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A Case Study of Governance in Relation to Private Space Exploration, exemplified by Mars One: Private One-way Colonisation of Mars.

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Choosing to explore society's ability to cope in outer space, brought me in touch with remarkable people from academia and all walks of life. I was constantly fascinated by their passion, be it either in favour or against private space exploration and the daring feat of private colonisation of Mars. I am deeply grateful for their patience, professionalism and in some cases border-line mentorship extended to this novice researcher. I was challenged again and again, particularly at one point from an extraordinary individual, stating that 'Since you are starting out fresh, and haven't yet bought into the earthbound laws that haven't and won't work in space, I thought I'd inject an expansion of your consciousness into your research work, and see what you come up with'.

Not being able to fully comprehend the significance of the advice at the time, having finalised the research, I now understand what was meant. For this, I am deeply grateful. This dissertation seeks to bring the reader with me on this journey.

ABSTRACT

A Case Study of Governance in Relation to Private Space Exploration, exemplified by Mars One: Private One-way Colonisation of Mars.

Dorte Jessen

The case study of 'Mars One' (a Dutch non-profit foundation that plans to establish a permanent human settlement on Mars by 2025; www.mars-one.com), aims to analyse if a reflexive social learning process is taking place in Europe by examining if society is equipped to develop ethical and moral guidance to govern our behaviour as human beings in outer space and the modern ethical dilemmas emanating from the consequences of being sent into space by a private entity as opposed to a government.

The theoretical arch is anchored in *Social Learning Theory* and symbolic loading (Wynne, 1978). It builds on the concepts of *Adult Infantile Narcissism* (Dickens and Ormrod, 2007) and *Technological Adolescence* (Mitchell and Staretz, 2011), underpinned by the social narrative of *Beck's Risk Society* (Beck, 1992). The research methodology engages an exploratory *instrumental* case study approach (Stake, 1994), analysing primary data collected via semi-structured interviews with key informants and content analysis from Mars One audition videos. This is followed by a grounded theory approach, applying an inductive logic to infuse the theoretical propositions (Charmaz, 2014).

The analysis opens by establishing that inherent in governance are ethics and morals. It concludes that while the United Nations 1967 Outer Space Treaty provides a robust governance *foundation*, it has but scratched the surface when it comes to govern the incredible complexity of technological capabilities discovered by mankind, enabling the attempt of private interplanetary human colonisation. Ultimately, social theory, policy and ethical and regulatory frameworks are developing at a notoriously diffident stride, whilst the technological trajectory is proceeding at neck-breaking pace.

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CHAPTER ONE – INTRODUCTION

Components of the contextual background and the research problem were developed by the author, Dorte Jessen, during the preparation of the research proposal; Formally Assessed Essay 3 (FA3) 2013. Full details are included in the bibliography.

1.1 Research Topic

Technological advancement within the space industry has grown exponentially over the past fifteen years, as has the economic capacity required to launch. One of the most noteworthy developments has been the entry of the private sector into the space arena, proving that space exploration no longer has to be rubber-stamped by a government (Spencer and Rugg, 2004: 12).

Whereas private space colonisation remains a concept yet to be realised, space tourism, with far lower stakes, is already a reality, even if it remains prohibitively expensive for most. In 2001, the first space tourist Dennis Tito reputedly paid USD18 million and undertook six months training (Kemp, 2007: 45) before spending eight days at the International Space Station (Spencer and Rugg 2004: 11). The emerging space tourism industry is becoming well established, with key players such as Universal Space Lines, Space Adventures and Virgin Galactic (Spencer and Rugg 2004: 40-41), the latter having the strongest profile founded by Sir Richard Branson. Up until recently Virgin Galactic was most likely to successfully launch the first commercial spaceline offering brief sub-orbital flights, with a ticket price of USD 250,000 from Spaceport America, New Mexico. So far, it has attracted 700 financially solvent, early adopters who have signed up for tickets to become an astronaut. Virgin Galactic's plans have been delayed by a recent tragedy in October 2014, when their *SpaceShip II* spacecraft crashed during a test flight leading to the fatality of the co-pilot. However, their vision and quest remains intact (Virgin Galactic, 2014).

An equally relevant development is the commercialisation of the space industry, in that NASA after decommissioning its space shuttles, and temporarily utilising Russian supply craft, is turning to the commercial space industry for outsourcing future human space flights and refuelling missions (Augustine *et al.*, 2009: 50-53). This has created

opportunities to further fuel the pioneering private commercial space industry, with leading players such as XCOR Aerospace (2015), SpaceX (2015a) and Deep Space Industries (2015) amongst others. SpaceX, founded by millionaire Elon Musk, (cofounder of PayPal), made history in 2012 when their Dragon flights became the first private commercial spacecraft to deliver cargo to the International Space Station. Human flights are envisaged to start in the next couple of years (SpaceX, 2015a).

These industry actors are by and large involved in the same ventures, be it space tourism, government-funded refuelling missions to the International Space Station or the conceptual foundation of 'Mars One', a Dutch foundation that intends to establish a human colony on Mars. They share a common denominator and are drawn together by the undercurrent of a unifying ideology dubbed the 'NewSpace Revolution' (Tumlinson, 2011). Perhaps the purest articulation of such an example would be SpaceX, which is far from being only a business venture assimilating the Columbus-Myth of pioneering, but was established with a vision 'to revolutionize space technology, with the ultimate goal of enabling people to live on other planets' (SpaceX, 2015b). Not surprisingly, SpaceX is one of Mars One's partners (Mars One, 2015a).

1.2 Background of Mars One

1.2.1 Concept

Mars One is a Dutch not-for-profit foundation that intends to establish a permanent human settlement on Mars by 2025 by sending people on a one-way trip to the red planet. The endeavour will be funded by releasing broadcasting rights to an associated reality TV show, sponsorships and revenues from intellectual property (Mars One, 2015b). A staggering 202,586 people signed up in the first five months; the only initial criteria required candidates to be 18 years of age and to pay a registration fee (Mars One, 2015c). Second stage of the selection process was conducted in November 2014 and screened the applicants to identify intelligent, creative, psychologically stable and physically healthy future astronauts and colonists. This produced a shortlist of 663 candidates from 76 countries, all with different reasons to sign up with Mars One. The list spanned from test-pilots to medical doctors to students, all seemingly with a healthy sense of humour. The motivation to go to Mars varied from humbly 'wanting to donate

their life to science', 'put their life on the line to progress humanity', or to 'experience and conquer the unknown'. These 663 candidates will be further narrowed down following a round of interviews, results to be announced mid-February 2015 (Mars One, 2014).

After two additional shortlisting rounds, final selected candidates will be employed by the Mars One Astronaut Corps. After eight years of technical, personal and group training, in geology, exobiology[1], food cultivation, electronics, technical equipment repair, medical first aid, physiotherapy and psychology; and a seven months transit journey, the first four people will land on Mars in 2025 (Mars One, 2015c).

1.2.2 Communication, Identity and Outreach

Mars One's communication is aimed at the adventurous and curious spirit of a distinct group of hopeful explorers from a population comprising of individuals from highly developed nations, raised in a plentiful modernist society, who most likely have not experienced the struggle for their daily bread. Consider this excerpt from Mars One:

> *Not everyone who reads this would have applied for a position on the team with intrepid South Pole explorer Ernest Shackleton in the early 1900s. This was the announcement:*
>
> *"Men wanted for hazardous journey, small wages, and bitter cold, long months of complete darkness, constant danger, safe return doubtful, honour and recognition in case of success."*
>
> *Despite the ominous tone of the ad, the response was overwhelming.*
>
> *Mars One will carefully select the crew for a number of skills and qualities. They will be people who have dreamt their whole life of going to Mars, and in many cases will have pursued careers that increase the odds of being selected for this kind of mission. The selected team will be very smart, skilled, mentally stable and very healthy. They will go to Mars to live their dream.*
>
> (Mars One, 2015d)

Mars One has been able to penetrate the contemporary media environment's constant ambience of infinite outlets and websites. With a remarkable aptitude for

[1] Exobiology is the biology of alien life.

communications and social media they have cut through the noise with their campaign entitled 'The Next Giant Leap for Mankind' (Mars One, 2015e). Naturally, social media are utilised to their fullest extent and in addition to the usual suspects of Facebook, Twitter and Linked-in, the portfolio extends to apps such as 'stumbleupon', 'reddit' and 'VK' (Mars One, 2015e). Design is an integral part of their communication package. Their identity is unique, light and accessible, kept in a youthful tone, cleverly backed by a remarkable line of ambassadors and advisors including leading academics such as Dr Hooft, theoretical physicist and Nobel laureate and Dr Zubrin, the founder of the Mars Society.

Mars One's ambassadors also include Alyssa Carson, a 13-year old American, determined to becoming an astronaut. She has been working towards fulfilling this dream the past nine years, in the later years with NASA (through their space camps). Her father confirms that a one-way trip is 'one of the options she is looking into' (O'Brien and Murtaugh, 2014). It begs the question if a venture like Mars One would attract people who would be going *because* of the cameras, or perhaps *despite* the cameras.

Crowdfunding is generated via the Mars One website as well as their recently launched 'Mars One Community Platform' (https://community.mars-one.com/), an exchange platform for dialogue on a wide range of topics including whether it is ethical to go to Mars, and broadcast the journey (Mars One Community, 2015). The position is that TV coverage would be unethical if people were unaware, while also acknowledging that financing the mission through reality TV is an inventive means to an end, not an end in itself. The nobler purpose is to settle in the solar system and fulfil human nature in its desire to explore (Peck, 2014).

Funding is also raised via the 'Urgency Network', a web-based organisation that partners with select causes and support their fundraising through unique experiences. This has been known to include celebrities such as Sir Paul McCartney, Sir Richard Branson, with a recent addition; to win a (return) trip to space (Urgency Network, 2015). Public Relation activities are carefully coordinated and include founder Bas Lansdorp, ambassadors and astronaut candidates promoting the cause on broadcast TV (Discovery News, 2013), and through media-outlets and partners (Mars One, 2015e). In essence, Mars One can be considered media-savvy. Broadcasting rights for the astronaut selection are still being solicited via the Mars One website, a possible indicator that

despite a robust ambassador and advisor base for the 'the next giant leap for mankind' (Mars One, 2014), committing funding and signing the dotted line, remains difficult.

There is no mention of the legislative framework upon which Mars One is basing its activities in the literature or online resources. They do, however, have two space law experts amongst their advisors[2] (Mars One, 2015f). Given that there are still ten years until any actual space activities would take place, no licence is required for the time being. Authorisation and licencing would depend on the launching state.

1.2.3 One-way Mission to Mars

The idea of a manned mission to Mars is not new. What is new, is that technology is now advanced to a level comparable to the difficulty of going to the moon in 1969 (Zubrin, 2011: 19). What is also new, is the concept of a privately funded *one-way* mission to Mars, as opposed to a government funded return venture through the likes of NASA, to whom the idea of a one-way mission is politically untenable, thus completely unthinkable (Westenberg and Ortner 2011: 329). Ideally, in a democracy, this represents also the consensus of society.

Launching a one-way mission eliminates the need to send fuel and supplies for the return journey and cuts costs dramatically (Schulze-Makuch and Davies, 2011: 90). Not just by a factor of two, but by a considerably higher factor, as it also determines the fuel and the size of the rocket ship (Kraus cited in Westenberg and Ortner, 2011: 329), whereby costs can be reduced with as much as 80% (Schulze-Makuch and Davies, 2011: 90). When comparing an estimate of the investment for 'The Human Mission to Mars Corporation' of USD145 billion over a period of 10 years with the Iraq war budget of USD1 trillion over 7 years, this is no longer prohibitively expensive (Joseph, 2011: 307). Meanwhile, Mars One sets the budget at 'just' USD6 billion for the first four astronauts, while the next manned missions will cost 4 billion each (Mars One, 2015g). With four

[2] Mars One's team of advisors include Ms. Masson-Zwaan, President of the International Institute of Space Law (IISL) and Mr. Sridhara Murthi, adviser to the Prime Minister of India and Vice President of the IISL (Mars One, 2015f).

people in a shuttle, that's one billion a pop. A decade worth of missions would amount to USD22 billion.

Truth is, the sooner we get people on Mars – even if there is not a return ticket for the time being – the sooner we will start being able to return from Mars. But does that mean that we should?

1.3 Research Problem

When the international community has mandated the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)[3] to exclusively manage the peaceful uses of outer space activities for the benefit of humankind (UNOOSA, 2015a), can initiatives of essentially ***private*** colonisation of Mars featured on a reality TV show or commercial space tourism, potentially building hotels in space, as suggested by Virgin Galactic (Wolfe, 2013), be said to be for the greater good of mankind? Is it time to consider that the private space industry has an important role to play in the overall advancement of mankind? Is it possible, that government-led exploration and research is not the most efficient vehicle for space exploration? Even if private ventures are taking on an element of research, possibly advancing space technology ten-fold by surpassing cardinal rules of space travel such as surviving and return to Earth (i.e. one-way ticket), is it ethical? When one in every nine people in the world goes hungry (WFP, 2015), is it responsible to raise USD6 billion to send four people to Mars…to die?

Through the case study of Mars One – a one-way trip to Mars - this research project sets out to analyse if a **reflexive social learning process** is taking place in Europe by answering the following research questions:

1. To what degree society *is equipped to develop* appropriate governance systems to guide our behaviour as human beings in outer space?

[3] The United Nations Office for Outer Space Affairs is the Secretariat for the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), which is the primary international forum for the development of laws and principles governing outer space (UNOOSA, 2015a).

2. What are the consequences of being sent into space on a one-way ticket by a private entity as opposed to a government?

1.4 Aim and Objectives of the Research

The aim of the research is to detect if a reflexive social learning process is taking place and to establish if the collibratory element in society with its methodical scepticism is powerful enough to balance adventure and prudence in society and responsibly govern undertakings such as colonisation of outer space.

1.5 Analytical Framework

The research project examines space exploration and private interplanetary colonisation in the context of Beck's Risk Society, which outlines that we are living in a period with unimaginable and uncontrollable risks, where one [nuclear] accident could spell complete annihilation (Beck, 1992:30).

The literature review will demonstrate that ethics and morals are inherent in governance. This insight will guide throughout the examination of the *instrumental* case study of Mars One (Stake, 1994), as it seeks to illuminate whether a reflexive social learning process is taking place. Primary data collected via semi-structured interviews from key informants and content analysis from audition videos will be analysed through a systematic inductive process, following a grounded theory approach (Charmaz, 2014). This process will distil four core categories: *Hybrid Governance*, *Sustainability*, *Limited Reflexivity* and *Humanity;* and two cross-sectorial themes: *Convergence* and *Nimble.*

On this basis a theoretical arch will be established, building on *Social Learning Theory* and the concept of *symbolic loading* (Wynne, 1978), along with *Adult Infantile Narcissism* (Dickens and Ormrod, 2007) and *Technological Adolescence* (Mitchell and Staretz, 2011), underpinned by Beck's Risk Society (1992). Whereas only limited reflexivity was detected, social learning *is* occurring. Only this time spearheaded by the 'layman' instead of scientific experts.

The examination will conclude that while the UN 1967 Outer Space Treaty may not be an ideal solution, for the time being, it represents broad international consensus.

1.6 Definitions

Risk is a combination of the *probability* and *frequency* of occurrence of a defined hazard and the magnitude of the consequences of the occurrence (Warner, 1992: 4). A key observation however, is that probability will depend on the *risk perception* and its severity (Adams, 1992: 9).

CHAPTER TWO – LITERATURE REVIEW

2.1 Introduction

The literature review is a critical step in providing an awareness of the existing literature and research on a given subject, enabling the researcher to identify gaps and refine the research questions (Craig, 2009: 84) ultimately for the purpose of contributing to the overall body of knowledge (Craig, 2009: 8). Given the very fast-paced development within commercial space travel and private space exploration, the literature review will concentrate on publications and articles published over the past ten years. Classic, political science on governance and capitalism will complement the literature review, incidentally not limited to the past ten years of literary contributions. In addition, to add context and enrich the analysis, an account of the ideologies and viewpoints in the ongoing debate for and against private space travel will be provided.

First and foremost, a firm understanding of existing legislative governance frameworks with the added intricacy of being in outer space need to be established before attempting to elevate the discourse to a theoretical level.

2.2 Governance

2.2.1 Defining Governance

Governance is a concept as old as civilisation itself, spanning across millennia, constantly redefined, linked, delinked to states, types of rule, societies, non-state actors and the international community. Contemporary political science is witnessing globalisation and discovery of a civil society beyond the state, while the nation-state is experiencing a decline of sovereignty, as it is being side-lined by multi-layered governance and the ethical culture of self-governing individuals (Dean, 2007: 81). Therefore, a precision of pertinent concepts is needed for the basis of the analysis.

In his timeless description of the governing principles of the ideal republic, Plato outlines a civilisation built on the virtue of justice, where a man is his own master, yet citizens and state maintain a mutual sense of duty and obligation, keeping evil at bay (Plato, 2004: 129-130). It is a functional political hierarchy, equipped with philosophers,

civil servants, warriors and scientists each fitted to their calling based to their natural aptitudes (Plato, 2004: 59-60). It is striking, that some 2,500 years later, this resonates with Dean's observation, that governance contains a connotation of social control legitimised in a democratic (capitalist) society (Dean, 2007: 45), under an 'authority of expertise' (Dean, 2007: 37).

With the risk of oversimplifying Foucault, his suggestion that governance can be defined as type of 'voluntary conduct' applied in a very broad sense not only associated with political structures, but also the conduct of children, souls and communities (Foucault, 1982: 790), seems the most fitting, as it is this notion that is permeating collective decision making in transnational social domains (Dean, 2007: 27). Simply put, to govern is to structure the possible field of action of others (Foucault, 1982: 790). It is prudent to acknowledge, that although territory can be contested in an increasingly virtual and mobile society, a territorial element and thereby military component is assumed a fundamental part of any sovereign governance as part of upholding institutional political authority (Dean: 2007: 133; Foucault, 1982: 792; Plato, 2004: 59).

Society is problematic to define. In this context it will be limited to the extent possible to a 'western' and 'European' society, a definition that will assist in scoping the research project. Finally, *behaviour* is equally riddled with nebulous futility. As a natural progression of Plato and Foucault, it will be defined as collective acceptable behaviour compelled by *voluntary conduct* with a *mutual sense of duty and obligation*.

On this basis, it can be concluded that ethical and moral structures are inherent within governance frameworks, thus begging the question: Which legal framework? Although the appears unambiguous, in that activities in outer space are governed by the United Nations Committee on the Peaceful Uses of Outer Space (UNOOSA, 2015a), it is exceedingly complex.

2.2.2 The Legislative Foundation

The United Nations legal subcommittee: Committee on the Peaceful Uses of Outer Space (COPUOS), is the only international forum exclusively mandated by the United Nations General Assembly to develop international space law, while the United Nations Office for Outer Space Affairs (UNOOSA) is the secretariat of COPUOS (UNOOSA, 2015b).

Activities in space are governed by the United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, UN Treaty #8843 (UN, 1967). It is usually referred to as the Outer Space Treaty (OST) and is considered one of the most significant law-making treaties established in the second half of the twentieth century (Kopal, 2008: 1). The Outer Space Treaty shaped the governing principles of outer space, namely the recognition that it is free for exploration and use for the benefit and in the interests of all countries, thus becoming the province of all mankind. It entered into force on 10 October 1967, thereby laying the foundation of international regulation of space activities thus establishing the framework of the current legal regime of outer space (Kopal, 2008: 1-3). Space governance is highly political, as any international commitment under the UN Treaties, institutionally carry a provision to pay due regard to national security and foreign policy interests (COPUOS, 2010: 7).

As of 1 January 2014, the Outer Space Treaty has received 103 ratifications (COPUOS, 2014). In addition to the Outer Space Treaty, four main UN treaties have been ratified, all of which are legally binding instruments as per the Vienna Law of Treaties (UN, 1969). The 1967 Outer Space Treaty forms the basis for all these consecutive space treaties, effectively elaborating on some of its principles (Kopal, 2008: 7). The legal principles in these treaties promote international cooperation in outer space and establish non-appropriation of outer space by any sovereign nation, weapons control, freedom of peaceful exploration, liability, astronaut rescue, protecting the environment by minimising harmful impact, registration of space activities, scientific investigation and exploitation of natural resources. It also asserts that activities in outer space (and benefits accrued) should benefit all countries and mankind, particularly developing nations (UNOOSA, 2015c).

Most notable, in the context of examining interplanetary colonisation, is *The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,* also known as the Moon Agreement. Like the other treaties, it elaborates on a range of themes in the Outer Space Treaty, reaffirming that the moon and other celestial bodies shall be used solely for peaceful purposes, that the environment should remain protected and that the location and purpose of any post should be duly registered with the United Nations. Furthermore, 'the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible' (UNOOSA, 2015d).

There is, however, controversy around this issue and whether it takes into account the proceeds for instance from mining and selling of plots of land on the moon. The protagonists claim that since the treaty does not specifically articulate personal or corporate claims of private ownership, individual or corporate rights to extract and mine minerals - explicitly mentioning the planet Mars, it is not covered by the treaty (Joseph, 2011: 316). The antagonists acknowledge this element, and while they may not agree, their concern is that the treaty presumes that the peoples (nations) of the world are pledging to operate and behave differently in the space environment than they have been accustomed to on Earth, rendering the treaty highly idealistic and anti-capitalist (Sulzman, undated). Either way, it means that the spacefaring civilisation race (perhaps even deliberately) does not appear to be *perceived* to be founded in an unambiguous robust legal framework. This has resulted in opportunistic practices for instance selling of 'lunar property deeds' to oblivious, well-meaning individuals.

Responding to these misleading views and discussions in the press, the Board of Directors of the International Institute of Space Law (IISL)[4] issued a statement clarifying that the purpose of Article II of the Outer Space Treaty is to exclude all territorial claims to outer space, including the moon and other celestial bodies (IISL, Undated: 1). The IISL proceeded to note that when Article VI of the Outer Space Treaty stipulates that 'the activities of non-governmental entities in outer space, including the Moon and

[4] The Board of Directors of the International Institute of Space Law (IISL) consists of space law specialists, including past and present chairmen of the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) and its Legal Subcommittee (IISL, 2009).

other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty', it means that States are internationally responsible for national activities in outer space, whether carried out by governmental or by non-governmental entities, and it is referring to *private parties.* Given that the State is responsible for authorising and supervising these private entities under the OST Article VI, the activities of private parties *are* national activities (IISL, Undated: 1, emphasis added). IISL also reminds that states are obligated to implement the treaty within their national legal system, ensuring that appropriation or territorial claims in outer space are explicitly prohibited and unlawful under national legislation (IISL, 2009: 1).

It is clear that the 'appropriate state' must authorise and supervise any space activity. The only problem is, that the term 'appropriate state' is not defined in the treaties. Whereas it is straight forward which nation is responsible supervising private parties or citizens selling lunar deeds, for more complex space activities it is not as simple to assign liability. Appropriate state could mean the state of incorporation or the launching state (Wassenbergh, 1991: 17-26). In addition, complexities associated with liabilities of personnel hailing from several nations on a spacecraft registered in yet another state, leaves ample room for interpretation.

The Moon Treaty is considered a failure with little bearing on the future of space exploration and space exploitation (Listner: 2011). As at 1 January 2014, it had been ratified by 15 nations (COPUOS, 2014), none of which hold spacefaring capabilities. The Netherlands have ratified all five treaties (COPUOS, 2014). Given the Moon Agreement collected only a modest number of ratifications and signatures, COPUOS in its pursuit of regulating emerging issues in the legal field of space exploration, turned instead to developing principles, providing guidance and recommendations for member states on the application of international law, but unlike the treaties, they are not legally binding (Kopal, 2008: 7).

These legal principles promote international cooperation and have elaborated on topics as they became relevant. Such topics cover satellites for international direct television broadcasting (1982), remote sensing and observations of Earth (1986) and general standards for the safe use of nuclear power sources in outer space (1992) (UNOOSA, 2015c). It is clear, that as in any other emerging industry or technological

advancement, the legal framework and guiding principles have been driven by necessity and developed in parallel with new challenges evolving.

During a 2010 COPUOS summit, it was acknowledged that the constant development in science, technology and new exploration efforts, along with the increased commercial and private activities in the space sector, has stimulated a demand for establishing regulatory structures to meet the needs of the private sector, new commercial actors and beneficiaries among spacefaring nations. The aim being to achieve consistency and predictability in the conduct of space activities under the authority of the State, with the establishment of a reliable authorization and licensing regime. This would include private human space transportation (COPUOS, 2010: 5-7). A recent initiative by the European Union drafted an International Code of Conduct for Outer Space Activities (EEAS, 2014), essentially reaffirming the treaties of the national responsibilities within the international framework. This is an example of how the guiding principles in the treaties are evolving into regulatory frameworks, thereby making their way into national legislation. In relation to the development of space law, the question is, whether it is happening fast enough.

Stemming from the review, it appears that the Outer Space Treaty is seen to be based on ideological principles, which presumes that we will act differently in space than what we have done on Earth. Whereas the sentiment is understandable, the question is whether this is at all helpful, when it comes to our *actual* conduct in outer space.

2.3 Beck's Risk Society

Ulrich Beck outlines in his *Risk Society Thesis* that we are living in a period with unimaginable and uncontrollable risks. It is a late-modern society fraught with risk where one [nuclear] accident could spell complete annihilation (Beck, 1992: 29-30), thus one might argue that space exploration is virtually the embodiment of Beck's Risk Society.

The foundation of Beck's Risk Society is first and foremost a reflexive and modernist society, conceived from an industrial society. Born on the wings of rampant consumerism it has become a global capitalist society, filled with contrast and uneven distribution of wealth and risk (Beck, 1992: 41-52). It is a world where on one hand in

the industrialised West the struggle for one's 'daily bread' has lost its urgency, whilst on the other hand the Third World is menaced by hunger (Beck, 1992: 20).

Beck reminds that industrial risks and the destruction such as contamination, forest death, ecological expropriation and extinction of endangered species that follow in their wake, do not respect national boundaries (Beck, 1992: 37-42). These risks include pollution of the Earth with creeping ecological expropriation (Beck, 1992: 38), which in its extreme would have us search for natural resources elsewhere - such as mining of asteroids (Fogg, 2007: 206). Fogg challenges pioneering the space frontier with wider ethical questions about space settlement in general including the biological transformation of an entire new world, and the need for an ethical relationship with our own (Fogg, 2007: 206). The solidarity of organic, living organisms is fighting a losing battle against the unbridled first priority of protecting economic interests and growth.

The *human consciousness of nature* is wounded, undermining the dualism of body and spirit (Beck, 1992: 74, original emphasis), thereby corroborating Engel's dialectics of the mutual relationship between man and nature, where by virtue of their interconnectedness, a change in one, leads to an alteration in the other (Engels, 1959). 'Violations of the natural conditions of life turn into global social, economic and medical threats to people - with completely new sorts of challenges to the social and political institutions of highly industrialised global society' (Beck, 1992: 80).

Due to Mars' distance from the sun it is a weak energy source, and 'nuclear power is probably needed' for manned missions to Mars (Augustine *et al.*, 2009: 36), while nuclear propulsion is deemed 'essential' for any crewed activity beyond Mars (Augustine *et al.*, 2009: 102). Beck touches upon the legal issue associated with the inability to privately insure atomic plants, which are operational for generations (Beck, 1992: 22). These issues are relevant in relation to establishment of a human colony on Mars. This problem is two-pronged in that this concern stretches both to irrevocable damage resulting from terraforming Mars or contamination of either the Earth or Mars atmospheres, but also in the issue of the social protection of the astronauts. For instance, what legal obligation can be carried against a private enterprise that is likely to cause irreversible ecological footprints on neighbouring planets? Whereas a private entity may have all the best intentions to continue to backfill and fuel a Mars colony from Earth

- beyond that of a moral obligation – no legal obligation can be assigned to a private entity that no longer exists, following for instance bankruptcy (Jessen, 2013: 6).

2.4 Social Learning and Symbolic Loading

Wynne's *Social Learning Theory* and the concept of symbolic loading (Wynne, 1978) is at the centre of the analysis of the contemporary phenomenon of private colonisation of outer space. This is coupled with Beck's reflexive Risk Society, which despite being fragmented and individual, is driven by a deep collective anxiousness which fuels methodical scepticism in an increasingly aware public (Beck, 1992: 49), thereby paving the road for a collibratory and participatory process with broad participation, empowered even at grass root level, driven by a constant dynamic tension. The ideal collibrational environment is a complex public debate built on antagonisms with strong incentives to promote rival values where opposing forces are deliberately juxtaposed (Hood and Jones, 1996: 206-215).

Wynne formulates Social Learning as 'the voluntary and proactive revelation of any pre-commitments held by those in positions of authority, whose decisions or actions affect our lives' (Wynne cited in Institute of Lifelong Learning (2011) Module 4: 1.11). It is the idea that a public debate - typically of new technologies, often backed by heavy investments, forms a complex pattern of social relations and commitments rooted in both factual and political realities (Wynne, 1978: 349). This means that during a multi-facetted and informed debate, the transparency generated from articulating these different intellectual, ideological and social world-views, can assure that the decision to proceed with, or abandon, technological or scientific questions are based on a thorough balanced analysis through independent and democratically established intermediary bodies (Institute of Lifelong Learning (2011) Module 4: 1.12).

Symbolic loading is when the respective arguments leave the realm of rational deliberation, deduction and reductionist logic based on the concrete implications and merits of the case at hand, and enter a realm where the project is evaluated on its *symbolic* value, becoming the product of long-held assumptions, preferences and prejudices of what it represents for the industry [or ideology] as a whole (Wynne, 1978: 349-350). As it was the case in 1978 when British Nuclear Fuel Limited's (BNFL) proposal

to build a Thermal Oxide Reprocessing Plant (THORP) was evaluated as a representation of the fate of the nuclear component in Britain's future energy mix. The discourse between an autocratic elite and more egalitarian objector groups (Wynne, 1978: 351) is very similar to what is happening today, in the discourse of a privately induced space race.

The analysis will examine whether this is the case from the view point of practitioners, academics and the general public. The attitudes, sentiments, levels of engagement (reflexivity) and awareness of Mars One, will serve as a proxy-indicator as to whether social learning is taking place in relation to private space exploration, and if so, to what extent it can be deemed reflexive. It will also seek to gauge to what extent ethical considerations form part of the debate, and with what connotation.

2.5 Positions for Colonising Mars

One of the biggest reasons not only for a mission to Mars, but for space programmes in general, is the technological dividend, meaning space exploration is an inspiration for generations of doctors and scientists, which is imperative to innovation (Collins and Lampson, 2013; Aldridge *et al.,* 2004: 41-43). Technological advances discovered originally for space exploration, have provided immeasurable contributions to overall innovation and living standards, such as satellite navigation, water purification systems and medical imaging (Obama, 2010), as well as attracting more candidates to academic institutions. This is corroborated by the European Commission, which asserts that space generates knowledge, new products and types of cooperation, thus a driving force for innovating industries, competitiveness, economic growth and job creation (EC, 2011: 2) thereby stimulating the GDP.

China and India who have emerged as strong BRIC economies have adopted strong policies to develop science and technology curricula resulting in large pools of talent (Goldman cited in OECD, 2011: 38). Furthermore, there is no doubt that spacefaring nations, by virtue of their demonstrated authority and capacity over this new frontier, are afforded a significant advantage in geo-politics. Certainly China, now also rising as a space power, has not underestimated the importance of the notion that it is a way to demonstrate their economic prowess, political solidarity, prestige and position in the world (Stuart, 2012).

The argument in favour of colonising Mars is articulated and spearheaded by Dr Robert Zubrin, US astronautics and nuclear engineer, founder of *the Mars Society* and ambassador for Mars One. The main reasons for colonising Mars boil down to knowledge (scientific enlightenment; the question of whether we are alone in the universe), the challenge (nations and people decay without it), the opportunity and for the future of humankind in a new frontier, politically and socially autonomous (Zubrin, 2011: 17-24; Mars Society, 1998). This is echoed by Mars One articulated with their 'next giant leap for humankind' campaign (Mars One, 2015e). This is complemented by the argument for a 'life-boat' for humankind, in the event that a major catastrophe would devastate humanity and Earth, keeping our species alive until reverse colonisation could be attempted (Davies and Schulze-Makuch, 2011: 10).

In addition, with the rise of the BRIC economies, natural resources from space may provide for a 'second wind' to the *Limits of Growth Thesis*, a systems thinking approach developed in the early 1970s, taking into account industrialisation, pollution, population growth and resource depletion (Meadows *et al*., 2005: 189-191). Depending on the predictions, we may have another 1,000 years' worth of resources on Earth, before needing to abandon Earth to avoid distinction (Hawking, 2015). A Mars mission would likely stimulate the mining of asteroids and natural resources (Fogg, 2000: 206), following depletion of resources, and will attract substantial commercial interest when these options become viable. Extraction of minerals from asteroids is gaining traction with budding mining enterprises starting to form, as well as established companies such as Deep Space Industries prospecting the options for harvesting in-space resources with robotic spacecraft (DSI, 2015). Views are still divided on whether asteroid mining will be economically feasible, while others argue that the technology exists, it is just a matter of time before it can be converted into a commercial, financially viable and sustainable venture (Larsen, 2015: 1).

Pro-space foundations such as the Mars Society, the Space Frontier Foundation and the Dutch-based Space Horizon advocate for permanent and sustainable space solutions (Mars Society, 1998; Space Frontier Foundation, 2015; Space Horizon, 2015). Westenberg and Ortner, also in favour of colonising, pose the question whether a one-way mission to Mars could be seen as a suicide mission, and even if the trip was

funded by the traveller him/herself, would it be ethical? They conclude that it would likely generate a massive international debate on the topic, and 'while this could have positive aspects, it could also present some very negative consequences, particular if [US] Congress and other bodies create legal and regulatory roadblocks – this could also hinder other space exploration efforts' (Westenberg and Ortner, 2011: 329-330). Counter-intuitively the notion that a deliberate preference for avoiding publicity will aid the chance of success, is detected. Meanwhile, Kraft asserts that 'the question is not whether we will make it to Mars, but whether we will be successful once we get there' (Kraft, 2012).

The argument for *not* going to Mars, is more nuanced and rarely articulated in purist terms of *not* going to Mars. Instead a review of sociological and ideological viewpoints, concerned with the consequence of capitalism in space, the maturity of the human race (or lack of same) and civil or military use of nuclear power in space will serve to balance the representation of positions.

2.6 The Dialectics of Humanities, Capitalism and the Universe

Ironically, despite the fact that Mars One is a non-profit organisation, given that the launch of Mars One is envisaged to be financed to a large extent through a TV reality show (Mars One, 2015b), capitalism will be launched into *outer* space. Parker recognises that the paradox of having capitalists in space (Parker, 2009: 85) is embodied in Max Weber's retort to capitalism, observing that:

Where the fulfilment of the calling cannot be directly related to the highest spiritual and cultural values, or when, on the other hand, it need not be felt simply as economic compulsion, the individual generally abandons the attempt to justify it at all. In the field of its highest development, in the United States, the pursuit of wealth, stripped of its religious and ethical meaning, tends to become associated with purely mundane passions, which often actually give it the character of sport.

(Weber, 1930: 182)

Essentially, the means become the end and playing the game becomes the purpose. A profane voyage in the pursuit of spiritual enlightenment. Therein lies the

paradox (Parker, 2009: 84). This aimlessness is further compounded by the emergence of an *Infantile Adult Narcissism* personality type predominantly in the West, where many of the most economically and socially dominant individuals are failing to adequately grow up (Dickens and Ormrod, 2007: 613). Freud observed that infants make constant and often unreasonable demands, expecting their universe to orient around them. Serious problems result if these attitudes persist later in life. Part of growing up is to meet disappointment and to recognise the importance of other people, including their needs and wants. Without this realisation, some may remain at the infantile level (Freud cited in Dickens and Ormrod, 2007: 613-614).

This means that whole generations born into a contemporary world of plenty have never met disappointment, one of the triggers to the rite of passage of maturing into adulthood. This is an extremely competent, financially capable group of independent *individualists*, increasingly interacting with the universe in a physical manner (Dickens and Ormrod, 2007: 610-613). With a cultural theory lens individualists predominantly view nature as benign, an environment to be controlled, consumed and preferably conquered (Adams, 1995: 36-37). This is hardly articulated any clearer than the basic premise of colonising Mars, being *terraforming*; the process of engineering a habitable environment out of a barren one (Fogg: 2000: 2). Whereas this personality trait is at its extreme, elements from this hyper-rich elite and members of affluent society are developing a cosmic elite with narcissistic characteristics, taking to the universe as yet another object to be dominated, thereby sustaining their personal illusion of omnipotence (Dickens and Ormrod, 2007: 622). This will inevitably become a catalyst for a role-model aspiration for younger generations, some of which could be amongst the 663 Mars One shortlisted candidates.

No doubt, as evidenced by the advances within space industry and space tourism, the pro-space movement labelled the 'NewSpace Revolution' (Tumlinson, 2011), which seems less concerned with the impact on nature and increase in the associated risks, has gained more traction than those in opposition. Naturally, this is not a surprise, given the space industry is the embodiment of progress and technological capability. Access to media as advocacy and the ability to develop what is undeniably a distinctly virile industry which captures the allure of adventure, is backed also with the

vast availability of capital, political influence and scientific, academic institutions. In this sense, political influence is witnessed on a daily basis with authoritative governance of broadcast and press, enabling individuals to unleash their powers and fulfil themselves, overcome the feeling of victimhood, exclusion and dependency (Dean, 2007: 37), a description that fits well beyond the cosmic elite.

Meanwhile, on the other hand are social interest groups - in many cases more traditional activists – with far less access to funding – continuously raising these exact concerns of the side-effects of capitalism, along with a deep concern of the use of space for military purposes. Amongst others, this agenda is pursued by Global Network Against Weapons and Nuclear Power in Space (2015) and the Institute for Security and Cooperation in Outer Space (ISCOS, 2015). ISCOS maintains a very strong ethical sentiment for human conduct in space, advocating for a less earthbound world-view. In between, are organisations which to some extent capture the essence of both sides of the spectrum. One example is the Institute of Noetic Sciences (IONS), founded by former US astronaut Edgar Mitchell, promoting both the advance of space exploration and science, and advocating strongly for expanding the horizon with a higher collective consciousness for the benefit of nature (IONS, 2015).

Another example is the European Science Foundation (ESF) who has raised the question whether we are equipped to send humans into outer space, not only with regards to technological scientific disciplines, but also for the humanities (ESF, 2013). Conscious that the contribution of the humanities will be essential to the future of space exploration, in 2007 ESF, the European Space Agency (ESA) and the European Space Policy Institute (ESPI) established an interdisciplinary approach to the human presence in outer space entitled: 'Humans in Outer Space (HiOS) — Interdisciplinary Odysseys'. It advocated for strengthening the profile of social science disciplines such as law, philosophy, ethics, culture, art and psychology. These values were articulated in the *Vienna Vision*, a unique European perspective on the emerging needs of the humanities and social sciences in relation to space exploration (Worms *et al.*, 2010: 3). It is pertinent to note that at this point in time, ESA and the Royal Society UK, does not have any formal structured expertise in the area of humans in space.

The *Vienna Vision* urged the international community to expand their horizon and divert the focus from technological efforts with strong roots in the natural sciences, to also embrace the value of humanities, social, cultural and political sciences (Lukaszczyk, 2008: 50-52). While the importance of the HiOS cause found extensive academic support, the financial interest abated after three years. While understandable, this is concerning. Acutely aware, Worms poses the question that given these less obvious Earth culture social sciences last decades with uncertain financial returns, how can they be anchored academically and financially with the prevailing democratic organisation prone to short-term planning, as opposed to, for instance, centralised states such as China with long-term planning? And what are the consequences for the future use of space if for instance China takes the lead? (Worms *et al.*, 2010: 4). Another pertinent question might be, what happens if a non-state organisation takes the lead?

As we stand on the threshold of becoming a space faring civilisation, Sagan reflects on our global problems, with its vast national antagonisms, nuclear arsenals, rising populations, increased disparity between the poor and the prosperous, food and resource shortages, and the impact on natural environment – a system it seems to some, destined to collapse (Sagan, 2011). Meanwhile, Mitchell and Staretz argue that an element of our long-term survival depends on the ability of humanity to prevail over the obstacles and perils of exploration. So far, the rewards have always far exceeded expectations, even if we were never able to predict the magnitude and range of the risks nor the extent of the benefits (Mitchell and Staretz, 2011: 47). Nonetheless, they raise the importance that ethics and morality rest within humanity, as nature takes no moral sides.

Nature remains available for exploitation for good and for evil. For instance, one of mankind's many discoveries, is how to unleash energy stored within atoms. This knowledge has been used for peaceful purposes such as generating electricity as well as for weapons of mass-destruction. In other words, our morals, values and ethics have not kept pace with our technological prowess (Mitchell and Staretz, 2011: 55). This renders us to live through an unstable era of *Technological Adolescence* (Mitchell and Staretz, 2011: 55, Sagan, 2011). Without a dependable assurance that we as a human race can command these powerful technologies without the risk of self-destruction.

Self-discipline is likely to be the prerequisite to continue to evolve ethically and technologically (Mitchell and Staretz, 2011: 55).

This adds a familiar element of purity of the conquest (Kant, 1998), as it bears witness to the absence of a sound *ethical* governance system to guide us through this unstable technological adolescence. After all, although morals are there to constrain *our* behaviour, values still boil down to how effective we are at influencing the behaviour of others (Fogg, 2000: 7, original emphasis).

Combining Beck's caution of the escalation of irrepressible risks with catastrophic potential as a product of a late-modern industrial civilisation (Beck, 1992: 29) with the inescapable hazard from accumulation of space-debris is yet another validation of the risk society thesis. Capitalism, still by and large fuelled by consumerism in contemporary society, remains predominantly driven by the individualist, perhaps even a cosmic elite (Dickens and Ormrod, 2007), sending Adams' myth of human nature into overdrive. Meanwhile, the egalitarian who reviews nature as ephemeral, fragile and in need of protection [from humans] and to be treated with sensitivity (Adams, 1995: 34-38), has not gained as much traction.

2.7 Conclusion

The literature review opened with a definition of governance, before introducing the governance structure under the 1967 United Nations Outer Space Treaty, which although dated has been revised to include an additional four treaties – the Moon Agreement being the most relevant for private space exploration. An overview of the argument both for and against open utilisation of space, hereunder colonisation of Mars was provided. Social Learning Theory and the concept of symbolic loading (Wynne, 1978) was introduced, which will support the analysis throughout. A review was undertaken of the contemporary society with its emerging cosmic elite (Dickens and Ormrod, 2007) through the lenses of the Risk Society (Beck, 1992) and cultural theory (Adams, 1995). These insights from the literature review will inform elements of the research questionnaire in terms of governance, reflexivity and risk profile.

CHAPTER THREE - METHODOLOGY

3.1 Introduction

Given that Mars One offers a unique proposition in an emerging field, constitutes multiple entry points for reflecting on the theoretical framework. In order to analyse whether society is equipped to govern private space exploration, the methodology gravitated towards an exploratory, qualitative case study. The methodological approach is described in detail, starting with a critical analysis of case study as a methodology including its strengths and limitations (Yin, 2014). It proceeds to account for how inductive logic, grounded theory principles and the literature review guided the process (Charmaz, 2014), before arriving at the sampling strategy for the primary data collection. A reflection on the ethical dimensions concludes the methodology, above all ensuring integrity in the research.

3.2 Research Design

Determining the most suitable research method, design and instruments, requires careful ontological and epistemological considerations (Bryman, 2012: 19). Ontology can be described as an expression of the researcher's assumptions about the nature of reality (Gilbert, 2008: 138), in other words, their world-view. With differing world-views, these ontological assumptions will influence the way research questions are formulated and how research is conducted (Bryman, 2012: 34). Epistemology relates to researchers' different ideological positions about what constitutes acceptable knowledge and how the social world should be examined (Bryman, 2012: 27). The purpose of social research is to seek explanation of how the world works by testing theories. It can be through a positivist approach, seeking explanations through cause and affect though a quantitative and purist approach, or the contrasting interpretivist position seeking explanations through understanding (Gilbert, 2008: 138). Either way, it leaves room for a continuous iterative process and reflexivity in their respective theoretical validations. In reality, often a more nuanced approach with mixed methods can be beneficial and enrich the research process.

When devising the research premise for the examination, a key consideration was Mars One's ability to generate a public debate, with a distinct element of social reflexivity. By challenging existing paradigms and commonly held positions, Mars One could be seen to be 'embodying a view of social reality as a constantly shifting emergent property of individuals' creation' (Bryman, 2012: 36). In order to analyse these dynamics, there was a clear sense (from the researcher), that the research strategy was bound to be qualitative and interpretivist in its ontological and epistemological orientation, assuming the world is socially constructed with multiple realities (Gilbert, 2008: 138), capturing different perspectives exposing a variety of veracities, thereby assuming a relativist perspective (Yin, 2014: 17).

A case study is appropriate when there is a need to do a focussed in-depth investigation of a contemporary phenomenon within its real world context over which the researcher has little or no control, and should be seen as a research strategy, not merely a data collection tool (Yin, 2014: 12-14). In terms of more epistemological considerations, Yin further advocates that incorporating both qualitative and quantitative data into the case study research using multiple sources of evidence in a converging manner, is the special strength of the case study method (Yin, 1994: 285-287). A common misconception, based on the perceived shortcomings of the case study as a research method, suggests that a case study follows a less rigorous methodical path (Yin, 2014: 3). As with any other research strategy, a critical evaluation of the appropriate research strategy, taking into account the strengths and weaknesses will deflate these objections. These are treated in more depth in the ***3.2.2 Validity and Reliability*** section.

3.2.1 Instrumental Case Study

The type of case study utilised for the analysis of Mars One follows Stake's definition of an *instrumental* case study – where the primary topic researched is the issue or theory which is sought represented by a single case study (Stake, 1994: 237). In other words, it is not the action itself of sending people to Mars that is the topic of research; it is the *phenomenon* of a one-way trip to Mars, the theories concerning this, the impact on society and the societal characteristics that it bears witness to. Given the

unique composition of this particular venture, the contemporary phenomenon of Mars One would be an example that honours all these criteria.

The case study research methodology is multifaceted and inspired by Mills' principles of considering a variety of (theoretical) viewpoints and consequently letting the work become a moving prism catching light from as many angles as possible (Mills, 1967: 214).

3.2.2 Validity and Reliability

The jury is still out on whether validity and reliability in case study is a determining research design criteria. While Yin advocates for ways to enhance both internal and external validity along with reliability, it is barely touched upon by Stake (Yin and Stake cited in Bryman, 2012: 69). Suffice to say, that the research strategy selected does limit the external validity; focusing on an individual case does not attempt to be representative – nor is it a sample of one. Instead it offers a much more nuanced insight into a unique situation. The explanation is found in the core purpose of the case study, which does *not* seek to generalise and extrapolate probabilities (Bryman, 2012: 69-70), but to expand upon and generalise *theories* (Yin, 2014: 21, emphasis added).

Therefore, this research project proceeded bearing in mind the inherent limitations to validity in case studies, in line with Yin's proposed tactics in terms of: i) *construct validity by* using multiple sources and maintaining a clear chain of evidence; ii) *internal validity* utilising theory; and iii) *reliability* carefully using case study protocol in the line of enquiry (Yin, 2014: 45).

Caution should be given to the issue of researcher's bias which may unintentionally be imposed on a very small data-set more vulnerable to inaccurate reporting, thereby endangering the ability to generalise or draw conclusions (Institute of Lifelong Learning (2011) Module 3: 1.13). Being an instrumental case study, the ability to generalise was not critical, the concern was rather a bias in formulation of the questionnaire by 'power of suggestion'. To ensure as neutral a data-collection in responses as possible, interview-schedules were piloted and impartial experts consulted to test validity. Piloting the questionnaire in advance of circulation also ensured that the questions did not overlap, and there were no major omissions, in that key informants

were invited to propose additional topics in need of examination. In addition, a stakeholder analysis, was prepared during the literature review as a reiterative process.

Finally, as different methods are likely to contain different sources of error, triangulation was applied throughout to ensure as balanced, nuanced and accurate representation of the findings as possible to foster objectivity in the analysis (McNeil and Chapman, 2005: 9-11). This positivistic approach (to the extent possible) aided to defuse and neutralise the researcher's unavoidable biases and value orientation, which often exists initially (Gross and Levitt cited in Pigeon, 1996: 166).

3.3 Methods

In order to accomplish the wider objective of analysing whether society is equipped to develop appropriate governance systems to guide our behaviour in outer space and the consequences of being sent into space by a private entity, the case study consists of a combination of: i) a qualitative literature (desk) review of available secondary data, ii) a primary survey based on semi-structured qualitative interviews with key informants, and iii) content analysis of Mars One audition videos of future astronauts, which were treated as primary sources given the performance is the subject of interest.

3.3.1 Literature Review

A thorough literature review is critical in gaining an understanding of the knowledge already in the public domain. This will assist the researcher to identify gaps and as importantly, refine the research question (Cooper cited in Yin, 2005: 14), whereby the literature review becomes a means to an end, and not an end in itself (Yin, 2014: 14). With this in mind, prior to the research commencing, a literature review of secondary sources was conducted to focus the research project as well as attaining precision in the formulation of the research question. Care was given to follow the hierarchy of academic sources (Institute of Lifelong Learning (2012) Course Handbook: 30), starting with peer-reviewed journals as in a fast-moving industry, these are more likely to be critically examining contemporary events and most recent developments. Published books were consulted, especially for the grand social and political narratives, along with a myriad of websites ranging from United Nations to more modest sized

interest-groups. Sources were evaluated based on authenticity and credibility (Bryman, 2012: 554) keeping the research reliable while observing a firm grip of being *informed* but not *derailed.*

In addition, the literary foundation for the case study sought to inform the theoretical foundation of the research question: governance, risk perception and social learning and their tendencies within the contemporary late-modern risk society. The starting point for the social scientific enquiry is the social narrative of Beck's *Risk Society* (Beck, 1992) and Wynne's *Social Learning Theory* (Wynne, 1978). The theoretical angles rooted in governance lead towards the classic political literature namely Plato's *Republic* (Plato, 2004) and Weber's deliberations on capitalism (Weber, 1930).

The contextual elements surrounding any case study are critical for collecting empathic insights with different centres of gravity (Berger and Mohr (1975) cited in Institute of Lifelong Learning (2011) Module 4: 1.17). Therefore, the analysis included review and sought consultations with key ethics committees such as the Royal Society Fellowship (UK), European Network of Research Ethics Committees (EUREC) and United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). These organisations influence the formation of public policy through scientific advice to European decision makers and form an important part of the overall societal context, through deliberation on related contemporary topics such as genetics, cloning, quality of life, toxicology and environmental impact on humans (Royal Society, 2014).

The literature review was based on evaluation of secondary data in each of the thematic areas, by reviewing contemporary peer-reviewed journals, leading European space-universities space law activities, interest-group mission statements, planetary protection policies, industries and inter-governmental institutions such as COPUOS and view-points drawn from public opinion of private space travel and the concept of one-way trip to Mars; an electronic media-watch including mainstream media, assessing/ranking their relevance by continuously referring to the research question. This iterative process assisted in sharpening the focus of the research problem and thereby the key informant questionnaire. Whereas the research aims to retain its European perspective, it became evident that without an American contribution,

researching space exploration is not meaningful; thus a number of US perspectives and leading policy journals were included.

Engaging in a literature review scoping out whether society is equipped to develop ethical standards to govern our behaviour in outer space necessitated a thorough review of existing governance literature, which inherently gravitated towards the political sciences. This was required to gain an understanding of the current state of the legislative foundation in the area.

Not surprisingly, a review of legal infrastructure of private space exploration is tremendously complex, and a sincere appreciation was gained as to its intricacies. Any deeper studies of this kind would benefit from a formal background within not only law, but in the specialised area of space law. Further insight was gained both by review of the UN curriculum on basic space law (UNOOSA, 2015e), as well as through an interactive process with two leading space law universities. They proved extraordinarily helpful and willing to patiently assist in familiarising the novice researcher with what is arguably a convoluted area of expertise, which despite decades of refining global treaties and aligning with national sovereign law, remains ambiguous with ample room for interpretation. The effort, although arduous, was well rewarded with an appreciation of these ongoing dichotomies, consequently feeding into the examination and treatment of the central issue of governance.

Throughout the literature review, one of the biggest challenges was the vast range of specialities, ranging from aerospace engineering, geology, biology, space tourism, etc. Social sciences in relation to space exploration diverts online searches in some cases in obscure directions. Particular care had to be taken by the researcher not to get lured down the track of namely conspiracies and the eternal question of whether we are alone in the universe. Although well deserving and both retain relevance, a distinct decision was made to not include these areas in the project, as they would constitute a full research project in their own right, and simply overwhelm the scope of what is achievable within the parameters of a Master Degree research project. Strains of relevance, however, have been distilled and included as appropriate.

3.3.2 Primary Data Collection: Qualitative Interviews

The primary data-collection consisted of a primary survey based on semi-structured qualitative interviews with key informants and a future astronaut along with content analysis of a sample of Mars One audition videos of future astronauts.

Key informant interview schedules consisted of between 12 and 15 open-ended questions tailored to the area of expertise of the respondent allowing for in-depth elaboration, all analysed in the light of the theoretical perspectives outlined above. An example is included in Annex II: Research Questionnaire. All interviews were conducted in English. The interview questions also included reference to budding theories, which had emerged during the literature review, for the purpose of seeking validation or debunking. The approach applied with key informants was exploratory in nature and conducted predominantly skype-interviews, enabling the easy recording of the dialogue, electronically capturing data for onward coding and analysis.

In addition to the ethics form, permission to record was sought verbally. Not all skype calls were video calls; thereby it was not possible to engage in a meaningful participation observation. Instead the level of enthusiasm from the participants was used as a proxy-cue to the extent possible (this however did not present conclusive results, but merely an indication). Immediately after the interviews, key points and notes were written down in researcher's memos to capture as fresh impressions as possible, while progressively grouping themes. These memos served as a vital reference point during the analysis phase as they contained both findings and reflections of the interviewer.

The sampling strategy was based on a deliberate purposive sampling approach, aiming to gain access to as wide a range of institutions as possible (Bryman, 2012: 416) (see also Robson 2011: 148-149 for *theoretical sampling* in relation to grounded theory), starting with the Mars One team. All efforts were made to mobilise participation from the Mars One founder and team via email, networks, ambassadors, Mars One community site etc., each time approaching the organisation with a letter of introduction and consent form, outlining the confidentiality of the research project. To date, two separate semi-personalised (not automatic) responses have been received from Mars One, both providing similar advice and appreciating the interest, however,

given they receive many requests of this type, they cordially referred to their website for additional information. Therefore, the Mars One component is mainly based on information sourced via http://mars-one.com/ and https://community.mars-one.com/ and the astronauts-to-be perspective covered via audition videos, broadcasts and available online resources.

The remainder of the sample was designed based on a stakeholder analysis, aiming to cover as many perspectives as possible in line with Mills' (1967) principles. Based on the literature review and the acknowledgement of the importance of the US perspective, the relevant institutions identified were: the aerospace industry (US, UK), industry organisations (US), leading academics in social and political science from space universities (UK, France, the Netherlands and US), space lawyers, space experts, interest groups in favour and in opposition of private space exploration (US and Europe), space agencies (NASA, ESA, ISS) and ethics committees (Royal Society and EUREC).

Table 4.a: KEY INFORMANT SAMPLING AND RESPONSE

SECTORS	SAMPLE	RESPONDENTS	GENDER		REMARKS
			M	F	
Pro-Space Interest Group	6	2	1	1	
Opposing Interest Group	6	2	1	1	
Space Industry	3	0	0	0	No response
Industry Organisation	1	0	0	0	No response
Academic & Space Expert	5	4	3	1	
Space Lawyer	3	2	2	0	
Space Journal	1	1	0	1	
Ethics Committee	2	1	1	0	Declined due to lack of appropriate expertise
UN Agency	2	0	0	0	Declined to maintain neutrality
Space Agency	4	0	0	0	Declined/ No response
Mars One	1	0	0	0	Unable to participate but referred to website for relevant info
TOTAL	**34**	**12**	**8**	**4**	

34 organisations were contacted via email mid November 2014 carrying a letter of introduction to the research along with a consent form. Three weeks later, a reminder was circulated. 12 organisations accepted to participate in the research; 6 skype-interviews were conducted, 6 responded by filling out the questionnaire and submitted via email. Gender-balance was not prioritised in the sampling design, but rather aimed at finding the right organisations and to cover the main areas of expertise. Nonetheless, the gender profile ended up with 4 female – two of whom hold a PhD. Of the 8 male respondents 4 holding a PhD. The relevance of including gender, furnishes the findings with an extra element of diversity.

Particular care was taken to ensure the main stakeholders were represented, which was achieved - with the exception of the UN and the aerospace industry. Despite initial correspondence soliciting additional information, the aerospace industry opted not to participate, which no doubt was influenced by the Virgin Galactic tragedy which occurred only two weeks earlier (31 October 2014), when a spacecraft crashed during a routine test flight leading to the fatality of the co-pilot (Virgin Galactic, 2014). The UN gracefully declined participation as to not jeopardize their position of neutrality.

3.3.3 Primary Data: Mars One Future Astronauts

Table 4.b: MARS ONE FUTURE ASTRONAUT SAMPLING

COUNTRY	SAMPLE	GENDER	
		M	F
France	2	1	1
Germany	2	1	1
Italy	2	1	1
Spain	2	1	1
United Kingdom	2	1	1
United States	2	1	1
TOTAL	**12**	**6**	**6**

A sample from the 663 shortlisted Mars One future astronauts was included. *Refer to (Mars One, 2014) for full list.* The 663 applicants came from 76 countries; with the majority (75%) coming from highly developed nations according to UNDP's Human Development Index (HDI) (UNDP, 2014), the largest being the United States (35%), Canada (8%), UK (5%), Australia (4%), France (2%), Spain (2%), Germany (2%), Japan (2%), Italy (1%) and Israel (1%). Given the research is focusing on the European perspective, this defines France, Germany, Italy, Spain and UK as the sampling universe. 2 from each of the 5 nations (strata), were randomly sampled from the list of applicants, 1 male and 1 female. Given the US has a strong influence in space and the public dialogue, an additional 2 candidates were included, likewise, 1 male, 1 female. Given the auditions were analysed for the purpose for which they were produced, they will be regarded as primary sources.

3.3.4 Primary Data Analysis

Robson stresses the importance of a systematic analysis of qualitative data in the application of thematic analysis to form the basis of a grounded theory approach (Robson, 2011: 467). While he is not denying the value of these interpretive, constructionist and relativist directions in a post-positivist scientific era, the virtues of maintaining a scientific approach are paramount (Robson, 2011: 492). This conviction resonates well in relation to minimising bias and ensuring as objective an analysis as possible, within the framework of a unique, single, in-depth case study, carried out by a sole researcher.

The techniques for identifying themes subjected the data to an initial descriptive categorising or coding based on specific topics, acts, conviction, opinion and state of mind, followed by analysis of repetitions, to identify patterns in categories, concepts and themes distilled by the process (Robson, 2011: 479-482), applying an inductive logic (Robson, 2011: 19). Budding concepts and theories emerging from the literature review and initial interviews were systematically sought validated or debunked through content analysis as well as interviews with various entry-points. The process thereby following a grounded theory approach constructing (or validating) theories *grounded* in the data in a state of constant comparative data-analysis (Charmaz, 2014: 342), imprinting a reflexivity not only in the theories and concepts sought validated but also in the data-analysis techniques. A schematic outline of the process is included in Annex IV.

3.4 Ethical Considerations

Honesty in research is paramount (Institute of Lifelong Learning (2011) Module 3: 9.3) and great care was taken to ensure a neutral treatment of all sources and findings, and letting the data speak for itself, without seeking confirmation of preconceived ideas, but instead applying an open and creative process of insight and discovery (King *et al.*, 1994: 12) within the defined parameters of the research. The best indicator that this was achieved is that the ideas and conclusions permeating from the research well outclassed what the researcher might have initially thought possible.

Anonymity is essential for the validity of the responses and it is key that all respondents are confident that their responses will be treated with respect and confidentially, hence motivating them to share their honest opinions and true sentiments without concern for repercussions (Robson, 2011: 208). Participation was voluntary and all contact with participants was initiated by a letter of introduction accompanied by a consent form, establishing the legitimacy of the survey (for detail, refer to Annex III: Consent Form). The consent form was endorsed by the Leicester University Ethics Committee and outlined clearly anonymity and confidentiality and that participants may withdraw from the study at any time without any consequence, and that research data will be destroyed after 3 years.

The majority of respondents were satisfied with their anonymity; however, the researcher was met with a dilemma when two respondents wished to be quoted for their contribution, a dilemma acknowledged by Robson (Robson, 2011: 209). This was easily resolved by including only points which were found to have merits within the literature review, as the concepts were available on the prospective organisations' websites, thereby avoiding to jeopardize the balance, integrity or independence of the research. On the other hand, a key concept was posed from a prominent participant, and while permission was asked to accredit this particular concept to the participant, it was gracefully declined. Instead it is featured in the findings as a concept distilled from the primary data, in accordance with the preference of the participant. All endeavours were made to complete this project in an ethical fashion. This included treating all respondents, supporters, data and information with utmost respect and dignity.

Establishing a genuine and legitimate working environment in the research universe, is likely to have compelled more participation from key stakeholders.

It is critical to be conscious of the potential impacts the research itself may have, once in the public domain, as it may inadvertently stimulate an ongoing debate, providing ammunition that may favour one school of thought over another. However, as the ultimate purpose is to publish the findings to inform the contemporary public and academic debate, the safeguard comes back to honesty. However, having proceeded with a neutral, balanced, well-established structure of social scientific inquiry (King *et al.*, 1994: 12) with a transparent methodology, diffuses this concern.

3.5 Conclusion

The blessing of researching an emerging social phenomenon such as inter-planetary colonisation, is that only limited research exists. This is concurrently a curse. When selecting the topic of analysing the phenomenon of Mars One, it was anticipated that it was likely to validate established social scientific theoretical foundations, as well as potentially spearhead new ones. Therefore, a distinct exploratory approach was employed, following Stake's definition of an *instrumental* case study (Stake, 1994: 237), maintaining a *relativist* perspective (Yin, 2014: 17). The case study is by no means intended to be representative of all such ventures, nor is it intended to derive generalisations from the findings (Bryman, 2012: 70). Instead, the purpose is to illuminate *theories* (Yin, 2014: 21, emphasis added) surrounding governance. Therefore, a grounded theory approach proved most suitable.

The inductive approach requires a rigorous, systematic effort in order to offer transparency and internal validity in the project. To honour these criteria, the foundation of the research was refined by the literature review of secondary sources, deliberately informing both theoretical perspectives and the interview schedule by a continuous iterative process. The primary data-collection was conducted using semi-structured interviews, progressively coded as per the guidance within grounded theory approaches (Robson, 2011: 467). Although it was not possible to mobilise participation from Mars One, rich information was available online enabling the analysis to proceed based on a wide range of publically available documents and media, including sampling

of Mars One audition videos of future astronauts. The purpose of the analysis is a theoretical deliberation on whether *society* and less so, whether the *astronauts,* are equipped to develop a governance structure, thus it was not a critical omission given the availability of other sources.

The selected methodology provided a robust foundation on which an effective and sound body of work can be built. With due appreciation of its limitations, the methodology was coupled with mitigating factors to minimise the impact of these restrictions. Finally, care was taken to administer a high ethical standard throughout, ensuring anonymity and confidentiality for all involved key informants and maintaining honesty in all aspects of the examination.

CHAPTER FOUR – FINDINGS AND ANALYSIS

4.1 Introduction

An overview of the analytical strategy will be followed by a summary of the research findings from the primary data-collection, applying a logical analytical strategy protocol. Each key topic will be illuminated from a range of different vantage points. This will be complemented by a review of Mars One audition videos. The aim is to provide a clear and concise basis for the onward discussion and theoretical discourse.

4.2 Analytical Strategy and Protocol

The findings are based on 12 key informant interviews and 12 Mars One audition videos for future astronauts (for detail sampling strategy, refer to Chapter Three: Methodology). All key areas were covered from at least one European key informant.

Given the findings will be formulated based on convergence and connections within the responses, a logical approach will be applied in the analysis-phase in order to increase the construct validity and create a chain of evidence (Yin, 2014: 126-130). The analysis will not seek to draw generalisations or representativeness, but instead base its findings on pertinent points articulated by key informants. Given that the analytic priorities were inherent in the original formulation of the questionnaire, designed to illuminate the research question (Yin, 2014: 136), the key topics will form the starting point in the presentation of the findings. Responses were tabulated and coded, following principles ensuring anonymity for respondents.

The second step will follow a systematic approach of an open thematic coding technique for the purpose of identifying cross-sectoral themes and conceptual core categories (Robson, 2001: 489-490) to further guide the analytical path. Only then, will it be attempted to elevate the level of abstraction to combine these themes with Social Learning Theory and symbolic loading (Wynne, 1978: 350) by integrating the method of constant comparison (Pidgeon and Henwood, 1996: 92-94) aiming to stimulate the conception and infuse the formulation of a grounded theory (Charmaz, 2014).

4.3 Findings: Key Informants

The key topics were: governance, difference in risks for private vs. governmental colonisation, representing mankind, public dialogue and Mars One accountabilities (for example of questionnaire, refer to Annex II: Research Questionnaire). The interview schedules were adjusted and targeted to the intended audience; thus not all questions were answered by all respondents, and some additional questions were added depending on the area of expertise. For instance, the purely social scientists engaged in ethical fields of expertise were not burdened with the legal questions related to the Outer Space Treaty, and vice versa. Where quotes are in brackets, they are transcribed 'sic erat scriptum' from their original source, complete with errors and colloquialisms.

4.3.1 Governance

Just over half of the respondents considered the 1967 UN Outer Space Treaty (OST) to be a sufficient foundation to govern the current development in private space travel and exploration. All who responded 'yes', qualified their answer that it was a 'good foundation to be supplemented by national legislation' and 'it's a good start'. This group included mainly academia and space lawyers. Those who responded negatively, qualified their answers with 'the OST is old and written into another time, 'new frameworks need to be established' and 'of course not!'

In relation to who should coordinate a colonisation venture such as Mars One, there were some consensus in the responses. All but two responses included: UNCOPUOS and National Governments with the UN furnishing the diplomatic infrastructure. This consensus was mainly from academia, lawyers and space experts. One respondent nominated the global society, whereas one respondent proposed to include provision for coordination with cosmic cultures (i.e. extra-terrestrial life).

The respondents were offered a list of 12 different categories ranging from politicians, academia, ethical institutions and media and asked to nominate the greatest influencers on governance in outer space. Here, all respondents agreed that politicians and the aerospace industry had the strongest influence. One respondent noted that 'obviously a lot more sway goes to organisations that have the capability to go to Mars

versus the ones that say they can. Mars One does not have a space at the big-boy's table – yet - but they definitely have a voice. In fact, the industry probably listens more to Mars One that they should!'. The UN, media and academia, were all deemed to have 'some influence'. General considerations were many-fold and dealt with the hybrid private/public partnership governance or 'spontaneous regimes' established, driven by necessity. For instance, orbital spot allocations used to be a 'first come, first serve' principle, until the industry and relevant governments created a private/public constellation to coordinate this activity.

4.3.2 Difference in Private vs. Governmental Risks

The question was posed, whether there is a difference in the type of risk emanating from private versus government based interplanetary colonisation. The majority responded 'yes', accompanied by qualifying statements such as 'yes, but the government is still the right body to govern – or as a minimum a hybrid', while others deferred to the more traditional structure of colonisation where the accountability returns to the 'imperial centre'. One responded 'No, given the state supervision assumes part of the responsibility, for instance against bankruptcy, it must be dealt with through the licence'. One respondent was not sure.

Sustainability, with the undercurrent of 'financial sustainability', was raised as a very important factor by several participants. With some agreement that a venture of the magnitude of inter-planetary colonisation, must provide return on investment. It will not be rendered a success, if only initial venture capital is mobilised. This was corroborated by a respondent stating 'the determining factor [of the success of space exploration] will be the capitalist interest'. In relation to a new approach to risk within the private industry, inspired by the high-tech industry, another respondent pointed out that the private sector was 'building as much capacity for adjustment into their spacecraft as possible, quite a departure from the prevailing government perfection model'. One respondent noted the continued taboo of certain military activities, while another confirmed this notion, adding that 'military and corporate [capitalism] will go hand in hand'.

4.3.3 Balanced Public Dialogue

The question was posed whether the public debate surrounding private space travel and colonising Mars is a *balanced* dialogue. All responded 'no' – with gusto - albeit with different rationales. The responses were clearly delineating the various ideological affiliations held by the respondents. Both sides would acknowledge that is it 'not a fair fight', far from a balanced dialogue with the gravitation of power 'following the money' with 'science is still intimidating'. 'Funding does provide for a voice, perhaps even with a *power over legitimacy* element to it'. Another destabilising factor is the perception that the media is heavily biased towards a pro-space agenda, with very close links to political inner circles. A concern was the 'lack of infrastructure available to the general public, not already controlled by the media moguls', with one respondent feeling that, 'if anything, it has gotten worse over the last few years', with only lip-service paid to the broad public participation in decision making, when in reality 'it is near impossible to gain access to the negotiations that are still happening behind closed doors in Geneva'.

Probing a bit further into the reasons for an *unbalanced* dialogue and the seeming lack of reflexivity, one respondent offered the explanation that 'it is hard to find middle-ground when you have two extreme sides. On one hand you have peace and exploration on the other hand you have weapons and dominance', which was supported by another sentiment which was that 'it is very bi-polar, and people are passionate either way'. One respondent categorically stated that 'We just kind of ignore those people and try to convince them that they are wrong, but then they dig their heels in, and they say *no* and that all the money spent in space should be spent on Earth. At a certain point, you just have to agree, to disagree'. Asking if there was a grey-zone, it was suggested that if there is a grey-zone, or a middle-ground, it is best illustrated by the 'new-comers' who to enter the space arena undecided, and then make up their mind about which camp to end up in.

One respondent noted that while Mars One does seems to get media attention, it generates only modest public debate, which is not focused on governance. Scepticism towards their motives was expressed from several respondents, with a strong reservation expressed towards the lack of *substance* in the campaign, suggesting it may merely be a publicity stunt. Across the board, it was acknowledged, that Mars One has

been able to elevate the topic of 'space exploration in mainstream media, and it was the reason why some respondents mobilised an ounce of respect for the foundation. The interest groups not supporting the NewSpace agenda equally acknowledged that Mars One was fuelling the topic, which to some extent provides a platform for debate. From the pro-space respondents, a few expressed an element of 'media-darling' with an element of endearment. None of the respondents believed that Mars One has the capacity to go to the red planet, and they all felt that their timeline is wildly optimistic. As pointed out by one respondent, 'if they want to be taking off in 2024, they will need to be literally cutting steel four years from now, and they simply will struggle to mobilise the resources, plus the equipment they propose to use, are still in the testing phase'. Some were far more sceptical of motive than timeline.

4.3.4 Envoys of Mankind

The respondents were asked a line of questions in relation to a collective sense of responsibility, divided into a hypothetical Mars One crew's moral responsibility and our responsibility to them. Two responded that the crew is only accountable to the private entity that sends them, but within corporate ethics. All others stated that the crew remains accountable to mankind. Whether mankind remains accountable to them, all stated 'yes', summarised by 'regardless of formal accountability structures, you would feel an unconditional sense of responsibility, for those poor bastards'. While mainly the interest groups in opposition were expressing concern that 'yet another [capitalist] venture will be launched under the *Columbus-myth,* a respondent reminded that we are 'hardwired to be curious', and 'it is what defines our survival'.

The question was asked, if the crew composition could be an indication of the current state of society. Everyone responded 'yes', but no elaborations were offered. Moving on to reflecting whether the element of casting for a Mars One crew for a reality TV series was compatible with the rights and obligations of astronauts as envoys of mankind, the answers were divided. Half stated 'yes, it *is* compatible', and while concern was stated 'the term *envoy of mankind* might be eroded by for instance Virgin Galactic' others stated the opinion that 'just because they are publically selected does not negate their rights as an astronaut'. The respondents that answered 'no, it is *not* compatible',

referred to the irreconcilable issues linked to the purpose of casting for a TV reality show which 'undeniably needs drama, while a successful mission in a confined space needs as little friction as possible.'

4.3.5 Mars One Accountabilities

The respondents were asked to nominate the biggest risk, showstopper, opportunity, duty and responsibility for the implementation of the Mars One project. The main risks identified were technology failure and/or delayed progress in development along with the human factor. Showstoppers were funding and not obtaining a licence. Opportunities ranged from 'vanguard, on behalf of space exploration', to exploration and settlement of outer space to creating a considerable market back on Earth for the TV rights etc. The duties identified were 'take care of settlers until they are self-sufficient' and 'maintain good ethics including full disclosure of the real risk of dying either en route, from radiation poisoning, thirst or starvation.' It was also highlighted to avoid contamination, to no exploit the grounds for profit, and to represent consciously on behalf of mankind. The responsibilities identified was to share scientific results with the global community. The obligation 'not to waste the opportunity' was identified as a cross-cutting sentiment.

4.3.6 Summary of Key Informant Findings

The only thing everyone could agree on, was that no matter the formal legislative regime, there is a deep sense of collective responsibility towards people in outer space.

The 1967 OST is perceived as a sufficient *foundation* by the industry and academia, and despondently inadequate by others. There was greater consensus on the pro-space movements flank, nominating the UN and member states as best positioned to coordinate the response, with interest groups nominating instead the global society with provision for cosmic cultures. It was widely acknowledged that the politicians and the aerospace industry were the biggest influencers on governance. There seemed to be a sentiment across the interviews that the trajectory of private space exploration is undeniably steep, and it is only a matter of time *when* it will realised. There was less consensus as to which body would be best positioned to govern this venture, with clear

delineations within pro-space movements and academia as opposed to interest groups. Private/public hybrid constellations were suggested as an option with merits.

For private versus governmental risks, the responses were very diverse with wide acknowledgement that the difference in risk would be neutralised as the accountability returns to the sovereign state. Again, a hybrid solution was suggested. As for the public dialogue, there is a clear sense that it is not perceived to be balanced, with a gravitation of power influenced by political and financial capabilities. The debate seems to consist of at least two opposing groups with highly diverging views, spanning the extremes from peace to dominance, with little if any middle-ground. Mars One was recognised as providing an entry point to bring space related topics into the mainstream media, for the benefit of the whole sector. The Columbus-myth of pioneering was acknowledged by the full spectrum of respondents, although again, with very different connotations.

No matter the formal accountability structures, there was a wide sense of responsibility, towards people in outer space. There were very differing viewpoints of whether casting for a reality TV show is compatible with astronauts being 'envoys of mankind', either for or against, with no-one undecided.

Whereas this is not a representative sample, and it is not meant for generalisation, there does seem to be a recognition – which was also supported by the literature review, that there is a very bi-polar, heavily skewed debate, in favour of pro-space movements. With extreme ideologies represented, capitalism on one end, solidarity and egalitarian ideology at the other, it seems difficult reach a common basic agreement, while allowing for the fact that there will always be people pro and against.

Finally, the survey detected a continued taboo of military power in space, despite the perceived persistent symbiosis between (western) capitalism and military interests. While this has certainly been the case in more classic approach to colonisation and perhaps a valid topic, it is beyond the scope of this examination to analyse these dichotomies. Suffice to say, that Eisenhower's warning of the military industrial complex gaining undue influence (Eisenhower, 1961), still speaks volumes to the current state of space exploration, some 54 years later.

4.4 Findings: Future Astronauts

A sample of 12 Mars One audition videos from the shortlist of 663 candidates were reviewed, for the purpose of detecting their attitude towards risk (propensity to take risk), their perception of risk, and their motivation towards signing up to Mars One. Sending out an open call for astronauts produces a mixed response. In detecting motivations to go to Mars, responses ranged from 'wanting to donate my life to science' and 'wanting to preserve the human race', to the 'notion of being part of starting fresh on a new planet, avoiding to commit the same mistakes we did on Earth with poverty and hunger'. There was also a Marsian who just wanted to go back home.

The adventurous spirit was found in most of the responses, in some cases very athletic males and females, some of which were highly educated in pure sciences, including a retired test pilot. The types of people were very diverse, mostly sincere and humble while some seemed slightly more conceited. All noted their sense of humour, which was part of the questions to be responded to in the call for applications. An element that was detected in several responses, was that people felt adrift and wanted to find a sense of purpose. One articulated it as 'floating through life'.

The candidates by enlarge all appeared to be well-adjusted, with at least two categories of applicants. There were the ones that were very determined, dedicated and larger than life, and would find adventure anywhere, regardless of going to Mars. Others seemed slightly more resigned – for instance 'always dreamed of being an astronaut, but was not good at math and science', and this was their chance. In terms of risk, it did not seem a concern at all. Only occupation with the rush of being selected, working for Mars One for eight years and most importantly: going to Mars.

The review of Mars One audition videos observed that adventure was the main motivating factor to going to Mars, along with wanting to find a sense of purpose in the name of humanity. All were observed to be vivacious, healthy and in many ways a testimony to a typical contemporary European Society. None of the candidates seemed to have experienced the struggle for their daily bread.

4.5 Conceptual Core Categories

Based on key topics from the key informant findings, core categories were derived from first applying an inductive logic, and second, engaging the method of constant comparison (Pidgeon and Henwood, 1996) to identify patterns and themes, for the onward purpose of seeking theoretical formations and linkages. To the extent it was meaningful, audition videos have contributed to the identification of patterns.

The core concept of ***Hybrid Governance*** emanated from the increasing private/public overlap, which has been seen to stimulate the creation spontaneous hybrid regimes out of sheer necessity. This suggests greater integration between international sovereign states (inferred to include the military) and the private sector, inspired by the emergence of a nimble industry approach. It seeks to include as much capacity for adjustment and upgrade as possible, a clear departure from the prevailing government perfection model. ***Sustainability*** was either articulated or inferred in most of the interviews. Be it financial sustainability, a prerequisite for launching an industry in space (i.e. for mining), sustainable governance, sustainability through nimble technology, or sustainability for the colonists on Mars, it was detected as a core concept throughout.

Limited Reflexivity and Collibrationism in an exceedingly bi-polar and imbalanced public debate, perceived to be enabled by resources and politics, heavily gravitating towards a pro-space agenda, was unmistakably apparent. Although the case study is not representative, it provides some indication of the current state of affairs. ***Humanity*** was the only one concept unanimously subscribed to by all. The overarching sense of responsibility and the collective moral imperative, completes the core categories.

Throughout, the characteristics of *Convergence* and *Nimble* have been found to be common denominators and recurring themes, applicable to all core concepts. ***Convergence*** should be interpreted widely, as a contemporary cultural dimension. An opportunity for particularly Mars One and the industry to elevate the dialogue into the public domain. ***Nimble*** refers to the idea of starting small. As a drip only, and gaining traction before moving to critical mass. A curious creature, without the constraints of bureaucracy and the prevailing government perfection model. Agile and without an anchor. Perhaps even with the sentiment of a good-hearted, adventurous renegade.

4.6 Discussion

The literature review, along with the core thematic concepts derived from the research, will populate the discussion examining first the establishment of governance as it is needed in relation to technological progress, before proceeding to humanities in space and the difference in private and public risks. This will enable the identification of patterns to inform the theoretical discourse, grounded in the research findings.

4.6.1 Governance: Forming as it is Needed?

The literature review established that the 1967 UN Outer Space Treaty (OST) remains the main international governance foundation, broadly sanctioned globally, upholding the principles of free space exploration for the benefit of all mankind. The overarching ethics in the OST have formed the basis for four additional treaties; the Moon Agreement undeniably being the most important one in relation to Mars colonisation as it includes provision for establishing an international regime, to govern the exploitation of resources as this becomes feasible (UNOOSA, 2015d). It is interesting to note, that the treaty does not specify which actors are envisaged to sit at the table. The OST also formed the basis for five guiding principles adopted by the United Nations (Kopal, 2008) including on satellites and remote sensing of Earth (UNOOSA, 2015c), all developed in step with the *technological* progress, thus suggesting that governance, to some extent, is developing as it is needed.

Meanwhile, asteroid mining and human settlement in outer space are yet to create the necessity for a firm governance structure. Considering that mining enterprises are well underway, they may represent the next addition to space law with space law scholars observing that an element of 'industry self-imposed' governance structure may complement the current legislative framework (Larsen, 2015: 20). This development was corroborated by the survey-findings, which highlighted cases where more creative and nimble solutions were found, for instance by a solution to an analogue problem i.e. satellite spot allocation, through *spontaneous hybrid regimes*, including private and public partnerships. Notwithstanding the risk of amplifying the prevailing societal power structures (Young, 1982: 292), this development is reassuring.

The driver in an industrial late-modern society is capital. And lots of it. As observed through the survey findings, financial and commercial sustainability will likely be the determining factor of the success of private space exploration. Despite the collective good intensions and establishment of governance structures as they become necessary, perhaps even with a reflexive approach, Beck (1992) is concerned with the risks that *cannot* be regulated. For instance, the consequences of the long-term ecological impact and liability for nuclear power (Beck, 1992: 29-30), this time released into outer space where the environment is far more unpredictable than on Earth. Add to that, the human factor with settlement in space.

It can be argued that the legal frameworks for space formed so far, have focused on *technologies* and to a reasonable extent formed as they were needed. But as the European Science Foundation (ESF, 2013) has persistently raised – and what this dissertation aims to argue – with private space exploration just around the corner, what about the *humanities*?

4.6.2 Private versus Public Risk and the Precautionary Principle

From the outset one of the main reasons to conduct the research, was to study the consequence between being sent into outer space on behalf of a government as opposed to a private entity – and whether society is equipped to develop a governing structure to manage the difference in these risks. Indeed, the findings validated with wide consensus that 'yes' there is a clear perceived distinction in public versus private risk, especially when looking at types of risk, such as risk of bankruptcy thus stranding global citizens in space, whereas levels of radiation (which rather bears the traits of a hazard) naturally would be the same, no matter the launch entity. This observation was accompanied by the acceptance and suggestion from the key informants that sovereign states assembled under the UN would still be the right body to govern these risks. It could be through traditional or hybrid governance constellations, all depending on the particular area of risk. This was substantiated by the literature review under Article VI, OST, obliging states to authorise national space activities, hereunder licencing (UN, 1967).

This means that even if there is a distinct difference in the *type* of risk that may be encountered, for governance purposes they would fall under the same regulatory

framework. The distinction here, is that the risks of *humans* in outer space, as suggested also by ESF (Lukaszczyk, 2008: 50) is vastly different and far more complex than *robotic* missions into space, such as the 'Curiosity' Mars rover mission (NASA, 2015). Nonetheless, given the international governance framework is developed under the United Nations, it is envisaged to cover both types of risk, regardless of a private or public launch entity. As the consensus from the findings support this structure, the analysis will embrace this conjecture.

Wynne poses the ever relevant question, of whether collective participation can keep the pace that decision making in complex advanced technology demands, and if not, who deserves priority? What is the appropriate balance between process and product? (Wynne, 1978: 349-351). Or perhaps in this context it is better framed as: 'what is the appropriate balance between process and *progress'*. The answer continues to puzzle. One side asserts that historically progress has been favoured in what can hardly be described as a balanced debate, albeit with more and more strains of a reflexive collibratory approach (Hood and Jones, 1996: 206). Nonetheless, when reflexivity is both limited *and* late, even if providing at least the differing viewpoints a chance to be heard, it is only a matter of time before it will be drowned out by the capitalist stampede (Weber, 1930: 57). Meanwhile, the camp in favour of progress interprets the same reality with impatience and almost disdain for an apparent lack of vision for progress. Which may seem unfair, as they are more likely to have political influence to further their agenda.

There is a balance to be struck here. Ethical and moral guidance need to be inherent within the governance framework, but not to the extent that it stifles progress. Progress and conscience *can* advance together. Even Ralph Nader agrees with this - that we can have both technical capacity and maintain the moral imperative (Nader, 1965: 281). The key will likely be found in the propensity to accept risk (Adams, 1995: 15) in what is likely to become a collective application of the *precautionary principle*, or as dubbed by some environmentalists 'trial without error'. The biggest concern is that it ignores the most dangerous source of error; the unexpected (Wildavsky, 2000: 23). In relation to space exploration, that is a considerable factor. The difficulty rests within reaching consensus on if or when catastrophe strikes. While one side wishes to stop the experiment, the other is pushing on to see what might be learned from pushing ahead.

The question is, which bias is the safest? (Wildavsky, 2000: 23). Safety comes from use, with pioneers suffering the costs of premature application. For the most part, technologies become safer over time, and needless to say the second generation cannot learn from the first generation, if there is none (Wildavsky, 2000: 35).

One might wonder if the sense of urgency to initiate private space activities, partly is motivated by the creation of a 'life-boat' for humankind (Davies and Schulze-Makuch, 2011: 10), but also partly by wanting to go 'under the radar' and mobilise the mission before the international debate attracts too much attention[5] (Westenberg and Ortner, 2011: 330) and thereby spur political procrastination. It is comforting to note, that this view point is not widely supported by the majority of the industry, which was articulated by space experts during the interviews as well as in the industry literature (Larsen, 2015; Lukaszczyk, 2008), who do not wish for a new wild west.

Naturally, also from a collibrationistic viewpoint, such an approach would be concerning, as according to Beck (1992), one of the elements that will ensure a continuous reflexive society, is exactly the element of a strong balanced multi-facetted debate. This dynamic tension is needed to govern these decisions as we fare into unchartered territories, be it gene-technology, nuclear utilisation or private exploration of outer space. In addition, this view point could undermine the credibility and reflect poorly on the entire industry in its seemingly deliberate renegading of the spirit of the international governance system under the United Nations, which, despite being ideological, is considered the most suitable foundation currently in existence.

4.6.3 Social Learning in an Adolescent Risk Society?

The social cognizance of the complexity of space activities is growing exponentially. We all agree that it is important. COPUOS acknowledges the increasing demand for regulatory structures (COPUOS, 2010: 7), while the European Science Society cautions that space law 'will become urgent' (Lukaszczyk, 2008: 50-52). Then why doesn't the European Space Agency have a department to deal with humans in space? Neither from a natural science nor a social science point of view. More understandably

[5] Note, these are not the viewpoints of Mars One but from independent ideologists in support of human colonisation of Mars.

perhaps, neither does the Royal Society, UK, which has otherwise been known to provide scientific and ethical guidance the public with the development of new technologies. Why is it not gaining traction? Or is it that we are conditioned to be looking for a Kuhnian revolution of paradigms (Kuhn, 1962), for one to collapse, for another one to emerge? Could it be that the 'softer' social sciences indeed are moving forward, but compared to technology developing at neck-breaking speed, and governance moving at a notoriously diffident stride, it has simply not been possible to detect the modest advance of the social sciences? All going to plan, there are still ten years until Mars One will have 'space activities'. In relative 'space years', that is right around the corner.

Determining whether society is equipped to govern this development, an indicator is whether social learning is taking place. It has been established both in the literature review and survey findings that only limited reflexivity seems to be occurring. In fact, limited reflexivity and collibrationism was one of the outcomes most clearly expressed in the survey. This is unlikely to change, as the polarised debate is rooted in extremely opposing ideologies with very little middle-ground, being either passionately for or against opening up space. Add to that, the natural bias towards progress driven by aerospace industry resources and political influence.

Even if there is a public debate, it is not perceived to be transparent, nor balanced. In the case of Mars One it is experienced to be more of a multi-way communication with an either deliberately risk averse demographic, or one that is ignorant of the real risk, than that of an informed debate. Some key informants expressed reservations towards any actual *substance* within the Mars One campaign, and the disclosure of the real risk of dying en route or prematurely from radiation, raising serious concerns of the ethical issues even if it was only a publicity stunt, while others expressed their respect and support. Based on the observations and findings, it can be argued, that the debate – or the media attention on the topic – is not a balanced, informed dialogue by a long shot. Nor is it prioritising to communicate the risk. Au contraire.

It can also be argued that the topic of a one-way mission to Mars is not really what is being discussed or promoted in the public domain. It is rather the contemporary phenomenon that private space exploration *is* possible. It is within reach for anyone – not only a cosmic elite. It is an expression of technological advance forging its way ahead,

not only symbolically loaded (Wynne, 1978), but perhaps even symbolically *saturated*. Mars One represents not only a nimble Dutch non-profit enterprise, with a vision to settle humans in outer space, but also whether society has the right and the prowess to do so; and as it would appear, ruffling a few feathers in the process. In a contemporary late-modern industrial risk society (Beck, 1992), driven by a collective degree of adolescent immaturity and individualism (Dickens and Ormrod, 2007), the collective signature of the contemporary phenomenon will be heavily biased in favour of progress. Add to that, the element of capitalism through the broadcasting rights to a TV reality show or through extraction of minerals as auxiliary activities, risk is *bound* to be accepted in the name of the greater good, likely under the precautionary principle. In this culture and at this time, it would seem that the establishment is lagging behind, while a nimble private industry is pushing ahead.

Not attempting to reignite the nature versus nurture debate, it can be argued that Mars One is a product of its time – not the other way around. A small non-profit foundation, which mobilised 202,586 future astronauts overnight. But 202,586 adventurous, risk averse, receptive individualists needed to exist. 202,586 people for whom the idea of leaving Earth, never to come back, seemed a reasonable proposition. One cannot burden Mars One with that. Never mind commercial or technical viability, Mars One has tested and proven their concept for *social viability*. If anything, Mars One leveraged the *convergence* available to them. This includes a technological convergence and accessibility through the privatisation of the aerospace industry (Stuart, 2014) as well as convergence in popular culture saturated with social media, multiple realities, sci-fi, influential celebrities and early adopters signing up with Virgin Galactic for brief sub-orbital flights. Mars One both uses it, and forms part of the texture of the 2015 contemporary society. So far without much competition.

Building on the theories of adult infantile narcissism (Dickens and Ormrod, 2007) and technological adolescence (Mitchell and Staretz, 2011) and the dynamics unfolding in the symbolically loaded debate, a budding concept of S*ocietal Self-Esteem* may be emerging. Societal self-esteem is the idea that the collective culture has a life of its own, a value system with a consciousness. One that thrives in the reflexivity of the risk society, perhaps even outgrows its transient anxiety (Beck, 1992). It is the sum of all

what all individuals are doing. It is closely linked to social learning theory and the dynamics unfolding in a heavily symbolically loaded debate, in this case heavily stacked in favour of the NewSpace agenda.

It can be argued that, to some extent, select demographics are afforded more influence to the collective narrative, which in turn becomes a testament to societal self-esteem. The voice and consciousness of an era. For instance when 202,586 members of the general public – in this case, many of whom are well-adjusted, well-educated younger people from western industrial societies - are seeking to leave the surface of the Earth, never to return. The question is, what does that say about the current state of society, if anything? It seems that the development of a collective maturity or a common self-esteem is the natural progression. One that would guide the social and technological evolution consciously, hopefully towards stability with less risk of self-destruction.

Thus it is argued that elements of social learning are unfolding, although this time, the tables are turned. This time it is the public – represented by a small group of enthusiasts – either in favour of space progress, or the more cautious flank who advocates for establishing a common platform, in unison pleading for the establishment to catch up. In this sense, Mars One – along with its contemporaries – be it for or against, is spearheading the discussion, compelling it to become part of the strategic priorities within the establishment. This follows the Wynne tradition of social learning, and it is suggested here that the collective *voice* that is societal self-esteem, which ever its intonation, is what is driving the heavily symbolically loaded public debate. This time from a nimble vantage point, spurring on the establishment to catch up, which in a way is 'reverse' social learning, in that typically technological progress has been spearheaded by science and experts (Wynne, 1978). This time however, the 'layman' is in the lead, shaping the agenda, be it motivated by adventure, escapism, seeking a sense of purpose or simply predestined evolution.

CHAPTER FIVE – CONCLUSION AND RECOMMENDATION

5.1 Governance, Risk and Social Learning

The research set out to examine whether a reflexive social learning process (Wynne, 1978) is taking place in Europe, by investigating to what degree society is equipped to develop appropriate governance systems to guide our behaviour as human beings in outer space, and what are the consequences of being sent into space on a one-way ticket by a private entity as opposed to a government.

Early in the analysis, it was established that ethics and morals are inherent in governance (Plato, 2004), in that legitimised social control (Dean, 2007), a voluntary code of conduct both politically and socially, permeates communities and souls (Foucault, 1982: 790). On this base, the review found that indeed, a governance framework is in place represented by the United Nations 1967 Outer Space Treaty.

The current legislative framework under the Outer Space Treaty, was written in a different time and outlines the intent of a harmonic collaboration based on ideals we have not been able to uphold on Earth. Along with the Moon Agreement, these overarching principles are based on an ideological premise of international peace collaboration and equal global distribution of wealth. However, this does not resonate with the reality of living in a reflexive late-modern industrial society (Beck, 1992) by and large driven by capitalist interests and financial sustainability. This was corroborated by the research findings, which confirmed that, the governance *foundation* seems robust even if it is ideological, bordering on the collectively naïve.

The concern, therefore, is how to operationalise this robust treaty, without losing the heart and spirit in which it was written, while harnessing the technological progress and tenacity. Perhaps the concentration is too much on the material at hand and a whole different level of abstraction is needed in order to tackle these themes: one that has evolved to capture the technological prowess as well as the human and spiritual factor. Suffice to say, although the current regulatory framework and the treaties developed under the UN Committee on the Peaceful Uses of Outer Space, may not be an ideal solution, for the time being, it represents the highest level of international consensus.

With the introduction of new major parameters: i) private space exploration and exploitation (e.g. mining); ii) global allocation of capital generated in space; and iii) humans in outer space, possibly as permanent settlers; the legal and social infra-structure and society's capacity to *grow and learn* will have to go into hyper-drive if it is to catch up with the standing of the technological potential. We may still have decades, if not a century. We could also wake up tomorrow and realise that the long wait is over.

Therefore, it is comforting that institutional inter-governmental self-imposed hybrid legislatory regimes have been developing as they were needed in relation to technological progress and international collaboration in space. Occasionally with a creative, but sound interpretation of the UN framework in the collective interest of progress. This is an important indicator, in the question of whether society is equipped to develop suitable governance frameworks when it comes to humans in outer space.

Therefore, given that the foundation, principles and diplomatic infrastructures are available, in theory, society is equipped to develop suitable governance frameworks for humans in space. In reality, it is doubtful. Or at least doubtful that it will occur in time.

Timeliness is not so much associated with the potential annihilation of the world as we know it, contamination and depletion of resources (Beck, 1992), for which we may have another 1,000 years (Hawking, 2014), but rather associated to the ramping technological progress within space exploration. It is not unlikely that within a decade or two, technology will have resolved any outstanding obstacles to send humans on what could conceivably be a one-way trip to Mars, at least initially. Ethics aside, there are compelling technological reasons to start with a one-way trip. No doubt, the first generation going would be taking far greater risks, than the generations that will come after them (Wildavsky, 2000). But that is often how evolution works.

The research found that whereas there is a distinct *perceived* difference in the *type* of risk encountered whether sent into space with a private entity or a government, they would fall under the same regulatory framework, and social protection would be provided through state licensing. Although this to some extent satisfies the aim of this particular research, certainly, it is sensed that there is plenty of scope to further

research the difference in private and public risk in outer space, and expand existing theories in this area.

As with any new technological advancement, to maintain a stable development, it is important that society and its risk frameworks are developing at the same pace. Ideally, guided by a reflexive social learning process (Wynne, 1978). The research found, that indeed a social learning process is taking place heavily symbolically loaded (Wynne, 1978). The level of reflexivity however is modest, and not surprisingly, heavily biased in favour of progress. The advancement of this ultimate frontier is unlikely to be slowed down due to the ethical deliberations of a conscious public, especially with the limited collibratory strength. At best, the precautionary principle of deploying mitigating measures, while accepting enormous and unknown risk will be applied. One can hope it is prohibitively expensive, but if it is technically feasible, eventually money will not be an issue. Even if Mars One does not raise sufficient funding by their milestone deadlines, this does not mean that another entity will not.

The research also detected a reversal of the roles, in the sense that traditionally scientific experts have been in the lead, communicating with the public with varying degrees of authority. This time, however, it would appear that a small demographic from the general public is taking the lead. Whether progress is spearheaded by a cosmic elite (Dickens and Ormrod, 2007), early adopters or a nimble renegade space foundation, motivated by escapism or the Columbus-myth with a promise of adventure, is less important. The substance that is generated is not.

The 2007 ESF Humans in Outer Space project, elevating the social sciences onto the space agenda, can be viewed in its own right as an attempt to vanguard society towards a future, which will hold humans in outer space. Although these activities may be only a decade away, a long-term visionary approach is required to mobilise support. Perhaps the project was premature, as it did not yield the results and find the support it had hoped for. This is concerning.

Meanwhile, European sovereign states such as the Netherlands are hosting ventures such as Mars One. Within a legal framework leaves ample ambiguity in determining the ‘appropriate state’ for licensing and authorisation.

Well-intentioned visionary scholars faced numerous challenges in elevating the humanities onto the public space agenda most likely for two reasons. One, it does not offer a tangible, viable financial proposition, therefore it is not sustainable in a capitalist society and two, it is not sexy. You cannot sell it. Or at the very least, it is a hard sell. Whether we like it or not, and whether there is cringing, tongue-in-cheek or mild admiration, all bottled up in good old-fashioned hypocrisy, Mars One with their sleek design, media-savvy and let's face it; sex-appeal, may be what is needed to elevate the humanities – if not into outer space - then at least back onto the international agenda. Perhaps this is their role; that of ***vanguard***. In that light, it is not important whether they make it there or not, but that they pave the road for the ones that will.

ANNEX I: ABBREVIATIONS & ACRONYMS

BRIC	Brazil Russia India China
COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
EC	European Commission
EEAS	European External Action Service
ESA	European Space Agency
ESF	European Science Foundation
ESPI	European Space Policy Institute
EUREC	European Network of Research Ethics Committees
GDP	Gross Domestic Product
HDI	Human Development Index (UNDP)
HiOS	Humans in Outer Space
IISL	International Institute of Space Law
IONS	Institute of Noetic Sciences
ISCOS	Institute for Security and Cooperation in Outer Space
ISS	International Space Station
NASA	National Aeronautics and Space Administration
OECD	Organisation for Economic Co-operation and Development
OST	United Nations 1967 Outer Space Treaty
THORP	Thermal Oxide Reprocessing Plant
UNOOSA	United Nations Office for Outer Space Affairs
WFP	United Nations World Food Programme

ANNEX II: RESEARCH QUESTIONNAIRE

INTERVIEW QUESTIONS/SCHEDULE
KEY INFORMANT

GOVERNANCE IN OUTER SPACE

Social Learning governing ethical and moral standards of behaviour in outer space

Technically it is feasible to send people to Mars. It is unlikely that any government or consortium of governments will commit the required funding for what would be a two-way trip. Meanwhile, private one-way colonisation of Mars are well underway with plans to establish a manned mission to Mars by 2025 (Mars-One.com).

1. Do you consider the current legal framework under the 1967 UN Outer Space Treaty an adequate and sufficient foundation to govern the current development in private space travel and exploration?

2. Do you consider the ***risks*** from *private* colonisation versus colonisation facilitated by a *government* are any different from each other?

3. In relation to space exploration – private or governmental - what do you believe are the biggest influencers on governance in contemporary European society?
   a. Politicians
   b. United Nations Committee on the Peaceful Uses of outer space (COPUOS)
   c. Global Society
   d. Academia
   e. The Aerospace Industry
   f. Ethical Institutions – which ones?
   g. Interest groups/associations – which ones?
   h. TV/Media
   i. Celebrities / Early adopters
   j. Social Media; Facebook, Twitter, etc.
   k. The public in general
   l. The public exercising their democratic right of voting
   m. Other. Please specify:

4. Mars One (http://www.mars-one.com/) aims to send people to colonise Mars in 2025. What do you see as the biggest:
   a. Risk
   b. Showstopper
   c. Opportunity
   d. Duty
   e. Responsibility

5. In your opinion, is the European society equipped to competently engage a *balanced* dialogue surrounding the modern dilemmas surrounding private space travel and colonising Mars? Is it polarised or is there a middle-ground?

6. In your opinion, do we have a mutually valued exchange of views of the opposing views of organisations in relation to private space exploration?

7. If private interplanetary colonisation goes ahead:
   a. Is the composition of the first crew accountable to mankind, or only to the private entity that sends them?
   b. Do we as mankind remain accountable to them?
   c. Would the composition of the crew in any way represent or bear witness to the current state of our civilisation (societal self-esteem)?

8. For other new areas (i.e. stem cell research, cloning, artificial human enhancement), do you feel we as a society have been able to provide sufficient governance, legal frameworks and regulations?

9. Envoys of mankind
   a. Astronauts are regarded as 'envoys of mankind' in the Outer Space Treaty. Bearing in mind extensive testing and vetting of applicants for Mars One, is the additional element casting of a reality TV series compatible with this purpose?

10. Would you like to add anything?

Thank you very much for your participation in this interview. Your contributions are truly appreciated. For any questions, please do not hesitate to contact me.

Dorte Jessen
Dortejessen@hotmail.com

ANNEX III: CONSENT FORM

Informed Consent Form for Research Projects

Dear Sir/Madam,

You are invited to participate in a research study conducted for the Master of Science Risk, Crisis and Disaster Management at Leicester University, UK. As part of my dissertation process, I am conducting a research project examining whether society with its existing ethical committees and framework, is equipped to develop ethical and moral standards to govern our behaviour as human beings in outer space.

I would like to learn of your views on the subject, which will involve reflections in relation to private space exploration, the perceived risks and opportunities in the wake of these endeavours, particularly with relation to the modern ethical dilemmas emanating from the consequences of being sent into space by a private entity as opposed to a government.

Any views expressed would be given in confidence, and any quotes would be anonymised and used solely to conduct, publish and disseminate my research. The information obtained will be stored securely and will under no circumstances be shared with any third party. The data will be destroyed after 3 years. In the event that I would like to use this data again for a different research project or I would like to keep the data for longer than this 3 year period, I will contact you again to ask for your additional consent for this. It is important to note that you can withdraw from the research at any time.

For any questions concerning this process, please contact: dortejessen@hotmail.com.

Yours sincerely,

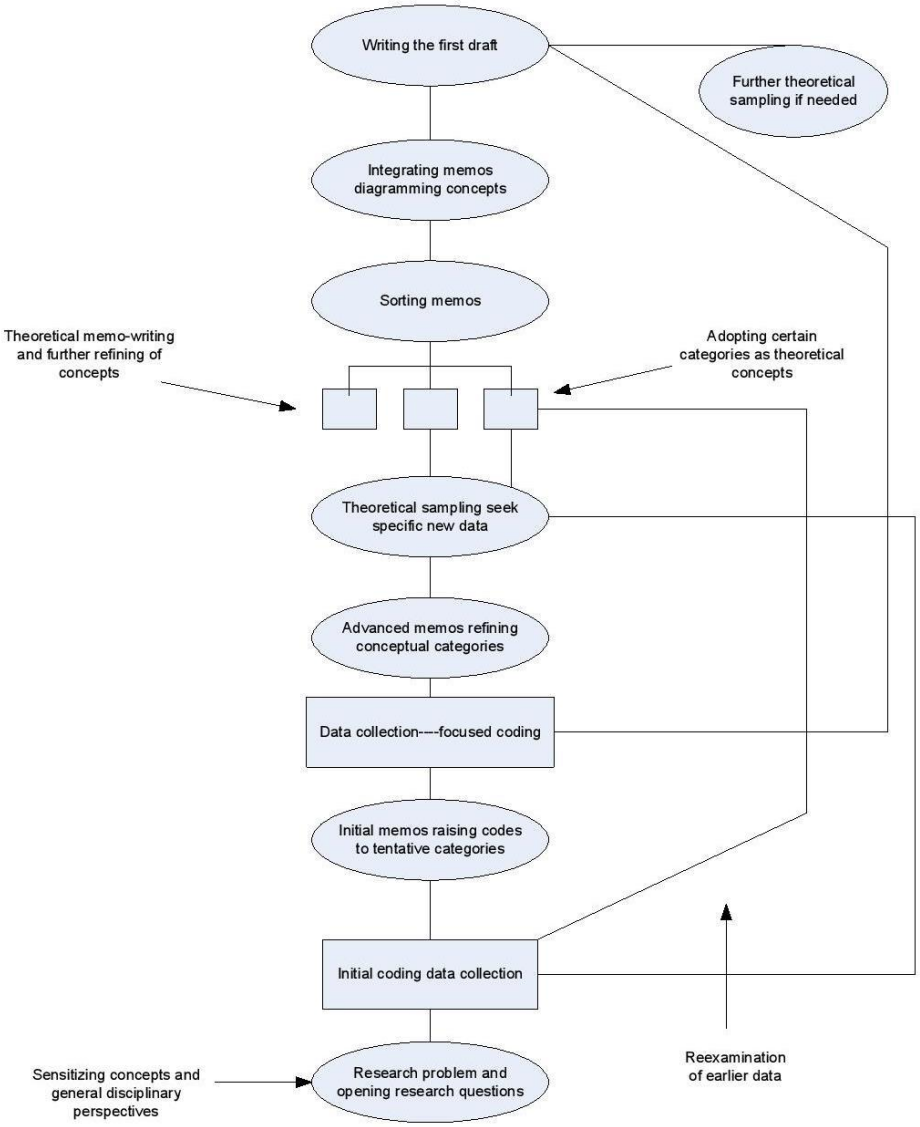
Dorte Jessen

I agree to participate in this research on the basis outlined.
Signature: _____ *Date:*

Print name of interviewee _____

Print address: _____

ANNEX IV: GROUNDED THEORY DIAGRAM



Source: Charmaz, K. (2006) Constructing Grounded Theory: *A Practical Guide through Qualitative Analysis*, London: Sage Publications.

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