility to deal adequately with both dimensions and to carry out sound risk communication" (Leiss, 1996, p. 87).

Apropos to the First Phase, we can effectively establish a causal link between simply expressing the risk quantitatively, to that of a basic 'message/risk message'. In our interpretation, a risk message consists of a pure quantitative expression of risk, without any form of explanation, nor public-induced vernacular. Phase Two, a dialogue is established, one that is focused on two points of communication, that is, the 'individual and the institution' expressing the risk messages. Lastly,

Phase Three, we begin to form the idealization between risk communication and risk management, in that there must be a *purpose* in the communication, to further clarify and bridge the gap between the experts and public.

However, we posit that there may be indeed a Fourth Phase of Risk Communication: in that there is a further need to not only explain the risk messages in an evidence-based narrative, but due to information saturation, there must be an approach with which to prioritize risk-informed input.

While the Three Phases of risk communication broaden the boundaries of risk communication, society is at an impasse where the communication of risk information cannot be accurately assessed prior to its dissemination. This ultimately leaves the decision-maker and citizen with an overwhelming amount of information, and, at times, conflicting risk messages, further confounding their risk perception. This is exacerbated as the risk communicative strategies employed, are counter to that of the data disseminated, or, as interpreted through their risk perception. As a result, the trust between authorities and the public, and that of expert and decision-maker, erodes, as one views the other as confused, dishonest, or seemingly 'above them'. Hence, there must be a newfound manner with which decision-makers, experts, and public address the fourth phase of risk communication. The information saturation of the fourth phase of risk communication must be able to be digested, or processed, by not only the public, but as well as the decision-makers, and utilized in a coherently transparent, and applicable risk communication strategy. Once again, the importance of a systemization of input prioritization within the decision-making process becomes evident.

In furthering the argument of the fourth phase of risk communication, we look to Baruch Fischoff (1995), in his article, *Risk Perception and Communication Unplugged: 20 Years of Process*, in which he synthesizes the Three Phases of risk communication, in stating:

"All we have to do is get the numbers right. All we have to do is tell them the numbers. All we have to do is explain what we mean by the numbers. All we have to do is show them that they've accepted similar risks before… All we have to do is make them partners. All of the above…" (Fischoff, 1995).

However, this induced veneer of progressed rationality may mislead those whom are unaware of the social boundaries in which risk communication has endeavored to establish itself in. To put more succinctly, risk communication has endeavored to not only establish itself as an interdisciplinary communicative approach, but also, to establish itself as a progressive, interactive, participatory method of governance. There has thus yet to be a framework or strategy that positions itself between the paradigm of policy and data, overseeing the content, quality and purpose of the data/messages being disseminated. Information saturation in the Fourth Phase of risk communication has yet to be addressed; instead, we are left with a revisit to past methods, constraining ourselves to a *hermeneutical circle of logical subterfuge*, essentially, a dog chasing their own tail. Of course, it would be remiss of oneself to not address the frameworks, strategies, and paradigms that have come to the forefront in an attempt to domesticate the discipline of risk communication. For we are simply, "standing on the shoulders of giants", and the possibility of conceiving of a new framework, is only possible due to the failures of the past (Newton, 1676).

2.4.1 Risk Communication's Models, Frameworks, & Theories

The very nature of any risk communication strategy can be reduced to a transparent, two-way dialogue, meant to educate, motivate behavior, or to persuade the public in assessing and/or determining the efficacy of risk strategies, or interpretations of the potentiality of risks (Bostrom et al., 1997). Further, in a breakdown of the 'Seven Cardinal Rules of Risk Communication', Covello and Allen (1988) list:

"Accept and involve the public as a partner; plan carefully and evaluate your effort; listen to the public's specific concerns; be honest, frank and open; work with other credible sources; meet the needs of the media; speak clearly and with compassion",

as key tenets with which risk communicators should abide by to institute a trusting and transparent source of communication between the expert and the public (Allen & Covello, 1988). While the 'Seven Cardinal Rules' provide an initial foundation for risk communicators, the authorities and public were left with a still ever-increasing gap between the facts, and that of the risk messages communicated, i.e., risk perception. Furthermore, the 'Seven Rules of Risk Communication' does not attempt to address the inherent problem of information saturation, and is therefore incompatible with the new era of risk communication. In an attempt to bridge that gap, three models have arisen out of the foundation laid by the cardinal rules, that of the Deficit Model, the Mental Models Approach, and that of the Multi-Way Model; however, the key focus will be on the Deficit and Mental Models Approach.

Renn (2009) describes the Deficit Model as the, 'sender-receiver model', in which he states the model has, "…drawn fire for promoting a mechanistic understanding of communication and for emphasizing a one-way communication route" (Renn, 2008, p. 209). Such a perspective centered itself on establishing a hierarchical standing between expert and public, where the expert was intent on aligning, "…lay perspectives with those of 'the experts' with the expectation that this would change lay behavior" (Balog-Way et al., 2020, p. 2242). In essence, the model disregards the notion that the public could internalize, process, or provide any sensible risk perceptive that could benefit the risk assessment. However, while such a communication style seemingly provides a 'straight from the source' type of communication, Fischoff articulates, "…poor communications cause immediate damage…that happens when people see scientists as insensitive to their needs and scientists see people as incapable of grasping seemingly basic facts" (Fischoff, 2012, p. 4).

This phenomenon, coined the 'Asymmetry Principle', states, "Trust is much easier to destroy than it is to create…distrust…tends to reinforce and perpetrate distrust; distrust colors our interpretation of events, thus reinforcing prior beliefs" (Slovic, 1993). Due to the fact that the experts are a key staple in each of the risk management processes, there is an utmost need to ensure that they are, in some sense, buffered, or protected, from the onslaught of public relations. However, this does not mean granting the experts, or scientists, immunity from scientific malpractice, or hiding them behind the numbers. Exposing them as the sole determiner of communication is reckless, and as per the Asymmetry principle, can erode any and all trust, should the public misinterpret, misperceive, or simply distrust the person, regardless of the message and content.

While the deficit model has since lost its posterity in the risk communication field, Renn (2014) states, "…the deficit model still maintains a substantial following in industry and in the state, local and federal government" (Renn, 2014, p. 1277). However, the deficit model is not a broad enough model with which to curb the number of publications that emerge due to 'information saturation', nor does it attempt to tackle the void between risk perception and risk messages, and is therefore an insufficient model to do so. Thus, due to the evolving nature of transitional and interdisciplinary risks, the transition to a more interactive, two-way model between actors surfaced, in that of the Mental Models Approach.

As the narrative between the actors of the social arena began to be redefined in terms of power relations, there was a fundamental need to understand what the public were perceiving, rationalizing, and ultimately, communicating about risks. In an attempt to bridge the gap between risk perceptions of the public, and the technical risk assessments communicated by the 'experts', risk communicators refocused their communicative efforts by, "Using psychological behavioral research to establish adequate and efficient messages, and identify proper vehicles…reducing what

they call ‘knowledge gaps’” (Bourrier, 2018, p. 4). Thus, birthed the ‘Mental Models Approach’. Constructed by Morgan and Fischoff, they strongly advocated for, “…in-depth qualitative interviews prior to developing risk communication programs of any kind…” (Bourrier, 2018, p. 5). The Mental Models Approach utilizes a two-pronged approach, in that it capitalized on the expert assessments of risk, while integrating an open-ended questionnaire that would provide a backdrop to the decision-theory-inspired influence diagram (Morgan et al., 2002, p. 20).

In addition to the basic risk assessment process, as well as the recipients’ preconceived beliefs, Atman et al. (1994) argues that, “…the information should be presented with appropriate text structure and reinforced with textual aids… in effect, a risk communication should complete a recipient’s mental model of the relevant risk processes…”, ultimately affecting decision-making (Atman et al., 1994, p. 779). With that being said, there are still inherent limitations by which the Mental Models Approach are constrained by; that is, they are still models, and thus bound by the physical limitations of their nature. Johnson-Laird (1983) refers to the limitations as a, “doctrine of functionalism”, or in Chomsky’s term – ‘explanatorily adequate’ –; further, he states, “It must lay down explicit constraints on the class of possible mental models…as the mind’s necessarily incomplete model of itself allows only a partial control over the many unconscious and parallel processes of cognition” (Johnson-Laird, 1983, p. 11). Therefore, delving into the psychoanalysis of each individual is inherently impossible, and more rationally, isn’t resourcefully feasible, thereby limiting the influential impact of what makes the Mental Models Approach so enticing. While broadening the foundation with which to evaluate, characterize, and communicate risk, the Mental Models Approach is still deficient in the attempt to assess an oversaturation of information in volatile risk environments.

In totality, the author believes that there is an opportunity for each and every one of the arguments to have its position within the realm of risk communication. Society is far too stratified to impart one singular risk communication strategy, as the individuals' consciousness is a juxtaposition of reality vs. perceived risks. A mosaic of the strategies, each at the helm of the authorities, ready to be implemented, shall be assessed to be utilized based on the characteristics of the risk communication strategy, the risk event, and the intents and purposes of the goal to be achieved. That being said, a key focus must reside in the ability to understand the effects of transparency on both the decision-maker, as well as the public.

2.5 Transparency & Information Saturation

Vast amounts of accumulated research over the years have posited a number of theories and models in hopes to establish a causal pathway in mitigating the disparity between expert and layperson; thus far, we still seem to have an ever-increasing chasm between the two. Covello and Slovic (1986) attempt to formulate the four communication problems, in their essay, *Risk Communication: A Review of the Literature*, in which they list, "Message problems, e.g., limitations of scientific risk assessments; source problems, e.g., limitations of risk communicators and risk assessment experts; channel problems, e.g., limitations in the means of media…; and receiver problems, e.g., characteristics of the intended recipients of the communication" (Covello et al., 1986, p. 171). While these four risk communication problems are well-situated within the risk communication paradigm, and certainly important, they do not address the novel phenomenon that has come to prominence with the current mass-media-digital age: that of, 'information saturation', a la 'fishbowl transparency' (Coglianese, 2009, p. 537).

Defined as, "…the full disclosure of information without explanatory information or contextualization…", information saturation overwhelms the public and individual risk consciousness through the bombardment of abstract quantitative expressions of risk, and expert colloquialisms (Löfstedt & Bouder, 2014, p. 75). The term 'fishbowl transparency', herein referred to as, 'information saturation', is a term that has come to fruition with the growing of the collective psychosocial risk consciousness. This has been exacerbated with the rise of the 24/7 mass media cycle, social media, and the increasing attempts to give 'face' to transparency.

As a result of information saturation, the public are at the mercy of their own imagination, that is, open to unfounded interpretations of probability and expert vernacular. This can be attributed to the heuristic, "imaging the numerator", thereby leading to a rise of 'inaccurate'[4] risk perceptions (Slovic & Peters, 2006, p. 323). Further, information saturation can also be attributed, "…not so much to the actual amount of information available, but to our inability to manage and perhaps process it" (Ahmed, 2020, p. 2). This inability to process and/or manage the information, leaves the populace to their own heuristics, or worse, a complete and utter disregard for new information that may, or may not, contradict their perceptions of risks. There thus arises the conundrum of the management of transparency debate, in that transparency can be that of a double-edged sword: where unfiltered and raw transparency may overwhelm the citizen (information saturation), leading to a perception of 'who's right/wrong', and/or where "negative information" may pose as a counter tactic to the authorities who release the information (Löfstedt & Bouder, 2014, p. 6).

[4] However, one mustn't resign oneself to the notion that there lies one, singular risk perspective that is accurate, for that line of thinking completely negates the purpose of risk communication and that of risk perception studies. The beauty, and ironically, the difficulty in risk communication, lies in the multidimensional, multi-perspective, and vast prisms with which risk messages are perceived, registered, and communicated.

In discussing the concept of transparency, Löfstedt and Wardman (2016), state, "…there has been relatively little work that has provided empirical evidence to inform the transparency debate… it transpires that transparency policies alone are insufficient to address the real-world complexities of communicating with patients and other end users" (Löfstedt E. V. & Wardman K., 2016, p. 1079). In an effort to increase transparency and openness, European policy-makers have instituted a number of, "…public hearings, and organizing public consultations on topics ranging from tackling conflicts of interest to proposals to release more safety-related data into the public domain" (Löfstedt & Bouder, 2014). However, the public hearings, consultations, and the like, rely on the notion that the public will be not only willing, but intent on participating in the open-source consultations provided by the municipality. Further, this idealization of participatory public hearings does not take into account the pervasive distrust found, particularly in American communities, when faced with high-risk events, e.g., COVID-19 (See Figure 4) (Alba, 2020).

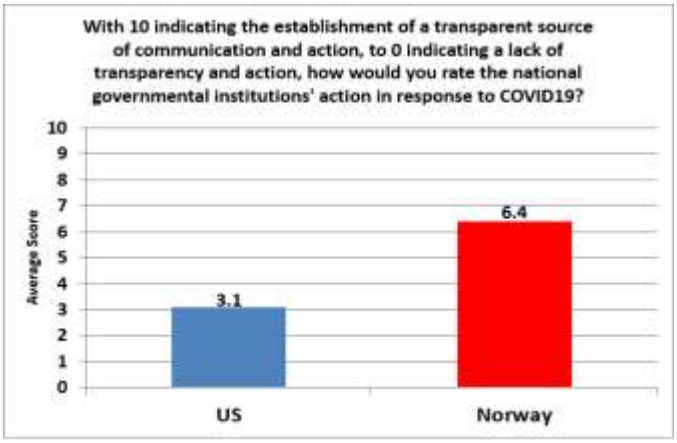


***Figure 4**: Perceived Transparency, U.S. & Norway Results (Alba, 2020)*

The concept of unregulated transparency can be rooted in the 'blame-avoidance' game of politics, whereby politicians release an inordinate amount of information, in that of a "snowing" tactic, "…with so little interpretation or quality control that it has the effect of reducing rather than increasing effective openness and information..." (Hood, 2007, p. 204). Unmitigated information saturation, 'snowing', 'fishbowl transparency', 'infodemic', call it what you will, are all symptoms

of the zero-sum game of politics, and thereby exacerbates distrust, disdain and decreases participatory discourse and participation (Davidai & Ongis, 2019, p. 5). Again, and it cannot be stressed enough, there must be an approach that prioritizes the information input that dictates policies in high-risk decision-making events, and even further, in decision-making in general.

Risk analysts, policy-makers and decision-makers alike, recognized the need to cull discord and distrust, while attempting to enculture a mentality of trust and participation. As a result, multiple models, frameworks, and theories have been propositioned, each with their own merits. Yet, a missing connection still persists…hence the lack of progress in risk communication practice concerning the influence of an oversaturated confluence of risk messages. There is thus a need for an approach that unites risk-informed input prioritization, risk-informed decision-making, and risk-informed communication strategies, to combat the information saturation of the Fourth Phase. Such an approach will work to bridge the gap through a refocusing on the *quality* of input selectivity, and intrapersonal perspectives, to better engender an effective risk-informed, risk communication framework. Accomplishing such a feat will theoretically enhance the quality of discourse, thereby framing discussions on the scientifically proven data, risk perceptions, and two-way discursive participatory communication. However, while such concepts appear well-thought out on paper, one must be cognizant of the potential effects of unfettered social media usage, and the rise of anti-intellectualism and its maladaptive effects on trust, discourse, and transparency.

2.6 The Rise of the 'Cosmopolitan Turn' & Anti-Intellectualism

"There is a cult of ignorance in the United States, and there always has been. The strain of anti-intellectualism has been a constant thread winding its way through our political and cultural life, nurtured by the false notion that democracy means "my ignorance is just as good as your knowledge.""

Isaac Asimov, *A Cult of Ignorance* (Asimov, 1980, p. 19)

The individual is defined by the society in which he/she is realized within, and society, in turn, is determined by each individual, and the manifold interactions that occur on a psychosocial level. Beck (1995) describes such a process as the concept of the 'cosmopolitan turn', a natural byproduct of the risk society and reflexive modernization; Beck (1995) states, "…the assessment of risk is subject to a high degree of ambivalence, due to the complexity of society and technical knowledge…expert knowledges tend to contradict each other…scientific calculations are challenged more and more by political groups" (Lupton, 1999, p. 83). As a result of the new risk society, transnational risks are a tangible, yet specter-like phenomena, visible, yet invisible, (e.g., COVID-19, climate change, etc.). Thus, concurrent with the *different* knowledges espoused by various political authorities, and the conflicting expert and institutional knowledges, leads to what he terms, a 'reflexive modernization' of the sovereign citizen. Beck (1995) articulates, "Progress has turned into self-destruction…through the inexorable and incremental processes of modernization…judgments on risk represent implicit moral judgments on the ways in which…societies have developed" (Lupton, 1999, p. 87). This 'individualization' of the citizen, and thus, the reflexive questioning of the institutions and experts, confounds whatever notions of risk the individual/society has determined to be of relevance, thereby leading to a rise in 'anti-intellectualism'.

Inherent in the applicability of risk communication strategies is the need for a trusting populace. While it may seem trivial on the surface, the prospect of attaining, and maintaining, trust is a feat that has continued to challenge authorities. The individualization, and that of 'anti-intellectualism' of the citizen, further instills a sense of disdain and distrust, dilapidating the avenues with which risk communication strategies operate. In an attempt to construct a study identifying the root causes of the rise of anti-intellectualism within the United States, Motta (2018) states, "…individuals

holding high levels of verbal intelligence are less likely to hold anti-intellectual views than those with lower levels of verbal intelligence…" (Motta, 2018, p. 487). Verbal intelligence is defined as having the necessary comprehension skills to understand the scientific jargon communicated from the authorities, in essence, 'communicative skills', or in this case, risk communication comprehension (Motta, 2018, p. 475).

However, ironically, the rise of anti-intellectualism has also been theorized to be attributed to the 'democratization of knowledge', or, as herein defined, information saturation (Hofstadter, 1966, p. 37). As the populace gains more access to knowledge, they are overwhelmed with abstract data and scientific jargon; no amount of verbal intelligence can appropriately assess and interpret the amount of risk messages disseminated. This cacophony of incessant information, concurrent with conflicting risk perceptions and expert public disagreement, has sparked a backlash against institutions and authorities alike. Löfstedt (2016) states, "…the information…put out in the public domain is used as ammunition by the groups attacking the agency…to reduce the credibility of the agency in question" (Löfstedt & Schlag, 2016, p. 14). Thus, as a result of the polarization of U.S. politics, there has arisen a new, contradictory tactic, in which the populace critiques the policy-maker's attempts to 'hide' behind the science, utilizing the very data that supports the policies, to ultimately discredit the policies (Motta, 2018, p. 470).

Consequently, the information saturation of data and policies that the scientists relied so heavily upon to communicate risks, has been weaponized as a politicized-communicative medium by the populace to attack the experts' lack of narrative compassion. In other words, due to the constant barrage of scientific jargon/data, lacking any interpersonal narrative or background, portions of the populace felt ostracized. As a result of this risk perception, the pubic utilized their instinctual heuristics ('risk as feelings'), and repurposed the same input to attack the very science that was

meant to either comfort, explain, or provide reasoning. However, one must be cognizant that even with evidenced-based narratives, local participation, and integrating risk perceptions, there still remains an ulterior agent that has its own influence on risk messages: The Social Amplification of Risk Framework (SARF).

2.7 SARF & Regulatory Cultures

Renn (2008) metaphorizes the arena (SARF) to be that of a stage, one where actors from media, government institutions, stakeholders, the public, and other periphery forces, are all vying for political 'clout' in a power-struggle to advance various risk debates (Renn, 2008, pp. 131-132). Kasperson et al. (1988) state, "…the information system may amplify risk events…by intensifying or weakening signals…each recipient also engages in amplification (and attenuation) process… social amplifications of risk will spawn behavioral responses, which, in turn, will result in secondary impacts…" (Kasperson, R. et al., 1988, pp. 181-182). Therefore, each independent entity is that of a node, in the sense that they have their own reciprocal effects on the message being transmitted and received. Further, the implementation of any risk strategy is at the mercy of the social arena within which it is realized, and as any theatre critic will attest to, the stage is not only a medium for expression, but is in and of itself, an actor.

Thus, the SARF can be visualized as an independent entity that has its own ripple-effects on the risk messages being communicated and interpreted. Further, the independent actors are all playing an integral 'part of the show', each having their own amplification and attenuation effects on the risk messages. As such, the political will of the arena, and its constituents', must provide a consensual environment for the risk strategy to flourish; in other words, for a risk-informed strategy to flourish, all actors, including the arena, must be structured in a manner with which risk-

informed policies, strategies and communication efforts are appreciated. Henceforth, when discussing the actors and their influence on the risk perceptions and communication of societal and individual risks, it is befitting of oneself to ensure that the paradigm by which the risks are realized, are understood as a factor unto itself.

Incorporating the notion of the cosmopolitan turn, individualization, and that of the SARF, there is a growing need to propose a risk-informed framework with which to communicate, assess, and characterize both the physical reality of risk, and that of the social constructionist perspective. Such a conceptualization of risks, and risk communication, is inherent in our fourth phase of risk communication practice. While the third phase maintains that the 'audience' are no longer a passive third-party, but are indeed providing their own epistemic risk perspectives, there is a need to further delve into the quality and input of the communication messages. Löfstedt (2005) furthers this sentiment in stating, "…the research showed that there was a link between high perceived risk and high distrust…and also that regulators were trusted less and less…. regulators started taking the whole area of risk communication, public perception of risk, and the role of trust in the management process much more seriously" (Löfstedt E., 2005, p. 9). Hence, is the need to integrate this new fourth phase of risk communication into the policy-maker and decision-maker's circle of influence, and by relation, the regulatory style of the arena.

Despite maintaining a constant state of interdisciplinary fluidity between styles, four main regulatory cultures have been proposed by Renn (2008): *adversarial, fiduciary, consensual, and corporatist* (Renn, 2008, p. 360). Each of the regulatory cultures emphasizes the various aspects of the social arena, dependent on the individual regulatory style- e.g., highlighting/diminishing public and professional input, professional/expert public scrutiny, closed/open negotiations, stakeholder involvement, etc. (Renn, 2008, p. 360). However, the intended goal is to promote

inclusivity, democratic values, public participation, and an emphasis on expert background knowledge being subjugated to the risk-informed tenets of input prioritization, thereby establishing a constant, and reliable stream of two-way communication. Overviewing the four proposed regulatory cultures, none provide the regulatory culture for which the proposed approach would prosper in. Fortunately, there has occurred a shift in thinking. Arising out of the two counteracting movements of Japan/Europe, and that of the United States, Renn (2008) proposes a fifth regulatory culture, a *mediative* style, where a new focus of openness and public participation has led to a more refined goal of "communitarian orientations" (Renn, 2008, p. 361). This new orientation of communicative regulatory styles, has led to the birth of the mediative style, where the focus resides within:

> "Open negotiations among the consensual, fiduciary, or corporatist members; inclusion of public interest groups, early involvement of the public through decentralized and innovative discourse models; providing scientific expertise to all groups, but avoiding advocates of special interest groups; strengthening the role of interpretative functions that science and the social sciences…can offer to the discourse participants" (Renn, 2008, p. 361).

As one knows, change does not occur overnight. The evolution of the new mediative style must be one that is imbued as a cultural and sociopolitical movement. There must be an inherent desire to achieve a discourse-focused, expert-public-motivated, inclusive regulatory style. Hence, transformation will be incremental, but there must be a steadfast resolve amongst those who wish to impart change. There must be an *avantgarde* refocusing on the budding of a communicative style that profounds the current regime, realizing that the due course of expert-public-driven communicative input has come. Furthermore, such a transformation in regulatory style will ultimately cull the individualization of the anti-intellectual movement; for one mustn't strive to silence the majority, but to listen, understand, and reciprocate to their thoughts and emotions, in lieu of outright correcting.

3.0 Methodology

> "*To explain the phenomena in the world of our experience, to answer the question "why?" rather than only "what?", is one of the foremost objectives of all rational inquiry"*
>
> — (Hempel & Oppenheim, 1948, p. 135)

In an attempt to address the newfound[5] risk communication era of information saturation, this thesis challenges the potential of, "*How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19".* The decision to perform qualitative research resides in the nature of the research question, and thus requires the researcher to perform semi-structured interviews, relevant case study document analysis, and a content analysis of COVID-19. Fossey et al. (2002) defines qualitative research as aiming to:

"…illuminate the subjective meaning, actions and context of those being researched. The importance of the power relations between the researcher and researched, and the need for transparency (openness and honesty) of data collection, analysis, and presentation implied here highlight the extent to which criteria for quality profoundly interact with standards for ethics in qualitative research'" (Fossey et al., 2002, p. 723).

In the following sections, a discussion overviewing the aforementioned qualities of qualitative research in relation to the research question at hand, as well as a content analysis of COVID-19, will be conducted.

3.1 Research Method

Due to the expansive nature of research methodologies, and the finite number of resources, the preferred choice of methodology to answer the research question is that of an exploratory

[5] The author is aware that the terminology regarding 'information saturation, 'fishbowl transparency', 'snowing' of information, etc., have been well-established within the risk discipline for years, however, the establishment of a connection between these definitions and a new era of risk communication has yet to be conceived, hence the usage of 'newfound'.

qualitative, ‘pilot’ case study (Neuman, 2014, p. 51). Breaking down the chosen methodology leaves us with three distinct, yet iterative research components: exploratory, case study, and pilot.

First, in exploratory research, and in very much the same vein as a ‘pilot study’, requires the researcher to utilize qualitative data that, “…adds focus but rarely yields definitive results…”, and provides, “…research into a new topic to develop a general understanding and refining ideas for future research” (Neuman, 2014, p. 15). The basis of this thesis is attempting to establish a risk-informed approach to prioritize the influx of information saturating the decision-making process. Therefore, this is thus an exploratory, first attempt/pilot study at establishing a holistic framework to do so. As such, the author understands that this is not, and will not be, the ultimate solution, but hopes that this pilot study may initiate further discussion to help bridge the gap between risk communication, risk perception, and R.I.D.M., when confronting information saturation.

Next, Yin defines a case study as, “An empirical inquiry about a contemporary phenomenon (e.g., a “*case*”), set within its real-worldcontext- especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2012, p. 4). The choice to pursue a case study research proposal provides the researcher with a broad number of publications to study the sociocultural and political effects that have occurred in light of the onset of the COVID-19 pandemic.

3.2 Research Design

While the research conducted in this study proposes a holistic approach with which to vet the influx of COVID-19 information, it must be once again stated that this is a first attempt at a pilot study. In doing so, we utilize an inductive qualitative approach to move from the evidence or phenomenon studied, to make generalizations and/or theories as to how to prioritize information saturation in this new era of risk communication (Neuman, 2014, p. 48).

3.2.1 Research Triangulation Methodology

In aggregating the results from the study, a 'triangulation' method of research is utilized to assist in improving the theoretical and epistemic validity and reliability of the research gathered. Golafshani (2003) provides a literary synopsis of the pros and cons of triangulation methods, ultimately stating that the ability of triangulation to combine various methods provides a more robust resilience to the results obtained (Golafshani, 2003, p. 603). Further, the triangulation method utilized in this study develops Uwe Flick's (1992) triangulation model, and augments it to benefit the research methods chosen (See Figure 5 and Figure 6) (Flick, 2009, p. 27).

As a result of COVID-19, and the location with which the participants are located (United States), the semi-structured interviews were conducted virtually, via the Zoom platform. Six participants were chosen, representing varied sectors of society. The selection was made in hopes of providing a diverse range of perspectives of COVID-19, and the effects on transparency, decision-making, and risk communication, in relation to their own personal experiences and professions. Further analysis is provided from a past SRA study (Further discussion in Section 3.2.3). This was all completed in conjunction with a content analysis of COVID-19 to complete the triangulation methodology.

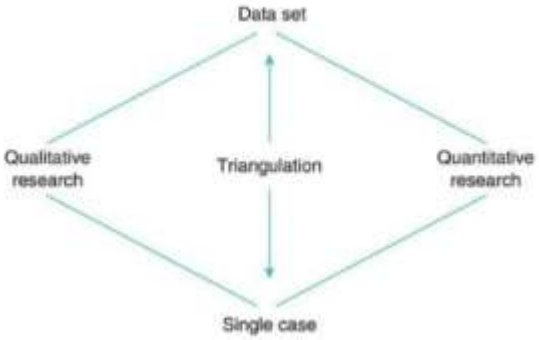


Figure 5: *Triangulation Model (Flick, 2009, p. 27)*

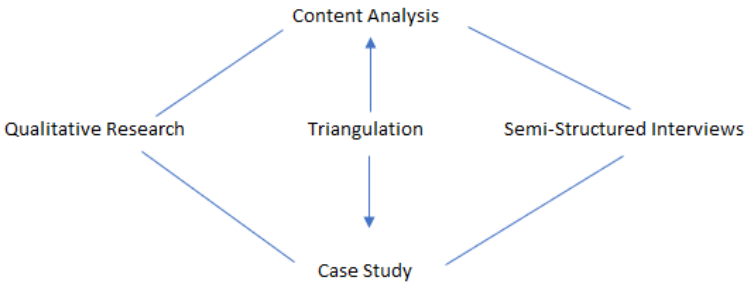


Figure 6*: Triangulation Model, Augmented*

3.2.2 The Delphi-Method-Inspired, Semi-Structured Interview

The decision to choose a select number of participants for a semi-structured interview offers the participants the opportunity to delve into the open-ended question structure, without any inhibition nor restraint. Kvale (1983) confirms such a process, stating, "…an interview, whose purpose is to gather descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomenon" (King, 2004, p. 11). Thus, the semi-structured nature of the interview provides the participants the opportunity to indulge into their own experiences, bringing their invaluable insights, perspectives, and opinions to the forefront.

A carefully curated group of participants were chosen, so that the varied sectors of society (e.g., academia, an epidemiologist, a cardiologist, non-profit organization leader, teachers, etc.), would be represented in hopes of providing a 'specialized' focus group. This focus group was meant to provide an 'expert' supplemental backdrop to that of the SRA survey responses garnered. The goal of the Delphi-Style, semi-structured interview, was to conduct multiple interviews with those whom are considered to be leaders in society, in hopes of obtaining a deeper understanding of the proposed thesis in relation to the varied sectors of society. Therefore, to establish the common themes and codes, the author decided to pursue a Delphi-style-inspired style of interview.

In this selection, a Delphi-style-inspired technique was employed, that, "…structures a group communication process by bringing a panel of experts to formulate a prediction or set of priorities…classified as a 'subjective intuitive method'…Delphi method is viewed…as an exploratory technique…in knowledge building" (Brown, 2018, pp. 95-102). In essence, the interviewer created two rounds of interviews, built off of the answers from the first interview with each of the participants. The second interview would utilize some of the themes and codes

established from the first interview, to facilitate a more thorough discussion on the topic. While not entirely a carbon copy of the Delphi-Method, in that we had only chosen six expert panelists as opposed to the ten to twenty recommended, the author believes that this method provides a more robust and replete representation of the key figures of society, thereby providing the necessary input for the research.

3.2.3 SRA Conference Survey

Over the latter part of 2020, the author published a dialectical analysis of the risk management structure of both Norway (Stavanger) and the United States (key focus on New York and California), where the results were presented in an international-virtual conference hosted by the SRA. The study utilized an online survey platform, via TypeForm, to obtain over 115 random responses from that of New York and California, and over 75 random responses from Stavanger. The questions revolved around the risk management structure of the respective countries, inquiring about the participants' perceived responses to the actions of the government in policy-making, their perception of trust, transparency, and government effectiveness in light of COVID-19 (See Attachment 8.1). The research and responses obtained will supplement the thesis with the 'laymen' perspective, where there was no specific 'type' of person sought after. Lastly, the author is aware that there are inherent limitations of the study, as the representative sample provides only a small fraction of the United States and Norway.

3.3 Planning & Conducting the Interview

A locational focus of the curated selection of participants was that of the United States, primarily California, being that California is the researcher's home state. Additionally, a majority of the

submitted anonymous answers from the SRA survey were from California, so logistically, for this thesis, it made sense to build off of the largest reservoir of submitted answers. However, as previously stated, due to the researcher's current location (Stavanger, Norway), the interviews were conducted through the Zoom platform. This has not proved to cause any discord nor consistency in the answers received, and all participants were more than willing to participate. Prior to the interviews, thorough research was conducted to ensure that the inherent power relations between that of the interviewer, and the interviewee, were cognizant in the interviewer's mind. Furthermore, since there, "…is no such thing as a neutral or value free position, in order to carry out critical research we must make our taken for granted assumptions explicit and see how they operate to legitimize power imbalances" (Davey & Liefooghe, 2004, p. 181). This understanding provided the researcher with the necessary wherewithal to interpret and adjudicate the carefully curated participants' responses, to that of the SRA survey questionnaire.

Prior to beginning each of the interview sessions, participants were asked if they would agree to be recorded via the screen sharing function of the Zoom Platform. All six agreed and were more than willing to oblige. Of course, anonymity and confidentiality were promised, as it provided the participants a 'blanket' of protection, to ensure their identity, and that of their profession, remained unaffected by any potentially decisive answers. The main problem that arose was the nine-hour time difference between the two countries. This proved to be a bit challenging to navigate, as the interviewer wished to ensure that each participant was not only comfortable, but that interview was conducted at the respondent's behest. This resulted in some exceptionally late nights, and early mornings, with multiple pots of coffee... alas, such is the nature of the researcher.

Lastly, in planning and preparing for the interview, the researcher took inspiration from the 'miner metaphor' as discussed by Kvale (2012), in which he states, "…knowledge is understood as buried

metal and the interview is a miner who unearths valuable metal. The knowledge is waiting in the subject's interior to be uncovered, uncontaminated by the miner" (Kvale, 2012, p. 19). In this, we aim to approach the interview with a Socratic method of discourse, hoping to build a disciplined dialogue, where the participant can answer in free form, whilst unknowingly bridging the gap between the theoretical framework, their perceived reality, and the research question.

3.4 Validity & Reliability

In assessing and determining the validity and reliability of the results and research conducted, one will find a plethora of definitions, dependent on the type of methodology chosen. Neuman (2014) articulates that establishing reliability and validity within a research study provides the route to a truthful, credible and consistent study, thereby maintaining the integrity of independent, academic research, the bedrock of our scientific discipline (Neuman, 2014). In defining reliability and validity, respectfully, Neuman (2014) states, "Reliability means that the method or instrument you use to make measurements is consistent and dependable", while defining validity as addressing, "…how well the aspect of reality you measure matches up with the ideas you use to understand the aspect of reality" (Neuman, 2014, p. 132). In analyzing our own research, we will be operationalizing a 'triangulative-hermeneutical' cycle to address reliability and validity.

Cassel and Symon (2004) delve into the objective hermeneutic cycle, first expressed by Forster (1994), in which he suggests a seven-stage model where the, "…the first step is development of an understanding of the meanings of individual texts (or discourses) …", where then, "…the researcher starts the process of identification of sub-themes, and then at the third stage begins to identify thematic clusters" (McAuley, 2004, p. 198). Extrapolating that to this study, moves the

researcher from conducting the Socratic, Delphi-Style, semi-structured interviews ascertained content, into coding and thematic categories, expressed in a 'Thematic Map' (See Attachment 8.2).

At the fourth stage, the researcher moves into the triangulation phase; utilizing the categories and sub-themes ascertained from the Socratic dialogues with the participants, a test of reliability and validity is performed, where the researcher, "…goes back to the subjects of the research and test out the interpretation with them", essentially, a form of the Delphi-Style interview process (McAuley, 2004, p. 199). Steps five through seven include recontextualizing and retriangulating the data, placing it into a larger context (the research question, as well as the proposed framework), and finally, writing up the research (McAuley, 2004, p. 199). While there is no possibility of achieving perfect reliability and validity, the author believes that the hermeneutical model for the qualitative ascertainment of validity and reliability, provides a more in-depth analysis of the results acquired, further establishing a consistent and dependable study.

3.4.1 Internal Validity

Neuman (2014) defines internal validity as allowing one to rule out any threats, causes and/or deviations, by controlling the experimental settings and environment- e.g., selection bias (lacking random assignment), history (event maturation of COVID-19), testing (nature of an interview influences their answers), and experimenter expectancy/ behavior (Neuman, 2014, pp. 209-210). To combat such threats to internal validity, the author presupposed the semi-structured interviews to be bolstered by that of the SRA random participant answers, thereby eliminating a biased sample of participants. Additionally, the selection of an adjacent group of selected participants from the community is further encouraged when conducting case study research, as making, "…realist assumptions about the interview data would want to be sure to include a sample representing

important distinctions within the organizational population…the analysis gains in validity by increasing the number of viewpoints collected via interviews" (King, 2004, p. 16). Therefore, the utilization of a triangulation methodology provides the credibility and validity for the research, and subsequent results, garnered.

3.4.2 External Validity

Inherent in the search for credible qualitative research is to demonstrate the subjective perspective of the research participant in the context of those being interviewed, as well as the influence of the surrounding environment on their individual perspective within the confines of the study (Fossey et al., 2002, p. 723). Extrapolating such a statement, and applying this to the general population, leaves one with the concept of external validity, where there is an ability to generalize the findings outside of the particular study (Neuman, 2014, p. 210). The hopes and aims for this case study research are to provide an initial pilot study to 'kick-start' an introspection into the prioritization of input in the decision-making process, emphasizing R.I.D.M., risk perception, and risk communication. The research is meant to be holistic in its approach, providing the necessary backdrop for others, and the author himself, to critique and further delve into the nature and importance of input prioritization.

3.4.3 Reliability

In the context of qualitative case studies, the concept of reliability has led to a number of interdisciplinary feuds regarding the *reliability* of 'qualitative reliability'. Syed and Nelson (2015) note, "Objectivity is inherent in the definition of reliability, as it implies some underlying truth that can be assessed by different raters…the phenomenon exists independent of the individuals

who are assessing it" (Syed & Nelson, 2015, p. 376)[6]. In order to attain some semblance of structured reliability, the author established a set of codes and themes. Upon establishing said themes and codes, the author reinitiated a condensed interview with each of the participants, utilizing a Delphi-Style method of cross-examination. The triangulation method provided the foundation with which the research could be further assessed through the lens of reliability and validity, ensuring that the codes and themes established, were not simply 'one-off' mishaps. Thus, as previously stated, the author purposely kept the semi-structure interview process, inspired by the Delphi-style of methodology, but focused mainly on the Socratic method of discourse, thereby facilitating a natural course of discussion, in hopes of attaining the 'miner's gold'.

3.5 Analysis Process

The participants, whom remained anonymous to one another, would participate in a first round of interviews with the researcher. Once the first round of interviews was complete, the researcher established a thread of common codes and themes pertaining to each of the questions and answers provided by the various expert participants. As described by Cresswell (2015), coding is a methodology with which the interviewer may dissect the information obtained from interviews, and establish a set of themes and categories to order the data (Cresswell, 2015, p. 156).

After establishing the codes, a second, more refined interview was completed, where the author collated the various themes and codes and presented them to each participant, asking them to speak more on the topic, given the themes and codes established by the other experts. This process provides, "…inbuilt feedback; minimizes bias from dominant personalities, provides a level of

[6] While the author admonishes the idea that quantitative research is completely devoid of subjective influence and/or bias, a thorough philosophical discussion pertaining the contested objectivity within the natural and social sciences is outside the scope of this paper.

agreement where there is often an absence of empirical evidence, and pinpoints areas of agreement and disagreement in an existing knowledge area" (Brown, 2018, p. 103). This process further strengthened the input that was obtained through the interviews, thereby providing the researcher a much more valid and reliable set of codes and themes with which to create the thematic map.

That being said, one must be cognizant of the "Fallacy of Patterns", in which the researcher may tend to look and/or focus on codes and themes that may not be *truly* there, but due to the subjective nature of qualitative research, have a potential to influence coding (St. Pierre & Jackson, 2014, p. 716). Once again, the analysis process hinged on the innerworkings of the triangulation method, in conjunction with the Delphi-Style interviews, SRA survey results, content analysis, and the case study research, in order to combat the "Fallacy of Patterns".

3.6 A Decision-Making Content Analysis of COVID-19

Originating in Wuhan, China, in the latter stages of 2019, the Corona Virus (SARS-CoV-2) soon metastasized to every continent of the world, save for Antarctica. To provide an idea of the exponential transmissibility of the virus, "The World Health Organization first declared a Public Health Emergency of International Concern on January 30, 2020, and later announced a pandemic on March 11, 2020" (Nowakowska et al., 2020, p. 1). As a result of the immediacy of the unknown nature, and complexity of the risk, national and local governments were thrown into a state of perpetual disarray. The novelty and ambiguity of the virus, left them at the mercy of inaction, thereby allowing the viral spread to continue.

For the sake of brevity, the content analysis will use selective examples to convey the inherent threat that COVID-19 pose(s) to the United States Federalist decision-making process,

highlighting national and local restrictions, mandates, and decisions that inhibited action, and/or facilitated the spread of the virus. Haffajee et al., (2020), states:

> "As of April 1, 2020…72 days after the first U.S. case of COVID-19, 33 states and dozens of localities had issued stay-at-home orders…. Many jurisdictions continue to permit widespread noncompliance with CDC-issued social distancing recommendations, evidenced by crowded spring-break beaches, discretionary travel, open schools and day care centers, busy stores selling nonessential goods…" (Haffajee & Mello, 2020, p. e75(2)).

Thus, the question arises, how and why were the decisions made by states, sometimes literally right next to each other, having contradictory ideas about what was the best decision for their citizens? Where was the uniformed decision-making, the 'science' behind the decisions?

However, that phrase, 'science behind the decisions', *can be* rift with misconceptions, for the concept of simply 'following the science' resides in a concept devoid of the main tenets of risk management (e.g., values, perceptions, inherent biases, and political affiliations, etc.) (Aven & Ersdal, 2008, p. 204). Stevens (2020) argues, "…ministers can trawl for evidence that suits their purposes or invest selectively in the types of research that are likely to show them in favourable light. What results is the 'survival of the ideas that fit" (Stevens, 2020, p. 560). Thus, the decision contexts with which the United States decision-makers' were held to, led to an extraordinary situation where decision-making faltered based on an influx of contradicting information, inherent biases, and a political will of maintaining an economic status quo. Hence, once again, is the need to filter and prioritize the input of the decision-making process through a risk-informed systemization framework.

To further exemplify the sociopolitical environment of the United States, on March 24th, "President Donald Trump said he wanted the nation 'opened up' by Easter. He later backtracked and said social distancing measures would extend beyond this date…", thereby confounding the publics'

understanding of the severity of the pandemic, as well as instilling a false sense of confidence in the leadership's ability to accurately assess the gravity of the situation (POGO, 2020). Further, in a June 23rd report (United States House of Representatives, 2020), the President's appointed COVID-19 task force, "…warned that several states were in the 'red zone', indicating a severe outbreak. On June 16…Pence wrote in a Wall Street Journal op-ed that the 'panic' over a resurgence of the virus was 'overblown'" (Feuer, 2020). Unfortunately, this is only one example, of the many, *many* convoluted exchanges of antithetical statements made by both the authorities to the public, and experts to the leaders -- naturally, this leaves the risk-perception-heightened-citizen asking, "Whom do I believe? What is right? Who is wrong?", and hence sows the seed of distrust, disdain and perceived incompetency (Fischoff et al., 1980, p. 253).

Thus, as a result of the novelty, complexity, and uncertainty of COVID-19, compounded with an influx of scientific data, the 24/7 news cycle, and an immediate need to cull heightened risk perceptions, the United States government found themselves in a stalemate of inaction. Further, the American news conglomerates have increasingly become more and more polarized over the last few decades, and as a result, has created indelible partisan divides where, "…the polarization of the media would create a situation whereby the public may not be able to receive coherent and credible information…some media even engaged in conspiracy theories and framed the COVID-19 pandemic that is inconsistent with scientific evidence and expert recommendations" (Bekalu et al., 2021, p. 2). This polarized divide further perpetrated the inherent 'blame game' cycle of what has now become American politics, the blue vs. red divide, as those media networks whom are deemed to be of one faction, would be needlessly tossed to the side, *even* (read as: 'especially'), when presenting peer-reviewed, internationally accepted evidence, that countered that of the preconceived beliefs of the confused citizen.

Further demonstrating these topics, resides in an ongoing systematic study of over 9,861 COVID-19 PubMed publications, that of which produced 1,239 keywords to have occurred in five, or more, transcripts over the course of one month (See Figure 7) (Lund et al., 2021).

Cluster 9: Education and communicatioin	Weighted Degree	Occurrences
communication	265	47
social media	196	50
education, distance	176	34
students, medical	153	26
curriculum	119	27
education, medical	102	19
medical education	97	33
leadership	88	19
clinical competence	81	14
nigeria	77	19
california	76	13
education	76	28
education, medical, undergraduate	65	10
misinformation	61	12
consumer health information	58	8

Figure 7*: VOS Viewer Cluster 9, (Lund et al., 2021)*

Examining ‘Cluster 9’ provides the researcher with an, albeit, small timeframe, yet expansive publication sample size; and while it is only data ascertained from one month (January 2021), the representative amount indicates that the vast majority of studies published were focused on: communication, social media, education, leadership, and misinformation. Furthermore, and as evidenced in the semi-structured interviews, similar topics, key words, and discussions have been brought up by the participants, providing even more credibility to the reliability and validity of the current study and research (See Section 5 for further analysis). A further overview of the results obtained will be conducted in Section 4.

4.0 Results

The following discussion presents the findings ascertained from the Delphi-Style, semi-structured interviews, supplemented by the 2020 SRA questionnaire survey results. To best serve the purpose of the research question, the eight questions from the interview, and subsequent results, have been amassed into four categories. The categories are constructed based on the nature of the questions presented, as well as the core concepts elicited from the participants (See Attachment 8.2 and 8.3). Furthermore, graphs portraying the SRA results from the U.S. and Norwegian respondents will be presented to supplement the findings of the interviews; however, a key focus will be on the results obtained from the U.S. respondents, as it is more pertinent to the thesis at hand. The four categories are as follows: Section 4.1, *Authoritative Communication,* Section 4.2, *Transparency of Authorities,* Section 4.3, *Rise of Anti-Intellectualism & Social Media,* and, lastly, Section 4.4, *Perception of Government Actions in Response to COVID-19.*

4.1 Authoritative Communication

In response to the question, "*How would you describe, in your view, how the communication of COVID-19 has transpired/worked between authorities and the public?",* a core theme of: "disorganization, no uniformity, and contradictory actions," were present in each of the six participants' answers. Further, all participants provided communication critiques and the consequences that ineffective communication had on their perception of trust towards the government and the individuals comprising government positions. Lastly, participants predominantly critiqued the stark differentiation between the local, state, and Federal Government's communicative organization and implementation of varied communication strategies. An overview of responses will be had in Section 4.1.1.

4.1.1 Authoritative Communication & Critiques

In discussing COVID-19 communication, one respondent (P1, a Bachelor's college student), stated, "*It seemed to be disorganized, reactive, and inconsistent. Local news and health agencies were continuing to give daily updates through the day each and every week…but there seemed that there was a lot of unknown*". All respondents mentioned that there was a sense of disunity that was occurring throughout the various parts of California, as each of them hail from different parts, and was therefore extremely evident to them. Another respondent (P2, a Doctoral Candidate majoring in Clinical Psychology) stated, "*Absent that definitive information (*necessity of social distancing and mitigation measures*), many people chose to believe what was convenient or easier to believe, which was to downplay the situation and deny its gravity*". Lastly, half of the respondents from the interview (P1, P3, P4), explicitly stated the notable difference in local vs. federal communication, critiquing the contradictory stances and actions, while others applauded the local efforts, counter that to the '*lackluster*' federal leadership's actions.

While respondents were vehemently in unison on the lackluster attempts made by the Federal Government's COVID-19 communication and actions, respondents (P1, P3, P4) cited that their local jurisdictions worked vigorously to "*work with the information they had*", counter to that of the national response. P4 (President of a San Diego Non-Profit) states, "*Who is to trust when Federal Government says one thing, and the local Government says another? This can only breed ignorance and exacerbate divisiveness*". Further, P4 and P5 discussed the lack of cohesion between the CDC and WHO, to that of the Federal Government, as P5, a highly revered epidemiologist with over thirty years' experience, stated, "*The scientific world did things normally, consistent, but they were undermined by the Federal Government*".

One interviewee, (P6), a cardiologist, stated that California Governor Newsom, whom had imposed strict ordinances on gatherings and restaurant regulations, was soon seen "…*galivanting about town celebrating his birthday, and the locals thereby claimed that he imposed 'rules for thee, not for me*"". Interviewee (P5), states, "*The messaging was too gentle, too obtuse, with not enough specificity, I would have said, "Don't kill grandma, wear a mask*; *to the point, with bravado*". All six of the respondents, upon being interviewed for the second round of Delphi-Style interviews, reported that they too would have insisted upon a stronger, more resolute, and affirmative messaging, rather than "*politically-correct recommendations*".

4.1.2 Authoritative Communication, SRA Survey

In affirming the interviewees' statements regarding the consistent briefings regarding COVID-19, 47% of American respondents from the SRA survey stated that political leadership gave daily updates on the COVID-19 situation, while 25% reported that weekly briefings were conducted, and 28% responding other- 'other', not shown in graph (See Figure 8). Figure 8 and 9 depict that while the communication remained somewhat consistent, American's perception of safety drastically differed from that of their Norwegian counterparts; 43% of American respondents cited

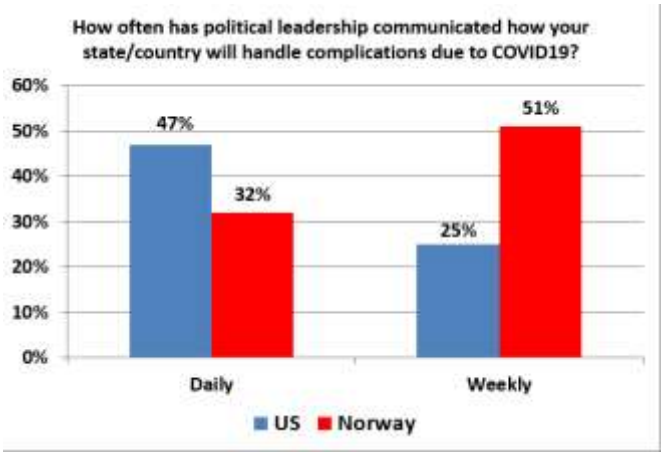


***Figure 8**: Leadership Communication, SRA (Alba, 2020)*

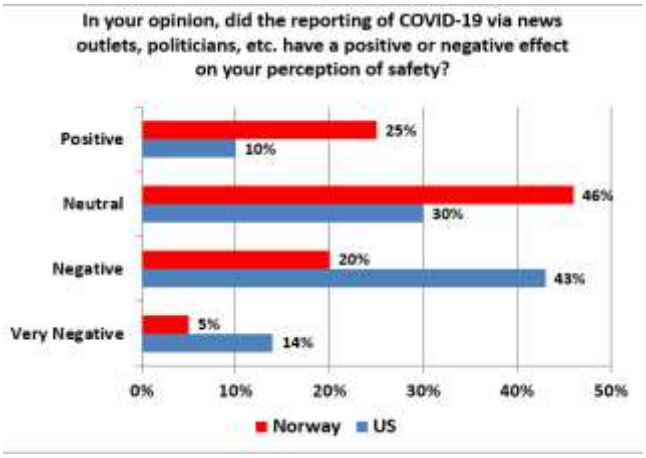


***Figure 9**: Perception of Communication, SRA (Alba, 2020)*

that the reporting of COVID-19, via news outlets and politicians, instilled a ‘negative perception of safety’, while 46% of Norwegians responded with a ‘neutral perception of safety’ (See Figure 9).

Overall, while communication was consistent, American interview respondents were extremely dissatisfied with the message content, as it lacked data, science and overall effectiveness. Essentially, they were critical of the message content and the manner with which the content was packaged and disseminated. Supporting the curated respondents’ answers, the SRA survey results indicate that while the communication was consistent in timely updates, the publics’ perception of safety did not correspond to that of their Norwegian counterparts, nor did it coincide with the communication efforts by that of the political leadership.

Furthermore, as portrayed in the PubMed study (Figure 7), the topic of ‘Communication’ had a weighted degree of 265, with 47 occurrences being registered from the Scopus database (Lund et al., 2021). To expand on the significance of the weighted degree centrality, Lund et. al states, it, “…is the sum of links a given node has to other nodes, taking the strength of the link into account. This measure indicates the importance of a node” (Lund et al., 2021). Therefore, ‘Communication’ registered as the most commonly sought-after research topic in published journals within the allotted time period; as evidenced in the respondents’ answers, communication is one of the most heavily discussed topics in the semi-structured interviews. Thus, a correlation exists.

4.2 Transparency of Authorities

Section 4.2 is an amalgamation of two iterative questions (Question 3 and Question 5), intended to qualify respondents’ answers, through a two-pronged question, separated by another question.

This would allow the interviewee to reflect on their previous answer, whilst answering a different question- in other words, cleaning the memory slate, whilst still inducing a stimulative thought environment. Furthermore, the topic of leadership registered with a weighted degree of 88, and a number of occurrences with 19 (Lund et al., 2021).

Therefore, Question 3 was, "*Over the course of the last year, concerns have been raised about a lack of transparency in the decisions/policies being instituted in relation to COVID-19; in your view, how would you respond to such a statement?",* while Question 5 inquired, "*How would you describe the level of transparency between the government/authorities/ experts to that of the public, in the form of policy-making and communication, in relation to COVID-19?".*

In aggregating the data, all of the respondents reported that they agreed that transparency lacked in response to the communicative efforts of the Federal Government and adjacent institutions. However, two of the six participants interpreted the question, and argued for, a State vs. National transparency problem, and even further, an Individual vs. Entity discussion; the other four argued that the change of administration has increased transparency. Section 4.2.1, *Local vs. State vs. Federal, Individual vs. Entity,* will include statements by P1 and P4. Furthermore, Section 4.2.2, *New vs. Old Administration,* congregates the statements made by the other participants pertaining to the effects of a new administration on transparency in the decision-making and communication sphere. Lastly, Section 4.2.3, *The SRA Insight,* overviews the insights garnered from the SRA survey.

4.2.1 Local vs. State vs. Federal, Individual vs. Entity

In discussing the communicative transparency debate, P1 stated, "*Overall, I do not agree with this statement; I think the communication regarding COVID impact and response was overall accurate*

to what was put into action and I believe that the intentions and actions from our local and state government were genuine. From a national standpoint, some of the most notable and powerful government officials and public figures were illogical and selfish in the denial and questioning of the legitimacy and impacts of COVID-19…" P1 understood the question through the lens of a discussion between local vs. Federal Government, and individual vs. entity actions, arguably, a worthwhile discussion.

Furthermore, P4 stated, "*At the national level, I wholeheartedly agree with that statement… this was a huge eye-opener for those that haven't really been paying attention to when the wrong person is at the helm, how much power they wield, and how much access to information they can restrict…".* Further, P4, argues, "*When you start to see a government entity using that kind of 'high-school mentality' to be less transparent, it separates people, because you either have more of a cultish mentality that he can do no harm, this person can do whatever he wants, and we can rationalize it in our minds… however, the majority will say, "Who is going to give us the right information and who can we trust at the end of the day? Media, independent media?""* Lastly, and moving onto the local jurisdiction side, P4 stated, "*In terms of California, we wrestled with that over the summer, where he (*Governor Newsom*), is facing a recall effort because there were mandates that were set upon (*masks, social distancing, no indoor dining, etc.*) at the early stages, and at the same time, he (*Governor Newsom*) was photographed having dinner at one of his restaurants…when we talk about transparency, the fact that that got out, just showed when you're in these positions to lead, and things like that happen, you lose a lot of credibility*". While all interviewees argued that there was some degree of transparency that was missing, and moreover accountability, others had different interpretations of the question, as seen in Section 4.2.2.

4.2.2 New vs. Old Administration

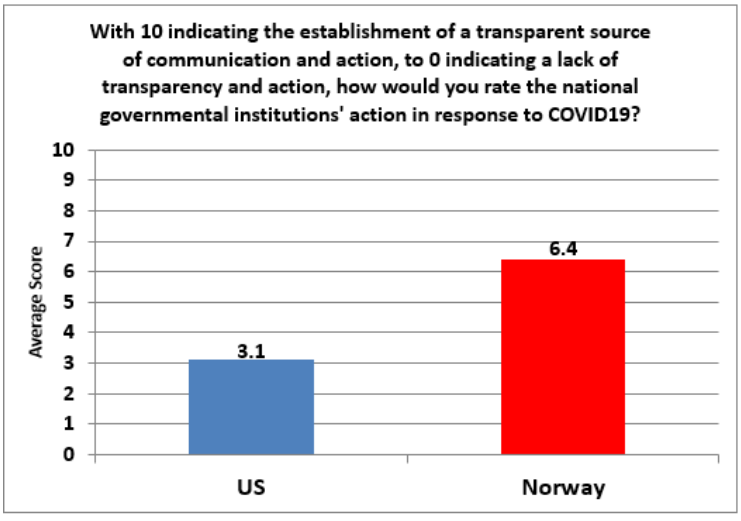
P2, P3, P5, and P6 articulated that the transition into a new administration has broadened the scope with which transparency has been instituted in policy-making and communication, but still maintained reservations and concerns. P2 stated, "*The Biden administration has demonstrated far greater transparency… than the Trump administration did. Trump routinely undermined scientific experts and passed policy- or failed to pass policy- without communicating the underlying reasoning*". P3, a high-school teacher with a Master's degree in education, echoes these sentiments, "*Once the public became aware, Trump was inconsistent, and, at times, false with the information he did provide. Due to the international scale of the problem, and social media, people were able to get more accurate information. However, it should be taken into account that people were well aware of the disease and its consequences before Biden took office*". Lastly, P5 added a new perspective to the question, through his 30 years of epidemiological experience, in which he articulated, "*The CDC would make recommendations and then the Trump administration would rewrite them without telling anybody… when you're a professional, you look at all the references that come along with it, so you know the data they use to generate their recommendations, but you don't know until after the CDC releases them, what the administration did to soften things. From the CDC point of view, usually they had data to back up and you knew all data is variable in its quality and you recognize that*".

4.2.3 The SRA Insight

As cited in Section 2.5 (Figure 4), the graph below represents the responses from 117 American's in regards to their perceived amount of transparency in the actions and policies of the national government. Utilizing a Likert Scale, the average perceived transparency in communication,

amounted to 3.1 out of 10, while the Norwegian counterparts responded with over twice the perceived transparency, registering a 6.4 rating.

Furthermore, at the end of the SRA survey, an open-ended question stating, "*How has the COVID-19 experience, thus far, proved to strengthen, or diminish, your trust and accountability towards authorities, politicians, institutions?"*. Out of the 117 respondents, 76 responded with 'diminished trust'; 20 responded with a mixture of 'loss trust in the Federal Government' but 'gained trust in the Local government'; 17 responded that they either have not lost trust, or have actually gained trust in the actions of the Federal Government; with 4 respondents not wishing to answer. Averaging the answers of the open-ended question provides one with a 65% average of those whom stated that they had 'loss trust and accountability towards the authorities' in light of COVID-19. Thus, it can be hypothesized that the answers of the SRA questionnaire (3.4 out of 10 of transparency) and those of the open-ended question (65% loss trust) correlate and provide epistemic validity and reliability between the two questions. In other words, being that there are 35% of those whom did not lose trust, and 3.4% of those whom believe there was some semblance of transparency, a correlation can be made between the perceived trust and perceived transparency of the authorities, and therefore, of communication.



Perceived Transparency, U.S. & Norway Results (Alba, 2020)

4.3 Rise of Anti-Intellectualism & Social Media

As the interview matured, the discussion moved into the realm of Social Media, and the linkage between anti-intellectualism, and anti-science rhetoric, inquiring: "*Many have argued that there has been an increase in the level of 'anti-intellectualism/anti-science' rhetoric following the onset of COVID-19, how would you respond to that statement?"* All six of the participants, while agreeing, also stated that there has, in their opinion, been a steady rise of anti-intellectualism, with some different interpretations for the length of which this rise has been occurring. Lund et al. (2021), note that social media registered as the second highest weighted degree, at 196, and a number of occurrences registering in at 50 (Lund et al., 2021); thus, an extremely salient topic within both the scientific-academic realm, as well as the participants' answers.

4.3.1 The Anti-Science, Anti-Intellectualism, & Social Media Debate

In discussing the debated rise of anti-intellectualism, P5 stated, "*I think it has always been the same. I've spent over a decade writing on Alternative Based Medicine, and people have always been unhinged from reality on all sorts of topics, that's the human condition…the only difference now, is people have a podium from which to project their opinions. If we go back to the 1918/1919 pandemic, they did the same thing back then, called it bogus, etc. etc. it's just the way people are*". The interviewer continued to press, "From your expert opinion, what is there that we can do to quell this anti-intellectualism, or as you say, this part of the 'human condition'?", to which P5 retorted, "*It's always going to be a part of society, the literature is very clear, when people have opinons that are not fact-based, giving them facts doesn't change their opinion…there's a big subset of people that are fact-resistant*".

Partipants P1, P2, P3, P4, and P6 spoke on the amplification effect of Social Media, in which P2 stated, "*The increase in anti-intellectualism is perhaps best exemplified by the oxymoronic term 'alternative facts', and the dangerous surfeit of false information perpetuated on social media platforms and by popular media outlets*". Other participants echoed the same sentiments, focusing on the fact that Social Media has exacerbated tensions, and the underlying problems that have been fundamental to the rise of anti-intellectualism.

In attempting to provide a solution, both P3 and P4 provided some insight: P3 stated, "*The increase in available information is only a wonderful thing to those who have the funds of knowledge to understand how to decipher and evaluate information. Since many societies have not prioritized education…many people are ill-equipped to handle the gigantic amount of information*". Further, P4 stated, "*Where do we get our news? And that's Facebook…It is a place where people can spout ideologies and get into culture wars, you come up with a statement and you clip a post from whatever publication, 'cause if its from the internet it's got to be true, right? And there's 700 comments, back and forth, back and forth… and literally, with this past administration, fanning those flames, I think it is a huge part of the government's fault, we have not reigned in regulations for these companies, I'm not saying de-platform them, but when there is misinformation, be on top of it, it has just snowballed and snowballed*".

Overall, all particpants agreed that while, yes, there has been a rise in anti-intellectualist rhetoric, there are underlying, deeper issues that have allowed for this to occur, with two participants, P3 and P4, offering solutions to mitigate future anti-science rhetoric (increase education availability; government accountability). All participants further stressed the role of Social Media, and the negative effects that '*misinformatio*n' and '*anti-science platforms*' can have on the individuals' cognitive processing abilities.

4.3.2 COVID-19 News Consumption, SRA Survey

While not addressing the concept of 'anti-intellectualism' and/or 'anti-science' rhetoric directly, the SRA survey inquired about the sources with which the respondents obtained their COVID-19 news. Respondents from the United States responded that the top three sources were, in order: Television News Networks (26%), Social Media (24%), and Online Media Websites (24%) (See Figure 10); meanwhile, Norwegian counterparts indicated that Online Media Websites (31%), Social Media (25%), and then Television Networks (19%) were the three main sources for news consumption (See Figure 10).

It is apparent from the results, that both sets of participants rely heavily on not only mainstream news networks, but also look to their peers on social media, influencers, and other online content providers, to better understand the issues that are within their sphere of influence. The variation of news consumption ultimately has a direct influence on participants perception of safety, as evidenced in Figure 9.

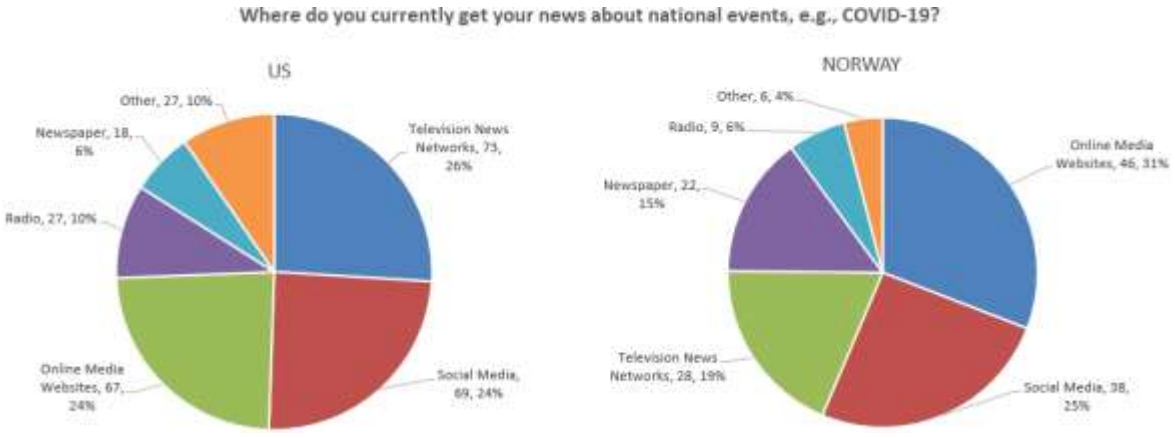


Figure 10: *COVID-19 News Consumption, SRA (Alba, 2020)*

4.4 Perception of Government Actions in Response to COVID-19

Section 4.4 is an amalgamation of questions 7 and 8 (See Attachment 8.3), whereby the interviewer focused on eliciting natural responses regarding the respondents' perception of the government's management of risk, and how their trust in government decision-making has been affected as a result of COVID-19. The questions are as follows: "*How has COVID-19 affected your perception of government's management of risk?"* And lastly, "*It has been a year since the onset of COVID-19, how has your trust been affected in the decision-making of the government in their handling of high-risk events?".*

Overall, the respondents answered in two separate camps, that is, some focused on the individual's ability within government to have adverse effects on decision-making, while others focused on the government as a united entity. That being said, all six participants advocated that the government should work as a cohesive unit in decision-making, however, only two participants took the liberty to discuss their perspectives on the capacity of the individuals' influence. Section 4.4.1, *Perception & Trust, An Individual vs. Unified Argument,* and 4.4.2, *Perception & Trust: An SRA Survey,* overview the answers, respectively. Lastly, once again returning back to the Lund et al.'s (2021) study, 'Leadership' registered with a weighted degree of 88, with 19 occurrences.

4.4.1 Perception & Trust, An Individual vs Unified Argument

In addressing the leadership's role in decision-making, respondents P1, P2 and P3 stated, respectively, "*My faith in government is now more dependent on the individuals in charge and I have grown more worried about the short-comings and even the fragility of our governing system and its' safeguards".* Respondent P2 argued, "*Trump is somewhat anomalous, but also*

disconcertingly representative of (the fallacy of) American democracy". Further, P3 stated, "*It has actually helped me to better understand the scope, power, and influence individuals can exert within our systems of government. Through my political science studies, I had always suspected that individuals were likely deserving of greater credit for historical occurrences than many within the field may want to admit".* P5, while mainly discussing the need of a unified cohesive government, stated, "*I haven't lost trust in the government, per se, but I have lost trust in people. And since government is comprised of individuals, good people mean better government, bad people mean worse government- it's that simple".* While some respondents took time to focus on the potential for individuals to have adverse effects on decision-making, and thereby their perception of trust and risk-management abilities, all six respondents recognized the need for a unified, cohesive government in the face of high-risk events.

In responding to the questions, P4 stated, "*My trust (*in government decision-making) *is hanging by a thread…what are other governments doing across the globe? Look at Canada, New Zealand, you see what these other governments are doing for their citizens, "Wow!", the U.S. is the only country in the world that is saying, we will give you $2,000 in the beginning, and you figure it out- we've got bigger fish to fry. And then we receive $1400! So, even a new government won't keep their word unless they are prodded and provoked… It must be a two-way communication, two-way effort, show me your credibility. You need to show me you're something that works for the people, and if you don't show me, action dictates trust. Are you worthy of my trust?".* Further building on this sentiment, P5 discusses how the lack of action portrays the intrinsic need for a centralized government. P5 argued, "*I think it showed how important it is to have government involved for these large issues, because it wasn't (*involved) *for a year, and hundreds of thousands died, and you need… when you have things that affects all parts of society, the only organization that can*

deal with things appropriately is a centralized government, if not else, in terms of messaging. I think the first year of COVID is a good demonstration of what happens when government bows out… people died".

P6 furthered the importance of messaging, and gave a personal anecdote of why they were lucky it was '*only a pandemic'*- P6 stated, "*I work in the field of healthcare and was exposed to cardiologists, respiratory therapists, I have friends that work in hospitals… and we talk about these things, how full hospitals are, how many patients are actually on vents vs. how the numbers are being reported… my statistics teacher said, 'there are three types of lies: "Lies, Damn Lies and Statistics". You can spin numbers to make them look how you want them to make'".* P6 further argued, "*The government was needed to help quell the sensationalism in news, the fear mongering, the constant onslaught of news can lead to a weaker mentality- decisions were not made with these concerns in mind- The brain atrophies in isolation, and there must be decisions that are being made that takes into account more than just a small slice of the picture".*

P2's interpretation of the questions brought the discussion to a more philosophical perspective, in which they stated, "*It is terrifying to consider how badly the pandemic was handled, and the complete unwillingness of government officials to face difficult or unwanted situations. The American government denies what is unpleasant to look at, and, by large, the American people are complicit in that denial because they don't like to look at painful or ugly truths either. That which is repressed emerges later as fate".* Overall, the respondents mainly focused on the need for a government that was unified in protecting, communicating, and advocating for science-based policies when faced with high-risk events.

4.4.2 Perception & Trust: An SRA Survey

In an attempt to assess the satisfaction with the government's actions in response to COVID-19, the researcher aimed to address both the perception of success within two dimensions: the local/state government, and the Federal Government.

Utilizing a Likert Scale to gauge the respondents' perception of success, out of the 117 U.S. respondents, the average score for the Federal Government's COVID-19 response rated at an average of 2.7 (See Figure 11). Contrarily, when inquired about the satisfaction pertaining to the local and state government's COVID-19 response, American satisfaction increased to almost twice the average of that of federal response, that of which averaged at 5.3 satisfaction out of 10 (See Figure 12). The results indicate that both sets of participants are more satisfied with their local representatives, than that of the national governments, and while Norwegian's indicated only a marginally better rating of satisfaction, there resides a commonality between the two groups' increase in local government satisfaction.

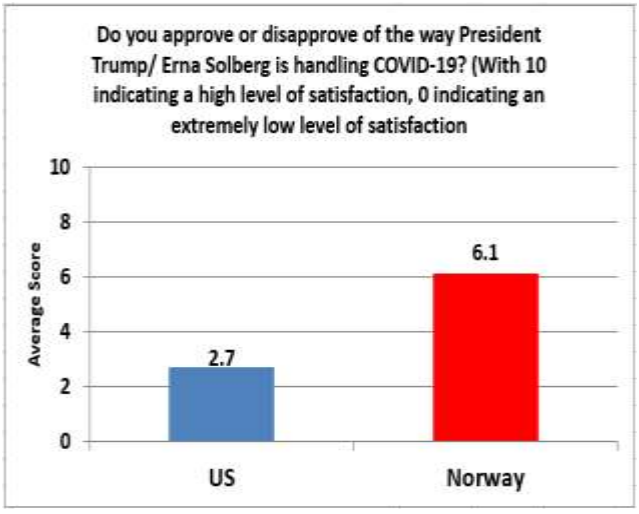


***Figure 11**: Federal Satisfaction, SRA (Alba, 2020)*

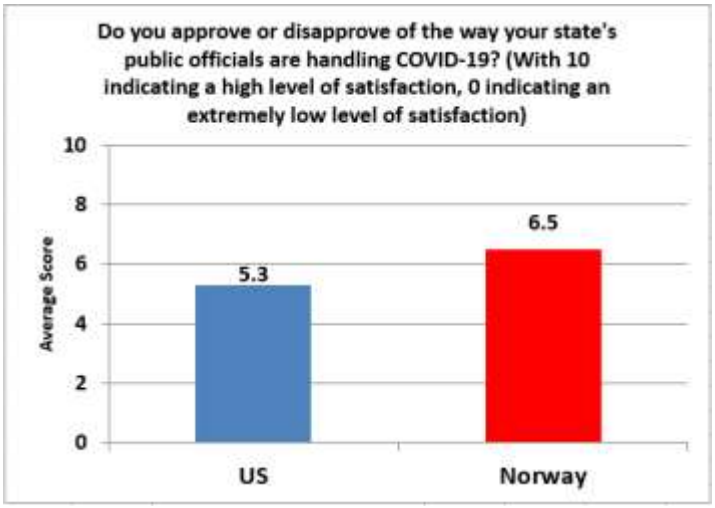


***Figure 12**: Local Satisfaction, SRA (Alba, 2020)*

Throughout the semi-structured interviews, communication and leadership were key topics that factored into every respondent's answer when discussing their perceived insight into the issues stemming from the United States COVID-19 response. Albeit, respondents made concessions that their local jurisdiction, and that of California as a whole, actively tried to respond more efficiently and proactively than that of the Federal Government. Furthermore, U.S. SRA survey respondents correlated this sentiment, indicated in Figure 11 and Figure 12, whereby respondents reported almost two times more satisfaction from local representatives, than that of the Federal Government.

5.0 Analytical Discussion

"The unit is not an individual but a social individual, one who has a place in the social order…To understand the individual we must study him in his group setting; to understand the group we must study the individuals' whose interrelated actions constitute it"

(Asch, 1952)

The following discussion analyzes the main themes, codes, and categories that were established in the semi-structured interviews and SRA survey results, whilst analyzing them in light of the research question: *How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19.* A keen focus will be had with regards to complex adaptive systems theory, particularly with respect to information processing and population ecology. Such an analysis is provided with hopes of establishing the necessary causal relationship of risk-informed input prioritization within the decision-making context. As such, the following chapter will be segmented into six, iterative sections: Section 5.1, *Complex Adaptative Systems Theory of the Politic Body, A COVID-19 Assessment*; Section 5.1.1, *Population Ecology and Information Processing*; Section 5.2, *Analysis of Responses: Communication & Leadership;* Section 5.3, *Analysis: Through the Lens of Complex Adaptative Systems Theory*; Section 5.4, *With Crisis, Comes Opportunity;* and lastly, Section 5.5, will introduce the proposal of our framework, *The Risk-Informed Systemization for Communication (R.I.S.C.) Framework.*

5.1 Complex Adaptative Systems Theory of the Politic Body, A COVID-19 Assessment

The concept of complex adaptative systems theory birthed out of the analogical relationship between the ever-evolving nature of viruses, to that of the ever-evolving-sociopolitical nature of societies (Holland, 1992, p. 18). Thus, it seems poignantly appropriate, to analyze COVID-19 and

the effects of ill-informed decision-making, one should turn to the theory that mimics the virus's very nature. Including such an analogical comparison, provides one with the wherewithal to better understand the intrinsic relationship between the politic body (i.e., immune system) and the individuals who comprise the system (i.e., antibodies and antigens) (Holland, 1992, p. 18).

The basis of complex adaptative systems theory is described by John H. Holland (1992), stating:

> "Because the individual parts of a complex adaptative system are continually revising their ("conditioned") rules for interaction, each part is embedded in perpetually novel surroundings (the changing behavior of the other parts). As a result, the aggregate behavior of the system is usually far from optimal, if indeed optimality can ever be defined for the system as a whole…. It is the process of becoming, rather than the never-reached end points, that we must study if we are to gain insight" (Holland, 1992, p. 20).

Therefore, much as is COVID-19's epidemiological nature to continue evolving when confronted with new vaccines, environments, etc., so too, is the individual within the politic body when confronted with new information, environments, and risks. It is thus within this analogical conceptualization of complex adaptative systems theory, that one may begin to assess and analyze the individual and societal permutations that occur in decision-making.

Building on this, and within the systems theory paradigm, the concept of contingency theory, "… claims that the manner in which the organization is organized and functions must correspond to the nature of the environment which it finds itself in" (Lawrence & Lorsch, 1967). Hence, is the importance of establishing a regulatory political culture that is mediative in its' spirit, inducing an ethos of democratic values, intent on integrating the individuals' risk perception, values, and the risk-informed tenets of input prioritization within the decision-making sphere. There is thus an integral focus on the need for interconnected and consistent internal, external, vertical and horizontal communication, in which all communicative facets of the system are integrated into the decision-making process. Furthermore, akin to the SARF, complex adaptative systems theory

recognizes that each independent entity is that of a node, and therefore must be integrated into the mental and physical computations that result in policy- in doing so, one must be adamant in the establishment of the regulatory culture that promotes the individual as an integral factor of input prioritization. However, one must be cognizant of the characteristics of the social arena's 'population ecology', to better stimulate the 'information processing' of the system.

5.1.1 Population Ecology & Information Processing

Dooley (1997) notes that the complex adaptative systems theory revolves around three components: systems theory, population ecology and information processing (Dooley, 1997, p. 69). With respect to the research question, a synopsis of population ecology and information processing will be briefly discussed.

Dooley (1997) argues that the variation experienced in 'population ecology' is not due to the organization adapting to the environment, but rather, "…is induced by institutional experimentation, direct and indirect incentives…selection is a purposeful managerial choice of action, based on pre-established goals, values…these models are based on the assumption that information spreads in an infectious manner via personal contact" (Dooley, 1997, pp. 72-73). Such a description is reminiscent of Section 2.3 and Section 2.6, and the inherent chasm that is between the risk messages communicated by the institutional leaders, and the effects and perceptions of those risk messages when communicated without any personal narrative or further explanation. Hence, is the importance of not only advocating and implementing an approach that instills a culture that prioritizes risk-informed vetted input, but also one that fulfills the cognitive need of personal narratives, to relate the data to the average layperson in a digestible fashion.

Moreover, Aven and Bouder (2020) argue, while, "…politicians are guided by health experts, physicians, immunologists, and others with extensive knowledge on the topic…other experts provide input on economic and societal impacts. In times of crisis, the balance between these different inputs…varies" (Aven & Bouder, 2020, p. 1). While the institutional leaders of the system may have a well-constructed plan behind the 'information saturation', or 'snowing' of information, the information will spread as perceived by those whom interpret it, regardless of the 'intention' behind the numbers. It is therefore of utmost concern to ensure that the communication and prioritization of input, data, and policy are done so in a thoughtful, purposeful, and two-way-inspired, dialectic manner, ensuring to integrate those, and their perceptions, whom the policies affect.

Such a discussion provides the segue for the next component of complex adaptative systems theory, in that of 'information processing'. Dooley (1997) states, "…since individuals are limited in their information-processing capabilities, so too are organizations: organizations act on incomplete information, explore a limited number of alternatives, and do not necessarily develop accurate cause and effect maps of reality; heuristics dominate organizational decision making…" (Dooley, 1997, p. 74). Furthermore, and as has been expressed in Section 2.2.2, 2.3, 2.4, and 2.4.1, mental heuristics and risk perception have an immediate effect on the information processing of the individual, and by proxy, the system. Thus, the models created must be observed and understood as but limitations of the human world, and are thus restricted by the very nature of their bounded rationality. In other words, while information saturation overwhelms the system, thereby rendering the system ineffective- as evidenced in the over 613,000 COVID-19 deaths in the United

States, alone[7]-, there must be an integral priority to filter the information, ensuring decision-makers have access to vetted, risk-informed input.

However, while there is the utmost need to ensure the information incorporated into the decision-making process is risk-informed prioritized, there mustn't be too stringent of a focus on *perfect information*, as that too, may induce a state of deliberative paralysis (Collier, Z. et al., 2015, p. 3). Nevertheless, this does not simply mean to further 'open' the already porous lines of Open Access Strategy to the decision-makers, as that simply leads to a further inundation of information. Instead, the focus should be on how to curate a risk-informed prioritization of input to better assist those in decision-making positions, integrating the perspectives and voices of those whom the policies affect, thereby establishing a much more well-rounded policy-risk assessment. Ensuring that risk-informed input is systemized in a manner that buttresses the main tenets of risk-informed decision-makers, ultimately curtails the amount of information oversaturating the information processing of the individual, the decision-maker, and the populace as a whole.

Thus, these two components of the complex adaptative systems theory provide a robust and broader spectrum with which to overview the main codes and themes established in the three studies [(Lund et al., 2021), (Alba, 2020), and the semi-structured interviews], in relation to the systemization of risk-informed input in decision-making.

To further clarify, Section 5.2, will provide an overview of the codes and themes, in conjunction with Lund et al.'s study, showcasing the saliency between the topic's relationship. Next, Section 5.3, will provide further analysis, delving into COVID-19, the established themes and codes, all in light of complex adaptative systems theory, to highlight the importance of risk-informed input

[7] At the time of submission, these were the latest statistics of COVID-19 deaths. As found on: (Worldometer, 2021)

prioritization. Next, Section 5.4 provides the backdrop for the proposed framework; and lastly, Section 5.5, outlines the main tenets of the proposed framework.

5.2 Analysis of Responses: Communication & Leadership

The following section will provide a supplemental backdrop of Lund et al.'s (2021) PubMed study, to further validate the three studies' codes and themes that have been aggregated for this thesis. Furthermore, this will be assessed in tandem with the transparent communicative efforts, or lack thereof, of the United States leadership following the onset of COVID-19.

Lund et al. (2021) listed the following terms with their respective weights and occurrences, as: Communication, 265/47, and Leadership, 88/14 (Lund et al., 2021). Overviewing the respondents' interviews led to a major theme pertaining to the COVID-19 communication and trust in leadership transparency: that is, all of the respondents perceived an authoritative sense of 'disunity', 'incompetence', and 'disorganization' in COVID-19 communication, which ultimately dilapidated their already perceived 'lack of trust', in not only the system and leadership, but as well as in the individuals that comprised the system.

Furthermore, as portrayed in the SRA survey, U.S. respondents (Figure 8) indicated that even though authorities communicated on a primarily daily basis (47%), their perception of safety registered as mainly negative (43%), to neutral (30%) (Figure 9). Contrarily, Norwegian respondents (Figure 8) indicated that while communciation was primarily conducted on a weekly basis (51%), their perception of safety registered as neutral (46%), to positive (25%) (Figure 9) (Alba, 2020). Additionally, while respondents in the semi-structured interviews referred to the authorities' communication as being continuous throughout the pandemic, all participants

described the message content and data information as: ‘seriously lacking’, ‘contradictory’, ‘disorganized and inconsistent’, ‘absent of definitive information’, etc. (See Section 4.1, 4.1.1, 4.2, 4.2.1, 4.2.2, 4.4, and 4.4.1, for further discussion).

Therefore, one can theorize that while the communication was essentially on par with that of their Norwegian counterparts, the fact that U.S. respondents’ perceived a much lower lack of communication transparency (Figure 4), may account for the disparity in their lower perception of safety from the communicative efforts. While unrestrained transparency has been evidenced to have malintended effects on trust, in order to be effective, “…the information disclosed must be understandable, accessible, contextualised, relevant and usable” (Löfstedt & Bouder, 2014, p. 3). As per the respondents’ answers, any sort of transparent communication was nonexistent, and thus only further exacerbated their negative perception of safety. Moreover, and as evidenced by the SRA study’s results, Bostrom et al.’s (2020) study reaffirms both results, in which they state, “Surveys show that Germans support current lockdown measures and have trust in the competence in both science and politics. The Norwegian Citizen Panel Survey shows similar results in Norway. In contrast, surveys in the U.S. show increasing distrust in the president…” (Bostrom, et al., 2020, p. 909). Accordingly, trust, and the perceived transparency with which authorities communicate and act, are highly correlated in high-risk events, and are representative in the U.S. participants’ ‘negative perception of safety’ responses.

Building on this, Kim and Kreps (2020), state, “…the U.S. federal government repeatedly downplayed the risk from the coronavirus, telling the public that the viral risk would probably just go away on its own if we just waited” (Kim & Kreps, 2020, p. 403). As history shows, such communicative messages were not only extremely wrong, but were outright lies. The American populace were in a cross-fire of contradictory domestic and international news, where one was

showcasing other countries ability to take proactive and precautionary measures, while the other was a platform for U.S. leadership to spout nonsensical COVID-19 ‘facts’. Moreover, U.S. authorities were blatantly admonishing world-renown epidemiologist, Dr. Fauci, as well as the institutions whose sole job is to inform and protect against diseases, i.e., CDC and WHO. As previoiusly stated, the confluence of mixed messages exacerbates the citizens’ already heightened risk perception, and can further ostracize them away from truthful discourse, rendering any sort of two-way risk communication ineffective and obsolete.

For example, Ahmad (2020) notes that the potential for negative backlash against an information overload of conflicting news messages can result in ‘news avoidance’, whereby the citizen employs a mental shield of cognitive dissonance to filter any ‘unpleasant’, yet factual news (Ahmed, 2020, p. 3). Such a phenomenon is exacerbated by a populace whose trust has been dilapidated by maleffective government communicative efforts, who have backtracked against not only experts, but as well as other nations, and their own initial messages. There thus arises a causal process, as discussed in Section 2.3, 2.5, and 2.6, where the citizens’ heightened risk perception, leads one to act on instinctual heirustics, thereby prompting a ‘news avoidance-type’ mentality; this thus sparks the beginning, or further exacerbates, the anti-science rhethoric and anti-intellectualism that is so pervasive within certain factions of the populace. As such, one is left with, once again, an elusive circle of repetition, where mistakes are amplified, and any deed worth noting is dismissed due to a foundation of distrust, i.e. the Asymmetry Principle (Slovic, 1993).

At this point, an analysis will be conducted that submits the aforementioned discussion of COVID-19, primarily the lack of communication, leadership, and risk-informed input selectivity, to that of the complex adaptative systems theory.

5.3 Analysis: Through the Lens of Complex Adaptative Systems Theory

The following section will integrate the complex adaptative systems theory, to that of Risk Analysis, risk-informed input prioritization, and COVID-19, to analyze the responses garnered over the course of the past year. Aggregating the analysis of the respondents' answers, corroborates the utilization of the complex adaptative systems theory, and the effect of communication on the individual and the system, especially in that of population ecology and information processing.

As such, and in relation to complex adaptative systems theory, this phenomenon of 'news avoidance', and as a result, an exacerbated public distrust leading to anti-science/anti-intellectualism, can be expressed as a 'systems theory systematic feedback loop'. Putnam and Mumby (2013) state, these "… (a) causal processes form a closed loop whereby each cause becomes an effect of the other facors in the loop or (b) information about the past or present influences future states of the system" (Poole, 2013, p. 51). Thus, one can extrapolate that the risk perception elicited as a result of the population ecology, and those expressed in the SRA survey, were experienced as that of a 'feedback loop' of the system.

In other words, due to the conflicting risk messages communicated by the leadership, citizens did not know whom to trust, thereby heightening their already volatile risk perception. Instinctually, citizens therefore relied on their System 1 thinking, and to mentally protect themselves, turned away from any sort of narrative that would threaten their 'safety net of perception'. As such, this 'news avoidance' exacerbated by the leadership's politicization of COVID-19 (i.e., population ecology), further fuels the anti-science rhetoric and anti-intellectualist mentality (i.e., information processing), rendering any purposeful risk communication obsolete to a 'feedback loop', where facts and data have no power.

Thus, the system, and/or the social arena and SARF, has the potential, and has been evidenced, to amplify the rhetoric of the anti-intellectualist camp, especially when confronted with an unprecedented, generational pandemic. Ahmed (2020) states, "…both top-down (prominent figures) and bottom up (ordinary people) misinformation is circulating and that the single largest (39%) misleading or false claim about COVID-19 is about the actions or policies of public authorities" (Ahmed, 2020, p. 6). The extensive accessibility of social media, combined with the 24/7 news cycle and ongoing misinformation campaigns, breeds and fosters the anti-science/anti-intellectual movement, and as a result, further exacerbates the distrust between authorities and the populace. Moreover, the perception of safety from communicative efforts results in a primarily negative response, as trust is subject to the Asymmetry Principle, where trust is much harder to build, than it is to destroy (See Section 2.4.1). To combat this, it is thus imperative one recognize that the social arena's governance style has an immediate effect on how risks are interpreted, amplified, or attenuated. Therefore, one must strive to ensure that the prioritization of risk-informed input is the lifeblood of the politic body, for then an emphasis on risk-informed knowledge and input will help influence risk-informed policy, decision-making, and communication strategies.

Furthermore, to combat the maladaptive COVID-19 communicative feedback loops, one may look to the systems theory, 'Systems Principle of Openness', which examines, "...the need for communication to balance the exchange of information and resources both internally and externally. Due to these failures with system inputs and processes, the health and social outputs from the pandemic have been deficient…" (Kim & Kreps, 2020, p. 401). Once again, the conversation turns to the intrinsic need of input prioritization. Due to the overwhelming information saturation that overburdened decision-makers, experts, and the public alike, policy-

makers were left in a perpetual sense of deadlock. Instead of listening to the experts and crafting policy with pertinent and prioritized risk-informed input, President Trump and the 'COVID-19 Task Force' performed what Goffman terms, a 'dramaturgy'- Way (2017) writes, "…a growing number of scholars have made an important distinction between 'frontstage' and 'backstage' decsion-making….similar to a theatre setting, maintaining some level of 'backstage activity' is essential to the effective workings of the scientific community" (Way, 2017, p. 44). This type of 'frontstage' *playacting*, and ultimately, what can be now deemed as ineffective communication and inaction, is a symptom of the United States adherence to Federalism, and the need to maintain the 'illusion of freedom', a topic heavily brought upon by the interview respondents (e.g., noncompliance with mask mandates, economic prioritization over well-being, false narratives of COVID-19's lethality, etc.). This was further exacerbated by other countries proactive, and, at times, succesful actions in attempting to curb the spread of COVID-19.

Respondents noted that what irked them the most, was seeing what other countries were *actively* doing to stop the spread of COVID-19 (countries such as South Korea and Taiwan, who rapidily implemented a centralized national strategy to stop the spread), while the U.S. remained stagnant, or even, in their eyes, blatantly ignoring the fatal effects. Haffajee notes, "Lacking strong federal leadership to guide a uniform response, the United States quickly fulfilled the World Health Organization's predicition that it would become the new epicenter of COVID-19" (Haffajee & Mello, 2020, p. e75(2)). Unfortunately, what occurred in the United States fulfilled the potential of the contingency theory, in that the environment emulated the actions of the leadership, i.e., population ecology; as such, said environment was exacerbated by the bounded rationality of information processing, resulting in a negative feedback loop, further dividing a heavily politicized populace (See Figure 11 and Figure 12).

Demonstrating the contingency theory and population ecology incarnate, is the politicization of COVID-19, and the effect it had on an already divided populace. Shao and Hao (2020) state, "…confidence in political leaders' handling of the coronavirus outbreak is negatively related to one's risk perception…thus, people have lower risk perceptions of COVID-19 if they have greater confidence in Trump…" (Shao & Hao, 2020, p. 4). This type of political biasness is further exacerbated by the mental heuristics and risk perceptions of the populace towards that of catastrophic risk events, as discussed by Fischoff, Slovic, and Lichtenstein (1980). Fischoff et al. (1980) states, "More recent evidence suggests that since involuntary risks affect large number of people and often impose risks on individuals other than those who gain the benefits, voluntariness may, in fact, be a suggrogate for people's concern about catastrophic potential or equity" (Fischoff et al., 1980, p. 242). Therefore, one can theorize that those whom believed President Trump's baseless claims pertaining to COVID-19, did so, as it fortified their political affiliation against the 'others' (Lupton, 1999, p. 69); delving deeper into this psychoanalysis leads one to the analysis that their inherent fear of the COVID-19's involuntariness, made them want to have control over the disease (voluntariness), and therefore, followed the advice of someone who made their *perceived* reality, a reality (fortifying their System 1 heuristical thinking).

In other words, the perceived semblance of control and lack of immediate danger communicated by President Trump, provided them with a fabricated feeling of tranquility, and thus, any news that conflicted with their already established risk perception was deemed as 'fake news'. In the terminology of complex adapatative systems theory, due to the bounded rationality of an individual, and by proxy, society's information processing ability, concurrent with the population ecology established by the leadership, created a feedback loop of the contingency theory (i.e., an

echochamber), whereby all conflicting news was immediately cast away, as it did not benefit their risk perception.

Thus, in totality, the system is dependent on the individuals in both the systems governance structure, but more importantly, in those who comprise the system. For the system is in and of itself a representation of the thoughts, perceptions, values, and actions of those whom comprise it. As respondents' noted, '*government is only as good as the people who run it'*, and when government fails to make policy, "*Politicians were too afraid to upset their constituents and so failed to react appropriately, which reflect the power of individuals- and their perceptions and stances on issues- to influence policy".* Furthermore, the complex adaptative systems theory has conveyed the interconnectedness of the issue at hand- in that, there is an inherent linkage between all facets of society, and within the genetic makeup of each faction lies one commonality-- the input of decision-making. As exemplified in Section 2.4 and 2.4.1, the current risk communication frameworks established under the premise of the outdated 'Three Phases of Risk Communication' and the 'Four Problems of Risk Communication', must be reinvigorated and reassessed in order to work within the new paradigm of risk communication. It is with no exaggeration that the next step in combating misinformation, distrust, and anti-intellectualism, resides in the ability of the system to induce a culture that prioritizes risk-informed input, individual risk perception participation, and the basic tenets of risk-informed decision-making.

5.4 With Crisis, Comes Opportunity…

As previously stated, the author recognizes that the proposed framework is not the ultimate panacea, nor is it intended to be. This conceptual, holistic framework was birthed out of a recognized problem: due to a new era of risk communication, rift with information saturation,

decision-makers and experts alike cannot accurately, nor in a timely manner, institute risk-informed policy. As evidenced by COVID-19, policy-makers were stricken with policy paralysis, resulting in hundreds of thousands of deaths, and millions of families either in financial ruin, or devastated from the loss of a family member. However, as President John F. Kennedy once stated, "In the Chinese language, the word crisis is composed of two characters, one representing danger and the other opportunity", thus, it is with every crisis that one must look for opportunity, for there is a resilient nature of the individual, and when amassed together, change *can*, and *will* occur (Kennedy, 1960).

Therefore, as discussed in Section 2.7, in order for the holistic framework to even be considered as a potentially viable option, there must be a change in political will. There must be a cultural shift in the mindset of governance, where risk-informed decision-making, and risk communication are the end goals, but not the end product. Broadly speaking, R.I.D.M., and risk-informed risk communication strategies, are simply two pieces of the puzzle; a strengthened focus of risk-informed input selectivity must be prioritized across the decision-making politic body. Furthermore, and most importantly, such change does not occur in a 'closed-door boardroom', with only experts, elites and policy-makers; nay, it occurs in the mediative democratic social arena, where those whom future policies affect, are integrated into the decision-making process (See Section 2.7). While change does not occur overnight, it has been evidenced to occur much quicker than anticipated -- e.g., the Biden administration's COVID-19 vaccine rollout, infrastructure policies, and change in transparent communication and governance style.

Thus, with every disaster comes a 'window of opportunity' (Twigg, 2015); in this 'window', it is paramount one recognizes that systemic feedback loops need not solely have negative effects on intercommunicative relations and risk perceptions between authorities and public. The potential to

establish a political ethos determined to embrace a mediative, discursive, and risk-informed focus on input selectivity, provides the opportunity to establish a positive feedback loop, where risk perceptions are integrated into the decision-making process. As expressed earlier, risk perception has its own epistemic value on the understanding of risk. A multi-faceted approach built on quantitative risk assessments, fortified by risk-informed input selectivity, and supplemented and expressed through risk perception lens, provides a route to better engender a risk communication strategy that is established through the people, for the people.

Once again, the following proposed framework is simply a holistic outline of a framework to begin the discussion on how to facilitate the inclusion, and prominence, of a R.I.D.M. body whose primary goal is to ensure risk-informed input prioritization is steadfastly streamlined throughout the decision-making process. If the goal is to establish a risk-informed system of governance, one that prioritizes uncertainty analysis, subjective probability, cognitive biases and values, SoK tests, and is grounded in verifiable PRA, wouldn't the next logical step be to ensure the input that is prioritized to facilitate the system, be one that is comprised of the same values that the system wishes to create? One would like to believe so.

Thus, the author believes that the research conducted has provided the basis with which the need for a framework is of necessity; however, due to the restrictions of the thesis, the author will simply propose an outline, in hopes of fully fleshing out the framework in their next study.

5.5 The Risk-Informed Systemization for Communication (R.I.S.C.) Framework

Our research takes into consideration the seminal authors and journals dedicated to risk-informed decision-making, risk perception, risk governance, and risk communication, to propose: the Risk-

Informed Systemization for Communication (R.I.S.C.) framework. The newly proposed framework must operate within the risk governance paradigm established by Renn (2008), in which the mediative style of governance, predicated on risk-informed decision-making, is the primary goal of the authorities and the public (Renn, 2008).

In light of COVID-19, Wardman (2020) discusses the characteristics that must be present when dealing with crisis situations; much of what is discussed relates to the proposed framework, and that of the regulatory and leadership style needed. Wardman (2020) states, it must be, "…broadly attuned to the rich amalgam of transactions, individual qualities, social identity dynamics, and communicative mechanisms and exchanges that both comprise and are required of 'good' leadership" (Wardman, 2020, p. 1015). However, simply proposing and conjuring such concepts does little if it is situated in a decrepit-democratic-sociopolitical and cultural vacuum. There must be an iterative, risk-informed strategy that is imparted amongst those whom are in policy-making and authoritative positions, as well as a strong focus on the public sector.

As such, we propose that the first step to engender a mediative regulatory style, that emphasizes transparent-inclusive models of risk governance, is to strengthen the resolve with which we address the R.I.D.M. information input. Additionally, we must repurpose the manner in how we address uncertainties to the public, emphasizing uncertainty analysis through evidenced-based narratives, background knowledge, and SoK tests. Building on the work of R.I.D.M. input prioritization, we may begin to provide the necessary backdrop with which change may occur. As a result, we hope to thereby provide the appropriate environment to allow the proposed approach to gain credence amongst the decision-making body politic.

Therefore, the proposed approach will not dictate how to state uncertainties to the public, but will mandate those uncertainties are represented and acknowledged by way of subjective probability

and uncertainty analysis. The basis of the R.I.S.C. framework is to provide decision-makers, authorities, and the public with information that has been properly vetted through a risk-informed framework, ensuring that the main tenets of R.I.D.M. are abided by. Some of the main features that the framework will emphasize are that of: pre-cautionary and cautionary principle, incorporating subjective probability analysis, uncertainty analysis, SoK tests of all actors involved in the research/publications, etc. (See Section 2.2.1, 2.2.2, and 2.3 for further discussion).

The R.I.S.C. framework strives to establish a unified manner with which articles and journals are evaluated; a risk-informed 'impact score', determined by the level of risk-informed tenets abided by, will dictate the validity and reliability of the journal, author, and publication. In essence, publications must meet the risk-informed prerequisites prior to entering the decision-making process; such prerequisites will be evaluated through an 'impact score' which determines the level of risk-informed tenets adhered to (e.g., was there a thorough SoK test of all experts/data; uncertainty analysis conducted; solid PRA; subjective probability included; perception of those whom are affected included; values, biasness and perceptions accounted for; etc.). The higher the 'impact score', the greater the influence in the decision-making process -- this can be akin to the same manner in which risk acceptance levels are determined and/or the weighted degree of impact as per Lund et al.'s study. The impact score, may, in the future be automated through a risk-informed algorithm, sweeping the articles and journals for keywords, phrases, and conclusions[8].

Further, an augmented R.I.D.M. model will be implemented, see Figure 3 in Section 2.2.2, in which the risk-informed, Impact Score-verified articles, authors, data, and publications will be organized -- this will theoretically occur after Step 2, prior to the analysis and evaluations, and

[8] It must be noted that while the author does not have a background in computer engineering/science, this theoretical stance can only be posited on the ability of the future BAT available.

before Step 3. Open forums congregating the institutional leaders, stakeholders, and community liaisons, will have discourse-democratically held meetings on (potential) high-risk events, policies, and community related issues. Smaller forums dedicated to municipalities will be conducted in the same manner, in which those risk-informed decisions, will be evaluated, and moved onto the larger platform of decision-making.

In theory, this will not determine the risk communication model or strategy that is to be implemented, but will provide a corpus of articles and input that the decision-maker may use in whichever risk communication strategy that is deemed to be most effective, as determined by the nature of the risk event, population ecology and information processing, and that of the experts' opinion. As stated in Section 2.4 and 2.4.1, there are a multitude of risk communication strategies; however, it must be restated that due to the new era of risk communication and information saturation, a strict adherence to risk-informed input prioritization must be maintained in the choosing of the risk communication strategy.

Further, and as stated by Kasperson (2014), "Since a major function of risk communication programs is to provide needed and trustworthy information… confidence in the source of information is essential" (Kasperson, 2014, p. 1236). To build trust, an inclusion of the populaces' perceptions of the risk, the policy, or the issue at hand is paramount. An open, discursive strategy with which to vet the risks/policies is of utmost concern. Furthermore, the transparent route by which risk-informed input prioritization will transpire, will build trust in the process, for the populace will have an introspective understanding of the necessary requirements by which information must be vetted prior to entering the decision-making sphere. However, the author does realize, and has argued, that there is a potential for discursive-paralysis, and/or lack of resources to hold such meetings on a routine basis. That being said, a change in governance requires time,

resources, and political will -- should one of the aforementioned be missing, especially the political will, change will not occur.

In bypassing this obstacle, the route by which the articles and data that dictate COVID-19 policy will be streamlined in a coherent and risk-informed manner. As a result, this prioritization of risk-informed information will engender a transparent, consistent, and trustworthy source of risk-informed information, communication and decision-making, thereby building trust between the authorities and the public.

6.0 Residing Remarks, A Conclusion

In an attempt to answer the research question, "*How to formulate a risk-informed approach that fosters better prioritization of information in decision-making: A Case Study of COVID-19*", this thesis has built off of decades of risk analysis, risk perception, and risk communication studies, to better understand the effect of input prioritization. Utilizing an 'hermeneutical triangulative' method of research, pitting semi-structured interviews, SRA 2020 Research data (Alba, 2020), content analysis, and case study research against one another, provided the researcher with a robust methodology with which to address the research question.

The concept of risk-informed input prioritization is not a completely novel concept; however, little research has been conducted analyzing the decision-making paradigm between policy and input, with regards to a systemization of risk-informed input. The goal to effectively establish a causal chain of risk-informed input, streamlining the R.I.D.M. process, to better establish a risk-informed communication strategy, seems rather logical in its conception. However, once again, little attention has been dedicated to the process of ensuring that risk-informed input remains an integral presence in the R.I.D.M. body.

Integrating the risk perception of the modern layman, buttressing the technical PRA data with SoK tests, uncertainty analysis, and risk-informed tenets of decision-making, such as precautionary and cautionary principles, ensures that the broader, more complete characterization of risk paves the way for decision-making. However, and as has been evidenced by the COVID-19 decision-making, or lack thereof, more must be done.

The current risk communication frameworks employed have been ousted as being far from replete when facing the new era of risk communication that is rift with information saturation. A newfound

focus must emphasize the inherent importance of ensuring that the R.I.D.M. process is bolstered by risk-informed input, emphasizing the risk perception, values and judgments of the decision-making populace. Furthermore, an evolution of the political will must be encouraged, for change can only occur if there is a democratic, mediative regulatory style, that advances the main tenets of R.I.D.M. through a systemization of risk-informed input prioritization.

In order to better understand the complexities that arise in assessing the individual within the social arena, the complex adaptative systems theory paradigm provides the wherewithal to better envisage the inherent interrelatedness between the individual and politic body. Understanding that there is an *ipso facto paradox of existence*[9] between the two identities, allows one to fully immerse oneself in the decision-making paradox that arises when faced with risk perception and risk-informed decision-making (Alba, 2020, p. 9). There must be a complete understanding that the influence of risk perception supersedes the sole usage of QRA methodology to assess risk, for even if it is not *explicitly* included in the statistical analysis, it is ever-present, directly influencing decision-making and risk assessment. Hence, is the need to openly integrate the perception of those whom are affected by the decision-making process; in other words, we must prioritize the individual as a component of the systemization of input, and not just a simple bystander.

As has been made insidiously clear over the course of the last few decades, especially with the rise of social media and the 24/7 news conglomerates, a rise of anti-science rhetoric, with that of the anti-intellectualist camp, has grown to become ever more present in the public eye. The rise of 'fake news', and the lambasting of credible sources of input, expert testimony, and peer-reviewed publications, is an immediate threat to democracy, science, and the free-flowing nature of ideas.

[9] An *ipso facto paradox of existence* relates to the concept of there being one due to the existence of the other. One's existence, further bolsters the foundation of the other, while the other's existence, further spurs the growth of the other. There cannot be one without the other, for they are intrinsically linked in their existence.

Utilizing the complex adaptative systems theory, allows one to comprehend the causal linkages between population ecology and information processing, to that of the exponential growth of anti-intellectualism. Assessing the inherent relationship between leadership, trust and communication, and its effects on the publics' risk perception, illustrates the importance of ensuring that risk-informed input leads the decision-making body.

Unfortunately, COVID-19 has conveyed the innate weaknesses in our leadership(s), our governance and regulatory styles, and the communication frameworks by which risks are articulated for the public, and from the public. However, with every crisis comes an opportunity; an opportunity to seize the momentum generated from the travesty, and to turn that energy towards a new working model. It is thus imperative that the fourth era of risk communication, concurrent with the fifth problem of risk communication (information saturation), is advanced as the basis by which new frameworks must operate. A refocusing of the research, frameworks, and theories, must be effectuated to better prepare future policies, for there must be an essential focus on the systemization and prioritization of risk-informed input.

Humbly, an outline of such a framework has been proposed. The Risk-Informed Systemization for Communication (R.I.S.C.) framework is the match to light the kindling, for the problem has been there all along. However, while little research has been advanced advocating for a risk-informed-laden system that prioritizes risk-informed input, this framework and conceptualization is meant to spark the discussion. As stated, multiple times, the author is cognizant that this framework is far from complete, and is not calling for the immediate operationalization of such a framework.

Nevertheless, what should be noted, is that the time for a change in risk communication research and policy is upon us. The speed with which publications are entering the decision-making arena currently overbears our current risk governance and risk communication frameworks, thereby

inundating the citizen and policy-maker with ‘news/input/article overload’. This further confounds the risk perception of the individual, muddying the waters of effective, trusting public-expert, two-way-driven discourse. As the trust continues to dilapidate between authority, expert and individual, the room for anti-intellectualism to grow amongst our ranks rises with each passing day. COVID-19 has proven that a lack of trust in science, in leadership, in communication, and in each other, leads to preventable deaths occurring, and a further erosion of democracy.

6.1 Limitations & Further Research

Indeed, limitations must be stated when discussing the R.I.S.C. framework. The author recognizes that much work is still to be done with regards to not only the R.I.S.C. framework, but to the systemization of risk-informed prioritized input concept. The concept and integration as a baseline for future frameworks must be reassessed, and tested against the current thinkers of our day and age. The author hopes to take the framework, and the concept of risk-informed-input-prioritization frameworks, to the 2021 SRA conference for further deliberation, critique, and reassessment. The author believes that the submission of this study will test the reliability and validity of the framework, by submitting it to the cross-examination and scrutinization of fellow like-minded cohorts and risk discipline experts. Furthermore, an in-depth introspection into the effects of gender should, and will be conducted, as there lies an innate epistemic valuation to the effects of varied gendered risk perspectives.

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8.0 Attachments

8.1 SRA Survey Questionnaire (U.S. Version)

1. How old are you?

2. Please select which state you reside in: a. CA/NY

3. Where do you currently get your news about national politics? (Check all that apply) a. Social media/tv/ online news/ blogs/ magazine/ etc.

4. When it comes to national political news, which source of news do you trust the most (FOX, Al Jazeera, BBC, CNN, MSNBC, etc.)? a. Open ended answer, they can fill in multiple answers to

5. With 10 indicating a great amount of influence, and 0 indicating little to no influence, how much influence does the layperson have within the political sphere? a. 1-10 scale

6. Do you intend to vote in the upcoming election? a. Yes/no

7. Do you approve or disapprove of the way President Trump is handling COVID-19? (With 10 indicating a high level of satisfaction, 0 indicating an extremely low level of satisfaction) a. 1-10 scale

8. Do you approve or disapprove of the way your state's public officials are handling COVID-19? (With 10 indicating a high level of satisfaction, 0 indicating an extremely low level of satisfaction) a. 1-10 scale

9. In which month did COVID-19 become mainstream news within your peripheral sphere of influence? a. December 2019- August 2020

10. At what point did you perceive COVID-19 to be a risk to your livelihood (Health, lifestyle, job, family, etc.)? a. December 2019- August 2020

11. Did hoarding occur where you live? a. Yes/no

12. In your opinion, did the reporting of COVID-19 via news outlets, politicians, etc. have a positive or negative effect on your perception of safety? a. Very positive- very negative options

13. With 10 indicating the establishment of a transparent source of communication and action, to 0 indicating a lack of transparency and action, how would you rate the national governmental institutions' action in response to COVID-19? a. 1-10 scale b.

14. How often has political leadership communicated how your state/country will handle complications due to COVID-19? a. Daily/bi-weekly/weekly/bi monthly/ monthly

15. Do you think the communication of potential adverse events can be better communicated locally and nationally? a. Yes/no

16. Prior to the onset of COVID-19, in your own words, please describe your perceived relationship with public officials, authorities and institutions, (i.e., degree of trust, transparency, openness, etc.) a. Open Answer

17. Has the COVID-19 experience, thus far, proved to further strengthen your trust and accountability towards authorities, politicians, institutions, or diminish trust? a. Open Answer

8.2 Thematic Map

8.3 Delphi-Inspired Interview Questions

Thank you for taking the time to do this, I sincerely appreciate your invaluable input. Are there any issues or concerns if I record this interview?

To begin, would you mind briefly describing your profession?

1. How would you describe, in your view, how the communication of COVID-19 has transpired/worked between authorities and the public?

2. In your opinion, how much sway/influence does the average citizen have on the decisions made in policy related to COVID-19?

3. Over the course of the last year, concerns have been raised about a lack of transparency in the decisions/policies being instituted in relation to COVID-19; in your view, how would you respond to such a statement?

4. In your view, what can be done to better effectively manage the risk of COVID-19?

5. How would you describe the level of transparency between the government/authorities/ experts to that of the public in the form of policy-making and communication, in relation to COVID-19?

6. Many have argued that there has been an increase in the level of 'anti-intellectualism/anti-science' rhetoric following the onset of COVID-19, how would you respond to that statement?

7. How has COVID-19 affected your perception of government's management of risk?"

8. It has been a year since the onset of COVID-19, how has your trust been affected in the decision-making of the government in their handling of high-risk events?