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Leadership, competitive intelligence and Robert Oppenheimer's pivotal role in the dawn of the nuclear age

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Abstract

In an era of globalization, innovation, and competitive intelligence, the nuclear supply chain is continually evolving and increasing its capabilities. The top-secret operation ALSOS plays a key role in the (re)evolution of atomic energy as the energy of the future, with a constant focus on the responsible use of atomic energy. The US, a nuclear hegemon, has harnessed its leaders to their full potential, with J. Robert Oppenheimer being one of the leading names in charismatic, competitive, and transformational leadership. Through qualitative and content analysis, this article proposes a reflection on the origins and evolution of change in the nuclear field, in a continuous struggle for supremacy, connecting with current desiderata in the sphere of innovation, built on different leadership styles. The interest in leadership is recurrent, and the model of Operation ALSOS, in line with the iconic figure of J. Robert Oppenheimer, is representative of motivating the harnessing of new promises to inspire and revolutionize the world.

Keywords:

atomic energy; competitive intelligence; leadership; Operation ALSOS;
elite power; Robert Oppenheimer.

Competitive intelligence in the nuclear energy sphere is founded and structured on two types: strategic intelligence and tactical intelligence, each of which delineates different operational horizons. While the former is aimed at medium and long-term exploitation, the latter is aimed at immediate, short-term developments. *Knowledge Management* is about creating, analysing and processing knowledge and is part of the Strategic Intelligence Triad (Smith 2020) together with *Business Intelligence* and *Competitive Intelligence*, three fundamental elements in using knowledge to create and maintain a competitive advantage for personal benefit.

Humanity seems to have been guided by the adage attributed to the English philosopher Francis Bacon – “*Scientia potentia est*” (*Knowledge is power*), first found in the *Leviathan* by his secretary Thomas Hobbes. The United States of America, which has always held nuclear supremacy, was the world’s only nuclear power between 1945 and 1949; it seems to have been guided by this aphorism, which was later elaborated by the American philosopher and essayist Ralph Waldo Emerson.

In an era of globalization, where dependence on fossil fuels is becoming unsustainable, there is increasing discussion of a renaissance built on reinvestment in the field and, consequently, the nuclear industry is experiencing growing competitiveness. Nuclear energy is thus emerging as the energy of the future, encompassing economic, military, and environmental considerations. Notably, the European Commission has classified it as green energy within the context of combating carbon dioxide emissions, which are the primary contributor to the greenhouse effect.

1. The evolution of the atomic weapon, from simple to complex

In his ongoing quest to rule the world, man has delved into the mysteries of the universe and sought answers to its most pressing questions. In his accelerated study of matter, the horizons of his thought have broadened, and paradoxes have been transformed into logical, proven, argued content. From the primary research lines of matter through physics and chemistry, specialists have set out to conduct advanced studies on the exploitation of the energy and nuclear fields. Thus, at the centre of its interests have been processes concerning nuclear energy, nuclear technologies, and nuclear safety, with regulations and legislation in force. In the nuclear age, competitive intelligence refers to the early identification of potential threats, but also to the identification of opportunities, in the processes of intelligence gathering, analysis and interpretation. This includes programmes to monitor nuclear programmes, identify and assess intent and capabilities, and security policies to promote balance and nuclear non-proliferation.

The 1970 Non-Proliferation Treaty (NPT) and other international agreements such as the Comprehensive Test Ban Treaty (CTBT) are designed to promote

disarmament, deterring the spread of nuclear weapons around the world, gradually leading to their complete elimination. In the arms race in 2023, there are states such as the USA, the Russian Federation, the United Kingdom, France and China, which are officially recognised by the Treaty as possessing nuclear weapons, and states not officially recognised by the NPT, such as India and Pakistan. Israel and North Korea are suspected of having nuclear capabilities but do not officially recognise their nuclear arsenal.

In 2023, nuclear states officially possess, according to statistics, around 12,500 operational nuclear weapons, their motivations for arming being deterrence and national security, regional interests and protection of allies, strategic autonomy, the balance of power, and prestige of status in international politics. Given the increased level of insecurity and tensions, nuclear proliferation can weaken diplomatic relations and diminish trust between states.

In a past-present pendulum swing, whereas in the 19th century, concern for the development of the nuclear breakthrough segment was feverish, today, at least at the level of official discourse, it is precisely disarmament and non-proliferation of weapons of mass destruction that are encouraged.

1.1. Brief history

Although in the 5th century BC the ancient Greeks claimed that the atom was indivisible, etymologically speaking the word *atomus* itself, first used by Democritus of Abdera translates in the same way, later, after almost 2000 years, research revealed its ability to split. The theoretical construction of the atom is based on Antoine Lavoisier's 1789 *Law of Conservation of Mass* (the mass of a closed system remains constant regardless of the processes within it), Joseph Proust's 1799 *Law of Definite Proportions* (substances have a well-determined qualitative and quantitative composition), and John Dalton's 1803 *Law of Multiple Proportions* (compound substances are formed when different elements interact in different reaction systems). (Iosif 2009)

In 1808, the English physicist and chemist John Dalton assigned atomic masses (a revolutionary concept at the time) to 20 known chemical elements, which he put together in a rudimentary table.

In 1869, based on his precursor's innovation, the Russian chemist Dimitri Mendeleev published the first globally recognised periodic table of elements, which included all 63 chemical elements known at that time, according to their atomic number. On the left-hand side were the metals and on the right the non-metals. A visionary, Mendeleev left spaces in his table for unknown chemical elements, accurately predicting their properties. In the last decade of the 19th century, scientific discoveries gradually evolved from explaining the phenomenon of radioactivity to the modern development of atomic energy.

In 1897, physicist J.J. Thomson was to discover the electron, with the idea of splitting the atom into electrons, protons and neutrons coming later. This negated the preliminary theory of the atom as the smallest particle.

The existence of the atom was proved in 1905 by Max Planck and Albert Einstein, through the accuracy of mathematical calculations. In addition, the research of Pierre and Marie Curie and their descendants Frédéric Joliot Curie and Irène Curie into radioactivity and the nucleus was recognised by Nobel Prizes in physics and chemistry. The extended Curie family has won a total of 5 such prizes. (Marcovici 2018, 29-30) Related to the famous prizes, Alfred Nobel's name is associated with the same area of research, the Swedish chemist and industrialist being the inventor of dynamite.

Radioactivity was discovered by the French physicist Henri Becquerel by chance, "*while studying uranium and the phosphorescence of uranium salts*" (Marcovici 2018, 29). In 1895, German physicist Wilhelm Roentgen observed that radiation emission penetrates opaque objects producing fluorescence, and his discovery prompted Becquerel to test fluorescent uranium salts. In 1896, he demonstrated that uranium is radioactive, that is, it emits penetrating radiation that would ionize gas (Jones 1985, 25). Although it is a thousand times more common than gold, uranium is considered a rare element.

The study of the structure of the atom built the scientific foundations of nuclear physics, pioneered by the New Zealand-born Englishman Ernest Rutherford. Discoveries such as the nuclear fission of the German Otto Hahn and his collaborators in 1938 followed, as the means to the most destructive of human inventions - the atomic weapon. Nuclear fission involves radioactive decay, splitting the nuclei of uranium atoms and discharging the energy inside. At the other end of the spectrum, nuclear fusion involves the union of several atomic particles to form a heavier nucleus.

Fission bombs, also called atomic or nuclear bombs, were tested in 1945, and hydrogen bombs, fusion-based bombs (also called thermonuclear) were tested in 1952. The destructive force of the hydrogen bomb is much greater than that of the atomic bomb. Given the similarity between the first Soviet bomb and the so-called *Little Boy* bomb dropped on Hiroshima four years earlier, the supremacy of the US as the sole nuclear power from 1945-1949 is confirmed. Also, after the Second World War, accelerators and particle detectors appeared, making it possible to study the effects of moving atoms at high energies.

1.2. Key personalities

The early nuclear age embodies aspects of competitive intelligence, with several names that became household names marking the period of bold experiments that would change the course of the world and history. Of these, the most resonant,

J. (Julius) Robert Oppenheimer (1904-1967) was even the inspiration for director Christopher Nolan's eponymous historical-biographical film creation to be released in July 2023. Oppenheimer was known as the father of the first atomic bomb - the A-bomb, following the resounding success of the Trinity Test, a controlled nuclear explosion carried out in the Los Alamos desert in the US state of New Mexico. The Trinity Nuclear Test (T.N.T.) was the code name for the world's first nuclear explosion on 16 July 1945. Without his initiative to bring scientists and physicists together in a remote and secret location, the atomic bomb would have been unattainable. He was the director and scientific leader of the giant Manhattan Atomic Project, and following the dropping of the two bombs on Japan, his image acquired an undesirable celebrity. *Little Boy*, the bomb dropped on 6 August 1945 on Hiroshima, was uranium-based, while *Fat Man*, the second bomb dropped three days later on Nagasaki, was plutonium-based.

In contrast to Oppenheimer's popularity, **Edward Teller** was a staunch anti-communist, far-right anti-liberal, known as the leader of the first Ivy Mike hydrogen bomb, a project approved by President Harry Truman in 1950. Thanks to this responsibility, he was nicknamed the father of the hydrogen bomb (the H-bomb). In 1946 he was decorated by President Harry Truman, and in 1963 he was given the Enrico Fermi Award by President John Kennedy. In 1957, he was also awarded the Légion d'Honneur in France, and in 1962 in Great Britain as a Foreign Fellow of the Royal Society of Great Britain. In order to persuade Oppenheimer to leave Alamos for good, he was to strike precisely at his sympathy for the Communists.

Leslie Groves is also among the iconic personalities, having built the world's first de facto atomic bomb, fulfilling his mission of commitment with the successful Trinity Test. He was the general appointed to head the top-secret Manhattan Atomic Project by US Secretary of War Henry L. Stimson, with the approval of President Franklin Delano Roosevelt.

It is important to note that, in support of subsequent events (Trinity Test, bombs dropped in Japan), President Roosevelt authorised the Manhattan Project on 28 December 1942 (Gosling 2010, 20). Leslie Groves became well known in the military world thanks to his management and engineering skills, and the project brought him international fame and recognition. Following the bombing of the Japanese cities of Hiroshima and Nagasaki, he was to be awarded the Legion of Merit Medal and the Service Medal by the US government (and later by the governments of Belgium, Britain and Nicaragua) and retroactively promoted to the rank of lieutenant general.

At the same time, the German anti-fascist physicist Klaus Fuchs, actively involved in the atomic bomb project, was, despite his professionalism, also the spy who allowed the information to be leaked. With assurances of loyalty from the British services, he was co-opted by the US into the top-secret Manhattan Project in 1943, and a year later was given unrestricted access to the top-security sector. Despite all the

security efforts of General Leslie Groves and Colonel Boris Pash, head of espionage and counter-espionage at Los Alamos, it was only in 1950 that his Soviet espionage status was discovered and he was convicted. After the war, he returned to England as a British nuclear worker, and his knowledge remains of great impact. Like Oppenheimer, Fuchs had affinities with the communist movement.

2. The Top-secret ALSOS Operation

The Manhattan Project, a unique American atomic program conducted from 1939-1946, was the secret pinnacle of the US military's participation in World War II. It was the effort that produced the atomic bombs that were instrumental in ending the war with Japan and also marked the beginning of a new era – the nuclear age. The creation of an atomic bomb was the result of effective collaboration between science, industry/engineering and the US military.

The Manhattan Project is highly complex, combining military and civilian aspects. The project is led by two brilliant professional profiles. On the one hand, the US government has appointed General Leslie Groves as Project Director and, on the other, it has appointed Robert Oppenheimer, a professor of physics at the University of California, Berkley, as Scientific Director of the Los Alamos programme. At the time of the recruitment, they were looking for a man of outstanding ability and hard work.

Colonel Boris Pash, a specialist counterintelligence officer, is tasked with vetting everyone involved in the top-secret Manhattan atomic project, including Oppenheimer. Although he relied on his loyalty and trusted that he was not a spy, he still recommended surveillance of him to acquaintances, knowing that his wife, brother and sister-in-law were Communists and that he had donated money to the Communist Party without even being a party member.

In early 1942, the American war leadership understood with certainty that the Allied forces were in a race with Germany for primacy in the development of an atomic weapon, and it was the Army that would be given the task of administering the atomic system. Moreover, only the army could provide security, military services, and liaison services, in the context in which the success of this program was imperative. Drawing on its experience and human resources, the Army created a new organisation made up of engineers – the Manhattan District. This was the embodiment of the extreme motivation of the US to hold the primacy of atomic weapons production in the arms race against Nazi Germany.

On July 1st, 1944, the District received AA-1 authority, the minimum required for procurement. In the summer of 1942, University of California physicist Robert Oppenheimer was directing the theoretical design and construction aspects of the atomic bomb. He proposed setting up a separate laboratory devoted exclusively to

such work, a proposal soon accepted by General Groves. Unique in history is the large number of genius scientists gathered in one place. Groves and Oppenheimer agreed that the region around Albuquerque, New Mexico seemed the most promising for this purpose. They chose an uninhabited, isolated area on a high plateau on the site of a former private boys' school – *Los Alamos Ranch School*, which included 54 buildings. During World War II, it was bought and turned into a secret nuclear research campus. Isolation was a strong argument in choosing the site, the nearest town being 16 miles away (almost 26 kilometres) ([Jones 1985, 80-85](#)).

The ALSOS Project in Manhattan's Engineer District was less well known, the ALSOS missions being an integral part of it. It encompasses scientific intelligence missions that took place in Europe in Italy, France and Germany ([Atomic Heritage Foundation 2014](#)). More specifically, it is an intelligence-gathering effort aimed at finding out how close Germany was to developing its own atomic weapon.

The mission codenames were deliberately chosen to be harmless, and unobtrusive, but the codename *ALSOS*, the Greek word for *grove*, seemed to attract undue attention, which annoyed the Manhattan Project team commander, General Leslie Groves. Under his command, elite German scientists, nuclear raw materials, research documents on the development of atomic energy, and uranium ore deposits were captured in various operations ([Jones 1985, 281](#)). The concept of the power elite developed by C. Wright Mills in his 1956 paper of the same name ([Marshall and Scott 2014, 237](#)) is reflected in this fervent search for those representatives with superior power operating in the segments of interest in the project. The Los Alamos elite was that minority destined to dominate the world, and the set of values by which they were guided gave them legitimacy.

3. Robert Oppenheimer – manager, leader and central architect of the atomic bomb

Since the earliest times, in their evolutionary process, people have alternated between different social capacities, so that some have chosen to listen more, others to be more influential in their way of making themselves heard, but all have shared different needs, interests, aspirations and motivations and have tried to influence each other. Thus, leaders influence their subordinates, and subordinates in turn influence the leaders' manifestations and behaviours. Dominant personalities can assert themselves by alternating between force and threats, or they can gain respect through credibility, competence and the consistency of personal example.

In a world dominated by unpredictability, uncertainty and disorder, today's major national and international challenges require military leaders and others to adopt new leadership measures with a focus on motivation and engagement.

3.1. *Management and leadership in military operations*

If an organisational chart clarifies the roles and functions of an organisation, in the context of crises, armed aggression, economic crises or pandemics, there is a need for a leader who can demonstrate effective authority both horizontally and vertically within an organisation or institution. Robert Oppenheimer was more than a manager, he was a leader and an inspirational role model. On the one hand, management is *"the process of directing, controlling and coordinating the activities of an organization/institution, together with the people who perform these functions."* (Duțu 2008, 25)

According to the Dictionary of Sociology, *"as a process, it is conventionally divided into general management of the organization's main objectives and personnel or specialized management that deals with support roles such as personnel, legal issues or research and development."* (Marshall and Scott 2014, 426) Applied to the military, it can be defined as *"the set of principles, functions, methods, and techniques used by commanders to accomplish missions assigned to a particular structure with minimal loss of human and material resources."* (Duțu 2008, 26) On the other hand, *leadership* is the ability of a leader to direct and lead a group beyond limits, assuming the integration and resolution of difficulties as part of the experience. The qualities of a leader are assertiveness, self-confidence, empathy, modesty, kindness, which build the status of a strong leader, able to direct, guide and protect his team (Chrétien 2020).

3.2. Leadership theories, according to historical criteria, can be classified into *personological theories, behaviourist theories, contingency theories, new leadership theories and situational theories* (Duțu 2008, 14-16).

a) Personological theories subsume charismatic leadership theory and trait theory (the late 1940s);

Charismatic leadership theory underpins trait theory and is based on the hereditary traits of the individual. The term „charismatic” was introduced in 1920 by Max Weber, the Greek *kharisma* translating as grace, native given (Duțu 2008, 14). For a competent and effective leader, charisma is not enough, but it is necessary, that is why programs are organized to develop the charisma of the military leader that involves self-criticism or engagement in the process of mentors trained in this regard.

Trait theory. Personality traits are factors that influence leadership success. These are the following: physical and constitutional factors (external appearance, age, height, weight), psychological (intelligence, communication, knowledge, character, self-esteem and self-control, perseverance, initiative), psychosocial (diplomacy, sociability, cooperation, popularity) and sociological (socio-economic status).

Oppenheimer, despite his introverted, reflective and often reserved style, manages to inspire and motivate his team, even with a tendency to be critical and self-critical alike. His intelligence and skills were essential in the development of nuclear weapons, both in physics and mathematics.

b) Behaviourist theories, in the late 1960s, include the two-dimensional behavioural theory and the behavioural continuum theory.

The two-dimensional behavioural theory – one as an expression of the type of leadership that oscillates between a permissive approach and excessive control, both of which have negative effects, and the second as an expression of the modern type of participative, consultative leadership, with emphasis on both the particular goals of the individual and those of the collective.

Behavioural continuum theories start from the autocratic style and descend to Oppenheimer's characteristic democratic style in which the leader encourages member involvement in decision-making.

Several aspects of Oppenheimer's leadership style and behavior can be linked to behaviorist principles. Behaviourist theories in management focus on behaviour and influence on organisational performance. These are found in Oppenheimer's charismatic communication style, his interpersonal relationships with his other team members of engineers and researchers, and his ability to inspire and motivate them to achieve the ambitious goals of the Manhattan Project.

With an adaptive intelligence, in an accessible and engaging manner, he was able to explain complex concepts to them and was appreciated by his colleagues for his modesty and sophistication.

c) Contingency theories include the theory of the favourability of the leadership situation, the theory of the maturity of subordinates (until the early 1980s);

Fred Fiedler's *contingency theory* – the association between leader orientation and group effectiveness is dependent (contingent) on the extent to which the situation is conducive to influence. Contingency approaches focus on the conditions for leadership success in different situations (Merce and Halmaghi 2003, 1). From this theory derives the observation that leaders are formed, not innate, each manager can achieve success if he builds through his own leadership style.

Although there appears to be no direct link between Oppenheimer and contingency theory, his leadership of the Manhattan Project took into account contingent factors such as available resources, and political and technical situations given by the involvement of various science and engineering specialists. His approach as a leader involved issues of adaptability and management of contingent factors in the context of nuclear weapons development.

d) The theories of new leadership are as follows: cognitive theories (normative decision-making theory, path-path theory, attribution theory) and social interaction theories (dyadic-temporal link theory, transactional leadership theory). These are valued by Oppenheimer in his relationship with his team members, a relationship in which he has cultivated collaborative cohesion, open communication and active involvement.

e) **Situational theories** include Robert House's route-to-goal theory and Hersey-Blanchard theory.

In the context of situational theories of leadership, Oppenheimer's model of work deployment and role in the Manhattan Program can be interpreted concerning the needs of team members and the adaptive style of the leader. The effectiveness of the leadership style depends on the maturity of the subjects, the pressures exerted, the level of security, the willingness to make an effort, and even the degree of confidentiality assumed.

Robert House's route-to-goal theory (Merce and Halmaghi 2003, 6) from 1977 – addresses situations in which the maximum effectiveness of various leader behaviours is achieved, combining the leader's traits with situational elements (crisis situations, uncertainties). The important activities of leaders are related to clarifying the routes to various goals such as promotions, personal achievements, pleasant working climate, all of which are of interest to subordinates. Achievement of these goals generates knock-on effects: *Job satisfaction à Acceptance liderului à Willingness to work.*

Once this readiness has been achieved, the leader has a duty to keep the interest of subordinates alive, to stimulate them through rewards, and to guide and train them continuously. This can range from a guiding (directive), supportive (sensitivity to employees' needs), participatory (consulting subordinates' opinions) or achievement-oriented behaviour, where the leader emphasises encouragement, confidence and motivation.)

Hersey-Blanchard Theory of Situational Leadership or Leadership Life Cycle Theory – refers to the interdependence created between leadership styles and different situational contexts to ensure effective leadership.

To these are added *the theories of innovation and emotional awareness.*

3.3. Robert Oppenheimer and the power of leadership

Although late in the Second World War, the Americans managed to discover fission in the laboratory, bring it to the battlefield and temporarily hold a monopoly. In 1947, the Soviets succeeded in isotope separation of uranium by centrifuge, and on 10 June 1948, the first plutonium production reactor came into operation (Villain 2014, 36).

A physicist of genius and a man of integrity, J. Robert Oppenheimer was also a polyglot interested in philosophy, the interests of a precocious child continuing and developing into adult life. From his grounding in philosophy, with a well-defined awareness of a leader guided by ethics and responsibility, came the famous remark "Now I become Death, the destroyer of worlds", uttered during the first nuclear test, known as the Trinity Test, which took place on July 16, 1945, as part of the Manhattan Project. The phrase is a quote from a passage in the Bhagavad-Gita, an ancient Indian epic relevant to Oppenheimer at the time. A part of the epic Mahabharata contains

a dialogue between Prince Arjuna and the supreme Hindu god Krishna, describing Krishna's divine nature and warning that he will become, through war, the destroyer of worlds. Witnessing the explosion, the destructive power of the Trinity Nuclear Test impressed him and reminded him of the passage in the Bhagavad-Gita, hence his deep reflection on the ethical implications of developing nuclear weapons and his awareness of their devastating impact. He understands the intrinsic similarity to the destroyer god, assuming himself the role of an agent of destruction.

An undisputed visionary from his era, Oppenheimer had a well-defined strategy for the use of nuclear energy, understood the general implications, and promoted nuclear safety and the use of nuclear energy for peaceful purposes.

Based on the *Theory of Multiple Intelligences*, he stands out for his verbal-linguistic intelligence, his social and interpersonal intelligence, his abilities being put to good use in his actions by which he maintains group synergy, manages to persuade and motivate, understands emotions, mediates conflicts, demonstrating visible leadership qualities. He has a gift for oratory and is attentive to the meaning of the words chosen, the symbols and the intensity of the messages conveyed.

In his extensive recruitment drive, he has travelled all over the country to find and persuade the most talented scientists, mechanics, technicians and engineers to join the project. He used all his leadership skills, emotional and social intelligence, and stressed the urgency of the task. It was no easy task to persuade the best people to work at a remote military post in the middle of the New Mexico desert and live there with their families for the duration of the war.

Leadership qualities such as assertiveness, kindness and empathy were found in Oppenheimer as he supported his team through tough times when morale suffered from the stringent security requirements, fatigue from long hours in gruelling conditions, stress, and tension. Thus, together with other responsible coordinators in various departments, he has been concerned with organising recreational activities, increasing food facilities and ensuring good living conditions.

At first, recruits from the Universities of Princeton, Minnesota, Chicago or Wisconsin California arrived at Los Alamos in March 1943 with equipment essential to the process: two particle accelerators from Wisconsin, another from Illinois and a cyclotron from Harvard - a particle accelerator invented in 1934 by Ernest Lawrence, for which he was also awarded the Nobel Prize in 1939.

On April 1, 1943, Los Alamos was officially declared a military facility and Robert Oppenheimer was the scientific director, with recognized authority and administrative responsibilities. From his position of civilian authority, Oppenheimer established cooperative, not controlling, relationships with military personnel, an example being his close partnership with Colonel John M. Harman, the military chief who had responsibility for overseeing Los Alamos ([Jones 1985, 86](#)). The two

project leaders wanted to introduce various attractive work and living conditions, while General Groves wanted as much control over the scientists as possible. Groves even proposed appointing key civilian leaders as army officers, which aroused discontent and rumbling among the other scientists.

Choosing Oppenheimer as head of the Los Alamos lab was not easy, given that the other three heads of the other Manhattan labs – Ernest Lawrence, Arthur Compton and Urey - were all Nobel Prize winners. As an unproclaimed Nobel genius, although he applied three times for the famous scientific distinction – between 1945-1951 and in 1967 ([Marcovici 2018](#), 42), he always managed to give more than he received, proving once again his unquestionable qualities as an absolute leader.

Nicknamed the *American Prometheus* ([Bird and Sherwin 2006](#)), Robert Oppenheimer is like the figure from Greek mythology, a titan who stole “fire” from the gods and gave it to mankind, at the cost of his peace. Just two months after Hiroshima and Nagasaki, shaken by the effects of the atomic bomb, he resigns from Los Alamos. He quickly realised the devastating effects of the atomic bomb used for political and military purposes, and that these actions were no match for his set of human principles and values. Oppenheimer is the epitome of the ultimate sacrifice, the man who experienced ecstasy and agony, all for the purpose of science.

Oppenheimer’s work includes significant scientific contributions in the field of quantum physics, deep knowledge in nuclear weapons design and development, massive efforts focused on the Manhattan Project, which he led as technical director, and coordination of the team of engineers and scientists. His outstanding leadership and management skills inspired others to integrate the project as a shared mission with challenges and responsibilities.

Conclusions

Over the past century, scientific research in nuclear energy has evolved gradually from the founders of modern physics to the present day. Pierre and Marie Curie, daughter Irène, son-in-law Frédéric Joliot-Curie, and Henri Becquerel, the father of radioactivity, all Nobel Prize winners for their groundbreaking work, have laid the cornerstone for their discoveries in nuclear research. In that pioneering era, the harmful effects of reactivity were unknown; today, the pros and cons of atomic physics are being debated, with implications for the intentionality and orientations centred on military, economic and social interests, which could recalibrate the balance of power in the world.

ALSOS, part of the *Manhattan Atomic Project*, was under the civilian leadership of Professor Robert Oppenheimer and the military leadership of General Leslie Groves. To respond to the challenges thrown up along the way and to meet the feverish

debates, Oppenheimer's leadership is an art that aims to take account of moral values, individual and collective, to unite people in close cooperative relationships. It is an art when it is seen as the set of methods and procedures by which an individual motivates, persuades and leads other people to follow him even enthusiastically in the pursuit of a clear and well-defined goal. However, it is also science when methods and techniques are used as a result of research into the conduct of military action. Although a civilian, but also a man of atypical genius without a PhD, Oppenheimer had to think, behave and act like a military man, which is why we can extrapolate from civilian genius to military genius, especially given the importance of the military mission he was leading.

The leader encourages teamwork, the creation of a group identity, emotional intelligence being important in the processes of awareness, accessing and generating emotions. This virtuosity of intellect and feeling of the Oppenheimer leader also refers to the *military genius* proposed by Clausewitz in his *On War*. Military genius refers precisely to this "*harmonious union of forces*" (Clausewitz, 26) readily associated with all the qualities of the military leader. Of these, being visionary, generous, disciplined and a good communicator are the basic pillars of a solid leadership construct.

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