



Obstacles to the Development of Science and Technology in Indonesia During the Old Order and New Order: Is it Because of the Education Factor?

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Abstract: The acceleration of research and technology development in Indonesia is urgent because technological advances play a significant role in changing industrial structures and global competition. The solutions to research and technology problems in Indonesia during Indonesian history are to build an agency or institution. This paper describes the relationship between political, social, and economic factors that influence the development of science and technology in Indonesia. The research approach used is a Systematic Literature Review (SLR) which describes the writings of various experts (history, sociology, economics, and politics) that examine the factors causing the stagnant development of science in Indonesia. Searching the various kinds of literature shows the complexity and interconnectedness of various factors inhibiting technological progress in Indonesia. The unclear state planning further exacerbated these various factors in technology development during the Old Order and New Order eras.

Keywords: New Order, Old Order, Science, Technology.



Introduction

Development technology is conducted to push a country's development economy or create competition for entity business. Technology is significant for production and maintaining a fast-growth economy needed to increase Indonesia's standard life population (Wie, 2005). B.J. Habibie emphasized that no source of power is natural now; this becomes a critical success; a country for change becomes a strong nation, but science and technology can make it happen. Knowledge and technology are elements absolute in more process-wide and far more complicated, namely the development process nation (Prayitno, 2014).

Knowledge and technology are contained in and moved by humans. Because of that, said Habibie, progress is something the nation ends based on knowledge and skills that power humans. Hence, development potency resource man too many nouns are the core of development knowledge and technology (Prayitno, 2014). During constitutional law in the 1950s, the Indonesian elite established many institutions and political and social expectations to support the nation as an independent entity. Indonesia, in the 1950s, was built on debris institution colonial, as well as institutions and structures of the revolution, but still, there is little orthodoxy. Although facing a setback economy, failure cabinet, rebellion regions, and a weak state, the Indonesian elite is full of spirit debate about the future role of the Indonesian nation.

They started attempting to move the future of Indonesia as a nation. Politicians, intellectuals, bureaucrats, and officials force the land to believe in We are were a vision. The 1950s was a chaotic period, marked by competition among factions of different elite groups. Those times were also disappointing, mainly because of the failed attempt to formulate a new national constitution (Goss, 2014).

In 1956, the Indonesian government established Madjelis Ilmu Pengetahuan Indonesia (MIPI/ Indonesian Science Council) through Law (UU) No. 6 of 1956. Duties are to guide the development of knowledge and technology and consider the government in Thing wisdom knowledge. Three years after the establishment of MIPI, Soekarno inaugurated the formation Atomic Energy Institute, which later



became the National Atomic Energy Agency (BATAN) in 1959. The ATOM Indonesia project is under the auspices of the Atom for Peace Program, the idea of President Eisenhower (USA). In 1961, the reactor research Triga-Mark II was founded in Bandung.

At the moment of the Indonesia-Malaysia confrontation, Sukarno diverted nuclear program goals to the destination military with a startling plan to build the first atomic bomb in Indonesia (Raillon, 1990; Amir, 2009). The plan failed because, in 1965, Sukarno was overthrown by Suharto, who later gained power under the New Order banner. During the New Order era, BATAN built reactor research 100 KW Yogyakarta in the late 1970s, followed by a 30-MW reactor at Serpong several years then.

Before MIPI was formed, some institution research was already formed during the colonial period; one of them is LBN (Lembaga Biologi Nasional/ National Institute of Biology). Led by Otto Soemarwoto in April 1964, LBN is the most reputable institution directly under MIPI. At that time, LBN was the institution's official government for leading the discipline of biology in Indonesia. In 1967, the Assembly Provisional People's Consultative Assembly (MPRS) merged MIPI and the Ministry of Education and Culture Affairs National Research into LIPI (Lembaga Ilmu Pengetahuan Indonesia/ Indonesian Institute of Sciences).

Sarwono Prawirohardjo, who switched from MIPI Director to LIPI Director, is directly responsible to the President Republic of Indonesia because Indonesia needs powerful and competent research that can help in field knowledge and technology implementation plan Indonesian development. LIPI on duty realizes a plan to coordinate closer between all institutions to research good government and private sector (Goss, 2014).

In 1968, Suharto attempted to put politics, a moving economy, and development in order. Since the early 1970s, President Suharto has had to feel the importance of mastering technology. He decided that Indonesia must be ready in 1994 to face the challenge of technology century XXI (Raillon, 1990). As a result, in 1974,



president Suharto assigned Habibie to establish BPPT (*Badan Pengkajian dan Penerapan Teknologi/ Agency for the Assessment and Application of Technology*), Puspiptek (*Pusat Penelitian Ilmu Pengetahuan dan Teknologi/ Science and Technology Research Center*) and created the industry of Aerobics. The existence of LIPI did not seem to satisfy President Suharto, so BPPT was formed on August 21, 1978.

BPPT is a successor to Pertamina ATPP. That division was made in 1974 after BJ Habibie returned to prepare the existence of an Indonesian technology and aeronautics agency. Needed time to prepare costs and personnel required. Since born, BPPT has developed fast once. On August 28, 1982, the fixed structure consisted of a Chairman (BJ Habibie), Deputy Chairman (Parlin Napitupulu), six deputies with rank parallel Director General, 20 Directors, four Bureau Heads, and 11 Heads of Technical Implementation Units (Raillon, 1990). The Head of State sets three priorities: create industry aeronautics, founded an Agency for Assessment and Application Technology (for planning and adapting technology that comes and goes from Indonesia), and founded a PUSPIPTEK (Raillon, 1990).

BPPT prepares policy, coordinates program implementation, and makes an amount of activity in evaluating application technology. BPPT provides service to state and private agencies in field application technology. Importantly, BPPT is also on duty in practice to source power for humans. BPPT programs were created as the answer above problems in actual Indonesian society. In short, BPPT regulates the transfer process technology good upstream and downstream (Raillon, 1990).

Six years after the establishment of BPPT, the government re-established the *Dewan Riset Nasional* (National Research Council) on January 7, 1984. The National Research Council created formulation policy available research as a successor from Penpunas, who made Matrix National Research successful. Below the leadership of BJ Habibie, DRN consisting of from the 60's character scientific and university on duty define programs priority national and give it to Bappenas. Secretary General DRN personally *ex officio* held by Assistant Minister of



Research and Technology, Sediono MP Tjondronegoro, an expert development countryside. It is also planned to establish Academy Knowledge Indonesian knowledge as advanced from DRN (Raillon, 1990).

Exposure to proving that solution problem research and technology in Indonesia in perspective government is with build body or institution new on duty complete problem research that could not be completed by the agency before. Almost all institutions new research formed, commissioned to coordinate and integrate institution research and technology that has there is as well as synergize government, research and technology institutions, with the business world, however permanent just problem the return repeat and progress Indonesian research and technology remains not yet reach more good.

What root problem is stagnation of research, lousy coordination of various institutions, weak synergy *triple helix* (Government, research, and technology institutions, and the business world), and its weakness in innovation in Indonesia? Several studies show that the application of science and technology is not only related to politics and economics but also to many factors technology is also related to social culture. For example, France has shown how technology is meant to create a teak self-nation. In contrast, India expresses how it is a postcolonial country looking at technology as a form of modernity (Amir, 2009). Even Raillon (1990) saw that Indonesia had hampered the development of scientists because of a problem culture and psychological Lack of human resources educated, efficient, disciplined, working hard, etc.

Various research has already deciphered connectedness factors political, social, and economic influences development of science and technology in Indonesia. This article will browse the results of a study by experts from various fields about factors blocking the progress of technology in Indonesia during the Old Order and the New Order. Expert findings will be detailed and make the pattern to find the point meet and root problem of stagnation floating technology in Indonesia.

Methods and Research Design

Methods. The research design is *Literature Review* or reviews library. Study literature is research that examines or reviews critical knowledge, ideas, or the findings contained in body literature oriented academic, as well as formulates contributions theoretically and methodological for specific topics (Cooper, 1988). *The literature review* technique used is *Systematic Literature Review* (SLR), or In Indonesian, it is called a review. The systematic review method is a literature review method that identifies and assesses. It interprets whole findings on a topic researched for answer question research (*research question*) that has been set previously (Kitchenham & Charters, 2007).

Research Design. This study uses articles obtained from Google Scholar, JSTOR, science direct, and others using various keywords. The selected research articles are open-access articles. This Literature Review uses literature published from 1970-2020, which discusses the development of science and technology in Indonesia during the Old Order and New Order. The selected scientific journals are articles from journals indexed by the Web of Science (ISI), Taylor and Francis, and SCOPUS. These three moments are trusted as an indexing and rating organization for journals and proceedings in the research world. In addition, articles, journals, books, and magazines that discuss technological developments in Indonesia are also used as analytical materials, especially to evaluate the views of scientists who lived during the Old Order and New Order on the development of science and technology.

In Indonesia. The following articles and books are used, among others, as follows:

Table 1. Literature Used as an Analysis of the Development of Science and Technology in Indonesia

No	Article/ Book Title	Writer	Year Rise
1	<i>Technology to Serve Whose Interests? .</i>	Hadad	Prisma Magazine No. 4 Year XVI April 1987
2	<i>Overview of the Development of Technology Transfer in Indonesia .</i>	Ibrahim, MA	Prisma Magazine No. 4 Year XVI April 1987, pp. 18-28



3	<i>Technology Transfer: Between Hope and Reality .</i>	Lubis, TM	Prisma Magazine No. 4 Year XVI April 1987, pp. 3-17.
4	<i>Indonesian Universities: The First Generation .</i>	Paauw, DS	Prisma Magazine No. 2 Year VII March 1978, pp. 3-13
5	Long-term forecasting of technology and economic growth in Indonesia. Asian	Aminullah, E.	Journal of Technology Innovation, 15(1), 1–20. year (2007).
6	<i>Indonesia's Great Leap Forward? Technology Development and Policy Issues.</i>	Hill, H.	<i>Bulletin of Indonesian Economic Studies</i> , 31(2), 83–123. (1995).
7	<i>Technology Leadership in Turbulent Times.</i>	Chowdhry, U.	<i>Research-Technology Management</i> , 53(1), 29–34. (2010).
8	<i>Science, technology and production in the underdeveloped countries: An introduction.</i>	Cooper, C.	<i>The Journal of Development Studies</i> , 9(1), 1–18. (1972).
9	How Not to Industrialize? Indonesia's Automotive Industry”.	Aswicahyono, Basri, Hill, H.	Bulletin of Indonesian Economic Studies, Vol. 36, No. 1, pp. 209-241. (2000)
10	<i>Science and technology for wealth and health in developing countries.</i>	Acharya, T.	<i>Global Public Health</i> , 2(1), 53–63. (2007).
11	The regime and the airplane: High technology and nationalism in Indonesia.	Amir, S.	<i>Bulletin of Science, Technology & Society</i> , 24 (2), 107-114. (2004).



12	<i>Our Higher Education Now</i>	Amirudd in,	Prisma Magazine No. 2 Year VII March 1978, pp. 14-21. (1978).
13	<i>Nationalist rhetoric and technological development: The Indonesian aircraft industry in the New Order regime.</i>	Amir, S.	<i>Technology in Society</i> , 29(3), 283–293. (2007).
14	<i>Challenging Nuclear: Antinuclear Movements in Postauthoritarian Indonesia.</i>	Amir, S.	<i>East Asian Science, Technology and Society</i> , 3(2-3), 343–366. (2009).
15	<i>A sociotechnical order for the umma: connecting Islam and technology in Suharto's Indonesia.</i>	Moon, S.	<i>History and Technology</i> , 1–23. (2020).
16	<i>Manufacturing in India and Indonesia: performance and policies.</i>	Nehru, V.	<i>Bulletin of Indonesian Economic Studies</i> , 49(1), 35–60. (2013).
17	<i>Appropriate Technology Development as Effort Build Indonesia 's Economy Independent.</i>	Radhi, F.	<i>Journal Scientific Business Economics</i> , 15 (1), (2011).
18	<i>An Integrated Approach for the Choice of Appropriate Technology</i>	Ramanat han, K.	<i>Science and Public Policy</i> , Vol. 21, No. 4, pp. 221-232. 1994.
19	<i>The Role of Scholars in National Development</i>	Soemard jan, S.	Prisma Magazine No. 11 Year V November 1976, pp. 3-16
20	<i>The rhetoric of Indonesian technology development: An</i>	Suwarno, P.	<i>Asian Journal of Communication</i> , 6(1), 65–88. (1996).



analysis of BJ Habibie's speeches1.

21	<i>The Major Channels of International Technology Transfer to Indonesia: An Assessment.</i>	Wie, Kinderga rten	<i>Journal of the Asia Pacific Economy</i> , 10(2), 214–236. (2005).
22	<i>Technology Development as Salagh One Tool of National Development Policy .</i>	Alun, T.	Prisma Magazine No. 4 Year XVI April 1987 (1987).
23	<i>Technology in the Archipelago: 40 Ages of Barriers Innovation.</i>	Besari, MS	Publisher Salemba Teknika (2008).
24	<i>Sarwono prawirohardjo: Builder Institution Knowledge Knowledge in Indonesia.</i>	Adam, AW	LIPI Press (2009).
25	<i>Shackles Scientist and Knowledge from Dutch East Indies to the New Order.</i>	Goss, A.	Bamboo Community (2014).
26	<i>Year full challeng: Soedjono Djoened Poesponegoro, Minister of research first in Indonesia.</i>	Mashad, D.	LIPI Press (2008).
27	Historical Role of Prof. Dr. GA Siwabessy. In Nikijuluw, VPH and Rachman, E (ed). (2014). <i>Sang Upuleru: Commemorating 100 years of Prof. Dr. GA Siwabessy (1914-2014).</i>	Pieris, J.	PT Gramedia Pustaka Utama (2014).



28	<i>Indonesia 2020: Challenges Technology and Industry.</i>	Raillon, F.	CV Masa Agung (1990).
29	<i>Change Social: Dynamics Development Knowledge Knowledge and Technology in Community Life.</i>	Prayitno, US	Secretary General of the Indonesian House of Representatives (2014).
30	<i>From Pasteur's Way to the World: The History of Bipharmaceuticals .</i>	Holid, A.	Publisher PT Biofarma (2011).

Results and Discussion

Dimension linkages Among technology, politics, culture, and education with straightforward discussed by Francois Raillon (1990) entitled *Indonesia Year 2000: Challenges Technology and Industry*. The New Order Regime depends on skilled elite technocrats as the foundation of the development process nation. In 1970, scientists made agent government in effort development, which also happened during the Old Order (Raillon, 1990). Aminullah (2007). Amir (2009), Hill (1995), and Moon (2020) all talk about the development of science and technology in Indonesia during the New Order period.

However, Aminullah (2007) and Amir (2009) also discussed the development of technology until the reformation period, primarily until period the early 2010s, while Hill (1995) and Moon (2020) focused on studies of the New Order period from 1966-1998. Ibrahim (1987) and Hadad (1987) analyzed the development of past scientist independence of 1945 and its relation to the development of science and technology during the Old Order and the New Order.

Raillon (1990) independently completely decipher the development policies of the Old Order and the New Order in development research and technology for interest in industrialization and development. Raillon also outlines various research institutes such as LAPAN (*Lembaga Penerbangan dan Antariksa Nasional*/ National Institute of Aeronautics and Space), BATAN, BPS (*Badan Pusat Statistik*/ Central Bureau of Statistics), MIPI/LIPI, Bakosurtanal (*Badan*



Koordinasi Survei dan Pemetaan Nasional/ National Survey and Mapping Coordinating Agency), and BPPT.

Various companies big based neither does technology escape from study Raillon (1990), like Pelni, Pertamina, IPTN, LEN, and others. Goss (2014) focuses on relationships between scientists and countries from the 1950s to the end of the New Order, and Prayitno (2014) describes aspect sociological from development research and technology in Indonesia. In the Indonesian context, development technology needs to be supported by an existing institution working on research as a coach, coordinator, and advisor government. There are various institutional models of science, research, and technology (Adam, 2008).

Researchers talk about the same problem: analyzing inhibiting factors development of science and technology in Indonesia. Aminullah (2007) and Hill (1995) reveal factors of politics and economics as aspects of the central obstacle development of science and technology in Indonesia, while Moon (2020) and Amir (2009) review factors of social blocker development scientists. Moon (2020) sees an element relationship between religion and technology.

While Amir (2009) also reviews the factors of movement protest, Public civilians who follow hinder the development technology nuclear power in Indonesia. Denial is primarily driven by suspicion that the government could not handle high technology risks (Amir, 2009). Democratization in the post the collapse of the new order has allowed the growing and strengthening network group Public civil for to resistance organized to nuclear power well at the level national and local.

Raillon (1990) revealed that factors like politics and economics influence the development of science and technology in Indonesia. Ups and downs state politics and economics want adjustment structural field research. For example, in 1979, the state's income increased because the existence *boomed* Oil and Revolution green, and the state started glancing at technology, especially Field Energy. That occurs because Indonesia still needs a '*policy blueprint* for development technology.' Policy technology - and policy industry in common - are combined



from various intervention macro and microeconomics (Hill, 1995). In GBHN and Repelita, no one chapter discusses plan development technology (Hadad, 1987; Prayitno, 2014).

Of course, GBHN and REPELITA books will disappoint because no one chapter, especially those that show Plan Development Technology. In the 1986 GBHN, chapter III part B number 13 only mentioned that utilization of technology and science knowledge in implementation development conducted with pay attention conditions, fixed give the opportunity much work, using tools as much possible generated alone and able for maintained alone, heighten Skills for use more technology up in the coming day. From the excerpt, this still needs to be seen direction and development of technology in Indonesia. Development technology in Indonesia is one element of the planned development economy. Nevertheless, the desire to enter technology in Indonesia exists in the Indonesian nation (Lubis, 1987; Prayitno, 2014).

Not precise planning in development, scientists in Indonesia make appearances to debate with economists and engineers about the priority development of Indonesia (Hadad, 1987; Lubis, 1987). Hill (1995) saw that one of the problems of developing technology in Indonesia was disagreement Between the Minister of Research and Technology Habibie and New Order economists about an approach to developing the economy. Habibie believes that Indonesia must play a role in the design and development of technology height, not only in manufacturing, while economists are generally against this idea (Moon, 2020).

Aligned in developing wisdom over technology in Indonesia, Habibie feels no consistent, unified party; he says that the core of the development of science and technology is the human, that is, with developing optimization freedom scientific. On the other hand, it is technology fundamental. So policy development science and technology is application technology that supports the acquisition and development of appropriate and valuable technologies. The only size appropriates whether or not technologies that, according to Habibe, are used in value processes



add and solve problems in concrete development society. Emphasis on using and value plus in development technology that whatever must take (Prayitno, 2014).

According to Habibie (1985), managers' knowledge and technology must become pragmatic. Managers show relevant results for problems development concrete in the community; they must have results obtained in the time short possible. The manager urged to show results even though the programs overlap, are inconsistent, and need coordination. The manager must show results of no care and appreciation Public for knowledge and technology not adequate. Transfer process technology alone is very complicated because it involves various direct factors or no direct interest or influence on sustainability (Prayitno, 2014).

Several variables cause Indonesia to need still to be capable export commodity-based technology. *First*, at the macro level, there are no existing linkages Between policy economy and policy technology. *Second*, the government needs more commitment to developing the absolute technological *infrastructure* needed to develop commodity-based technology. Moreover, *Third*, has no existing linkages between the government's and industry's infrastructure technology (Radhi, 2011). Element private is not involved enough because no effort is involved directly through macro policy development (Alun, 1987).

Economic Factors

In the corner look economy, the primary problem development of technology in Indonesia during the Old Order and New Order is low Investation in technology (Aminullah, 2007). Investation in technology is the development ability of standard technology through the learning process technology that will avoid the development ability technology ambling in Indonesia in the past. Investation technology needs to be more inspired by a need for more awareness of building ability technology. Indicators of Investation in technology include efficiency private business sector, Productivity in R&D institution research, efficacy policy government in the field of technology investment, mastery of knowledge, and high-quality education (Aminullah, 2007).



Low investment in technology could be seen from the budget government for developing science and technology during the Old Order and the New Order. The budget is relatively small, and the space scope for influencing development technology is limited because significant funds will be allocated for professional development, with no fundamental research (Hill, 1995a). Funds issued by the Indonesian government in science, technology, and research since 1975 ranged from 0.9-1.3% to 0.2-0.346 of the total expenditure government (Hill, 1995b). That proves that no fundamental shift in emphasis on project technology occurred because the quantity 1991 state budget was almost identical to 1976 and 1977, even during the Old Order. Of course, once the increase peaked in 1983 and 1988, the next Keep going experienced a decline.

Hill (1995a), regarding the low budget for research and technology, reinforced the data submitted by Aminullah (2007). Past reality shows that budget R&D in the government in Indonesia first no different many from South Korea, with about 0.4% of GDP in the baseline 1970s. Then, since the 1970s and up moment this, the output of Indonesian R&D in part big financed by the budget government and continued down, down to 0.1% of GDP in 2004, while Expenditure on South Korea's R&D increased sharply to 2.85% of GDP in the same year, which significant occur financed by the sector private. Among the five ASEAN countries (Indonesia, Malaysia, Thailand, Vietnam, and the Philippines), only Indonesia failed to experience enhanced acquisition knowledge scientific through R&D, plus again kept deteriorating and occupying the base position since 2000 (Aminullah, 2007).

In principle, the development program infrastructure government's enhanced budget for research and technology in the 80s, particularly the facility laboratory at PUSPIPTEK (Science and Technology Development Center) in 1987-89 (Hill, 1995a). Numbers show influence from the existence of Habibie as Minister of Research and Technology and contrast with the approach his predecessor, Sumitro. Limited funds for the development of technology make focus. Countries like Indonesia focus on the absorption, use, and modification of technology import



effectively to ensure that companies locally make the most effective choice from the 'shelf technology' globally that technology spreads quickly (Hill, 1995b).

Reasons economy could also be seen from the fall of state revenue due to fluctuating oil prices in 1986. Decreasing state spending because of falling income and the desire to maintain the state budget balance causes expenditure for development, including development research and technology restrictions (Raillon, 1990). unified side, development technology depends on the fluctuating economy; however, on the other side, development technology also affects the situation economy. Economists blame project technology high, especially IPTN, because absorbing enough many sources of power economy without significant contribution economy is large, so that drag the country's economy Became deficit critical in 1998 (Amir, 2004).

Social Culture Factors

Technology is also related to factors of social culture. Project nuclear France has shown how power nuclear means creating a teak self-nation. In contrast, the energy program of nuclear power in India reveals how a postcolonial country looks at nuclear power as a form of modernity (Amir, 2009). So as with Indonesia, IPTN is a very prestigious project; this has become a form of nationalism-established technology for creating identity, national pride national, and confirming national sovereignty (Amir, 2004).

Amir (2009) and Moon (2020) view the development of Indonesian technology during the Old Order and the New Order as both a factor in economic, social, and cultural aspects. That appeared in the emergence of resistance organized to plan government in developing nuclear energy power in Indonesia (Moon, 2000). Denial is mainly driven by suspicion that the government cannot handle high technology risks (Amir, 2009). Democratization in the post the collapse of the New Order has to allow growth and strengthening network group Public civil for to do resistance organized to nuclear power good at the level national and local.



Amir (2004) assesses that two non-economic factors cause the failure of project leap technology such as IPTN. *First*, IPTN is based on the view of determinant technology that technology is considered the machine that carries a social change in society. This idea ignores understanding of how technology and society each other interact. *Second*, the IPTN results from the practice of solid technocracy, an atmosphere possible politics only those who know technology can determine how technology developed while forbidding the participation public. Policy most inclined technology by exclusive serve interest elite technology.

Moon is a different focus from Amir; Moon's (2020) narration that analyzes the relationship between religion and technology in Indonesia during the New Order interesting for observed. Development technology in the corner look Muslims in Indonesia is a vital spiritual and economic arena for Indonesian Muslims. Indonesian Islamic activists offer a redefinition of the development of the intended economy for change purposes and character participation in effort development (Moon, 2020). Moon Analysis (2020) views a perception of feeling marginalized people from Muslims in implementation development in Indonesia.

For Muslims, the construction of the New Order character elitist and only feel group Public specific and, in the end, caused injustice economy. Perception like that can hinder development because Muslims do not fully participate in the state's implementation of development.

Early 1990 was the emergence of ICMI (The Association of Indonesian Muslim Scholars), which carried the theme of unity of science and technology, religion, and other things that triggered a long debate. Moon's (2020) rate though Islamization and industrialization happened simultaneously in Indonesia, the relationship between them is complex. It is based on a debate about science and technology in the 1990s. Attention to technology and the trajectory development of the Indonesian economy taken at the congress 1994 shows long-standing concern about what many people think as the exclusion of economics and politics systematic Muslims by the New Order (Moon, 2020).



The cultural archipelago that still bound mysticism and irrationalism that have developed for thousands of years hinders the development of modern culture, including the traditional development of science and technology (Besari, 2008). Knowledge in Indonesia is alive in graft culture, which means the prevailing way of thinking, values, and way of life cannot grow knowledge in modern knowledge. Always question scientific not yet Indonesian culture people so activity research could not grow naturally as something phenomenon social (Besari, 2008).

Educational Factors

Raillon (1990), Paauw (1978), and Goss (2014) highlight the low quality of Indonesian human resources as a factor blocking the development of Science and Technology in Indonesia during the Old Order and the New Order. Raillon (1990) saw Indonesia as experiencing a problem culture and psychology Lack of human resources, educated, efficiency, disciplined, working hard, etc. Low HR quality limits the ability of Indonesian innovation, so that depends on technology import. The quality of human resources also determines the ability to access technology good diversion or technology transfer. Thereby no excessive for the state that education is the heart of technology strategy. Performance education level tall has been the core of the successful development of East Asian economies (Hill, 1995). The lack of experts awakened the Old Order and New Order governments to immediately build various universities, which gave birth to universities that developed domestically and privately (Paauw, 1978).

Quality education is crucial in building capability technology in all primary studies about this problem. This is also a determinant important from technology transfer speed. The foreign company is generally more ready to transfer knowledge if the cost absorption partner is local enough. Skill base weak domestic in Indonesia may be the only barrier most important to technology transfer by foreign companies (Hill, 1995). Besides that, university culture in Indonesia has not supported the development of scientists because the research is not detailed, quality teachers, teaching materials that do not make appropriate, obsolete



teaching methods, and the curriculum is monolithic. The culture has low discipline (Amiruddin, 1978). That thing has yet to change though the regime has changed.

Hill (1995) suggests that since the 1960s, expansion has occurred outside the standard quantity of education. Vocational and technical education at the medium level still needs to grow more. At all levels, curriculum education and engineering pedagogy seem insufficient to push curiosity and initiative. Ratio students/staff height and source power Support education limited. Remuneration throughout the system could be more robust to attract and retain staff-quality teachers. At level college high, there is only a little encouragement for staff to pay attention to teaching and research. College tall private offer considerable flexibility and capacity for innovation, but progress is hampered by control and complicated bureaucracy (Hill, 1995a). Besides that, Hill (1995a) views the low amount of Indonesian power scientists engaged in R&D who are still insufficient and far more minor than in Korea and India. That could be understood if we view data about Indonesian spending on very little education since 1970 and budget education far below other countries, including low teacher salaries (Hill, 1995).

Political Factors

Almost all studies primarily about development technology emphasize the importance of regime effective governance, thriving infrastructure with good management economy good macro, and attitude open to import technology (including those contained in an investigation of foreign direct and consequential work skills) (Hill, 1995a). That applies not only in Indonesia but in other developed and growing countries. Hill (1995a) revealed that small research and technology allocation happens in developed countries too. Only developing countries.

Developing countries must invest in science and technology or risk being left behind as the gap in technology between North and South is widening. However, in developing countries, there are pull and dilemma policy government Among technology investment or investment or sustainability in service base for the



whole community, such as care health and water supply and sanitation as well as Education services (Acharya, 2007). Reaching a balance is a challenging problem and permanently colored debate. Here location leadership plays a role in creating a track to go out from various difficulties and obstacles, encouraging countries to give clarity of strategy and options for future growth, and struggle for the right balance Among needs period short with long term (Chowdhry, 2010).

The 1950s and 1960s were years when Indonesia was experiencing a crisis in the world of research and technology, and by Makagiansar called period *survival* (Mashad, 2009). Must-have skills owned by the characters in the 1960s are the ability to sail between two coral reefs, namely Soekarno and Suharto (Pieris, 2014). Characteristic democracy Guided the New Order period began with the utilization of professionals and experts trained to use the right unique and robust position in Sukarno's government, also later Suharto. Even though no fact new, this administrative arrangement was rooted in the Van Mook regime in the 1940s.

Ambition people are technocrats permanently living in the 1950s, especially under management Feith. Of course, just in a parliamentary system, administrators could not embed their vision in Indonesian politics. Professionals maintain the idea in various professional associations and institutions and not once find a method to strengthen popular support. This became a barrier to hoarding power in a system of democracy in the 1950s. However, in the decade following 1957, there were enough compatibilities Between the ideals of scientists and nationalist ideologies owned by ruler authoritarian who made their work effective (Goss, 2014).

Sukarno tried to turn Indonesia into a unitary state by deploying power and more executives big. Even so, he did not start it from a strong position because since 1945, Sukarno was outside the state administration system, and only some power holders could direct the pull. Knowledge is case typical. Sukarno did not mean to control knowledge by oppressive, and Sukarno did not have an ideological program that scientists could follow (Goss, 2014).



On the other hand, Sukarno led more senior scientists close to the government, and they expected to formulate policy appropriate scientific with democracy led by Sukarno. Senior scientists play a role from the institution's director to Becomes manager of policy science. For many scientists, this is an excellent chance to channel and source much-needed power in their programs. Established institutions, especially those that do not relate with form ideology in wartime cold, tend to become suitable institutions with this policy. Several institutions, including garden Raya, have designed in the colonial era to develop in an authoritarian and ready state at the beginning of the New Order era (Goss, 2014). The pressure on the people's intelligence to support the regime without *reserve*; other than that, people Communists mocked them as hard, non-political person heads and stigmatized them with the term "slut " intellectual (Soemardjan, 1976).

Ideology Democracy guided, which Sukarno referred to as the Manipol USDEK (Political Manifesto – 1945 Constitution, Indonesian Socialism, Democracy Guided, economy Guided, and Indonesian Personality), is revolutionary for nature. Sukarno urged the Indonesian nation" for a "return lane revolution" in the fight to oppose imperialism and restructure society. The destination finally is to build a just and prosperous society. Sukarno tried at the end of ten-year to fulfill the debate and stalemate by embracing all ideologies. This thing part means kill difference. For example, he targeted intellectuals outside control politics by shutting down critical newsletters to the government (Goss, 2014).

Iwa Kusumasumantri, related nationalists with the PKI, took office as Minister of Higher Education and Science Knowledge after 1961. Iwa cruelly forced the draft Manipol -USDEK in all Indonesian universities and fired the professors who were administrators he considered against democracy guided. Students who intend to continue their education overseas can only do it if they get permission from a personal minister and must pledge loyalty to Manipol -USDEK before leaving. Among civil servants, including those working in the garden Raya, everyone is intimidated by the discourse of "*retooling*," namely the possibility that drop positions or mutation positions spark distrust among all government employees



who are not convinced about what to expect from self them. How are you them must looking for Street revolution? (Goss, 2014).

In 1966, the editor of the journal MIPI News wrote that with the destruction of the PKI and its sympathizers, the freedom of academics has back. Intellectuals do not need again worry that they will be stamped as " textbook thinkers" or creations; they will be called "reactionary. "Freedom responsible academic "new" will characterize the development next knowledge Indonesian knowledge (Goss, 2014). Split political During several years, the last era of democracy guided became a destabilizing factor for many scientists. Maybe many Indonesian scientists wanted to work for revolution, and the Indonesian nation, as Sukarno ordered them.

However, they do all that to increase their authority and professional competence, not with agitation, political and social. In addition, the fear of making mistakes and embarrassing their colleagues means that most scientists keep a low profile. Scientific institutions such as botanical gardens and MIPI also do the same. The beginning of the New Order seemed to many scientists to promise the return of research with less stringent political scrutiny (Goss, 2014).

Indonesia began economic reform in 1967 and experienced accelerated growth, then maintained for 30 years (Nehru, 2013). New Order To make a massive effort to chase the ambitious desire regime for build supremacy technology through establishing expensive, scalable aircraft extensive and sophisticated manufacturing in Bandung (Amir, 2009). Amount research analyzes several factors that also encourage the development of Research and Technology in Indonesia. Sulfikar Amir (2009) views factor nationalism Becomes a booster of progress in New Order Era technology.

Technological nationalism is a rhetorical strategy used by the technological elite to legitimize policies of high technology and to absorb a lot of economic and political resources, which have unexpectedly broad implications in society (Amir, 2004). Technological nationalism is a form of ideology that functions at three



levels: integration, legitimacy, and distortion (Amir, 2007). Technological nationalism encourages greater societal integration and has far-reaching implications by giving technology elites tremendous power to make technology choices (Amir, 2007). The rhetorical strategy of the technocrats in building power in New Order politics rated complete with "dramatic" (to borrow fill in Kenneth Burke) and independently optimistic link technology level tall with prosperity (Suwarno, 1996).

Nationalism technology in the New Order era lies in the function of discursive use by elite technology to get power and domination (Amir, 2004). *Nationalism technology* is a strategy the elite Indonesian technology uses to legitimize power and justify choice technology (Amir, 2004). Character ideological technology nationalism can hypnotize the thought public through admiration of technology artifacts (Amir, 2004). The impact of the "magic" of nationalism technology is ignored in choice development by pragmatics related to the type and level of technology that must be developed to meet the criteria *for appropriate technology*. The choice of *appropriate technology* must be based on several supporting factors, including the need for suitable technology for the development industry, the availability of *technology infrastructure*, the availability of human resources who have the ability to technology (*technological capabilities*), and factors supportive environment (Ramanathan, 1994).

Choice New Order government in developing high-tech technology in the field of industry airplane with established PT Dirgantara (PT DI) from IPTN and the field industry automotive with Project Mobnas is an example of *inappropriate technology* ever developed in Indonesia (Aswicahyono et al., 2000). Policy The New Order's politics also made Indonesia not free from dependency on technology in developed countries, and Indonesia's natural resources were increasingly depleted (Cooper, 1972). Activity science in developing countries tends to become a form of consumption than an investment.

Conclusion and Recommendations

From various descriptions, then several inhibiting factors to the development of Science and technology in Indonesia, among others: Ups and downs in state



politics and economics that want adjustment structural field research and technology; Ability Indonesian innovation is limited, so that depends on technology import; Access to technology (Diversion or technology transfer); Many research institutes, however, no coordinated with good; Source financing and Education: investment economy and people; competence power work (HR factor): and barriers culture and psychology of HR: educated, efficient, disciplined, work hard, and others.

Various study researchers, good historians, expert economists, expert politicians, and technology experts see Indonesia as trapped by various obstacles good by structure (political, social, political, cultural, and economic) and individual (scientist). Whereas by the empirical moment, these factors are blocker that still exists and need solving. Researchers previously have yet to explore the effort of active government, especially institutions of research and technology, to resolve various obstacles, including the effort to synergize *triple helix* (government, private sector, and scientists) in developing research and technology in Indonesia. Search various effort institution research and technology necessary for analyzing root problem blocker progress research and technology in Indonesia.

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