

---

### ***Critical Evaluation of Project Management Foundations***

*Muhammad Rizwan Wazir<sup>1</sup>, Muhammad Imran Wazir<sup>2</sup>, Salman Ahmed<sup>3</sup>*

---

**Keywords:**

Ontology; epistemology; project;  
project management process;  
ontological foundation;  
epistemological foundation.

**ABSTRACT**

*The three basic philosophies concerning projects are project ontology, project epistemology and project methodology. The logical precedence of these ideologies goes as: ontology followed by epistemology – followed by methodology. Project management process starts when the ontological framework is devised for the project, i.e. much before than describing epistemological dimensions of the projects. This research paper, through Archival Research methodology, attempts to identify the underpinnings as well as weaknesses of the epistemological dimensions due to the ontological framework chosen at the start of the projects. In doing so, this research paper identifies the shortcomings of the project management evolution and proposes a more detailed evolution process. This paper has also tried to relate the societal advancements to the successes of some projects as well as ‘the same’ to the failures of others.*

---

### **INTRODUCTION**

Project Management has evolved (to a certain extent) to be a true scientific discipline (Packendorff, 1995; Shenher&Dvir, 2007). According to Project Management Institute (2013), “Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements.” Schwalbe (2015) states that it’s not only the tasks for achieving the project’s scope, time, cost and quality requirements, but effective project management involves the facilitation of the entire processes to meet the needs and expectations of the people involved in the project, i.e. the stakeholders.

The literature, available for the “project management”, holds that project management starts between 1900s to 1950s (Kwak, 2003). It is also essential to add here that the literature of project management holds many examples of successful projects prior to 1900s, which are unarguably considered as projects by the PMI and other institutions as well as the researchers in the field of project management, thus bringing us to the discussion that project management has a much ancient history, stretching afore 1900s (Kozak-Holland, 2011).

---

<sup>1</sup>M.S. Project Management, Institute of Management Sciences, Peshawar.

<sup>2</sup>Associate Professor, Institute of Management Sciences, Peshawar. Email: [imran.wazir@imsciences.edu.pk](mailto:imran.wazir@imsciences.edu.pk)

<sup>3</sup>Assistant Professor, Institute of Management Sciences, Peshawar

## Evolution of Project Management & Its Philosophies

The field of project management has also possessed its merits and demerits through the steady process of evolution, where many a different areas of project management have been researched. Among other areas of interests, a lot of research has been performed on the ontological and epistemological philosophies of the projects & project management. Many renowned scholars and researchers have performed researches to understand the relationship among the three phenomena, i.e. ontology, epistemology (and methodology) of project management, and their effects on each process. A lot of studies have been performed in the field of epistemology and methodology, but the ontology attracted quite a lesser research (Blomquist & Lundin, 2010; Cicmil & Hodgson, 2006a, 2006b; Kreiner, 1995; Linehan & Kavangh, 2006; Winter et al., 2006). Bredillet (2010) argues that ignoring or underestimating ontological aspect of project management, the project management research will suffer, no matter, how deeper the epistemologies and methodologies have been worked out. Thus, this research paper attempts to comprehend:

“Has the boundaries between the ontological and epistemological conceptions been confused despite the evolution of project management into a “true scientific discipline” (Packendorff, 1995; Shenher & Dvir, 2007)?”

This paper also attempts to contribute to the existing knowledge of project management by addressing the ambiguities arising in the projects due to its ontological basis and/ or epistemological dimensions chosen to achieve the methodological objectives set for achieving the outcome(s) with reference to the six facets of ontology by Gauthier & Ika (2012). It is also emphasized by Cicmil (2006) that the "actuality" of the projects is an area that hasn't been addressed as much the "traditional project management" has been accentuated. All these, virtues & vices, are discussed with different projects and emphasis is made on the ontological framework chosen at the beginning to set out epistemological basis for those specific projects; thus, highlighting the success reasons as well as the failure causes.

Furthermore, as adopted by most of the researchers, the advent of project management started from the mid 1900s (Gauthier & Ika, 2012). But Kozak-Holland (2011) asserts that the project management prior to the beginning of the modern project management did exist, which has not been addressed properly. The quality compromises, users' dissatisfaction, stakeholders' disappointments and underperformance on various project outputs have become the rule of the project management processes (Cicmil & Hodgson, 2006a; Ika, 2009; Shenher & Dvir, 2007), which does highlight the fact that either the practitioners or the researchers of project management are skipping something of immense significance, thus bringing us to the following objectives to consider for resolving the afore-mentioned areas of dissatisfaction:

- a. Examine the ontological underpinnings to differentiate between the ontologies and epistemologies of the projects;
- b. Assess the evolution of the project management eras in order to deduce a more detailed project management evolution ideology.

## LITERATURE REVIEW

Ontology, epistemology & methodology have all been defined by different schools of thought for the purposes of their subjects. For project management, Grix (2002) provides us with the simplest of the definitions, i.e.

- ontology is “what is out there to know about”;
- epistemology is “what and how can we know about it”; and
- methodology is “how can we get to know about it”.

It is clear that the epistemology has precedence over methodology and ontology precedes epistemology. It is this very reason that ontology should be given preference not only in the terms of definition but in practical as well as research studies about any projects or project management.

### **Project Management Ontology**

Blaikie (2000) explains the ontology of project management as “Claims and assumptions that are made about the nature of project reality, claims about what the project is and whether it exists, what it looks like, what units make it up, and how these units interact with each other.”

Simplifying the explanation of Blaikie (2000) about ontology, it gets us to the very existence of something, or some idea about the project. For example, why exactly was the Great Wall of China built? It was initiated by the Chinese emperor, Qin Shi Huang (259 – 210 B.C.) for preventing incursions/ invasions from barbarian nomads into the Chinese states and empire. The idea that Chinese borders weren't safe from the barbarian nomads, was the ontological foundation of building the Great Wall of China. The process of comprehending the existence of a prospect, is the ontological foundation of the project of the Great Wall of China, then discovering the remedy to counter the weakness is the epistemological foundation of the project and finally building the Great Wall of China by using tools and resources, is the methodological foundation of the project.

Lawson (2004) further expands the scope of ontology by not limiting the existence of something, but also to the possibility of existence of something, i.e. Lawson (2004) holds that ontology is “the study of what is, or what exists” and “the study of what is to be or to exist.”

As Bredillet (2010), Lawson (2004) also holds that underestimating the significance of ontology and ignoring its precedence over epistemology, will cause the process to derail from its actual objectives. Lawson (2004) further argues about the importance of ontological framework as it being the guidance ideology for any project or process as “the value of ontology, whether philosophical or scientific, lies in bringing clarity and directionality” and “to suppose that the study of being (ontology) can be reduced to the study of theories and their presuppositions (about being) is to commit the epistemic fallacy, to reduce ontology to epistemology.”

#### **Project Management Epistemology**

Epistemology is defined as “a branch of philosophy that investigates the origin, nature, methods, and limits of human knowledge.”

The “investigation of the origins, nature, methods and limits of human knowledge” refers to the examination & exploration of the knowledge, which would be used/ utilized for achievement of the project objectives. For example, referring back to the Great Wall of China, where the ontological foundation of the project has provided us with the ideology of the threat of incursions by barbarian nomads. The epistemological underpinnings of the project are:

Origins of the threat – Barbarian nomads had attacked in the past;

Nature of the threat – Men with weapons, riding on horses, attacked the northern territories of China;

- a) Methods to counter the threat – Develop hindrances for the barbarian nomads, so they couldn't cross over to Chinese territories; and
- b) Limits or extent of efforts to counter the threat – Building a wall with clay of the rammed earth, woods and mountain rocks would make the barbarian nomads unable to cross over to Chinese territories.

#### **Project Management Evolution Eras**

The project management evolution comprises of four periods/ eras (Kwak, 2003), consisting of pre-modern project management (Earlier to 1958), modern project management (from 1958 – 1979), postmodern project management (from 1980 – 1994) and hypermodern project management (from 1995 to present).

It is important to understand the reasons for taking the project management to the next evolution periods, i.e. how did the modern project management era started, what made the foundations for post-modern

project management era and finally why was it required to upgrade the project management rules & procedures according to the ideologies and philosophies of hyper-modern era. Kwak (2003) explains the pre-modern project management era as the “origins of modern project management” with “better transportation and telecommunication systems allowed for higher mobility and speedy communication” (Seymour & Hussein, 2014) and refers to the time between 1900 to 1950s for the explanation of pre-modern project management era. The modern project management era is being referred to have significant technological advancements, such as first ever plain paper copier by Xerox; the technological advancements further paved the way for introduction of newer techniques for efficient project management along with the “application of Management Science”. For example, Work Breakdown Structure (WBS), Program Evaluation & Review Technique (PERT), Critical Path Method (CPM) are a few techniques to name which were developed and used during modern project management era (Kwak, 2003; Seymour & Hussein, 2014).

In the post-modern project management era, the multitasking Personal Computers (PC) made a significant impact on project management tools & techniques (Kwak, 2003). Correspondingly, the development of complex software systems to manage the projects more efficiently also became possible (Seymour & Hussein, 2014), which further provided the foundation of a new era of project management, i.e. the post-modern project management era. For example, “Projects Resource Organization Management Planning Technique II (PROMPT II) model” acted as the foundation of most of the project management programs; it was further refined into “Projects In Controlled Environment (PRINCE) model”; and both these models of project management not only appeared to be more advanced techniques than the earlier techniques being used during the modern project management era, but also improved the efficiency of project management teams to achieve the objectives of the projects (Seymour & Hussein, 2014).

Finally, for the advent of hyper modern era with the fall of post-modern era, the driving force was yet again the technological advancements (Kwak, 2003). During the previous era, the software systems had equipped the project teams with necessary skills, as the software systems addressed the effective ways & techniques of achieving the desired results and to be able to use the effective ways, the project teams were required to equip themselves with the new skills. Seymour and Hussein (2014) hold that this era, however, upgraded the software systems from ‘techniques’ to ‘responsibilities’, i.e. what is project manager required to do? The examples include the upgradation of PRINCE model of project management to PRINCE2, Critical Chain Project Management (CCPM) method (Seymour & Hussein, 2014), Logical Framework Analysis (LFA) designs, Monitoring & Evaluation (M&E) frameworks, Monitoring-Evaluation-Accountability-Learning (MEAL) project models, Risk Impact/ Probability Charts, the Must-Should-Could-Would (MoSCoW) model (Mind Tools, 2016) and so on.

It is important to note here that all the project management eras have been substituted due to “technological advancements”, i.e. the pre-modern era substituted by modern era due to the need for more advanced tools & techniques; the modern era substituted by post-modern era due to the advent of multitasking PCs; post-modern era substituted by hyper-modern era, again due to technological advancements, and thus shifting the project management tools & techniques from process oriented to resource oriented (Kwak, 2003; Seymour & Hussein, 2014); and according to Kwak (2003), all the technological advancements start from 1900s.

Although the literature for project management is not as rich as the literatures for medicine, engineering, philosophy, architecture, economics, mathematics and theoretical science (Chiu, 2010), but if we agree with the definition of project management as defined by the Project Management Institute (2013) that “project management is the application of knowledge, skills, tools and techniques to project activities to meet the project requirements ” then we believe that the history for project management can be traced back to the earliest of projects of the human civilizations, including the Great Pyramid of Giza, The Great Wall of China, the hanging gardens of Babylon and so on (Seymour & Hussein, 2014).

## Findings from the Review

It is evident from the literature that the technological advancements perform a crucial role in the evolution of project management processes, therefore, this paper attempts to divide the “pre-modern era” into two distinct project management eras, separating the two on the basis of technological advancements. The newly proposed two eras are:

1. Historic Era – From the start of civilization till the start of Industrial Revolutions; and
2. Afore-modern Era – From the start of Industrial Revolutions till mid 1900s. before

### Historic Era

Projects have been carried out since the beginning of civilization. Be it the Great Wall of China or Tower of Babel or the Great Pyramids of Giza or the Noah’s Ark and so on (Gauthier & Ika, 2012) – they all were projects when they were being achieved as well as were completed with the project management skills of the respective areas and eras. For example, pyramids were built by the Egyptians 4500 years ago, buildings of different sizes have been constructed since the beginning of civilization, and planning & strategy were referred to by Sun Tzu, 2500 years ago, i.e. “every battle is a project, to be first won then fought” (Mosaic Project Services, 2007). Gauthier and Ika (2012), along with the most of researchers in the field of project management, refer to these projects as *pre-modern projects*, but this paper disagrees with their pre-modern era and refer to it as historic (if not pre-historic) era. What were the ontologies behind performing the marvelous projects of all times? For example, for the Long Walls in Athens, it was **fortification** of the seaport, Piraeus; for the Great Wall of China, it was the **protection required** against the incursions and attacks from Inner Asia; for the Tower of Babel, it was **enmity** with God; for the Great Pyramids of Egypt, it was the **pride** of the pharaoh Khufu; for Noah’s ark, it was **protection required** from the great flood, the God’s punishment and similarly every project had ontological foundations. Then it were the ideas, which became their epistemologies, i.e. **the idea of building a wall** for protection from incursions & attacks from Inner Asia – the ideology (epistemology) for “the Great Wall of China”; **the idea of building a heavenly tower**, that touches the heavens – the ideology (epistemology) for “the Tower of Babel”; **the idea of building a long tomb** for Khufu – the ideology (epistemology) for the “Great Pyramids of Giza” and **the idea of building a huge ark** – the ideology (epistemology) for the “Noah’s Ark”. These all projects were first envisaged (the ontology), then planned (the epistemology) & then implemented (the methodology)– as per the modern definition of project management.

### Afore-modern Era

The afore-modern era, as it is presented in this paper, for projects & project management, is from the mid 1700s till the mid of 1900s. Kozak-Holland (2011) comprehends that the “Industrial Revolutions (1 & 2)” gave birth to the new management principles in the commercial world, which became the mainstay and lifeblood of project management; society altered the power channel from the “church” and the “crown” to the state & people of the state and large projects began to be funded by the state(s) and other commercial interests. The true form of Heraclitean “changing & emergent world reality” (Gauthier & Ika, 2012) appeared to be in actuality & practice during this era. This ontological change from “synchronic” to “diachronic” (Gauthier & Ika, 2012) was provided with the foothold by the technological advancements in the field of engineering (Kozak-Holland, 2011). But as Charles Percy Snow (1905 – 1980) quotes, “Technology... is a queer thing. It brings you great gifts with one hand, and it stabs you in the back with the other”, technological advancements did make the work easier but

also made lots of laborers jobless.

The projects & project management were changing with emerging newer and newer ways of achieving higher profits and incurring lesser costs. The catalytic element for this change was the “Industrial Revolution”, which not only replaced muscle with steam engines, but also improved the productivity of labour to handle the machines and equipment for all sorts of material and heavy loads (Kozak-Holland, 2011). This era witnessed the brighter change in the ontological foundations of the projects & project management with people learning the ways to operate the newer technologically advanced machineries, performing researches prior to starting the project and quantitatively analyzing the use of different materials for a specific project. For example, the production costs of concrete & iron dropped to such a level that they replaced the use of more traditional materials, as wood; and for the first time, with the use of iron & concrete in bridges in 1775 & in railroads in 1825, these projects pushed the limits of new technologies (Kozak-Holland, 2011).

## METHODOLOGY & RESEARCH DESIGN

The research is based on qualitative data gathered from the different time periods of project management, which has been further analyzed to deduce the outcome of this research study. For the purpose of the research paper, the primary data has been obtained from Harvard University Archives and History Today Archives, using the *archival research* method (strategy). Furthermore, data for verification and explanation purposes has been collected from the internet, already published researches and the details of the projects completed earlier, containing the information about the successful as well as unsuccessful projects. The data has further been analyzed to determine the ontological and epistemological basis of the projects to understand the success or failure causes. The analysis of the data proposes an in-depth exploration of the evolution of project management as well as its eras, to understand the reasons for change in the project management paradigms, i.e. from *historic* to *afore-modern*, *afore-modern* to modern or from modern to post-modern or from post-modern to hyper-modern. The in-depth exploration delivers the undermining reason for the change in the project management paradigms being the

### Technological Advancements.

The research study focuses both, the inductive approach – to provide examples for reaching a general conclusion, as well as deductive approach – to provide logic or reason to form a conclusion or opinion about something. The examples for inductive approach encompass the Great Wall of China, construction of Hoover Dam in 1931 – 36, the Manhattan Project in 1942 – 45, the Polaris project in 1956 – 1961, the Apollo project in 1958 – 1962, the Internet project in 1962, with the start from ARPANET, the Space Shuttle Challenger project in 1983 – 1986, the English-France Channel project in 1989 – 1991 and the Amazon Prime Air project. For the deductive approach the advent of Industrial Revolutions has been characterized for the requirement of a newer “past” paradigm of project management, when machines were introduced to project management processes, to understand the project management evolution in more detail with a wider scope of project management evolving process.

This research study is longitudinal in nature and is based on retrospective study type of the longitudinal research studies, where it looks into the project management processes of different eras/ periods with respect to their ontological and epistemological basis. This study explores the effects of different factors influencing project management processes, as power, technological advancements etc., in different time-periods, starting from the earliest of projects known to mankind, as The Great Wall of China, stretching to the projects in modern and post-modern project management eras, as the Manhattan Project, Apollo Project and Space Shuttle Project etc., and appearing at the projects of hyper-modern project

management era, as Amazon's Prime Air Project. This research study explores the relation of project management processes with the power sources during every period of project management as well as the *proposed* newer period of project management evolution, and relates that power source has always been the strongest stakeholder or participant of any project or project management process. Thus, ontologically, a project may be designed for a greater public betterment or technological advancement, but deep down the project design, its ontology also includes the contentment and gratification to the power source.

This research uses the mixed methods qualitative research approach. The data is gathered through "content analysis" method from the records of previously performed projects, available on the internet as well as in the printed forms. As the data being analyzed, it required to perform interviews, where structured interviews were developed and provided to the practitioners of project management processes, i.e. the project managers, project coordinators, operations managers and experts working in any projects. Due to the complex terminologies (and mostly conceived as psychological in nature), as project management ontology, project management epistemology etc. most of the interviews couldn't be completed and didn't provide any useful evidence related to the research study. Therefore, the data obtained from structured interviews was dropped to be incorporated in the research study and unstructured interviews were performed, asking about the ideas behind the projects being performed, in a much simpler language, so as to ascertain the relationship of practical knowledge with the already published researches. Most of the data obtained from the "unstructured interviews" method backed the data obtained from the "content analysis" method, i.e. relationship of power source to projects, misguided project management ontologies and project management epistemological processes treated as project management ontological basis.

Finally, the research philosophy undertaken for the purpose of this research paper revolves around interpretivism, i.e. the research study tries to interpret the ontological foundations of successful projects of the past, through discussions with the project manager and coordinators about the selected projects, and highlights the importance of the appropriately undertaken ontological foundations for successful completion of projects as well as the consequences of misappropriation of epistemological foundations as ontological foundations in the form of projects failures.

## ANALYSIS

The purpose of this paper has been to look deeper in the ontological conceptions of different eras of civilization with the perspective of project management and to analyze the relationship of ontological conceptions with the epistemological & methodological achievements of the projects. For the purpose, the projects and project management processes of all the different eras have been discussed, while also addressing their ontologies and epistemologies. The discussion also resulted in proposing a newer model/ concept for the evolution of the project management, i.e. dividing the "*conventional*" *pre-modern era* into **historic** and **afore-modern eras** of project management. Table 1 briefly describes the generally accepted beliefs and practices of the societies during (proposed) different eras of project management.

Table 1. Generally accepted beliefs and practices of societies during different project management eras

<b>Project Management Eras</b>	<b>Generally accepted beliefs and practices of societies</b>
Historic Era	King (or representative of the king) owned the populations as well as their lands. People/ populations were treated as the slaves of the kings (or their representatives) who would have to work for being provided with two meals a day.

Afore-modern Era	Machines would work faster and would require lesser manpower to perform a task. Corporations industrialized the businesses by procuring and installing machines, which would work faster and require lesser manpower to perform a task, thus causing a heavy population being jobless.
Modern Era	Science, reason and logic progressed through the use of sophisticated techniques as well as many high-value projects were required to be performed for the governments. This resulted in performing research and development, for the projects to assure the intended results at the end of the projects' completion.
Post-modern Era	The humans have progressed to 'specialization' phase, where they have formulated laws for "almost" everything, including the most importantly, Human Rights laws. Corporations/ governments considering themselves as the powerful were penalized for their wrong-doings/ unfavorable public practices under the formulated laws.
Hyper-modern Era	From 'specialization' phase, humans entered 'hyper-specialization' phase, where the corporations and governments required to have a public poll before performing any newer amendment to system, as the 'powerful stakeholder' of the systems required the support of the public but it also required quicker means for decision making, which resulted in the creation of high-tech software as well hardware to reach out to maximum population for polling and arrive at a conclusion promptly, to make a decision for public good.

The following tables have been developed from discussions with the project management practitioners and the data obtained from the literature review. Table 2 summarizes the projects, project management practices, ontological conceptions, epistemological conceptions and project managers in respective eras according to the newly proposed eras of project management evolution, whereas Table 3 provides the origin, inspiration, ideology, proponent & emphasis of the project management of the respective eras.

Table 2. Eras representing projects, project management practices, ontological conceptions, epistemological conceptions and project managers

<b>Eras</b>	<b>Project</b>	<b>PM Process</b>	<b>Ontologies</b>	<b>Epistemologies</b>	<b>Project Managers</b>
Historic	Creation of human beings for fulfilment of their needs.	A process that serves to achieve the needs of the human beings.	Protection, Power, Enmities, Pride.	The ideas to achieve the ontological conceptions.	Army Commanders, King's appointees, Priests.
Afore-modern	Changing & Emergent needs of the society as seen by the powerful segment of the society.	A process to achieve technological advancement, easy access routes or any other requirement of the societies as per the powerful segments of the societies.	Easy access routes, technological advancements, Higher profits & cheaper costs.	The ideas to achieve the ontological conceptions & the planning for project management.	Engineers & Architects.

Modern	A temporary endeavor undertaken to create a unique product and service and is designed to serve progress.	A technocratic and rationalist process produced from the scientific management approach to deliver controllability.	Technological advancement, information sharing, easily accessible international routes & channels and international rivalry.	The ideas to achieve the ontological conceptions and every project unique considerations. Mostly confused with the ontologies.	Architects of the project.
Post-modern	A showground of social & power plays to serve the interests of the powerful stakeholders.	A gathering grandiloquence in a context of power play, domination, and control.	Power, domination & control	The projects to achieve the ontological conceptions.	Orators of the powerful stakeholders
Hyper-modern	A network of individuals trying to achieve common goals and is considered to be “Work in progress”.	An instinctive process that keeps on changing its demands for achieving the goals.	Change, structural conflict, domination, power, contradiction & liberation.	Projects treated as processes & not objective entities to achieve the ontological conceptions.	Reflexive agents

*Note:* Developed from *Foundations of Project Management Research: An Explicit and Six-Facet Ontological Framework*, by Gauthier & Ika, 2012 and *The history of project management*, by Kozak-Holland, 2011.

Table 3.

*Eras representing project management origins, inspirations, ideologies, proponents & emphasis*

<b>Eras</b>	<b>PM Origin</b>	<b>PM Inspiration</b>	<b>PM Ideology</b>	<b>PM Proponent</b>	<b>PM Emphasis</b>
Historic	Since the beginning of civilization – Mid 1700s	The ontological conceptions (see Table 5)	Serve the powerful	Orators of the powerful	Intuition & Improvisation
Afore-modern	Mid 1700s – 1950s	Technological advancements	Serve the state & commercial stakeholders in advancement of society	Industrial revolutions 1 & 2.	Technological advancement, higher profits, cheaper costs & communication channels continuous improvement
Modern	1958 – 1979	18 <sup>th</sup> century’s philosophy of reason, science & progress	Produce reliable knowledge for better future	Serve progress & ensure controllability.	Project planning & control

Post-modern	1980 – 1994	Failure of Modern PM to highlight issues of power, domination, exploitation, manipulation, ethics & moral responsibility and control in project settings	Serving the interests of powerful project stakeholders	Projects are means to achieve higher level organizational goals.	Multiplicity, ambiguity, uncertainty and disintegration
Hyper-modern	1995 – till present	Social practices are constantly examined & reformed in the light of incoming information, thus constitutively altering their character	Transformation of modernity into a theoretical and practical movement through the development of socio-technical object	A reflexive practice where practitioners engage intelligently with the complexity of projects, learn & adapt effectively through experience, intuition & pragmatic application of theory in practice	A socio-technical New World

*Note:* Developed from *Foundations of Project Management Research: An Explicit and Six-Facet Ontological Framework*, by Gauthier & Ika, 2012 and *The history of project management*, by Kozak-Holland, 2011.

Since the 1700s, humans started to achieve scientific advancements in about every field and by the time the Industrial Revolutions struck the face of the earth, technological advancements had found a seat in the king’s chamber. The technologically advanced projects were completely different from those carried out in the nearer past of those projects, thus changing the dynamics of the project management. Although epistemological conceptions were not changed to a considerable extent during this era, but the ontological conceptions as well as traditions changed considerably along with the methodology of the projects achievement. Along with many a more changes, one considerably important change was the shift of the “power source” from the kings and churches to the state & corporations.

### Post “Modern” Project Management Eras

In 1950s, the modern era of project management has been encountered, where the scientific management approaches being used in project management processes with the use of methods as CPM & PERT for successful achievement of project goals. These processes were made the mandatory parts of the planning phase of any project and were considered to be the necessary tools for achievement of the project goals, i.e. *addressing the epistemological aspects* of the projects. But it has been also observed that due to being technologically advanced (and very much over-confident), man made mistakes in judging the ontological and epistemological conceptions, which resulted in project failures and catastrophic project management. The mistakes & criticism over the modern project management resulted in the incarnation of historic era’s project management, with the advent of post-modern era of project management. The ideologies of historic as well as post-modern era appear to be very much identical, i.e. serve the powerful for historic era project management & to serve the interests of the powerful stakeholders for post-modern era (Table 4). Not only the ideologies, but the ontologies, epistemologies & even the characteristics of the project managers are identical (Table 3). In these scientifically, technologically, philosophically and above all psychologically advanced era, the project management of post-modern era (identical to historic era) wasn’t acceptable, thus it faced heavy criticism due to its flaws. Then begins the era of hyper-modern project management, where the *basic ontological conceptions* are taken from the historic era,

but not from the project management and projects, but the scholars of the historic era as Parmenides & Heraclitus and emphasized that project is itself a changing & evolving process and not an objective entity, the “becoming project ontology” and also identified the shortcomings of the “being project ontology”. **Table 2 highlights the ontological and epistemological conceptions of projects in different eras**, thus responding to the first objective of the research paper, i.e. examine the ontological underpinnings as well as differentiate between the ontologies and epistemologies of the projects.

## Technological Advancements

According to the literature reviewed and discussions with the project management practitioners, one of the most crucial factors that has influenced the evolution of project management, is the “technological advancements”. For example, the examples of projects from the times of Industrial Revolutions and Historic era have been taken from the literature, to be discussed with the project management practitioners and analyzed for the techniques being used for their achievement. It has been found that for the projects before Industrial Revolutions, the use of scientific techniques being adopted for the achievement of project’s outcomes/ objectives has been utilized, that is, for example, fulcrums were used to lift and deploy large rocks of the Great Pyramid of Giza (Baldrige, 1996), which is considered to be a masterpiece of engineering. Having said that, it is noteworthy here that though the ‘*scientific thinking*’ was used to achieve the objectives of the projects in *proposed historic era* but technologically efficient machines only appeared in the early 1700s, which further became the root-cause of Industrial Revolutions in the mid-1700s. Technological advancements not only eased the ways and means to achieve the objectives of the projects, but also changed the dynamics of the projects being developed, that is, for example, a project proposal to government from a technologically equipped organization would be a lot different than the project proposal for the same project from a technologically unequipped organization. If comparisons of the project proposals are made, of both the organizations with the *technical terminologies* achieved and understood by that time period, as *project management triangle* or even with the *technical terminologies* achieved and understood by the latest time period, as *project management diamond* or *project management star*, it would portray absolutely different pictures of project’s completion. Table 4 shows the differences on the basis of technical terminologies between technologically equipped and unequipped organizations.

Table 4. Differences between technologically equipped and unequipped organizations on the basis of technical terminologies

	Technical terminologies	Technologically equipped organization	Technologically unequipped organization
<b>Project management triangle</b>			
1	Time	Lesser time required for completion of the project, as machines produce more quickly than human laborers	More time required, as using human laborers would cause slower pace of the project
2	Cost	Cost would be calculated on the basis of (technically) skilled labor required	Cost would be calculated on the basis of total labor required to complete the project
3	Scope	Greater, but for project’s individual self	Greater, but for project’s stakeholders (lesser accounted for during that time-period) as workers and third-party services providers
<b>For project management diamond</b>			
4	Quality produced	Better & alike	Inferior & greater chances of being dissimilar
<b>For project management star</b>			

5	Risks	Risks to foresee would be of machines' maintenance issues	Risks to foresee would be of 'union strikes'
6	Resources	Resources would include availability of machines' parts, raw material required to be processed by machines and technically skilled labor	Resources would include the availability of raw material and availability of human workforce

Note: Developed from *Project Smart* by Haughey, D., 2011 and *A Guide to the Project Management Body of Knowledge: PMBOK Guide, Chapter 1* by Project Management Institute, 2013.

The differences listed in Table 4 highlight that the advent of machines changed the ideology of the projects, though mostly differences mentioned highlight generally the epistemological and methodological choices, but more in-depth analysis provides with the ontological enhancements to the projects, as well. For example, a rail road project is an epistemological choice having ontological foundations of faster access routes requirements as well as inter-connectivity of two far-off areas of the same government/ republic. Therefore, it is suggested through this research paper that the shifts/ changes in the ontological, epistemological & methodological foundations/ choices after the advent of machines in early 1700s may be treated differently in project management literature than the ones prior to Industrial Revolutions. This suggestion/ recommendation also allows this research study to propose a newer theory of project management evolution, i.e. ***the project management evolution falls in five (and not four) different and distinct eras, where mostly the change in the evolution era has been caused by the better technological equipment or technological advancements***, thus responding to the second objective of this research paper by deducing a more detailed project management evolution ideology.

## GENERAL DISCUSSION

Despite the project management evolution to be a true scientific discipline (Gauthier & Ika, 2012), the available resources of knowledge, i.e. the internet and already published articles, correspond to various *phases/ process groups* of project management starting from *project initiation* or *initiating* and concluding at *project closure* or *closing* (Project Management Institute, 2016), but almost all the researchers haven't highlighted the most critical phase of the project management, i.e. the project requirement phase, where the problems are described for carrying out a project intervention, to resolve the problems. This phase contains the idea for starting a project, i.e. the ontological foundation for the project; for example, a project of constructing pedestrian bridges in hilly areas are based on the ideology of quicker access to the citizens of the hilly area, which forms the requirement of the project, then comes the initiation phase of the project and then the later stages of the project, as per the mechanism of project management. The projects getting successfully completed, does not necessarily provide the evidence of *project requirement phase* being **performed**, but only provides the indication that the *project requirement phase* being **addressed** satisfactorily, so as to perform the necessary intervention. Along with the *project requirement phase*, the next important factor is the *project ownership*, which needs to be addressed during setting up the ontological foundation of the project, because after the project implementation completes, the project needs to be further taken ahead by the parties who shall be selected as owners of the project. Equally important although, but both these, the "project requirement phase identification" as well as the "project ownership", are beyond the scope of this research study, therefore, the discussion will not be taken further.

## CONCLUSIONS

This research paper has analyzed the existing knowledge about ontological frameworks & the effects their selection on the epistemological basis set for framing the methodological objective to achieve the project outcome(s), where it has provided with the grounds for newer theory about the evolution of project management. It has discussed about the ontological dualism in various periods, its effects on the projects & project management in their respective eras, their epistemological underpinnings/shortcomings and the methodological virtues and vices. It has also helped in developing an understanding of the ontological precedence over epistemology and correspondingly epistemological precedence over methodology in setting out project objectives & frameworks and highlights the causes of the previous project failures, in specific, and project successes, in general. And finally, it has provided with a newly developed scientific approach of evolution for project management.

It is concluded from the research study that the relationships of project management processes as well as ontological foundations & epistemological choices identified the role of technological advancement to be one of the core topics for further studying to develop a better project management evolution process. It is also developed that the technological advancement at the time of Industrial Revolutions were far ahead from the time of building the Great Wall of China, therefore, both the projects should *not* be put into the same era for studying the evolution of project management. Hence, a newer era for studying the evolution of project management, is proposed, as timespan after advent of Industrial Revolutions be treated as ‘Afore-modern’ era while earlier to the Industrial Revolutions may be studied as ‘Historic’ era of project management.

## REFERENCES

- Baldrige, J. (1996). Moving and Lifting the Construction Blocks of the Great Pyramid. Retrieved 5 August, 2016, from <http://www.ling.upenn.edu/~jason2/papers/pyramid.htm>
- Blaikie, N. (2000). Designing social research. *Cambridge, England: Polity Press.*
- Blomquist, T., & Lundin, R. A. (2010). Projects: Real, virtual of what? *International Journal of Managing Projects in Business*, 3(1), 10–21.
- Bredillet, C. (2010). Blowing hot and cold on project management. *Project Management Journal*, 41(3), 4–20.
- Chiu, Y. (2010). An Introduction to the History of Project Management: From the Earliest Times to AD 1900. Delft: Eburon.
- Cicmil, S. (2006). Understanding project management practice through interpretative and critical research perspectives. *Project Management Journal*, 37(2), 27–37.
- Cicmil, S., & Hodgson, D. (2006a). Making projects critical: An introduction. In D. Hodgson & S. Cicmil (Eds.), *Making projects critical* (pp. 1–25). New York, NY: Palgrave.
- Cicmil, S., & Hodgson, D. (2006b). New possibilities for project management theory: A critical engagement. *Project Management Journal*, 37(3), 111–122.
- Cicmil, S., Hodgson, D., Lindgren, M. & Packendorff, J. (2009). Project management behind the façade. *Ephemera, Theory & Politics in Organization*, 9(2), 78–92.
- Gauthier, J-B. & Ika, L.A. (2012). Foundations of Project Management Research: An Explicit & Six-Facet Ontological Framework. *Project Management Journal*, 43(5), 5-23.
- Grix, J. (2002). Introducing students to generic terminology of social research. *Politics*, 22(3), 175–186.
- Habermas, J. (1992). Further Reflections on the Public Sphere in *Habermas and the Public Sphere*, ed. C. Calhoun. Cambridge, Mass.: MIT Press.
- Ika, L. (2009). Project success as a topic in project management journals. *Project Management*

- Journal*, 40(4), 6–19.
- Kozak-Holland, M. (2011). *The history of project management*. Oshawa, ON, Canada: Multi-Media Publications.
- Kreiner, K. (1995). In search of relevance: Project management in drifting environments. *Scandinavian Journal of Management*, 11(4), 335–346.
- Kwak, Y-H. (2003). Brief History of Project Management in *The Story of Managing Projects: An Interdisciplinary Approach*. USA: Greenwood Publishing Group. ISBN: 1-56720-506-2.
- Lawson, T. (2004). *The Cambridge Social Ontology Group*. Retrieved 23 May, 2016, from [http://www.csog.group.cam.ac.uk/A\\_Conception\\_of\\_Ontology.pdf](http://www.csog.group.cam.ac.uk/A_Conception_of_Ontology.pdf)
- Lewin, K. (1958). *Group Decision and Social Change*. New York: Holt, Rinehart and Winston.
- Linehan, C., & Kavanagh, D. (2006). From project ontologies to communities of virtue. In D. Hodgson & S. Cicmil (Eds.), *Making projects critical* (pp. 51–67). New York, NY: Palgrave.
- Mind Tools. (2016). *Project Management: Delivering Complex Projects Successfully*. Retrieved 18 May, 2016, from [https://www.mindtools.com/pages/article/newPPM\\_78.htm](https://www.mindtools.com/pages/article/newPPM_78.htm)
- Mosaic Project Services. (2007). *The Origins of Modern Project Management*. Retrieved 11 May, 2016, from [http://www.mosaicprojects.com.au/PDF\\_Papers/P050\\_Origins\\_of\\_Modern\\_PM.pdf](http://www.mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf)
- Packendorff, J. (1995). Inquiring into temporary organization: New directions for project management research. *Scandinavian Management Journal*, 11(4), 319–333.
- Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*. (5th ed.). Pennsylvania: Project Management Institute, Inc.
- Project Management Institute (2016). *What is Project Management?* Retrieved 11 May, 2016, from <http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx>
- Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research methods for business students*. (5th ed.). England: Pearson Education Limited.
- Shenhar, A. J., & Dvir, D. (2007). Project management research: The challenge and opportunity. *Project Management Journal*, 38(2), 93–99.
- Schwalbe, K. (2015). An Introduction to Project, Program, and Portfolio Management. *An Introduction to Project Management, Fifth Edition* (pp. 1-36). Minneapolis, Minnesota: Schwalbe Publishing.
- Seymour, T. & Hussein, S. (2014). The History of Project Management. *International Journal of Management & Information Systems*, 18(4), 233-240.
- Slavicek, L.C., Mitchell, G.J., & Matray, J.I. (2005). The Great Wall of China. *Infobase Publishing*. p. 35. ISBN 0-7910-8019-6.
- Smyth, H. J. (2009). Projects and programmes: Diversity of management, diversity of aims and interest: Editorial. *International Journal of Project Management*, 27(2), 97–100.
- Smyth, H. J., & Morris, P.W. G. (2007). An epistemological evaluation of research into projects and their management: Methodological issues. *International Journal of Project Management*, 25(4), 423–436.
- Söderlund, J. (2004a). Building theories of project management: Past research, questions for the future. *International Journal of Project Management*, 22(3), 183–191.
- Söderlund, J. (2004b). On the broadening scope of the research on projects: A review and a model for analysis. *International Journal of Project Management*, 22(8), 655–667.
- Turner, J. R. (2010). Evolution of project management research as evidenced by papers published in the *International Journal of Project Management*. *International Journal of Project Management*, 28(1), 1–6.
- Winter, M., Smith, C., Morris, P., & Cicmil, S. (2006). Directions for future research in project management: The main findings of a UK government funded research network. *International Journal of Project Management*, 24(8), 638–649