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Megaprojects Galore: Advent of the Giants

Mohammed Thoufeeq
Research Scholar
School of Management Studies (SOMS)
Research Unit - IGNOU, New Delhi, India

Abstract : The galore of megaprojects are evident globally, with the sharp rise in the investment directed towards large projects. As projectification is flattering to be a most acknowledged and accepted method of executing the requirements, so are the megaprojects. With organizations and countries executing their dreams and shine globally through megaprojects, the darker side is inevitable. The in executing megaprojects have sunk nations and turning century old organizations into bankruptcy. The paper gives with the insights of megaprojects, their evolution over the century and the current trends. The risks posed by the megaprojects as well as the opportunity it creates is narrated with references and benchmarks. The paper presents insights on the list of megaprojects that have had long lasting impact on many of the nations. The paper also answers on why megaprojects are still preferred despite the low success rate and concludes on the advancements that adds positivity to the megaproject practitioners and institutionalists.

Index Terms **- Megaprojects, Project Management, Project Risk, Opportunity, Project Trends, Complexity**

I. INTRODUCTION

Megaprojects are fascinating elements that the earth has ever witnessed since billions of year of its formation. Megaprojects are reshaping our planet like never before, and have imprinted symbolic changes. The 21st century, called an era of information and technology, has witnessed projects to the peak of human strength and knowledge. The growing essentiality of infrastructure requirements, globalization and modernization has triggered a massive flurry of megaprojects worldwide in the previous two decades. A new wave of investment in construction megaprojects has been sparked off by the rapid urbanization that is occurring all over the world. Megaprojects are not only enormous and getting bigger all the time, but they are also being constructed in an ever-increasing number and at an ever-increasing price. The growth of a country's economy and standard of living depend on its level of infrastructure. Businesses and individuals in any country have an immediate need for a well-maintained infrastructure. Historically limited to the construction industry, megaprojects have branched out into other sectors in recent years. In addition, the past few decades have seen remarkable advancements in technology that have made possible what was once just a pipe dream.

It is rightly said that this earth has everything for human need but not for greed. The ever-expanding human needs are outpacing the world's resources. Increase in population, consumption and globalization trend requires immediate need of basic amenities like safe drinking water, ease of transportation, sanitation, electricity, housing etc., The best option as foresighted to resolve the massive needs is through enormous infrastructure and development projects, for example dams, highways, powerplants, skyscrapers, infrastructures etc., The strategy of executing megaprojects evolved in the second half of 20th century by the developed economies and is growing exponentially in 21st century around the world (Moore, 1998). Megaprojects are now so huge compared to national economies that cost overruns benefit shortfalls, and dangers from a single project can affect an entire country or area, as was the case for Greece with the Athens 2004 Olympics and Hong Kong with its international airport upon its 1998 opening.

The paper outlines the evolution of megaprojects in the second half of the 21st century and its advent into the modern world. Large, multibillion-dollar industrial infrastructure projects in industries like energy, steel, petrochemicals, and transportation can have superior long-term economic and social benefits, but they are prone to cost and schedule overruns. Mega-projects are challenging initiatives where change and uncertainty are frequent occurrences. The ability to recognize and manage risks over the course of the project will determine its success. This means that for these initiatives to be successful, they need to be planned, structured, funded, and managed in a way that takes change into account, clearly defines risk, and minimizes the effects of late costs, functionality, and schedule (Chatterjee & Purnendu, 2015)

Post global economic crisis private investment has subsided. As a result, major share of investments are now paid for by the government. Thus, a massive amount of a country's budget goes toward building infrastructure through megaprojects. Current infrastructure expenditure is the largest investment boom in history; calculated as a proportion of global GDP the figures indicate the vastness and impacts megaprojects can cause. The global GDP as of 2021 stands at 96.3 Tn $ with agriculture contributing 4.395%, industry sector contributing 26.33% and the service sector majorly contributing around 65% to the GDP. The GDP forecast projection is 136.4 Tn $ (41.6% increase) by 2027 and 141.82 Tn$ (47.3%) by 2030. By 2030, emerging nations are expected to account for 60% of global GDP, and that needs massive economic growth and investments in expansion of trades, develop

infrastructure and technology. Megaprojects are the preferred delivery methods for achieving this, and directly impact the global economy.

The paper also gives insights to the risks and opportunity megaprojects bring along to the nation as well as firms funding or executing it. The magnitude of today's megaprojects, both physically and economically, means that the success or failure of a single project could have long-term impacts on whole nations. Megaproject success depends on such enormous sums of money that the results can have long-term effects on business balance sheets and even government balance of payments accounts. Even for a nation as large as the United States or China, analysts warn that the effects of a single megaproject, such as the Three Gorges dam, can have a significant impact on the economy., "may surely hamper the economic viability of the country as a whole" (Flyvbjerg et al., 2003a). A country's economy could be severely impacted by significant cost overruns on government-backed projects, which could influence a nation's decision to vote against an incumbent administration (Love et al., 2012).

II. Rise of Megaprojects

a. Projectized ways of execution on the rise.

From the days when a projects were tagged limited to massive undertakings featuring the majestic pyramids, the massive Great Wall that symbolizes China or the iconic Taj Mahal , it now appears that any action, no matter how little, might be considered as a project. The business world is increasingly becoming more projects oriented. Major projects must be undertaken in order to develop new technology goods, construct new capital assets, or launch innovative large-scale enterprises. Additionally, as technology has advanced and projects getting larger, complex and timebound in recent years; execution in the form of projects is crucial for business, and are the preferred mode to execute most of the undertakings (Williams, 2003).

Although the English term "project" is based on the Latin term "projectum," which means "to push something ahead." A project in general is a distinct, discrete activity that yields an observable and quantifiable outcome in accordance with set objectives or most common definition by Project Management Institute stating it as “A temporary endeavor undertaken to create a unique product, service, or result”. Records take us back to 1959, where project was defined as an organizational unit whose sole purpose is to achieve a specific objective, typically the timely, cost-effective, and high-quality delivery of a developed product that meets all specified requirements (Gaddis, 1959).

A business starts a project to focus its efforts on a specific opportunity or problem and to make it easier to organize those efforts. Organizations are developing projects as a means of concentrating resources on a chance or problem and as a means of efficiently organizing its efforts to accomplish a certain aim or target. The organizational strategy-oriented approach to the projects has grown to include a project-oriented approach and is necessary for the organizations' long-term performance. Organizations build projects to respond to these fast changing external conditions in order to achieve internal change, make capital assets, develop and supply technological products and services to clients, and experiment with new ways.

Projects are the most preferred means of reaching organizational goals with limited timeframe, according to academicians and practitioners. Improved upfront risk assessment, new project scheduling methodologies, the rise of projectized organizations, improved cross-functional cooperation supporting team dynamics, wider adoption of performance controlling methods, and the use of new technologies in project management are favoring projectized way of executing their strategic objectives (Görög, 2002; Keegan & Turner, 2016; Pinto, 2002). The project based approach is selected mainly for value justifications, future projected benefits realization driven by a definite aim, and organizational context beyond project life cycle (Bos-de Vos et al., 2019; Martinsuo & Geraldi, 2020; Winch, 2015).

b. Megaproject and its Definitions

Megaprojects are an elite subset of projects that are massive, complex, symbolic, and cost billions of dollars. Megaprojects are both a blessing and a curse, as their success is celebrated with fame and wealth, while their failure frequently ends in the destruction of organizations, assets, and reputation. Megaprojects are a new breed of projects that has been the forefront of discussions and research since couple of decades with limited literature availability. Multiple definitions of megaprojects are slated by some of the prominent researchers, some of which are listed per timeline. According to Strassman, P., & Wells, (1988), mega-projects are widely described as undertakings that demand coordinated applications of capital and governmental authority and modify landscapes quickly, consciously, and profoundly in very visible ways. According to Hassan et al., (1999) megaprojects are large engineering projects that possess the following five characteristics: Large costs in terms of capital, long duration and urgency, high technological demands, and the need for input from multiple disciplines. Miller, R., & Lessard, (2001) and Jaafari, (2004) assert that megaprojects are termed as programs that combine many projects into a large project that is strategically aligned and is used to deliver key strategic assets. (Grün, 2004) said that megaprojects are giants among projects, hard to execute, and are multi-organizational enterprises that are defined by their uniqueness, goal-orientation (technical, financial, and time), complexity, type and number of project participants. Flyvbjerg et al., (2003b) described that we are greeted with multibillion-dollar major infrastructure projects wherever we travel in the world and relates it to as a new political animal. According to Van Marrewijk (2007) megaprojects are often enormous construction projects with major social implications. Mega projects, according to George Jergeas (2008), are inherently tough, risky, and complicated undertakings with a plethora of interfaces and dependencies. In terms of investment, megaprojects vary from typical projects in that they are multibillion-dollar endeavors according to Lehrer and Laidley (2008). Ruuska et al. (2009) used different terms to describe large projects as important, complex and giants. According to Kessides (2013), megaprojects are large and complex, with technical and documentation requirements substantially above those of construction endeavors. Megaprojects are defined by Jergeas and Ruwanpura (2010) with an overall installed cost of more than $1 billion, excluding development costs, as well as being enormous in scale and are distinguished by a large number of

interdependencies and interfaces, innate complexity and risks; strategic and needs to be managed at layers above project level, and demanding massive engineering and construction efforts. Flyvbjerg (2014) illustrates that mega-projects cost one billion dollars or more, and are complicated large scale undertakings that take more than a few years to perceive and implement; and includes abundant private and public participants, affect masses of people and are transformative in nature. According to El-Sabek and McCabe (2017), megaprojects are complex endeavors that involve construction management, strategy, innovation, schedule, finances, administration, manpower, group dynamics, environment, and procedural challenges.

c. MEGAPROJECTS: SIGNIFICANCE AND ITS EVOLUTION

Executing megaprojects are enormous technological, business, and construction achievements that is a matter of pride (Jergeas & Ruwanpura, 2010). The boom in megaprojects is motivated by political glee, technological advancement and dominance, economic and aesthetic goals (Flyvbjerg, 2014). Megaprojects are evolving at an exponential rate due to economic success, rapid urbanization and quest for global supremacy (Hu et al., 2015). Megaprojects are used to deliver societally important infrastructure such as roads, infrastructure, tunnels, airports, and power plants, which is aimed directly linked with the national development and cannot be avoided or paced down (Pitsis et al., 2003; Winch, 2011). Apart from the of the objective benefits that triggers these giants, the megaprojects are equally proposed and driven by an elite group for the individual benefits they offer at different levels. A mega-project is unavoidable once it is envisioned. It would be done by someone else if we didn't (Gray, 1998).

Megaprojects continue to play a significant part in the process of fostering economic development, and their number has rapidly increased across the globe (Joseph S. Szyliowicz & Goetz, 1995). Megaprojects are evolving as a latest trendsetter and are considered as a new area of research and practice. Megaprojects are not expecting a recline in the ever-growing economy and its only a leap forward in numbers as well as size; on the contrary, scale appears to be accelerating (Flyvbjerg, 2008). The continuous desire to scale in megaproject development shows no signs of abating. The world has witnessed a boom in megaprojects and forecast indicates the surge to continue for the next decades. The demand for sustainable infrastructures and the aging of existing assets are a global issue across all sectors with the utmost relevance to and influence on urbanization (World Economic Forum, 2016). Infrastructure affects a substantial number of people and consumes a large number of resources. As a result, infrastructure sustainability is one of the driving forces behind creating more megaprojects that support economic growth, public utility enhancement, and the rising demand for environmental harmony improvement (Meng et al., 2018; Xue & Xu, 2018).

Megaprojects are not only enormous and getting bigger all the time, but are also being built in ever increasing quantities and at constantly escalating costs. The volume, frequency, and geographical distribution of megaprojects have increased dramatically in recent years throughout the world, and never before in human history have we produced more, or more expensive, infrastructure projects (Flyvbjerg et al., 2003a). Megaprojects have shaped the global economy and emerging nations over the past decade. The construction of pipelines, the provision of utilities, the development of new technology, the facility of food security, the development of environment and agriculture, the construction of wind farms and energy alternatives, the relief of urban overcrowding, the construction of better schools and medical facilities, and the reconstruction and modernization of bridges, underground infrastructure, and roads At the end of their useful lives, all of them need big investments (Bresnan et al 2003; Greiman 2013; Greiman, 2014)

Developing economies are gradually discovering themselves weak and unready in terms of infrastructure to meet the requirements of economic growth. This imbalance undoubtedly slows the economic growth rate, and example being India.. The urban economy's productivity is mainly dependent on well-organized infrastructure, particularly transportation networks intended to transfer a huge number of metropolitan residents. This insight has resulted in a significant increase in transport projects (Mann & Banerjee, 2011). While massive investments in interstate roads, airports, seaports, and infrastructure for energy are ongoing, urban infrastructure needs to be improved significantly as cities continue to grow and serve as the engine for an expanding economy utilizing megaprojects.

d. MEGAPROJECTS: THE ECONOMIC IMPACT

Megaprojects are not only getting bigger and costing more, but there are also more of them being developed. The McKinsey Global Institute (2013) estimates that by 2030, global infrastructure investment would average US$3.4 trillion every year, or roughly 4% of total global GDP, with much of this money going toward megaprojects. As stated in Flyvbjerg(2014), the worldwide megaproject market is estimated at US$6–9 trillion per year, or 8% of global GDP., if we include the numerous other industries where megaprojects are the primary delivery model. Current infrastructure expenditure is the largest investment boom in history; calculated as a proportion of global GDP the figures indicate the vastness and impacts megaprojects can cause. The global GDP as of 2021 stands at 96.3 Tn$ with agriculture contributing 4.4%, industry sector contributing 26.3% and the service sector majorly contributing around 65% to the GDP. The GDP forecast projection is 136.4 Tn $ (41.6% increase) by 2027 and 141.82 Tn$ (47.3%) by 2030. Emerging nations are expected to account for 60% of global GDP by 2030, and that needs massive economic growth and investments in expansion of trades, develop infrastructure and technology. Megaprojects are the preferred delivery methods for achieving this, and directly impact the global economy.

A level of investment in the energy infrastructure that has never been seen before is anticipated to take place over the next twenty years. Keeping up with the energy demands of the world until the year 2035 is expected to require a capital investment of $48 trillion, according to estimates provided by the IEA (2014). The direct cost of investments in renewable energy infrastructure will account for more than two third of this total. The cumulative investment of $22.4 trillion is projected only for the global oil and gas sector between 2014 and 2035.

From the data derived from megaproject database developed by the author featuring more than 3500+ megaprojects across the globe, the average figures post 2015 indicate that approx 11 to 18% of investment is diverted as megaprojects in developed countries; agriculture – 0.5 to 1%, Mining, Utilities, Manufacturing, technology and industries ranging to 2.4 to 4% while the service sectors linked to infrastructure, transport, communication, megacities, defense projects, research and associated services range around 8 - 12% compared to the national budget for the developed nations (termed by IMF as advanced economies). The investment in megaprojects to GDP was never so high in the past, compared to less than 1-2%, couple of decades ago. According to McKinsey (2022), the world needs to invest around $57 trillion towards infrastructure by 2030 for the purpose of achieving the anticipated rates of global GDP growth. About two-thirds of this demand will come from developing nations, which are seeing rapid rise in middle-class households, population, and urbanization. These countries have a dire need for transportation infrastructure, but frequently, plans for highways, bridges, and subways never come to fruition, even after being in the works for years. In many countries, construction and infrastructure is responsible for around 10 percent of the GDP value (Yoordijk, 2000), making it one of the most important contributors to an economy (Ngai et al., 2010). This is one of the reasons why megaprojects are considered to be the most important contributors to an economy. Additionally, large construction projects play a substantial role in the aspects of society pertaining to safety, health, and the environment (Bayliss et al., 2004). When investing in long-term government bonds yields an absurdly little return, tall financial institutions like pension funds and insurance companies must go elsewhere for viable long-term investments (Ferrari et al., 2016).

According to current research, projects account for around one-third of a typical Western economy shifting from an industrial to a post-industrial context (Schoper et al., 2018). Megaprojects and their outputs in no doubt have turned out be a key contributor towards the countries gross economy, in some countries accounting for more than 50% of GDP and to an average 7-15% in most of the developed or developing countries. These giants have become such a detrimental and unavoidable scenario, such that megaprojects have become basic requirement for economic growth and managing these megaprojects successfully has become essential requirement to spur economic growth.

III. MEGAPROJECTS TRENDS

a. MEGAPROJECTS: THE MEGA-IMPACT

The context in which projects are carried out has undergone a gradual but steady transformation over the course of time. As a result, it is important to explore some of the more prominent trends that have contributed to the formation of modern project management practice. The strategy of developing and carrying out megaprojects was pioneered after the midpoint of the 20th century by the developed economies, and it is experiencing explosive growth in the 21st century all over the world. Due to the fact that megaprojects are becoming an increasingly common method for the construction of infrastructure, they have become an essential component of the new politics of distance. As a result, over the course of the last ten years, there has been a discernible surge, both in terms of scale and frequency, in the undertaking of significant infrastructure projects. These endeavors have received funding from a variety of sources, including national and supranational governments, private investors, and international financial institutions (Flyvbjerg et al., 2003a).

Megaprojects are characterized by the enormous impact they cause, be it positive or native. The feats of the proposed “The Line megaproject”, which aims to fit 9 million people in a single building, equivalent to entire population of Austria, the telescopes that can travel millions of mile far from earth and capture glimpses of universe, the feats of gigantic ships that can sail 23000+ container units or accommodate 9300+ personnel on a voyage at one stretch, skyscrapers towers suspended over 1km in length. All mesmerizes human potential where sky is only the limit. Megaprojects are equally carriers of widespread destruction of earth resources clearing forest within days, flattening up mountains for minerals or dig holes to the core of earth or result in non-recoverable disasters such as BP Oil Spill, Chernobyl explosion etc., Due of the importance placed on technology and the assumption that nature is dominant; modernization ideology encourages international financial institutions, construction businesses, and monumentalist governments to favor larger scale projects (Gellert & Lynch, 2003). Larger pieces of machinery, or what Linder, (1994) refers to as "mobile fixed capital," are able to displace more soil in a shorter amount of time, which can increase the probable brutality of displacements. The performance trend of the megaprojects are best illustrated by the infamous Iron law labelling it “over budget, over time, under benefits, over and over again”(Flyvbjerg, 2014).

Megaprojects need significant amount of scientific and engineering talent. Megaprojects constitute "an opportunity, a temptation, and an intoxicating elixir," according to David, a former Research head of Exxon. They take scientific and technological expertise away from other projects without first considering the effects on the programs that lose the skill; frequently, they take the finest and brightest.

b. MEGA, GIGA AND TERRA PROJECTS

Megaprojects are enormous, complex initiatives that approximate a value of $1 billion, takes years to plan and build, includes a variety of private and public, and bring about significant changes that will affect tens of millions of people. These projects, which Hirschman (1995) refers to as "privileged particles of the development process, are often "trait making," and unlike smaller, more typical efforts that are "trait taking," or meant to fit into current institutions without altering them, these projects set out to fundamentally alter the social fabric.

The term "megaproject" became popular around the same time that in technological terms, the biggest projects were evolving from megaprojects into giga projects." As Giga is short for billion, thus "gigaprojects" is more precise to use for billion-dollar projects. The next higher unit of measurement is called a "Tera," and it corresponds as one trillion. Recent advancements in magnitude of the large projects and programs suggest that we may now be approaching what is being termed the "tera era" of project

management. Projects with budgets of over a million dollars fall under the Mega category, those over a billion dollars fall under the Giga category, and those over a trillion dollars fall under the Tera category when discussing the size of an undertaking.

c. MEGAPROJECTS: OPPORTUNITY EXPENSES RISK

It appears that many times despite knowing the obvious risks and complexity of megaprojects, the implementors risks their stake in execution. This is in line with the Hirschman's hiding hand theory slating that if the individuals knew the full costs and challenges from the outset, most of these risky endeavors would never be authorized. Hirschman (1967) noted that due to their own ignorance, people are "tricked" into taking on large tasks. The only way, in his opinion, for humans to fully engage their creative resources is by putting too much stock in our own optimistic assumptions about the task at hand, painting it in our minds as more routine, straightforward, and undemanding of genuine creativity than it actually is. Humans, in the same way that they underrate the difficulty of executing large-scale tasks, similarly underrate their own ingenuity in doing so (Flyvbjerg & Stewart, 2016; Gray, 1998). Risks include local governments withholding funding from ongoing megaprojects in anticipation of state funding that might not materialize or materializes later and left unfinished projects due to local governments' inability to cover cost overruns on stimulus projects. The effects on the economy and public confidence in the organizations and individuals in charge of managing infrastructure spending might be disastrous. The fact that a project is risky incurs comes with a monetary burden, the more risky the more the value. People are naturally risk-averse and will pay for anything including mitigations such as insurance, reserves etc., to decrease or completely eliminate dangers.

The risk cost is an economic term that denotes the greatest amount of money that an individual is willing to spend to eliminate a particular type of risk, so that the future is risk-free. Government bonds typically need the lowest return; in real terms, the yield is around 3-4 percent because these bonds are regarded nearly risk free. Private-sector debentures are often linked with a somewhat higher yield, approximately 5-6 percent in real terms. The return on equity, or ownership capital with risk, begins at this amount and can climb significantly depending on the perceived riskiness of the firm in question. The risks connected with infrastructure expenditures are likely to be significant. There are two primary causes for this. The first is that a financial commitment to a fairly large infrastructure project is principally a sunk cost which cannot be recovered if the project goes wrong or doesn't get completed. The other part is that the investment returns are directly associated with economic progress. The project will be successful if economy is strong; it will be unsuccessful if weak. As already said, general economic performance influences project market risk, especially when viewed from an economic standpoint. From an economic standpoint, it is impossible to provide insurance against market risks inside a country since they impact everyone, implying that risks cannot be distributed and pooled when seen from a national perspective (Flyvbjerg et al., 2003a)

When you think about how much the global economy depends on the success of investments in megaprojects, it's clear how important it is right now for projects to be completed quickly. If executed properly, the investment boom could serve as a boon because megaprojects investment is advantageous in multiple ways: it creates and retains jobs; there are many domestic inputs compared to imports; it increases productivity and competitiveness by lowering producer costs; and it benefits consumers by providing them with better services; and it improves the environment with a sound substitute; it supports the shift in generations towards globalization, technology and oneness (Helm, 2009).

Megaprojects have the potential to boost the economy, but if they are implemented poorly, the push could backfire and result in boondoggles on a scale never previously seen. The standard method of executing massive infrastructure projects has a horrible performance record (Flyvbjerg, 2009)

d. MEGAPROJECTS: SHAPING NATIONS & GLOBE

The challenge of how to develop and implement megaprojects stands out among the issues facing policymakers today. Megaprojects have grown commonplace, including huge dams, steel mills, motorways, tunnels, and airports. They can have a big impact on the attributes of the regions and countries, and they have a strong symbolic appeal in addition to being useful. However, as projects get bigger, so do their issues; these massive projects frequently fall short of their initial goals, resulting in high expenses and unintended repercussions that can only be dealt with via enormous suffering (Hall, 1982; Szyliowicz, 1991). Megaprojects have such high financial and social risks that they may endanger corporate survival and the economies of the participating nations (Miller, R., & Lessard, 2001). Public investment projects, however, have a variety of issues and reputations. Hall (1982) coined the term "great planning catastrophes" to describe projects that ended up costing far more than expected, taking much longer to complete than expected, and providing either no advantages at all or just very minor benefits that they must be abandoned or significantly amended. Cost overruns on megaprojects can cause financial instability for project sponsors or even entire nations. The recent known examples feature island nation Sri Lanka where the unyielding investments in Airports and Seaports funded by international loans have pushed the nation in a debt trap. To add to the list are also the sunken financial condition of Turkey and Greece, where large scale government sponsorship on megaprojects have impacted economic stability. Further to it, a series of project failures in Guyana has pushed a thriving nation into bankruptcy. Periodic financial crisis, Pandemic, Geopolitics and volatile market conditions are all having a negative effect on private investment, resulting an extra load and utilization of public funds, thus causing a massive risk to the nations and institutions proposing it. Many nations in the context of executing megaprojects have created financial crisis and reached near bankruptcy. Pitching billions more in stimulus money for a project that isn't working well is found to have direct impact on the new projects that would have otherwise initiated. Anguera (2006) stated that "the British Economy would have been better off if the Channel Tunnel had never been built" since the cost overrun and benefit deficiency were so substantial. Even before its opening, the Great Belt rail tunnel in Denmark proved unprofitable (Flyvbjerg, 2009). In a similar vein, Ansar et al. (2014) discovered, on the basis of the most comprehensive database ever assembled on the 245 major dams, that the money invested in the construction of over half of them cannot be returned. What could happen to the economy as a whole if infrastructure investment projects keep failing at this rate? Political factors have been acknowledged as important by E. J. Feldman (1985). He claims those

political variables such as the character of bureaucracy, the participation of citizens, and how these projects are financed and administered impact the outcome of megaprojects in addition to predicting challenges. The majority of public projects are widely criticized for serving as a magnet for wasteful actions, poor management, fraud, and financial abuse.

An economic boom occurs during the construction phase of a nonproductive project, but the bubble quickly turns into a bust when the promised advantages fail to materialize and the project begins to weigh on the economy. Excessive debt-financed investment in unproductive projects results in debt accumulation, money growth, volatility in the financial markets, and economic fragility, much as we currently see in China. We arrive to the conclusion that poorly managed infrastructure investment largely explains China's rising economic and financial challenges. Without a change to fewer, better-quality infrastructure projects across the country, we predict that China will experience a national financial and economic calamity that will probably also has an impact on the global economy. China's infrastructure investment policy should not be emulated by other countries (Ansar et al., 2016). Megaprojects have grown commonplace, including huge dams, steel mills, motorways, tunnels, and airports. They can have a big impact on the destiny of regions and countries, and they have a strong symbolic appeal in addition to being useful. Without megaprojects, the significant infrastructure issues that plague the nations cannot be tackled effectively or efficiently. However, the effective conception and application rely on the creation of strategies. The majority of the world's nations will face an order of magnitude higher infrastructure investment challenge in the coming ten years than they did in the previous two. Its current infrastructure is viewed as being subpar and, in some circumstances, unfit for the purposes it was designed for now and in the future.

Megaprojects are divisive areas in local government politics and reorganization. Public works spending encourages urban growth, regional competitiveness, and flexible accumulation in a global economy. Megaprojects are utilized to put towns in a position of competition with one another to draw in business and improve the overall quality of life for the people living in the area. Megaprojects are huge operations designed to modernize, streamline, and functionalize urban patterns (Altshuler, A., & Luberoff, 2003; Harvey, 2005). Megaprojects encourage the revitalization of historic districts, the conversion of deserted industrial parks, military bases, airports, and train stations, the creation of cutting-edge public transportation networks, and the building of expressways and airports. Politicians run vigorous campaigns to win over voters, lenders, and possible partners. They also point out additional sources of funding, such as higher fees, lease payments, and ticket surcharges, as well as external aid from the federal government and public investors. Large public works are created in a variety of ways that evolve along with political regimes and regulatory frameworks. In order to boost economic growth, increase international competitiveness, attain profitability, and increase tax revenues for the public sector, authorities encourage large-scale initiatives (Carrión, 2016). While megaprojects are criticized at one end, other views them as promising. Without megaprojects the world wouldn't have been so connected and advanced. The large projects are handling the role of national development and vision statements. Consider the example of Eiffel tower, which has yielded France revenue world more than 100s times of time its build cost over the century, and the impact it had on economy of France and its tourism is phenomenal. Megaprojects are monumental and the benefits are beyond the boundaries of project economics. The Panama canal for example built at a equivalent today's cost of $ 8 Bn, is earning $ 3- 4Bn annually and is a major contributor to the nation's economy and existence. China has been experiencing a surge in megaprojects have transformed itself to a world leader in megaprojects in the last three decades, and has benefited the most of it. Megaproject brings in great economic value and transforms the footprints of nations, if the right fit is selected and successfully executed.

IV. CONCLUSION

Selecting the most appropriate projects and accurately assessing their economic, social, and environmental implications has never been more crucial. In this high-risk business and government arena, systematic and reliable knowledge about megaprojects has never been more important for informing policy, practice, and public discourse (Flyvbjerg, 2008). Megaprojects are necessary to overcome the intractable infrastructure issues plaguing the globe The conventional strategy for planning and decision making, often known as the rational model, has been subjected to intense scrutiny and criticism over the course of the last several decades. Flexibility and adaptability will need to be elevated to positions of greater significance in public planning than they have ever held before (Szyliowicz & Goetz, 1995). To better distribute the costs and benefits of megaprojects, protect the environment and natural resources, and encourage objective and meaningful public engagement, significant changes are required. Utilizing the existing infrastructure effectively should be our first option. Congestion pricing is the most effective solution for areas with high peak-period traffic congestion. Peak-hour public transportation fares should be higher. To effectively utilize current infrastructure, the maintenance backlog must be addressed.

Fact-based and transparent project selection ensures accountability. Many countries like South Korea, UK, Norway, Canada, Denmark etc., are implementing innovative strategies to monitor megaprojects and regulate the negative impacts. Conducting feasibility studies on public megaprojects, value-for-money evaluations, funds to research on improving public investment, and reviews completed projects to learn from the lessons of past are some of key aspects. Ensuring transparency and public awareness of critical infrastructure projects requires better research. Megaproject failures like cost and schedule overruns and stakeholder conflict dominate megaproject research. To achieve accountability, the project selection procedure must be founded on facts and be open. Investors and owners must be involved in the formation of the project team. It's not enough for them to have a vague idea of how a project should work in theory. They must devise a comprehensive, workable plan to address foreseeable occurrences such as dealing risks associated with quality, rising contractor costs, and the need to replace a high-tech supplier. The project must assemble a team with all required skills, such as technological and legal regulatory expertise, contract administration, project reporting, regulatory hurdles, stakeholder engagement, and governmental and local connections.

Project sponsors, strategists, and executives who intentionally mislead lawmakers, administrators, investors, the public, and the media about costs and benefits are unethical and illegal and shall be punished while the good ones should be rewarded. Megaprojects are significant massive projects that garner enormous public and political interest due to their potential to have far-reaching impacts on local communities, natural ecosystems, and government coffers.(Mišić & Radujković, 2015). Without megaprojects, the

significant infrastructure issues that plague many developed or developing nations cannot be tackled effectively or efficiently. However the creation of fresh strategies is necessary for their successful design and application (Joseph S. Szyliowicz & Goetz, 1995).

Megaprojects are needed to provide billions of people with financial and social goods, as well as economic growth to pay for them. A failed project affects an entire economy, more than just one bridge, tunnel, or sewage system. Everyone benefits from doing it right.

Bibliography

[1] Altshuler, A., & Luberoff, D. (2003). The changing politics of Urban Mega Projects. Land Lines, 15(4): 1–4.

[2] Anguera, R. (2006). The Channel Tunnel—an ex post economic evaluation. Transportation Research Part A: Policy and Practice, 40(4): 291–315. https://doi.org/10.1016/J.TRA.2005.08.009

[3] Ansar, A., Flyvbjerg, B., Budzier, A., & Lunn, D. (2014). Should we build more large dams? The actual costs of hydropower megaproject development. Energy Policy, 69: 43–56. https://doi.org/10.1016/j.enpol.2013.10.069

[4] Ansar, A., Flyvbjerg, B., Budzier, A., & Lunn, D. (2016). Does infrastructure investment lead to economic growth or economic fragility? Evidence from China. Oxford Review of Economic Policy, 32(3) : 360–390. https://doi.org/10.1093/oxrep/grw022

[5] Bayliss, R., Cheung, S. O., Suen, H. C. H., & Wong, S. P. (2004). Effective partnering tools in construction: a case study on MTRC TKE contract 604 in Hong Kong. International Journal of Project Management, 22(3) : 253–263. https://doi.org/10.1016/S0263-7863(03)00069-3

[6] Bos-de Vos, M., Volker, L., & Wamelink, H. (2019). Enhancing value capture by managing risks of value slippage in and across projects. International Journal of Project Management, 37(5) : 767–783. https://doi.org/10.1016/J.IJPROMAN.2018.12.007

[7] Carrión, A. (2016). Megaprojects and the restructuring of urban governance. Latin American Perspectives, 43(1) : 252–265. https://doi.org/10.1177/0094582X15579900

[8] Chatterjee, A., & Purnendu, M. (2015). A Framework for Understanding and Modeling Risk in Mega- Projects and Its Impact on the Markets for Project Finance.

[9] El-Sabek, L. M., & McCabe, B. Y. (2017). Coordination challenges of production planning & control in international mega-projects: A case study. Lean Construction Journal, 2017: 25–29.

[10] Feldman, J. A. (1985). Four frames suffice: A provisional model of vision and space. Behavioral and Brain Sciences, 8(2) : 265–289. https://doi.org/10.1017/S0140525X00020707

[11] Ferrari, M., Giovannini, A., & Pompei, M. (2016). The challenge of infrastructure financing. Oxford Review of Economic Policy, 32(3) : 446–474. https://doi.org/10.1093/oxrep/grw017

[12] Flyvbjerg, B. (2007). Truth and Lies About Megaprojects. Inaugural Speech, 2002 : 1–27.

[13] Flyvbjerg, B. (2008). What You Should Know About Megaprojects and Why: An Overview. Project Management Journal, 45(2) : 6–19. https://doi.org/10.1002/pmj.21409

[14] Flyvbjerg, B. (2009). Survival of the unfittest: Why the worst infrastructure gets built-and what we can do about it. Oxford Review of Economic Policy, 25(3) : 344–367. https://doi.org/10.1093/oxrep/grp024

[15] Flyvbjerg, B. (2014). What You Should Know About Megaprojects and Why: An Overview. Project Management Journal, 45(2) : 6–19. https://doi.org/10.1002/pmj.21409

[16] Flyvbjerg, B., Bruzelius, N., & Rothengatter, W. (2003a). Megaprojects and Risk: An Anatomy of Ambition. Cambridge University Press. http://www.cambridge.org/9780521804202

[17] Flyvbjerg, B., Bruzelius, N., & Rothengatter, W. (2003b). Megaprojects and Risk. Megaprojects and Risk. https://doi.org/10.1017/cbo9781107050891

[18] Flyvbjerg, B., & Stewart, A. (2016). The Oxford Olympics Study 2016: Cost and Cost Overrun at the Games. SSRN Electronic Journal, July. https://doi.org/10.2139/ssrn.2804554

[19] Gaddis, P.O. (1959) The Project Management, Harvard Business Review - References - Scientific Research Publishing. (n.d.). Retrieved October 26, 2022, from https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=1110786

[20] Gellert, P. K., & Lynch, B. D. (2003). Mega-projects as displacements. International Social Science Journal, 55(175) : 1–1. https://doi.org/10.1111/1468-2451.5501009_1

[21] George Jergeas. (2008). Front-End Loading of Alberta Mega Oil Sands Projects. Project Management Journal, 39(4) : 28–42. https://doi.org/10.1002/pmj

[22] Görög, M. (2002). Strategy-oriented Approach to Projects and the Question of Project Success. Society and Economy, 24(1) : 55–68. https://doi.org/10.1556/socec.24.2002.1.3

[23] Gray, N. F. (1998). Acid mine drainage composition and the implications for its impact on lotic systems. Water Research, 32(7) : 2122–2134. https://doi.org/10.1016/S0043-1354(97)00449-1

[24] Greiman, V. (2014). Megaproject Research Paradigms: The Value of Empirical Evidence. 13th European Conference on Research Methodology for Business and Management (ECRM 2014), Board 2003: 169–176.

[25] Grün, O. (2004). Taming giant projects: Management of multi-organization enterprises. Springer Science & Business Media.

[26] Hall, P. (1982). Great planning disasters. University of California press.

[27] Harvey, D. (2005). Spaces of neoliberalization: towards a theory of uneven geographical development.

[28] Hassan, T. m., Mccaffer, R., & Thorpe, T. (1999). Emerging clients' needs for Large Scale Engineering projects. Engineering, Construction and Architectural Management, 6(1) : 21–29. https://doi.org/10.1108/EB021095/FULL/XML

[29] Helm, D. (2009). Infrastructure investment, the cost of capital, and regulation: An assessment. Oxford Review of

Economic Policy, 25(3) : 307–326. https://doi.org/10.1093/oxrep/grp027
[30] Hirschman, A. O. (1967). The principle of the hiding hand. The public interest.
[31] Hirschman, A. O. A. (1995). Propensity to self-subversion. Harvard university press.
[32] Hu, Y., Chan, A. P. C., & Le, Y. (2015). Pragmatic framework of programme organizational capability for delivering megaprojects at design and construction phases: a Chinese client perspective. Engineering Project Organization Journal, 5(2–3) : 49–62. https://doi.org/10.1080/21573727.2015.1014804
[33] Jaafari, A. (2004). Project management in the age of complexity and change. Calendar of Events (pp. 10, 47.).
[34] Jergeas, G. F., & Ruwanpura, J. (2010). Why Cost and Schedule Overruns on Mega Oil Sands Projects? Practice Periodical on Structural Design and Construction, 15(1) : 40–43. https://doi.org/10.1061/(asce)sc.1943-5576.0000024
[35] Keegan, A., & Turner, J. R. (2016). Quantity versus Quality in Project-Based Learning Practices. Http://Dx.Doi.Org/10.1177/1350507601321006, 32(1) : 77–98. https://doi.org/10.1177/1350507601321006
[36] Kessides, I. N. (2013). Regionalising Infrastructure for Deepening Market Integration: The Case of East Africa. Http://Dx.Doi.Org/10.1177/0974930612465224, 4(2) : 115–138. https://doi.org/10.1177/0974930612465224
[37] Linder, M. (1994). Projecting capitalism: a history of the internationalization of the construction industry. Greenwood Press
[38] Love, P. E. D., Edwards, D. J., & Irani, Z. (2012). Moving beyond optimism bias and strategic misrepresentation: An explanation for social infrastructure project cost overruns. IEEE Transactions on Engineering Management, 59(4) : 560–571. https://doi.org/10.1109/TEM.2011.2163628
[39] Mann, A., & Banerjee, T. (2011). Institutions and Megaprojects: The Case of Delhi Metro Rail. Environment and Urbanization Asia, 2(1) : 77–91. https://doi.org/10.1177/097542531000200106
[40] Martinsuo, M., & Geraldi, J. (2020). Management of project portfolios: Relationships of project portfolios with their contexts. International Journal of Project Management, 38(7) : 441–453. https://doi.org/10.1016/J.IJPROMAN.2020.02.002
[41] Meng, J., Yan, J., & Xue, B. (2018). Exploring Relationships between National Culture and Infrastructure Sustainability Using QCA. Journal of Construction Engineering and Management, 144(9), 04018082. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001463
[42] Miller, R., & Lessard, D. R. (2001). The strategic management of large engineering projects: Shaping institutions, risks, and governance.
[43] Mišić, S., & Radujković, M. (2015). Critical Drivers of Megaprojects Success and Failure. Procedia Engineering, 122(Orsdce), 71–80. https://doi.org/10.1016/j.proeng.2015.10.009
[44] Moore, D. (1998). Many world bank projects haunted by grand delusions. Forum for Applied Research and Public Policy, 13(1) : 26–31.
[45] Ngai, S. C., Drew, D. S., Lo, H. P., & Skitmore, M. (2010). A theoretical framework for determining the minimum number of bidders in construction bidding competitions. Http://Dx.Doi.Org/10.1080/01446190210151041, 20(6), 473–482. https://doi.org/10.1080/01446190210151041
[46] Pinto, J. K. (2002). Project management 2002. IEEE Engineering Management Review, 30(4), 42–55. https://doi.org/10.1109/EMR.2002.1167283
[47] Pitsis, T. S., Clegg, S. R., Marosszeky, M., & Rura-Polley, T. (2003). Constructing the Olympic Dream: A Future Perfect Strategy of Project Management. Https://Doi.Org/10.1287/Orsc.14.5.574.16762, 14(5) : 574–590. https://doi.org/10.1287/ORSC.14.5.574.16762
[48] Ruuska, I., & Teigland, R. (2009). Ensuring project success through collective competence and creative conflict in public–private partnerships – A case study of Bygga Villa, a Swedish triple helix e-government initiative. International Journal of Project Management, 27(4) : 323–334. https://doi.org/10.1016/J.IJPROMAN.2008.02.007
[49] Schoper, Y. G., Wald, A., Ingason, H. T., & Fridgeirsson, T. V. (2018). Projectification in Western economies: A comparative study of Germany, Norway and Iceland. International Journal of Project Management, 36(1) : 71–82. https://doi.org/10.1016/J.IJPROMAN.2017.07.008
[50] Strassman, P., & Wells, J. (1988). Introduction: Global Construction industry. London: Croom Helm.
[51] Szyliowicz, J. S. (1991). Politics, technology and development: decision-making in the Turkish iron and steel industry. Springer.
[52] Szyliowicz, Joseph S., & Goetz, A. R. (1995). Getting realistic about megaproject planning: The case of the new Denver International Airport. Policy Sciences, 28(4) : 347–367. https://doi.org/10.1007/BF01000249
[53] van Marrewijk, A. (2007). Managing project culture: The case of Environ Megaproject. International Journal of Project Management, 25(3) : 290–299. https://doi.org/10.1016/J.IJPROMAN.2006.11.004
[54] Williams, T. (2003). Learning from projects. Journal of the Operational Research Society, 54(5) : 443–451. https://doi.org/10.1057/palgrave.jors.2601549
[55] Winch, G. M. (2011). Towards a theory of construction as production by projects. Http://Dx.Doi.Org/10.1080/09613210500491472, 34(2) : 154–163. https://doi.org/10.1080/09613210500491472
[56] Winch, G. M. (2015). Project organizing as a problem in information. Https://Doi.Org/10.1080/01446193.2015.1021703, 33(2) : 106–116. https://doi.org/10.1080/01446193.2015.1021703
[57] Xue, B., & Xu, H. (2018). A whole life cycle group decision-making framework for sustainability evaluation of major infrastructure projects. Proceedings of the 21st International Symposium on Advancement of Construction Management and Real Estate, 2016, 209889: 129–140. https://doi.org/10.1007/978-981-10-6190-5_13/COVER
[58] Yoordijk, H. (2000). The changing logistical system of the building materials supply chain. International Journal of Operations and Production Management, 20(7) : 823–841. https://doi.org/10.1108/01443570010330793/FULL/PDF