UNIVERSITY OF TRENTO

DEPARTMENT OF INFORMATION ENGINEERING AND COMPUTER SCIENCE

ECONOMICS AND MANAGEMENT

Innovation & Entrepreneurship

Final report

TESLA VS EDISON: WHO WILL SAVE THE HUMANKIND?

Davide Bertolini, Tomas Bortoli, Chaudry Muhammad Hassaan, Giulia Corsi, Charles José Ferrari, Sara Gasperetti, Matteo Grossele, Natália Réka Iványkó, Subhankar Roy, Oleksandr Shyvakov, Davide Todeschi and Bereket Abera Yilma

ACADEMIC YEAR 2015-2016

Executive Summary

- This paper summarizes the work performed during the "I&E" course by two different teams that were asked to engage in a funny battle (following the British parliament style) related to a what-if scenario loosely based on the historical Tesla vs Edison diatribe, but projected in a futuristic environment we should explore.
- First we defined the context and the constraints of the battle field (the common ground from which everything originated), then the view of each team, emerged during the course of the battle, has been presented.
- Faithful to the event of the past, the Tesla team depicted his hero as an explorer which solved all the issues being inventive and creative. Some of his old inventions (i.e. Teslascope and Tesla's coin) were revamped, while other specially developed (i.e revolutionary spacecraft).
- Edison team, instead, centered his vision around the "exploiter" feature of their hero highlighting both his ability to create a community of scientists that yielded exceptional results (i.e. braincorder, human cloning) and his leadership skills which led him to be the commander in chief.
- After the battle, the teams were required to merge the two stories into one that could critically analyze the previous steps. Predictably the two views were both biased, partial and not really plausible: the truth lay somewhere in between. In order to reconcile them, a new fair tale which tries to give a more plausible view of the facts has been invented.
- In the end, analyzing the overall work, we found out that the battle was mainly characterised by three topics: the cognitive dissonance, the suspension of disbelief and the counterfactuals.

Contents

Chapter 1

Introduction

Thomas Alva Edison and Nikola Tesla are on the highlights and central scenario of the most innovative and creative minds the world have ever seen. Seeking for the human kind, both worked hard on developing energy facilities that compose our everyday life nowadays [TC93, Ash66]. On the front line of the industrial revolution, Edison and Tesla were working basically on a cold but thrilling war, where inside their labs on every day new discovers and new patents were registered [Ash66]. If the war itself was not enough, on this paper something else will be presented for the seek of the innovation and entrepreneurship.

After a while, in 2015, the "FPC" Conference about global warming, dealing with its duties, decide to make public and official the inevitable news: the global warming is about to transform the Earth on an impossible environment for the human being. For solving this, in agreement with the global state's headers, they decided to bring Edison and Tesla back to the world. In 2019, for the first time, the Stockohlm Royal Academy gave the Nobel Prize to two people at the same time, Edison and Tesla, in order to recognize their efforts for the Mars colonization. In 2054, the first machines arrived in Mars to start creating the new environment for the human beings, where in 2078 the terraformation started and originated the environment capable to support and assist human life.

Mars colonization and terraformation are not a new discussion on the planet: the organization Mars One [19] is already studying possibilities of Mars Colonization since 2011. The scientist David Warmflash, for instance, already discussed about these challenges

and even further, bringing new possibilities to it, for instance, the moon colonization [20]. Using Warmflash explanation, we can see that, besides the expensive transport of materials to Mars, new problems can be presented for its terraformation, for example, the cosmic radiation and the 100 times more rarefied atmosphere [20]. Even further, beside these challenges, it can be necessary to unfreeze the poles to obtain carbonic gas and build a new atmosphere in order to create the greenhouse effect and warm the poles. Another possibility, more confortable for the humans, could be the suggestion of O'Neill in 1976 known as O'Neill Cylinder [O'N74], in which the scientist, during a work with his students, suggested the creation of a big structure composed by two big cylinders that spin in different directions and could reproduce the Earth atmosphere pressure on space, creating a possible and confortable environment for human beings.

Chapter 2

Battle field and constraints

We are in the year 2098, the world is coming to an end but we are ready to live in Mars thanks to Thomas Edison and Nikola Tesla. How could this be possible? It will be answered by the independent stories of the two groups according to the following constraints, time frame and some common ground rules.

2.1 "The greatest way to predict the future is to invent it"

Despite the fact that we never know what happens in the future we might get a pretty good idea predicting it using some imagination. According to Alan Key [13], thinking out of the box and changing perspective on things help us in making progress. This is a battle in a futuristic scenario. And this battle is about coming up with a reasonable and more sound predictions about the future given some predefined constraints and ground rules.

2.2 World's Timeline

2015: Global warming is primarily a problem of too much carbon dioxide (CO_2) in the atmosphere which acts as a blanket, trapping heat and warming the planet. As we burn fossil fuels like coal, oil and natural gas for energy or cut down and burn forests to

create pastures and plantations, carbon accumulates and overloads our atmosphere. At the "FPC" Paris Conference on global warming, it was announced that a great part of Antarctica's glaciers would melt faster than expected, causing current landmass to be submerged by 2100. Nikola Tesla and Thomas Edison's clones, genetically reconstructed by an Icelandic team, were resurrected as their 25 year old selves, and the world looked at them to fix this crisis.

2016: After a meeting between the world's heads-of-state, an international competition was launched to find a suitable way of colonizing Mars. Tesla and Edison decided to partake in the confrontation aiming to come up with a viable plan for the survival of the humankind.

2029: For the first time, the Stockholm Royal Academy awarded a Nobel Prize to two people: Thomas Edison and Nikola Tesla. The prize was entitled to "The two people that contributed in a strong and positive way to ideate how Mars could be colonized for human life".

2054: Machinery to produce energy and water were sent on Mars to create conditions for future terraforming.

2078: Algae and plants were sent on Mars to start the terraforming process.

2098: A portion of Mars' surface is now terraformed, and would be ready to be colonized. Who, between Edison and Tesla, made the strongest impact in this journey?

2.3 Common ground rules

The two stories have to respect the following rules:

- Faster-than-light travel is not possible.
- Tesla and Edison's resurrection was a one-of-a-time event, and it cannot be replicated.
- Worldwide, 2015-2098 was a period of remarkable stability. No wars happened in this timeframe.

2.4 Rules of engagement

Given this facts both groups tried to come up with a plausible story to terraform and colonize Mars. Even if we are simulating a futuristic scenario in the stories, both groups agreed on using facts from the past to make their stories plausible and add credibility. And the battle field was set in a way that both groups were given fifteen minutes to tell the stories they came up with and afterwards debate over the implausible facts of other group's story.

Chapter 3

Edison view

This chapter narrates the story of Edison, a business man that was able to reach and terraform Mars in a short time, from 2015 to 2098.

3.1 "Genius is one percent inspiration, ninety-nine percent perspiration"

"Believe you can and you're halfway there."

Thomas Alva Edison, arguably the greatest inventor the world had ever seen, believed that he could save humanity from the claws of Global Warming and how he succeeded is a tale which would be left as footprints on the sands of time. In 2015 the scientists announced that Earth will no longer be habitable by the turn of the 22^{nd} century as the glaciers of polar caps would give way and our home planet will be underwater. To save humanity from this catastrophe an Icelandic team resurrected one of the greatest minds of the previous century – Thomas Alva Edison. While the fate of humanity was hanging by a thread, Edison was eventually instrumental in saving us in the hour of need and the story is no stranger than fiction. We had no option but to colonize our twin planet but colonizing Mars was not a child's play. Though called a twin planet, the conditions on both these planets were poles apart. Hence, taming the harsh condition on Mars was extremely challenging.

The first significant leap of mankind took place in 2020 when he came up with the breakthrough invention of "Braincorder", a device which could record one's own thoughts. It

gained immense popularity and it was owned by every other person. Braincorder was invented by Edison by keeping a big picture in his mind as he realized that *saving-the-world* mission is not a one man job.

Figure 3.1: Braincorder filtering

He manipulated the system such that he had a backdoor access to all the thoughts that were recorded by these devices. His complex algorithm was able to filter out all the thoughts of the physicists, meteorologists, engineers, mathematicians and computer scientists, whose efforts combined, could have the solutions to the equations of life-on-Mars. By 2024, Edison established an academy called ERA (Edison Research Academy) where a team of scientists worked towards a unified goal of terraforming Mars. In 4 years Edison was successful in putting all the pieces of jigsaw puzzle together and submitted the prototype of Mission-Mars which earned him a Noble Prize in 2029.

3.2 How to reach Mars

Transporting humans to Mars on space shuttles was clumsy and dangerous. At the same time it was very expensive. Moreover it was risky to expose the humans to the unknown and untested Martian environment. Edison believed that all human lives were precious so he worked with his team on the idea of saving as many humans as possible. Following a lot of brainstorming he came up with the revolutionary idea of recreating life on Mars thanks to Mind Uploading/Downloading [5].

Figure 3.2: Mind Uploading/ Downloading process

This is a process of copying mental content (including long-term memory and "self") from a particular brain substrate and copying it to a digital storage device. An individual would upload his consciousness and mind to a digital drive and his counterpart on Mars would be able to download the same. In other words, life was shifted without being physically transported over 34

million miles. The human clones that would be developed on Mars resembled their former self because of the same DNA they received. The DNA was teleported from Earth to Mars which ensured safe, secure and complete data transfer.

3.3 Challenges in Terraforming Mars and their solutions

Atmosphere on Mars: [MZ93] Life wouldn't be possible without the presence of atmosphere. Hence, it was very essential to replicate the earth-like atmosphere on Mars as well. Mars had very low gravity as compared to Earth, almost 1/3 to that of Earth and Mars had no magnetosphere. So, strategies were developed to address the following challenges:

Figure 3.3: Life on Mars

1. Building up an atmosphere on Mars.
2. Keeping it warm.
3. Keeping the atmosphere from being lost to the outer space.

The solutions that were proposed were:

1. Carbon Dioxide Sublimation: The composition of Mars' atmosphere was 96% CO_2, 0.145% O_2. Hence, the easiest way to survive was to sublime the CO_2 present at the poles which would create an atmospheric pressure of $30KPa$. This being over the Armstrong Limit, it eliminated the need for pressure suits.
2. Importing Ammonia: Importing ammonia from nearby planets (Titan-Saturn's moon was full of N_2) which had frozen ammonia. Since, NH_3 is mostly nitrogen by weight, it could supply the buffer gas for the atmosphere.
3. Importing CFC: Sending rockets with payloads of compressed CFC, which was a better greenhouse gas.
4. Use of orbital mirrors to direct the sunlight to melt the polar ice caps.

5. Recreating Magnetosphere [10]:
   (a) Launching a lot of aligned ferromagnetic dust into the atmosphere.
   (b) Putting a lot of ferromagnets on the ground pointing "north" at strategic locations.
   (c) Martian soil was full of iron oxide. Machines were to be built to magnetize the soil.

Shifting Life: [6] A new species will be genetically manufactured with the following features:

1. It could breathe in CO_2 in more amount than the normal humans could. Hence, it would reduce the dependency on Oxygen.
2. It would have reduced body metabolism.
3. Would have stronger bones and muscles to compensate for the reduced gravity.
4. Would have the ability to download minds/thoughts from their former self.

The new species of humans were more agile and able to survive in the new environment, which the normal humans from Earth never could.

Energy: Energy is a quintessential need for a civilization. Sustaining life was impossible without the energy sources. Harnessing energy was a huge challenge for the scientists but they came up with the following solutions:

1. Radioisotope ThermoDhaelectric Generator (RTG): It worked on a simple principle – electric energy is produced when two dissimilar electrically conductive materials are joined in a closed circuit and the two junctions are kept at different temperatures. Such a pair of junctions is called thermocouples. The thermocouples use heat from the natural radioactive decay of Plutonium 238 to heat the hot junction of the thermocouple and use the cold of the outer space to produce low temperature at the cold junction.
2. Solar Energy: Space based solar energy collection and microwave beaming for the baseload power. They were not affected by dust storms. It involved large panels of solar cells in Mars' orbit and beaming the power to Mars.

3. Wind Energy: It had several advantages:

   (a) Less gravity : Less massive components.

   (b) Low atmospheric thermal inertia: Producing consistent wind patters.

   (c) Large temperature and pressure swings: Producing high winds.

Water: [4] Sabatier system was devised to solve the drinkable water problem on Mars. It used a catalyst that reacted with CO_2 and H_2 to produced methane and water. H_2 was abundant in outer space and CO_2 is also abundant in Mars. Hence, there were no shortages of the core ingredients.

Real time Communication: [14] There was a delay in communication of about 3-20 minutes between Earth and Mars. Real time communication between these two planets was mostly implausible. Edison developed the mechanism of "Teleportation" which could transmit packets of information from one place to another without having to travel the space in between. Thus, large amount of information could be send in a matter of seconds. Cases of communication blackouts, ranging from few weeks to months could be avoided. It enabled real time control and manoeuvres of robotic precursors which helped in locating resources and finding the perfect habitat for colonization.

Agriculture: [7] Presence of water and algae helped immensely in transforming the terrains of Mars augmented by artificial atmosphere. Seeds that were transported, were cultivated by the robotic droids sent to terraform Mars. Since NH_3 could be imported from the neighbouring planets and various microorganisms produced methane, manure and fertilizers were not a concern. All the factors combined together facilitated adequate vegetation for a civilization.

All the plans were put to plan when the real implementations were carried out in the later years. Against all the odds, things started falling in places and his plan was successful. By 2098 Mars became habitable for the new humans. As it drew curtains for life on Earth it was a new dawn for mankind on Mars. Life may never give you a second chance but Edison did.

Chapter 4

Tesla view

The following sections describe the story about what happened from 2015 until 2098, and it is enriched with all the explanations needed to prove that what we sustain can be true.

4.1 "I don't care that they stole my idea, I care that they don't have any of their own"

The story takes place in 2015 when the melt of Antarctica's glaciers was announced and two of the most important minds in history, Nikola Tesla and Thomas Edison, were cloned to solve the problem. During the first year after the cloning, both of them started retaking their place in the new world. Edison, as an entrepreneur and a good economist, spent the year building up a new company, bringing together scientists from all the world. Tesla, first of all, recognized that to be an innovator in step with the times and with the new technologies he needed to improve his knowledge. In order to do this, he spent the year immersed in full-time studies, visiting laboratories and discussing about science with colleagues. In 2016 the international competition about colonizing Mars was launched. Tesla, as an explorer of the unknown, started working on visionary and innovative ideas like he had always done in the past. In fact also in his century he came up with such good and revolutionary ideas that he was able to break all the previous standards. It happened in the case of DC (direct current) and AC (alternating current), when the actual standard for street lighting and factories was

the DC patented by Edison. In that case, Tesla's AC motor invention was such a better innovation that it broke the lock in made by the previous standard and became the new way for energy transport [8, 12]. The working field of Tesla in the nineteenth century was a good base to come up with new ideas. His last inventions were about biplanes that could raise and lower vertically (the modern helicopter) [17] and stuffs about magnetism propulsion, communication with other planets with the so called "Teslascope" [2], and lasers. Edison, on his side, was not prepared as well. He spent the last part of his life being the manager of his companies. Then, since he was not interested in DC anymore, he left the electric power business and cinema and cinematography became his major interests. With this background, Edison just relaunched the competition to his employers while he was managing them. Since all of them had different ideas, they flew into complete anarchy and started looking at Edison to have a strong idea to follow, the vision of the company: he had been cloned for this, not to hire people to do that. But Edison was too attached on his economical way of thinking and he did not want to take such a big risk in innovating an unknown environment in a permanent way, so he remained stuck in trying to modify already existing machineries, shuttles, space capsules and modules making money out of them. Tesla knew that a permanent solution was necessary, and that humanity would not have accepted to live under a dome forever. People don't want to be alive, they want to live. There was just one solution: terraforming Mars. But first of all there was one problem to solve: how to reach Mars.

4.2 How to reach Mars

Tesla came up with a very revolutionary idea for space travels. On the basis of one of his previous researches, the Tesla's coil [15], he used the coilgun acceleration idea in order to launch shuttles to Mars, using just magnetic acceleration and electric power (AC current) generated by the coil electromagnets. With this technology it would have been possible to send shuttles to Mars and come back using no fuel and just clean energy sources. This was also important for Mars that is plenty of CO_2 and does not need an increment of this gas in

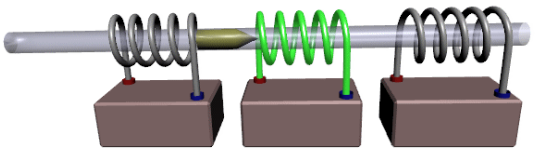

Figure 4.1: Coilgun

its atmosphere. Tesla had the great idea, but he needed an investor. In this moment a new person took place: Elon Musk. Musk was a living millionaire and he was at the head of Tesla Motors [9]. He had a strong belief in what Tesla had done and in him as a scientist example. As he said in 2007 “Without Tesla‘s vision and brilliance, our car wouldn’t be possible. We’re confident that if he were alive today, Nikola Tesla would look over our 100 percent electric car and nod his head with both understanding and approval” (Elon Musk, 2007). Musk was also the creator of the Space Exploration Technologies Corporation, and in the last years he was working on reaching Mars. In the context of 2018, with Tesla alive and his new idea ready, Musk ran to Tesla and asked him to join forces. This reflects what happened in the past, when Westinghouse, an entrepreneur, invested in Tesla’s AC idea and took him as a consultant. Tesla was not interested in money enrichment or in having his own company; he just wanted to see his ideas realized for the sake of humanity [12]. Edison started a campaign against the usage of electromagnetism saying it was dangerous. Instead of searching for better ideas, Edison laboratories started producing very dangerous EMP bombs to discredit Tesla’s innovation. That’s the same thing he did in the past, when he made rumors trying to discredit AC current [3, 18]. He did also things really lacking in ethics, like burning alive animals with AC current and inventing and selling the electric chair to the New York state trying to show the danger of AC [11]. However, in 2026, Musk-Tesla Company sent the first satellite with the new method, and everything worked successfully. As it happened in the past with AC, the idea of Tesla was so good and practical that all nations agreed that it was the best way to reach Mars. When Edison understood this fact, he tried to patent Tesla’s idea in order to use it on his products. This was the beginning of a legal war that involved the two companies, stealing time that could have been used for research. Edison was very expert in being a patent thief: in 1902 he was sentenced for producing cinematographic machines without being legally the owner of the patent [8]. Since this legal battle was compromising the mission the Stockholm Royal Academy decided to give a Nobel Prize to both Tesla and Edison: Tesla deserved it, but they gave it also to Edison to make him satisfied and stop the war.

4.3 Challenges in Terraforming Mars and their solutions

With Tesla's space transport (cheap and fast) the humanity could send a lot of things on Mars. Engineers from the Tesla-Musk company created AC current factories invented by Tesla to produce hydrofluorocarbons [1] (super greenhouse gases) to build up an atmosphere capable to trap a portion of the sunlight to warm up the planet. Those factories that Tesla invented were very special because the AC they used to work was produced by the radioactivity power of Mars that is too high for humans. In this way radiations were decreased and life was possible. With an atmosphere growing up Mars reached an equilibrium state and started staying warm naturally. To communicate with Earth while they were building up the machines, engineers used the Teslascope [2], invented by Tesla in the nineteenth century and developed in 2054 thanks to new technologies. With Mars warming up the water started melting and, for the second time in history, Mars had liquid water on its surface. Since on Mars the gravity is lower than on Earth, Tesla worked on some particular elastic materials that were able to produce a pressure on the body equal to the one we have on our planet. With this "second skin" people would have been able to inhabit on Mars without having skeletal system problems. In 2074 a sufficient quantity of iced water on Mars became liquid and in 2078 it was possible to send algae and plants on mars, fertilized well in order to grow up faster. Tesla insisted particularly in sending a huge quantity of Phytoplankton [16], that are phototrophic organisms that produce half the oxygen made by plants on Earth [AJL+14]. These plants and organisms had no natural competitors on Mars and they started a multiplication process, covering the surface of the planet. Also lithotrophic bacteria (that feed on inorganic material to produce organic material and energy) were sent. In 2085 also trees started creating oxygen.

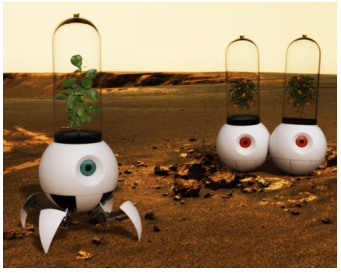

Figure 4.2: Algae and plants

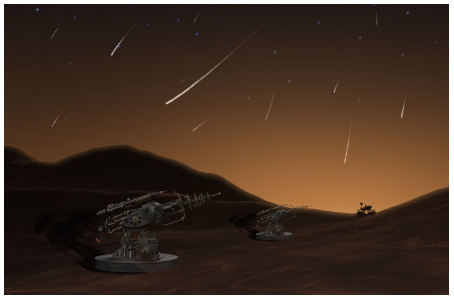

Figure 4.3: Death rays

Unfortunately there was still a problem: as you may know there are a lot of meteors that crash on Mars, and they were dangerous for the future human communities. The solution was found with Tesla's death rays, used to shoot and stop meteors. In fact during his life Tesla did great researches in

lasers and plasma cannons and he used the new technologies available in our actual present to improve them. Finally, in 2098, Mars was partially terraformed and the population was ready to colonize it, thanks to Tesla. What we wanted to remember with this story is that if you want to do something really innovative and to reach far goals you have to risk, and don't stuck yourself in old ideas and in money enrichment. If you work just as an exploiter, you will never come up with revolutionary ideas. The real innovator is the explorer, a person able to think differently and to be a dreamer. You cannot be an entrepreneur, without a great idea. But follow your ideas and everything you need will come.

Chapter 5

Fair Tale

This chapter tries to reconcile the two different views of Chapter 3 and Chapter 4 into one common and more realistic story.

5.1 "We cannot expect things to change, if we keep doing the same things"

Rapid increasing in global warming was threatening the survival of people on Earth in the twenty-first century: the world was on the verge of destruction! The Environmental Protection Agency (EPA) was making all the efforts to encourage people to implement behaviour that would prevent action aggravating the problem, but all in vain. It was announced that a great part of Antarctica's glaciers would melt faster than expected and this would lead the current landmass to be submerged by 2100. An International Conference ("PFC") was held in Paris (July 2015) in order to cope with this alarming situation. The participants of the Conference decided that the only way to save humanity from this calamity was to resurrect two of the greatest brains of all time: Nikola Tesla and Thomas Alva Edison. A team of Icelandic scientists genetically reconstructed the clones of the two scientists with the hope that these two would bail humanity out of the crisis. As the result of an ONU meeting between all the world's head of states, an International competition was launched (August 2016) to find a pragmatic way to colonize Mars; an objective to which all the brilliant minds of the world should start cooperating for the survival of the entire humanity. Tesla and Edison were invited

to team up and to start working on the project immediately putting aside their past indifferences and rivalry.

5.2 A new hope

In 2020 Edison founded the "Edison Research Academy" which paved the way to bring all the great scientists of the era to work together under his supervision. Tesla, after spending a few year upgrading his background with all the past discoveries, agreed with this idea and joined the Academia. Cooperation between the two was not easy, the latter being a meticulous man, always trying to upgrade his knowledge and his propensity towards mankind's benefit while the former was a more practical one and his ambitions pushed him towards glory, fame and money. Past events did not bode well, but the stakes were too high and failure was not an option.

Though, it was not an easy job to overcome all the hurdles on the path, our heroes struggled to come up with a feasible solution of transporting billions of people to Mars and of sustaininghow to the entire population once they set their feet on Mars. Since the beginning Edison believed in the power of its vision: success on the Mars mission would automatically open him the road to reuse the new developed technologies in markets that would led to huge revenues and fame. Therefore, he was really interested in patenting, under the name of his Academy, all the results of the ongoing work. He already managed to have a lot of person working for him in his labs and he was open to new suggestions from his employees whilst they worked tirelessly under his guidance. On the other hand, Tesla completely disagreed with this approach because he was a man who always worked for the benefit of mankind and didn't put personal gains before greater good. He couldn't comply with his partner's idea of monetizing the inventions in such a moment of crisis. This divergence led him to part ways due to his coworker's philosophy and he began independant work for Mars mission. The feeble alliance between the two saviours of the human race had been broken!

The world was scared: "Will the past come back again? Will we see again a legal battle between the two geniuses? Could we really afford to lose time for such a "stupid" thing when the world is moving to point of no return? Did they really learn nothing from their previous experiences?" Unfortunately the inevitable happened and a couple of

years were already lost in criticism between them which oversaw nothing but a lot of skirmishes between the contenders. As a consequence of this, progress halted while time was running out. Worst of all, it became clear that neither Edison nor Tesla could reach an optimal solution if they worked independently when they were meant to collaborate with each other in order to break the scientific and structure limitations of such a big problem. In order to rectify this state of affairs and to pacify the contenders, for the first time ever, in 2029 the Stockholm Royal Academy decided to award both of them with the Nobel Prize ("to the two people that contributed in a strong and positive way to ideate how Mars could be colonized for human life") clearly stating that both were important to solve the issue. At the same time the following condition were imposed by the ONU:

- In order to be sure that the controversy was entirely solved, none of them could patent any of the work done until this moment nor prohibit their usage in any way. That's for the humankind safety.
- They suggested the two geniuses to start collaborating again and if this wasn't practically feasible then they could continue working independently but starting from 2030 every ten years they had to present their progress in a Global Conference open to the entire world. This strategy would have allow everyone to be updated on the general progress and future developments. The aim was to bring down conflicts between the two.

Luckily the two main bottlenecks of the mission, previously introduced, were not directly correlated and, in effect, many scientists all around the world who were already involved to find answers that would allow mankind to live on the so called 'Red Planet' came up with one of the first solutions. Unfortunately, the first point remain a daunting dilemma, so take a look at how each of our heroes approached the challenge in the first public debate.

Edison and his team were working mainly on the idea of cloning and transporting the information, which involved the creation of a new cloned body at a given location (Mars) and the transmission of all the required information about the brain (preserving original memories, hopes and dreams) in a flash. The whole team believed in this idea because humans are nothing more than an assembly of atoms fabricated in a particular configuration that could be systematically disintegrated and recreated. In the meantime,

other researchers of the Academia were trying to figure out possible ways of terraforming Mars. Experiments were carried out in order to find whether humans can survive in the artificially created atmosphere there on Mars or not. Immediately after the idea of teleporting humans to Mars had been presented, the conference silenced for a while. People were in disbelief that they would be able to travel from one place to another in a blink of eye but at the same time the idea haunted the human imagination. Some ethical issues were raised: "Is the person that re-spawns at destination really me or just a replica? How many "me" are there at the same time? You may have the same characteristics (i.e. same eyes, weight, memory, skills) but what if teleportation goes wrong and the memories are lost in the void before reaching the destination?" And religious groups raised concern such as: "Where does the soul fit into all of this? Could we win death? Will so a man be more powerful than God?" They were indeed demanding questions but if you want to save your life, you would have to take bold decisions.

Tesla on his side, stated that he was working to transform his early inventions for the betterment of future. He already did some breakthrough research focused on manufacturing an electromagnetic field which would be used in the development of a revolutionary spacecraft which could achieve incredible speed while assuring a safe journey. He planned to use an enhanced coilgun accelerator to send the spacecraft to Mars using less fuel. He was also working on a particular elastic material that could be used to produce spacesuits that were able to generate a pressure on the body equal to the Earth's atmospheric pressure (thus avoiding the adverse impacts of the hostile Martian environment on the human race). Audience's reactions to this idea was generally positive, but one big question remained: "Could Tesla really transport 10 billion people using only clean source of energy? Could he develop all these stuff which he had promised? Wouldn't his working approach be too slow for such a daunting task?" Earth was running out of time and every passing day the fear of the destruction was haunting people always more.

The developments of the two inventors went on for years without any major problems. They progressed independently and, as previously decided, every ten years they presented their progress. In the fifties, the first machineries were sent to Mars with all the necessary accessories to carry out the mission. By the seventies, the first form of life (mostly algae and plants), started to populate the planet. With the right combination of plants and well selected microorganisms, planetary engineers generated the needed

oxygen and nitrogen. People appreciated the efforts of the scientists and were more convinced that eventually they could start a new life in a new place.

5.3 The structure strikes back

In the 2080's Mission Mars succumbed to a setback. Tesla admitted that it was too late and didn't know how to manage all the problems he encountered along the way - time constraint and scale factor seemed to be unaffordable even for a genius of his level. Fortunately Edison's solution seemed to be right there. He showed how his system can teleport humans not only to Mars but to any other habitable planet. He shared videos of early successfully experiments already carried out by his researchers. Edison was the clear winner of the dispute. People realized that afterall the cloning process could save their life and ethic aspects could be set aside if they wanted to still have a future.

Just a few week later, a video shared by a stranger showing the darker corners of Edison's cloning process was brought into public domain. The video proved that many of the cloned living entities during the experiments suffered from malformation, strange behavior, mental illness, bleeding and, in some cases they horrendously died. Obviously this spread wave of distress among the people and it was not less than a nightmare for them. Edison admitted that around 10% of the test conducted showed problems but everything will improve with some additional experience. Edison lost the faith of the common people about the cloning idea and they were petrified with the idea of failure of the mission. Edison reacted fighting for months and trying to convince people that his project, once completed, would become safe for humans ("only the final details are lacking"). But at the end, he realized the fact that his idea would probably never be supported again; probably his credibility has been ruined forever and people were too scary to give him another chance in a short time. Sorry, but according to his motto ("anything that won't sell, i don't want to invent. Its sale is proof of utlity and utility is success"), he abandoned his work and reached Tesla (struggling alone with his soul) in the limbo of savior missed.

As the saying goes, "Time and tide wait for none", we couldn't mask the fact that the deadline was getting closer and closer and the signals are undeniable: Europe was getting submerged visibly, Australia was just a memory and South America would have

follow the same destiny quite soon. Shortage of food, overcrowding, diseases, fear, panic simply took out the animal side of humans; population was getting lower and lower.

5.4 The return of the alliance

Both Edison and Tesla realized they cannot do it alone (2082): they had to collaborate. Edison spent almost his entire (second) life on his project and the only result he obtained was that his reputation was broken and, even worse, he ran out of ideas. Tesla's ideas sounded theoretically feasible but he had no more time/resources to develop it alone. For the first time in their life, they had really understood the importance of cooperation despite the roles they have played until now. Tesla even being a great scientist, really needed someone that could make his ideas concrete for large scale implementation. Edison, an inventor but a first businessman, needed fresh working ideas to exploit. So they joined their forces again: they used the idea of Tesla (the coilgun), the methodology (the Academy) of Edison and the structure (the Grim Reaper) and all the available resources in order to achieve their shared final objective: ensure the survival of the human species. Now their work seems much easier since the number of person to be transported is much less than before, so the chances of success are much higher.

And now, dear reader, we need to make you a confession: our information about the evolution of the story get more and more confused. Please don't get angry with us, our work is not easy in a context as the one described till here. What we know for sure is that in 2098 a small contingent of survivors is now able to leave Earth and start its journey of hope towards Mars against insurmountable odds. This has been possible, thanks to the work of our two saviors who in the end developed a fantastic spacecraft which, reproduced in countless of copies, allowed a miracle to become true.

As a side note we need to inform you that both our heroes died before they could see the outcomes of their work. Humans, now called "The Martians", once reported to have spotted Edison and Tesla in Mars. You may find this contradictory to our previous statement as because both were dead by 2098 but who knows they might have cloned and teleported themselves to Mars to confront new challenges in a new planet...

Chapter 6

Conclusions

Mars colonization is not a new topic: the science has developed in such a way that on each new invention and each new discovery made, the world look at Mars using different lenses and figuring new possible panoramas.

The evolution of the human species brought the globalization to our daily life: the world left by Tesla and Edison is now totally different, people are more conscious that if we have a global problem, we need to solve it globally and with a global help. Therefore, no surprises, when 2082 came to us and both Edison and Tesla realized that there was no better solution than working together on the development of Mars Terraformation.

Both Tesla and Edison already worked together on the development of the nowadays modern and industrialized world, even thought it was a big challenge. In our stories, they were called back for saving the world and there was no space for free runners once the whole species was at risk. This way, Edison and Tesla realized that they could not do it alone. Edison's reputation on the academic environment was broken, Tesla was not facing his totally bright time anymore and the challenge was waiting for both.

For the first time on their entire life, the two bright minds decided to work together and finally with the great ideas of Tesla playing the explorer rule and Edison the exploiter one, these ideas were put together and worked perfectly well together.

As expected, there is no piano concert if there is nobody to carry it into stage. On this case, both tried to be the pianists until noticing that it would not have worked this way. So, they shifted the gears to work together. The nowadays technology also gave

inputs to the battle: for Tesla and Edison it was not easy to deal with the modern fast communication and video sharing, while deeply concentrated they could have overcome the overwhelmed reactions.

Human beings had never been the best ones to believe in innovation. In the news, two new humans were brought from the past and were requiring lots of resources for their ideas. One explorer and one exploiter were in charge of leading the core of the human species continuity. After all, what does it means to have these two roles leading such an important task? For making it clear, Edison and Tesla had no need of extra work, besides working normally, to prove the importance of both to humanity. Tesla, a great creator that could invent unimaginable things out of his creative mind, played the perfect explorer role. Edison's mind, knowing exactly what to do and how to implement Tesla's ideas work, played a perfect exploiter role. This represents an important episode for the future of the humanity, that so far was taking Edison as the bad scientist and Tesla as the madman creating useless stuff. Finally, for the good of humankind, both roles can be understood.

The ideas of teleportation, spatial lifts, spatial buses, were always in the discussions, but the work of both, Edison and Tesla together made the point. As good explorer and exploiter together, managing with the old ideas of Tesla and Edison and bringing back the hidden documents from their past, they became able to create the fastest and most efficient spacecraft that humanity had ever seen. The speed closer to the light speed made the one year travel of 2015 a less than half an year travel, ensuring security without challenge people's confidence about humanity's future.

As a summary of the whole case between Tesla and Edison, it is not possible to say that if they worked together since the beginning they would have made the world a better place or the industrial revolution something else. Maybe the modern world is a good outcome of the Currency War, where the competition also made its points. If we change one point in the past story, trying to discover what would have happened in the present, we have to deal with uncertainty. But this time the scenario was quite more ambiguous and limited, and just with the work of both together, the two brilliant minds, the exploiter and the explorer, it was possible to save the humanity.

However, some fundamental questions are still open: who is the entrepreneur? The person who creates ideas or the one who makes them work? Can you be both an

explorer and an exploiter? [Mar91] The answer for this last question, for us, is no. You have to choose your role. Even the greatest minds of our present world have chosen, because of the life constraints that each role gives to the player (time, money, interaction with people, studies...). In fact we can find both great researchers and great managers. Who is the entrepreneur? Both, again. They are both entrepreneurs and innovators and both of them are needed in the development of innovative and entrepreneurial projects. Through this battle it was possible for the two groups and the class to observe the three elements that characterize exploration and exploitation: cognitive dissonance, suspension of disbelief and counterfactuals. First the cognitive dissonance, in which you are trapped in two contradictory beliefs and you have to perform an action that goes in contradiction between one of them [Fes62]. In this case you have to decide your role and to choose between exploring and exploiting. Secondly we have the suspension of disbelief, a term coined by S.T. Coleridge in 1817, that refers to the fact that if a writer is able to infuse a "human interest and a semblance of truth" [Col71] into a fantastic tale, the reader would suspend judgement concerning implausibility, he would suspend his "disbelief". Concluding, we have the counterfactual way of think [Roe97] our stories are located in the future and we have to look at the past and ask us "What if?" trying to create possible alternatives for the life event about reaching Mars.

Scientific bibliography

[AJL+14] Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. *Molecular Biology of the Cell*. Garland Science, 2014. pg. 10-15.

[Ash66] Thomas S Ashton. *The industrial revolution: 1760-1830*, volume 109. In the Hands of a Child, 1966.

[Col71] Samuel Taylor Coleridge. *Biographia literaria, 1817*. 1971.

[Fes62] Leon Festinger. *A theory of cognitive dissonance*, volume 2. Stanford university press, 1962.

[Mar91] James G March. Exploration and exploitation in organizational learning. *Organization science*, 2(1):71–87, 1991.

[MZ93] Christopher P McKay and Robert Zubrin. Technological requirements for terraforming Mars. *American Institute of Aeronautics and Astronautics*, 1993.

[O'N74] Gerard K O'Neill. A-111. The colonization of space. 1974.

[Roe97] Neal J Roese. Counterfactual thinking. *Psychological bulletin*, 121(1):133–148, 1997.

[TC93] Nikola Tesla and David Hatcher Childress. *The fantastic inventions of Nikola Tesla*. Adventures Unlimited Press, 1993.

Websites & videos bibliography

[1] Hydrofluorocarbons (HFCs). http://www.thinkglobalgreen.org/hfc.html. Last checked: 04.01.2016.

[2] The hyperdimensional oscillator. http://www.bibliotecapleyades.net/ciencia/ciencia_hyperdimensions01.htm. Last checked: 04.01.2016.

[3] Myth buster-topsy the elephant. http://edison.rutgers.edu/topsy.htm. Last checked: 04.01.2016.

[4] NASA Administrator. The Sabatier system: Producing water on the space station. http://www.nasa.gov/mission_pages/station/research/news/sabatier.html, August 2015. Last checked: 04.01.2016.

[5] Galactic Public Archives. Dr. Ken Hayworth, part 2: Will you upload your mind? https://www.youtube.com/watch?v=Kuc3u4FNem8, October 2014. Last checked: 04.01.2016.

[6] Michael Bay. *The island*. Warner Bros. Pictures, 2005.

[7] Justin Beach. Nasa's plan to use bacteria to produce oxygen on Mars. http://natmonitor.com/2015/05/17/nasas-plan-to-use-bacteria-to-produce-oxygen-on-mars/, May 2015. Last checked: 04.01.2016.

[8] Edison Tech Center. Ac power history and timeline. http://www.edisontechcenter.org/AC-PowerHistory.html. Last checked: 04.01.2016.

[9] Alex Davies. Here's why Tesla Motors is named for a famous serbian inventor. http://www.businessinsider.com/who-is-tesla-named-for-2013-8?IR=T, August 2008. Last checked: 04.01.2016.

[10] Lisa Grossman. Multiple asteroid strikes may have killed Mars's magnetic field. http://www.wired.com/2011/01/mars-dynamo-death/, January 2011. Last checked: 04.01.2016.

[11] Andrew Handley. Edison publicly tortured animals to discredit ac power. http://knowledgenuts.com/2013/10/19/edison-publicly-tortured-animals-to-discredit-ac-power/, October 2013. Last checked: 04.01.2016.

[12] Matthew Inman. Why Nikola Tesla was the greatest geek who ever lived. http://theoatmeal.com/comics/tesla. Last checked: 04.01.2016.

[13] Alan Kay. A powerful idea about ideas. http://www.ted.com/talks/alan_kay_shares_a_powerful_idea_about_ideas/transcript?language=en#t-27979, March 2007. Last checked: 04.01.2016.

[14] John Markoff. Scientists report finding reliable way to teleport data. http://www.nytimes.com/2014/05/30/science/scientists-report-finding-reliable-way-to-teleport-data.html?_r=1, May 2014. Last checked: 04.01.2016.

[15] Tesla memorial society of New York. Tesla coil. http://www.teslasociety.com/teslacoil.htm. Last checked: 04.01.2016.

[16] National Oceanic and atmospheric administration. What are phytoplankton? http://oceanservice.noaa.gov/facts/phyto.html. Last checked: 04.01.2016.

[17] A. J. S. Rayl. Nikola Tesla's curious contrivance. http://www.airspacemag.com/history-of-flight/nikola-teslas-curious-contrivance-10187565/?no-ist, September 2006. Last checked: 04.01.2016.

[18] The republic. Topsy, the rogue elephant, was electrocuted, poisoned and hanged. http://chroniclingamerica.loc.gov/lccn/sn84020274/1903-01-11/ed-1/seq-24/, January 1903. Last checked: 04.01.2016.

[19] Mars One Team. Mars One. http://www.mars-one.com/. Last checked: 04.01.2016.

[20] David WarmFlash. Forget Mars. Here's where we should build our first off-world colonies. `http://blogs.discovermagazine.com/crux/2014/09/08/where-build-off-world-colonies/#.VopR8nXhA8p`, September 2014. Last checked: 04.01.2016.