# Manhattan Project To Develop Nuclear Weapons

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The U.S. history when it comes to scientific innovation is rich. Before the world war two, countries were striving to be a superpower by investing in the military. During this period, Germany was one of the feared countries, and the U.S. was doing what it could to position itself as a leading superpower. The United States developed a project under the code name “Manhattan Project” before the Second World War with the aim of developing nuclear weapons. In 1939, scientists had a breakthrough in fission technology, where they discovered that radioactive materials could be used to create weapons whose impact was an enormous force.

Albert Einstein came up with the idea of developing such weapons by presenting his views to then-President Roosevelt to have America build such weapons. Einstein doubted that Germany was underway developing weapons of such magnitude, and it was time for the U.S. to have weapons of similar magnitude. By the year 1942, the idea had been accepted, and the Manhattan plant was already in operation. In July of 1945, the first test was conducted in New Mexico, which confirmed the abilities of such a weapon. At the peak of world war two, the U.S. unleashed two atomic bombs on Hiroshima and Nagasaki, which ended the war[1]. Man scientists are credited for the success of the project and its influence in ending the war. The Japanese bombing with nuclear weapons elicited varied views from the public, with most people questioning the ethics of using such weapons on the lives of people and civilians.

The idea of developing nuclear weapons originated from the fear that the then-German ruler, Adolf Hitler, was producing an atomic bomb. Most of the scientists attached to Germany believed that Hitler was splitting uranium, making it possible to build a weapon that could destroy a larger area. Amid the racist discrimination and persecution of Jews in Germany, several Jewish scientists sought refuge in America, which provided the opportunity for the U.S. to get privy to information about developing an atomic bomb. A notable scientist was Albert Einstein, who wrote a letter advising President Roosevelt to develop an atomic bomb early before Hitler was able to develop the bomb. After much deliberation, Roosevelt saw the need to develop this weapon to protect Americans and restore world order. By 1942, the Manhattan Project was underway and was secretly designed with the sole purpose of building atomic bombs that could secure Americans from external attacks.

The project remained a secret, and no member of the public was aware of the secret development of atomic bombs. The project was run privately, and up to 40 laboratories were up and running with more than 200,000 employees in different locations. All these employees had been contracted to help in building the first atomic bomb, and their efforts were geared towards realizing the dream. This project was made possible by various studies that had been conducted by a different physicist on the

reactive nature of various elements. Despite the fact that such discoveries were taking place, the political relationships between countries were deteriorating, increasing tension of a possible war. In Asia, Japan was beginning to expand by using its military might to the extent of its territories and control a more significant part of the region.

In the year 1931, Japan invaded Manchuria, which did not go well with other countries such as the U.S. Hitler, on the other hand, was rapidly expanding with his Nazism ideologies spreading all over Europe, making him rise to power[2]. Political stability was additionally tearing in Italy, where Italy was adjusting to the changes brought about by Benito Mussolini, who ruled as a dictator and operated a fascist government. Throughout Europe, countries experienced political turmoil, which made governments unstable and susceptible to external control. The Soviet Union was on the rise, with Stalinism leading to discrimination and political oppression, which forced people to lie lawfully to a government that was torturing its citizens. All this political turmoil created instability, and countries such as Japan, Germany, and the Soviet Union got the opportunity to expand, becoming a threat to the U.S. [3].

The period between 1936 and 1938 set the basis for the unity of countries to form alliances, which created a fear of the possibility of war where atomic bombs would be used. Hitler and Japan were rising in power, taking over other countries and expanding their dominance. Hitler, for example, established Nuremberg laws, which made it easy to oppress the Jews living in Germany. Germany invaded European countries and successfully managed to take over Rhineland in 1936. Japan invaded China in 1937, which saw a shift in power in Asian countries. By the end of 1938, Germany, Italy, and Japan formed an Axis alliance with the sole purpose of concentrating power and controlling other countries. It was through the Axis Alliance that Germany managed to take over Austria and Czechoslovakia because it received the much-needed backing. The actions of the alliance created fear among other countries, which ushered in a conflict that could later turn into a second world war[4].

The fear of the possibility of an atomic bomb intensified with the discovery of fission. During the discovery, Germany had changed its tactics from intimidation to the use of force, which made it possible to develop weapons. During this time, scientists were unaware of whether it would be possible to control atomic power. The scientists had to take up interventional measures to understand the strength of atomic power without waiting for Hitler to conduct an atomic test, which could have been fatal. The fear expressed by European scientists led them to address the U.S. on the possibility of atomic bombs being used by the Axis alliance. Leo Szilard and Albert Einstein thought that the U.S. would help in combating the advancement in nuclear development in an alliance that was vastly rising. When Roosevelt received the latter, he immediately convened a meeting with Uranium committees, trying to deliberate on the contents of the letter. The letter, which is today referred to as the “Einstein Letter,” was received coldheartedly as its contents were rubbished. At this period, the U.S. did not consider atomic warfare, and the ideas were not taken seriously[5].

The invasion of Denmark in 1940 a home to the renowned atomic scientist Niels Bohr confirmed doubts that Hitler was getting ready to build atomic weapons. The world feared that the researcher

would be captured and used to help Germany to build the atomic bomb. Amid several attempts by the Nazi regime to capture the scientist, the British secret service discovered the plot and helped the researcher to escape to Sweden and later to the U.S. to avoid working for the Nazi regime. During this period, Germany started to work on a project similar to that of Manhattan but was unsuccessful. The efforts of the Nazi regime were overtaken by the U.S., which made Hitler lose control of what could have been a game-changer in scientific advancement. If Germany had become successful in their project, the war would have been fatal, and a greater impact would have been felt. The Manhattan Project received a significant boost from the scientists who escaped Denmark, which provided enough proof that the world was on the verge of nuclear warfare. The U.S. had no option but to develop weapons that could be used in retaliatory attacks if Hitler would have started a nuclear war[6].

James Marshall was instructed to assemble an army corps of engineers who would speed up the process of developing an atomic bomb. During the same year, Marshall established a district group with a deceptive name, which could later be referred to as the Manhattan Project. The success of the Manhattan Project was due to the efforts of a different scientist who combined their efforts to create the atomic bomb. The project was led by Groves, who was hated by other scientists because of his leadership approach and the manner of making decisions. It was not until the end of the Second World War that other scientists appreciated the efforts made by Grove. Scientists from all over the world collaborated to make the bomb in a bid to defeat the Axis powers. The worry about Germany developing the atomic bomb led to Churchill and Roosevelt meeting in Canada to renew the determination to stop Germany from advancing and gaining military superiority through explosive weapons[7].

In 1943, over 150 U.S. warplanes destroyed a plant in Norway that was used to make bombs. The plant had been rebuilt after it had been destroyed before. As the hostility intensified, a group of resistance in Norway sunk a German that was transporting important materials for a nuclear plant. In 1944, the actual work of developing an atomic bomb was in full force. The project was divided into developing weapons, construction of fissile matter and the transportation of the developed weapon. At the initial stage, the project was faced with scarce materials, which were important in developing the bomb. It is estimated that more than $2000 was used to acquire the necessary materials for the project. The project had different laboratories in the country, but those located in New Mexico, Los Alamos and Oak Ridge were important in the success of the project. These laboratories had different responsibilities, which could be combined to assemble the bomb. The Oak Ridge laboratory supplied Uranium-235, while Hanford supplied plutonium, an important component in the manufacture of the bomb. Los Alamos had an assembly plant for weapons, with four atomic bombs produced in New Mexico and Los Alamos[8]. The major component that is used to make an atomic explosive is Uranium-235. There is no chemical process that can separate Uranium-235 from its full ingredient, which is Uranium-238. The only possible method of separating the two elements is through a physical process. It was, therefore, the responsibility of the scientists dealing with the Manhattan Project to look for different ways of separating these two elements and to decide on the two available processes. The first means to split the elements is through an electromagnetic process. Electromagnetic is a process of separating different elements, which was invented by Ernest Orlando

Lawrence, a scientist at California University. The second means is the diffusion process, which was discovered at Columbia University. The two processes mentioned above need difficult, massive buildings and facilities, and both processes need high electricity usage for the processes to be easily achievable. The diffusion process is more complex and needs large electricity voltages for it to be successful. Large power amounts and these facilities are critical in both processes to produce a minimal amount of this separate component, uranium-235[9]. Phillip Abelson created the third process, thermal diffusion. The thermal diffusion process was used for some time to separate these elements. The three processes were used as the primary methods of material separation in Tennessee at Oak Ridge.

Another important element in making the atomic explosive is plutonium-239. Arthur Compton is the scientist who produced the method used to obtain this element at a workshop at Chicago University. The procedure includes altering a reactor drift in uranium-238. Enrico Fermi finally succeeded in managing and making a continuous atomic reaction in the reactor aggregate in Chicago in December 1942. Value production and the addition of plutonium-239 needed the set-up of big-sized buildings and power that could give 25000 kilowatt-hours of heat for every plutonium gram made[10]. It was made to include the development of chemical extraction methods that were designed to work in a manner that was not there before. The middle step in this process was entirely based on laboratory production at Oak Ridge, whereas the bigger reactors were built at a laboratory in Hanford Engineering Company, Washington. It was a complex and delicate process which needed much care and attention.

In 1945, during the summer, the Manhattan Project received high numbers of plutonium-239, enough to be used in the production of a nuclear explosion of good quality at Hanford Engineering. This advancement in the weapon development and innovation of the weapon designs, alongside attaining the needed elements for the atomic bomb, was complete enough to the extent that the test of the nuclear instrument could be organized. The test was complex and complicated to achieve, as they had to obtain highly structured and complicated equipment. This equipment was to be assembled and constructed for a successful test of the atomic bomb. The complex process was delicate, and it was carefully conducted in preparation for the test[11].

In the same year, 1945, the Manhattan Project’s goals of making an atomic explosive were successfully achieved. Six years later, the scientists responsible for the Manhattan Project were in a position of controlling and harnessing the nuclear fission reaction. From the efforts of many different people through the years, the first atomic test bomb was successfully produced. On July 16, 1945, the first atomic bomb test with the code name Trinity went off. After the successful test of the atomic bomb, the period was referred to as the atomic age, which is remembered to date. This test saw the introduction of the nuclear weapon, and it was a big milestone for the Manhattan Project.

The first test, known as the Trinity test, was set off on July 16, 1945, at 5:30 AM. The test was carried out in New Mexico Alamogordo, at a military ground located around 120 miles from Albuquerque city. The nuclear explosive was set up on top of a steel bar, which was circled by scientific instruments so

that the information concerning nuclear explosion could be obtained easily. Military personnel and scientists looked at the nuclear explosion from the point of a bunker, which was placed approximately ten thousand meters away. When the atomic blast took off, it caused an intense and large flash of light, an unbelievable amount of heat, and an incredible shock wave was experienced throughout the air base and the basin. The military and scientists did not expect the effects and impact of the bomb. A ball-like fire quickly rose, followed by a mushroom-like cloud, which rose up to 40,000 feet[12]. The blast was measured and equated to between fifteen and twenty thousand tons of TNT and dynamite. After this explosion, the bar on which the bomb was set was destroyed, and the ground that surrounded the tower was fused to glass from the strength of the bomb. This test gave the information that was needed to assure the government, scientists and all the employees of the Manhattan Project that there was value in their work. The test also provided the evidence necessary to assure that it is possible to create both a plutonium and uranium bomb.

The Trinity tests involved other different tests that gave confidence to the scientists and allowed them to proceed with the plan of using nuclear explosives in the Second World War to concur with the Axis Powers. The plan was, however, not successful because by the time the tests were conducted successfully, Germany, one of the Powers, had willingly submitted to the enemies. The explosive was dangerous, and around seventy scientists signed a document not to allow the explosive to be used on the grounds based on ethics and morals. Morally, the different scientists did not believe that nuclear bombs should be used due to the extent of their destruction. The President of America at that time, Harry S. Truman, ignored the petitions and warnings by the scientists. He later decided to use the weapons to fight Japan as a warning and sent them a message that America was in possession of these weapons and was willingly ready to use them on warring nations. In 1945, on August 6, the US took a B-29 bomber to throw an atomic explosive called “Little Boy” into Hiroshima. The missile killed an estimated sixty-six thousand Japanese instantly when it was released. Over the years, the destruction of the bomb at Hiroshima totalled approximately 200,000 deaths [13]. Japan did not surrender with this bomb, and the US was forced to drop another explosive on Nagasaki Island after three days. The weapons had serious and adverse impacts on the citizens, and Japan could not take it anymore. These effects led to Japan’s surrender on August 10, 1945, which led to the end of the Second World War.

The bombing of Japan in 1945 thrust the Manhattan Project into the eyes of the public. The project that was previously secret attracted the attention of the public, who wanted to know the exact purpose of the project. The officials from the project, on the other hand, were not interested in disclosing military information that was considered classified. In preparation to counter the public scrutiny of the project, the officials designed a public relations program that would be used to inform the public of the need for the project while marinating the secrecy of the highly classified information. The public relations program was developed to give public releases and document a scientific and administrative history of the Manhattan Project [14].

Leslie Groves was tasked with the duty of managing the public relations program, where he approached William Laurence, a science reporter, to help him design and provide public releases that

would portray the project as important to the country. Laurence caught the opportunity to visit the project, interview staff, and oversee the testing and subsequent bombing of Japan. This provided firsthand information, which could aid the process of making public releases. The public releases were controlled and carefully managed to prevent a situation of mistrust between the members of the public. Immediately after the atomic bombing of Japan, President Truman released a statement regarding the bombing and the reason behind the bombing. The statement was part of the public relations program aimed at appeasing the public and informing them of the government's efforts to protect its citizens. Truman noted that it was not a culture of scientists and the government to withhold information from its citizens, but the technical aspect of the process necessitated withholding information to protect the citizens[15]. Truman ended while noting that the bombing had restored world order, guaranteeing peace to the world from those who had waged war and caused massive deaths to civilians[16].

After the Nagasaki bombing, an 182-page document was released to the public, lucidly explaining the details of the project. In the document, Groves noted that no additional information would be provided, and any person who would release information to the public would be judged within the provisions of the Espionage Act. The public relations program was successful in filtering information regarding the Manhattan Project and dealing with public pressures of wanting to know the exact processes conducted for the project. During this period, a poll was conducted which saw the citizens support the atomic bombing of Japan. Eighty-five per cent of the citizens approved the government's effort to restore world peace with nuclear weapons.

After the successful release of information to the public, which was controlled, magazine publications of stories about the war and the project ended the war. In the newspapers, there were stories from dark pessimists who tried to explain the real issues behind the project. There was a call for world peace, with numerous campaigns taking over to advocate for the formation of the United Nations. The world could now fathom the consequences of war and the ability of scientific innovation to destroy the world. As the year ended, more articles were written considering the ability of nuclear power to transform society. Most scientists predicted the possibility of developing atomic cars and atomic medicine. It was widely believed that nuclear energy would have the potential to transform the entire world[17].

The Manhattan Project could have been instrumental in ending the Second World War, but the impact of the nuclear weapons developed was far-reaching. Despite the numerous warnings by the scientists on the use of the bomb in war, the government decided to use the weapons to end the war. It can be argued that the decision was cruel as it led to more deaths, particularly by the Japanese army and civilians. The impact of the bombing was felt for quite a long time as most families were left crippled. After Japan's case, there have been efforts, particularly by the United Nations, to control the development of nuclear weapons and the use of nuclear technology in activities that could threaten world peace. The lessons learned from the bombing of Japan have seen countries with nuclear projects being hit with sanctions with the sole purpose of ensuring that there is world peace[18].

Atomic bombs pose more danger than good, and all projects that involve the development of weapons using such a technology should be banned. It is evident that the period before the Second World War was full of tension, and countries were in an arms race to develop sophisticated weapons that could be used to counter external threats by other countries. Japan still feels the impact of the bombing to date owing to the effects of nuclear radiation. The survivors of the bombing provide an account of the bombing, which tells the devastating effects of the use of nuclear weapons. As countries continue to improve their military, weapons such as these should be eliminated. Scientific projects that additionally threaten world peace should be shut down. The future of military technology is unknown, but it is definite that nuclear technology will no longer be involved in warfare.

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