

# Frontinus—A Project Manager From the Roman Empire Era

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## ABSTRACT ■

We compare selected project management practices undertaken almost 2,000 years ago with current literature on best project management practice. We take a case study approach focusing on a person who could be seen to have taken a project manager, project sponsor, and champion role. We suggest that some project management approaches used in Roman times are routinely used today; however, changes in the culture and technology have transformed possibilities for project management techniques, and so changed approaches are inevitable. The paper provides useful insights about the nature of changes to project management practice that may be expected during this century.

**KEYWORDS:** project management; history; culture

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## INTRODUCTION ■

Several project management authorities cite ancient civilizations as having practiced a form of project management while developing the great building and infrastructure projects of antiquity. For instance, Morris (1994, p. 4) discusses the example of the Great Wall of China and traces project management work being undertaken in a rudimentary form back beyond the Romans to early civilizations such as the Egyptians, who built the pyramids and magnificent urban structures such as temples, administration palaces, and the like.

While in some cases the physical remains of these ancient structures have been preserved, it is also through source materials (e.g., ancient literature, papyri, clay tablets, inscriptions, and relief artwork) that we have been provided with evidence of accounting information, administrative orders, and other instructions that suggest an orderly, planned, and somewhat coordinated approach to project management in antiquity. In some instances, modern archaeological work has also revealed much about the social status and conditions of those who carried out the labor. It is apparent that traditional skilled trade information and knowledge have enabled these structures to be designed and built, which suggests a kind of project management approach that may be familiar to today's project managers. Unfortunately, ancient source material is often damaged, fragmented, or entirely lacking, in some cases requiring much reconstruction work to be performed by modern-day scholars.

The Romans, like many other major ancient civilizations, undertook complex, large-scale infrastructure projects. While project management functions took place, they were not necessarily understood and described as such by the Romans. Furthermore, the technologies and project management approaches used were often learned or adapted from other societies. For the study of the Roman world (in some periods), there is a rich collection of source material that has been preserved. While scholars dealing with source materials from the Roman Empire must still confront the same obstacles of badly fragmented or incomplete documentation, several factors make the Romans a particularly appropriate topic for a project management case study. First, there is an extensive body of literature on the Roman Empire that has survived, and some of these texts are almost entirely intact. So too, centuries of the intensive work of historians, philologists, numismatists, epigraphers, and archaeologists have resulted in an extensive corpus of Roman law codes, judicial decisions, public contracts, and many other documents relevant to a study of Roman project management practices. Thus, the Roman experience of project management offers one of the most reliable and potentially valid insights into project management in antiquity.

In this article, we base our study on a surviving treatise by a late first-century Roman official, the *De Aquaeductu*, by Sextus Julius Frontinus. This text, which dates back to the year 97 CE,<sup>1</sup> describes in detail the management of the sophisticated network of aqueducts that supplied daily running water to approximately one million inhabitants of the city of Rome. The treatise's survival means that we are provided with a unique insight into the management of a very important piece of Roman public infrastructure in the first century CE.

The evolution of project management has occurred over the centuries and, by using a distant historical case study, we can explore the ways that project management has changed, the reasons for these changes, and what changes may be expected in the future. As such, this article focuses less on the physical infrastructure and artefacts of Roman aqueducts (or, for that matter, the roads, temples, and fortifications) and more on the decision-making processes that were evident in conceiving and managing these pieces of infrastructure.

The Romans were not the first to develop great infrastructure projects. Large-scale urban centers were developed in Egypt and the Near East in the third millennium BCE. The Romans also gained much of their knowledge and technology from the Greeks, who adapted their project management knowledge from an historical flow of knowledge transfer between the peoples of Mesopotamia, Northern Africa, and Persia. In turn, the Romans were very good adapters, and their influence was widely felt around the Mediterranean—from England to Mesopotamia and from the Sahara to Northern Europe. Much of their

infrastructure development is more visible to us today, so our perception of the feats of project management is more finely honed by this legacy from the Mediterranean world. Fortunately, the historical records from Roman times are rich and varied, and this period in history has been studied extensively over the centuries; so we have reasonably reliable evidence to work with when evaluating what transpired in those times compared with today's project management practices. In looking at the processes of realizing Roman-era infrastructure projects, we can draw heavily upon the well-established theory, archaeological, literary, and meta-analyses from centuries of scholarship.

The research questions posed in this article are as follows:

1. Have the best project management practices for initiating, funding, and implementing infrastructure projects changed fundamentally over the past 2,000 years?
2. If so, in what ways?
3. What implications may this have for current project management practices?

The first author has a practical project management perspective, gained from studying project management at the doctoral level as well as having significant project management practice experience on large construction projects. The second author is an ancient historian who specializes in the social and institutional history of the Roman world. This means that we can explore the project management perspectives of a Roman case study, using someone who we might recognize even now as a project manager, even though this individual lived 1,900 years ago. The valuable historical insights this article contributes to the understanding of project management focuses on the following:

- the manner in which the originating mandate for the project was developed and the management options for undertaking such projects;

- management processes undertaken in terms of organizational structure, planning, and control tools;
- resourcing of projects; and
- the political process of project stakeholder engagement.

We used a case study that focuses on the lived experience of Frontinus, a person we recognize as an early example of an “accidental” project sponsor and manager. An accidental project manager is one who has been thrust into the role with little or no training, development, or explanation of what the role requires (Graham, 1992; Pinto & Kharbanda, 1995).

The remainder of this article is structured as follows. First, the type of case study project is established. Next, the historical context of the Roman Empire in determining the rationale for its projects is briefly summarized by providing historical facts that allow readers to understand why infrastructure projects were necessary; the force of authority that sanctioned such projects and the chain of decision making that led from the project's inception (its perceived need) through to its business case development and gateway processes, which in turn led to its sanctioning, design, and delivery. These steps are followed by a brief description of the case study project, which sets its needs and delivery record within the contemporary context of the needs of the Roman Empire. The next section focuses on the cultural milieu and the forces at play between the project stakeholders. This helps to clarify authority and accountability lines so that we can better understand the pressures and drivers exerted on by the person we can identify as the project sponsor and project manager for the case study project. This is then compared with contemporary exemplar standards drawn from the current project management literature. Conclusions that address the research questions follow.

<sup>1</sup> We use the correct historical terms for measuring time—that is, CE, or common era, and BCE, or before the common era, which are also known as in the year of our Lord (i.e., Anno Domini, or AD) and before Christ (BC), respectively.

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### The Case Study Project Manager—Frontinus, Project Manager for the Aqueducts of the City of Rome (Late First Century CE)

Turner and Cochrane (1993) identify four types of projects based on using a four-quadrant model of methods with an axis of well-defined goals and another of well-defined methods. *Engineering projects*, or “earth” projects, have both well-defined goals and methods. These types of projects are typically initiated by a client to fulfill a particular need, and the project manager oversees the refinement of the needs analysis stage transitioning into design, procurement, and realization. Early published project case studies typically cite construction, shipbuilding, aerospace, and manufacturing projects as examples of projects because they attract a “scientific” view of operations management influence (Morris, 1994; Morris & Hough, 1993). The Roman case study project described in this article is a traditional project management “engineering” type of project.

It would be easy to hypothesize that not much has changed between the case study about the Roman Empire of the late first century CE and today—other than that there have been obvious changes in technology and attitudes toward authority and leader/follower interactions. The differences are, however, illuminated by the comparisons of the case study with current project management practices for similar contemporary projects. This allows us to appreciate the impact of any shifts in project management approaches on the contemporary practices for this kind of project.

Ancient history presents particular methodical obstacles that have informed the choice of subject. Naturally we could not interview anyone who witnessed how the project may have been managed during the Roman Empire times but because Frontinus left the legacy of his book, we were able to use this as a useful source

of research data, along with other historical data. Source material from the Roman world has survived sporadically, and the principal data sources are:

- literary sources: textual sources (e.g., Livy, Cicero, and Frontinus) that describe the legal and political processes for initiating projects, assigning funds, and making officials accountable;
- inscriptions: some preserved public contracts, along with the names of the contractors and the costs assigned for each task, as well as milestones and other official markers, which have preserved some of the names of the responsible magistrate(s); and
- archaeology: the physical remains of some infrastructure projects have survived into the modern era or have been excavated; specifically, numerous sections of roads, bridges, and aqueducts have been preserved.

In 97 CE, Sextus Julius Frontinus was appointed to the post of *curator aquarum* (superintendent of the aqueducts supplying the city of Rome). In the late first century CE, this was a prestigious post that was outside of the traditional military magistracies. Holders of the office were recommended by the emperor to the senate, which then formally approved the appointment. The *curator* bore the principal responsibility of ensuring the delivery and operational aspects of the supply of fresh water to Rome, the most populated city in the preindustrial world. What is unusual about Frontinus is that, among all the other men who had held this position, he was the only one known to have written a manual on the curatorship, detailing the operation and management of the city's aqueducts. His manual has survived and provides a unique insight into the management of Roman public infrastructure (Peachin, 2004, p. 12f.) in the first century CE and, as such, provides much of our data for analysis.

Frontinus was born circa 35 CE, probably in southern Gaul. He held a

number of public offices during his life: he was praetor of the city of Rome in 70 CE, held his first consulship in 72–73 CE, was governor of Britain between the years 73 and 74 CE and 78 CE, was the proconsul of Asia in 86 CE, was the *curator aquarum* in 97 CE, and held the consulship twice again in 98 and 100 CE (Bruun, 2007; Ward-Perkins, 1937). Over the course of Frontinus' life, the Romans conquered Britain, the eruption of Vesuvius buried Pompeii and Herculaneum, and the future emperor, Titus, destroyed the temple of Jerusalem.

During the era of Rome's first emperor, Augustus, the emperors built up an increasingly large civil administration. Augustus may have been responsible for the introduction of a number of other curatorships, in particular those responsible for public buildings and for regulating the flow of the Tiber River (Badian, 1996). The gradual expansion of this administration was advantageous to many citizens of equestrian status<sup>2</sup> from the provinces, furnishing men with a means to social advancement through managing the increasingly vast infrastructure of the empire.

By 97 CE, when Frontinus was *curator aquarum*, the city of Rome had numerous officials in charge of issues of public concern, such as maintenance of the Tiber River, organizing the publicly funded corn supply, the maintenance of aqueducts and public buildings, the city cohorts, and the *vigiles* (i.e., city firefighters). In the provinces, imperial administrators were primarily concerned with fiscal matters, while the day-to-day administration of the provincial cities was typically left to the local elites. Italian and provincial towns also had their own officials who tended to the local water supply. In the small city of Tibur, a short distance

<sup>2</sup> This status constituted the lower of the two aristocratic classes of ancient Rome, ranking below the senatorial order. These would later be considered throughout Europe as “knights” in later medieval times.

from Rome, inscriptions indicate that, at one time, there was an official called a *tribunus aquarum* and another official called a *praefectus rivi supernatis* (Mommsen, *CIL*, 14.3674 and 3682). Similarly, in Egypt, a preserved papyrus provided details about the accounting of income and expenditure made by local water commissioners in the town of Arsinoë (Hunt & Edgar, no. 406).

The surviving text of Frontinus consists of a preface and two books. The work has been recognized (at least as early as the Renaissance) as a valuable manual on the management of the network of aqueducts supplying Rome and was used by both papal engineers and administrators who maintained the city's ancient infrastructure as late as the 1600s (Bruun, 2008). The first book deals with aspects identified by Frontinus as pertinent matters for the management of the aqueducts of Rome (Frontin. *Aq.* pref. 3) and outlines the construction of each aqueduct in chronological order. For each aqueduct, Frontinus provides an explanation of the magistrate or magistrates responsible for the initial construction, the original rationale for construction, and where the aqueducts began in relation to their distance to landmarks such as roads and rivers. For the most part, his measurements were up to date and based on the contemporary road system (Evans, 1993, p. 450). He then describes the aqueduct courses, what distances were laid underground, which parts were constructed above ground, and where the aqueducts began to discharge into the city (Frontin. *Aq.* 1.5–15). This summary concludes with the observation:

With such an array of indisputable structures carrying so many waters, compare, if you will, the Pyramids or the useless, though famous, works of the Greeks. (Frontin. *Aq.* 1.16)

Frontinus then proceeds to describe the aqueducts in terms of their

relative elevations at entries into the city (Frontin. *Aq.* 1.18) and describes the basins for removing sediment and gauges for measuring volume (Frontin. *Aq.* 1.19–22). The remainder of book one explains the detailed system of measuring the operation of the aqueducts (Frontin. *Aq.* 1.23–63). Book two outlines the discrepancies between the operation statistics that Frontinus inherited and (what he claims to be) the actual measures he reached during his administration. There is a discussion about the different forms of system fraud and the legal frameworks within which the *curator* operated.

In his introductory remarks, Frontinus identifies three aspects he believes concern the office of *curator aquarum*: usage (*usum*), health (*salubritatem*), and security (*securitatem*). He further explains that, having been appointed to this important office, he deemed it necessary to first familiarize himself with the task by writing the manual.

He explicitly stated that the work was produced at the beginning of his administration, primarily for his own use, although he conceded that his work might be of assistance to future men in the post. These statements undermine recent attempts to infer hidden agendas in Frontinus' work. In particular, Peachin (2004) has argued that Frontinus wrote the manual in order to convince the senatorial elite to desist from illegal tapping of the water system, Bruun (2007) has succinctly refuted such a limited interpretation of Frontinus' motivations, and Rodgers (2004, pp. 8–12) has correctly noted a range of possible motives.

In the preface, Frontinus sets out his principles for the management of a public office:

I believe that there is no surer foundation for any business than this [knowledge of one's own job], and that it would be otherwise impossible to determine what ought to be done, what ought to be avoided;

likewise that there is nothing so disgraceful for a decent man as to conduct an office delegated to him, according to the instructions of assistants. Yet precisely this is inevitable whenever a person inexperienced in the matter in hand has to have recourse to the practical knowledge of subordinates. . . . they are, as it were, but the hands and tools of the directing head. (Frontin. *Aq.* pref. 2)

Frontinus relates his principle that those tasked with the primary responsibility of a job should possess practical knowledge about the task. He asserts that managers should only delegate physical and/or operational tasks to subordinates; all decision making should be performed by the individual with the principal responsibility.

This is interesting in project management terms because it implies that a project was identified to satisfy a particular need or benefit (in this case, the supply of fresh water), which entailed procuring the project, overseeing its realization, and then taking responsibility for the utilization of the project's infrastructure. This entailed a program of work (projects) that included identifying and justifying the business case for the initial development of the infrastructure, its procurement, and then its operation. The responsibility extended to ensuring the supply of fresh water, rather than just building an aqueduct, because the *curator* was also responsible for overseeing the ongoing operation. Setting aside any program management issues, we can still learn much about how the historical and archaeological records allow us to understand how the physical aqueduct infrastructure project was initiated, developed, and maintained (Evans, 1994).

Frontinus recognized that his position did not merely involve the obvious engineering responsibilities of ensuring the day-to-day operation and ongoing oversight of maintenance and construction, but also that success or

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failure had potential social and political ramifications:

[The Emperor] has laid upon me the duties of water commissioner, an office which concerns not merely the convenience but also the health and safety of the City, and which has been administered by the most eminent men of our state. (Frontin. *Aq.* pref. 1)

### Comparing the Historical Context of Infrastructure Projects in the Roman World With Contemporary Issues

Roman history is typically divided into two basic eras: the Roman Republic (from 509 BCE to 28 BCE), a period in which the Roman state was run by a plutocratic oligarchy, and the Imperial Era (from 28 BCE to the collapse of the Western Empire), a period in which the state was dominated by the rule of one or more emperors. Understandably, over such a long period, massive social, political, and constitutional changes took place, the most momentous being the shift in the first century BCE toward sole rule. This extended period also naturally led to changes in the approaches to project management as the sociopolitical and socioeconomic climates changed. This raises interesting governance issues beyond the scope of this article, but some are touched on where relevant to the focus of project management during this era. Crouch (1993) has argued that the increasing knowledge about and advances in water management went hand in hand with the growing ability of the Greco-Roman world to build larger and more complex urban environments.

The majority of substantial infrastructure projects, under both the Roman Republic and then under the emperors, were either undertaken to provide basic public services (e.g., aqueducts, ports, public spaces, and sewers) or to serve military purposes (e.g., walls, roads, and ports). Some of the main characteristics of these projects were: security was a prime consideration,

whether these projects were of a military or civilian nature; entertainment, social, and cultural venues (e.g., temples and baths) were often privately funded; the benefits of projects to local economic activity and trade were typically considered secondary to the provision of a specific service; facilitating the efficient movement of food and water was a prime concern for the state because plague, famine, and food riots were common throughout Roman history; and, finally, the delivery of projects of public significance was an important means of asserting personal social status.

#### Sources of Funds

At the most basic of levels, there were three sources of funding for potential projects: public finances, private benefaction, or imperial benefaction. The emperors typically had their own personal fortunes, which could be spent on specific projects, or an emperor could indirectly use public funds (typically acquired through warfare or taxation). For most *curators*, the principal sources of funds were either the *aerarium* (the state treasury) or local cities (Eck, 2003).

The Roman military consisted of approximately one quarter of a million men and was the single largest item of the state's expenditure. Frequently, major public works were paid for by the state from the proceeds of war. The first major infrastructure projects undertaken by the Romans occurred soon after Rome became the dominant power in the fourth century BCE in Italy. In 312 BCE, the Roman state began its first two major infrastructure projects in Italy: a highway that ran from Rome to the southern Italian city of Capua and an aqueduct that brought spring water into the city of Rome (Livy, 9.29). Similarly, the Colosseum in Rome and a number of other works were paid for by the Emperor Vespasian with funds acquired through his wars in the East (Suetonius, *Ves.* 9 and 17). There was a long-standing Roman tradition of constructing temples and other monuments from the

proceeds of war to commemorate the successful completion of campaigns.

There are numerous examples of private benefaction within local communities, both throughout Italy and in the provinces. While many cities in the Empire had Roman citizenship, the local community, and in particular the local elite, were expected to finance many regional projects. Emperors sometimes funded large-scale regional projects, such as Hadrian's substantial works in the city of Athens (Ridley, 1987, p. 484) or Antoninus Pius's disaster relief in Asia Minor (Huttl, 1933/1973; Ridley, 1987, pp. 498–499).

The above illustrates that projects were financed for a variety of reasons, and sources of funding came from the state, private individuals, and purloined resources from conquered regions. Securing funding was a strategic decision.

#### Reasons for Projects—Making the “Business Case” the Rationale

Roman officials were unpaid and worked for the personal and familial prestige that was attached to public office. In the cases of the aforementioned aqueduct and highway, which began construction in 312 BCE, in accordance with the traditions of the Roman Republic, these projects were named after the magistrate who oversaw their completion; in this instance, the *ensor* Appius Claudius, gave these pieces of infrastructure the names *via Appia* and *aqua Appia*. Similarly, Roman laws typically took the name of the magistrate who proposed them; thus, a law passed by Gaius Julius Caesar might be called the *lex Iulia*. This practice demonstrates an important motivation for undertaking projects. Competition for the preservation and/or enhancement of public prestige was an important concern for the Roman elite. Attaching one's name to an important piece of public infrastructure would positively enhance the personal prestige of an individual and his or her descendants.

The delivery of both publicly and privately funded projects was an important means of both establishing and maintaining social status among members of the leading families—initially in Italy, but increasingly under the Empire in many parts of the Roman world.

The public projects built under the auspices of the emperor himself enhanced his prestige and also overtly advertised the beneficial nature of his rule. In the case of the *curatores viarum*, although their principal duties were overseeing the maintenance and construction of roads, the builder was always identified as the emperor on the surviving milestones and inscriptions (Eck, 2003). More broadly, this principle is demonstrated by the fact that such projects were frequently “advertised” to the public on coinage carrying the emperor’s image. In turn, with most public offices tacitly or overtly overseen by the emperor, the success or failure in any office had very real consequences for the future opportunities for advancement of the official in question.

In this sense, “project success” can be seen to be viewed by the Romans more in terms of long-term success in which success of the firm (family) and the potential for opening up future ventures occurs. These days, many project managers tend to be mainly judged based on “iron triangle” measures of project efficiency. There is less emphasis on how the project outcome contributes to customer benefits, long-term benefits delivered by the project, its contribution to business sustainability (Shenhar, Dvir, Levy, & Maltz, 2001), or even how vanguard projects can establish a firm on an innovative new business trajectory (Brady & Davies, 2004). There are some interesting parallels with the value propositions for projects back then and the kinds of arguments made in a “business case” today.

### **Decision Making and Accountability**

The position of the *curator aquarum* was established by a decree of the senate

in 11 BCE (Frontin. *Aq.* 2.99), but the *curator* was nominated by the emperor and was intended to act as the emperor’s administrative agent. Responsibility for decision making rested with the official in charge. The *curator* was responsible for determining the division of the necessary work and overseeing the tender process for any contractors as required. This person bore personal responsibility for all the decisions and could be liable for prosecution after the term of office had been completed if it was believed that the curator had acted improperly or illegally. This is quite clearly reflected in Frontinus’ belief that there should be “one head and many hands.” This relates to the concept of a project manager being the single point of contact for project management matters (Project Management Institute [PMI], 2004).

Frontinus described a close working relationship between himself and the emperor (Rodgers, 2004). As an imperial appointee and also a member of the *consilium principis* (the inner circle of senior men advising the emperor) (Crook, 1975, p. 53), such a relationship was not unexpected. The *consilium principis* was an advisory body to the emperor that eventually assumed an important role in the governance of the empire and typically consisted of a small number of both family members and close allies of the emperor (Crook, 1975) who had an influence on imperial decision making. This also relates to the role of “project champion,” the person who provides high-level political support for projects, and a project sponsor who may champion a project but also provides support at a high level of corporate leadership to support adequate resourcing for the project (Englund & Bucero, 2006; Helm & Remington, 2005; Kloppenborg, Tesch, Manolis, & Heitkamp, 2006). Furthermore, this focus on political relationships links to the practice of stakeholder engagement for those stakeholders that have critical and influential impact on the provision of resources and political

support (Bourne, 2005; Bourne & Walker, 2003, 2005).

### **Labor and Outsourcing**

One of the primary duties of a *curator* was overseeing the distribution of construction work to private contracts (Eck, 2003). When originally established in 11 BCE, the *curator aquarum* had 240 state-owned slaves at his disposal; this number was increased to 460 by the emperor Claudius in the mid-first century CE (Eck, 2003). While these slaves were used for incidental maintenance and for ensuring the daily water supply, all large construction projects were given to private contractors (Rodgers, 2004, p. 265f), which was the standard Roman state practice at the time. Roman magistrates typically had access to a staff of publicly owned slaves (Mommson, 1887, p. 320f) and advisors. Outsourcing most maintenance and construction work to private companies was also normal. State officials were regularly responsible for awarding contracts and then ensuring that they were fulfilled according to the terms agreed upon. This has a modern equivalent in the project management and procurement literature (Bröchner, 2006; Fill & Visser, 2000; Quinn & Hilmer, 1994; Walker, Stark, Arlt, & Rowlinson, 2008).

One such example of the process for tendering public contracts is provided by an inscription, which preserves a public contract for the maintenance of the Via Caecilia (one of the great highways of Roman Italy) during a period between 90 and 80 BCE (*ILS*, p. 5799). The inscription records that the urban *quaestor* had engaged a number of contractors to complete sections of the project. The *quaestor* and each of the individual contractors are named as personally responsible for the completion of each task. The distance and the nature of the work are specified for each contractor, with a specific cost assigned for each. The rationale for making this inscription was that it served as a public statement

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of what had been contracted, because this was part of the process of ensuring public accountability. The project management literature provides many examples of the need for accountability, transparency, and governance to assign responsibilities to parties (PMI, 2004) and to administer contracts (Winch, 2001).

### Knowledge Transfer

As Frontinus alludes to, the former holders of the position of *curator* had not undertaken comparable research on the operation of the aqueduct system. Roman officials were neither expected to have formal training nor needed to provide evidence for their competency to perform a task. Under the Republic, campaigning for office was a serious political activity; however, from the period of Augustus onward, the emperor exercised control of public office through the “nomination” of candidates who were then duly elected. This said, it should also be noted that incoming *curators* did have access to both the pool of state-owned slaves and specialists, such as engineers and clerical assistants (Frontin. *Aq.* 2.100). These individuals would have had longer-term experience with management of the aqueduct system and likely had a role in ensuring knowledge transfer. The roles of knowledge transfer, organizational learning, and project learning are seen as important contemporary considerations for project managers (Manu & Walker, 2006; Maqsood, 2006; Reich, 2007; Sense, 2003).

### Legal Frameworks

There were a number of sources of Roman law that applied to an official like Frontinus in 97 CE, and these included imperial edicts, directives of the senate (*senatus consultum*), laws, judicial decisions, and customary practice. The position of *curator aquarum* was created by a decree of the senate in 11 BCE (Frontinus, *Aq.* 2.99) and through a law called the *lex Quinctia* (Crawford, 1996; Frontinus, *Aq.* 2.128).

Frontinus recoded a copy of the decree in his text, thereby preserving a record of the powers and duties of the *curator* (Frontinus, *Aq.* 2.100), which parallels the modern concepts of project corporate governance (Müller, 2009; Winch, 2001).

Misappropriation of funds, inaccurate accounting, or incompetence could be grounds for prosecution. During the Republic, prosecution for mismanagement was a real possibility, and under the emperors, failure to discharge your responsibilities to the expected standard could end a man's career. Again, this has its contemporary links to unethical behavior and governance structures aspects (Walker, Segon, & Rowlinson, 2008).

To conclude this section, we have shown a number of select project management processes and roles that exemplify project management and have provided both evidence of the Frontinus Roman and contemporary parallels.

### Discussion

Due to scope limitations, this article cannot provide endless examples of project management practices and role behaviors from both eras under study. The limit to this exploration is stated by the following research questions:

1. Have the best project management practices for initiating, funding, and implementing infrastructure projects changed fundamentally over the past 2,000 years?
2. If so, in what ways?
3. What implications does this have for current project management practices?

These questions were addressed by using a single case study example (an exceptional individual who could be described as fulfilling the roles of project manager, project champion, and project sponsor), which represents the best available evidence of project management best practices from around 2,000 years ago, and citations from current

examples of the best project management practices. It must be stressed that Frontinus provides an exemplar of project management during the Roman period. Similarly, citations of contemporary literature are provided to highlight the better or best practices, rather than what often occurs today. There are important similarities as well as differences between the historical case and modern approaches.

The historical context provided in this article suggests that the prevailing project management culture of the time was highly hierarchical. The Roman Empire survived for many centuries, and communication technology was primitive when compared with today's facilities and approaches. Communication channels were radically different from today, in which the Internet shapes our notions of the times to send, respond to, and receive messages, as well as generating and transmitting project information. In Roman times, giving and receiving orders and being influenced by those with the power to influence your family's (most especially, your descendants') reputation, vulnerability, and potential for advancement were of a different order of importance (literally vital to “life”) than is the case today.

However, by acknowledging this caveat, we can suggest some comparisons and draw conclusions. In many ways, little has fundamentally changed in project management roles and approaches, and yet the changes in the use of tools and techniques have been extensive. There has been no evidence of sophisticated planning, budgeting, financing instruments, and project control techniques and tools used during the Roman era compared with those currently used. There appears to be vast changes in the availability of project management tools and techniques between those suggested by the historical record of the Roman era under consideration when compared with the literature and practices of today. In Roman times, it was important to “get

Frontinus' Era Practices	Contemporary Practices	Explanation of Changes
1. Project funding is through "public purse," private venture capital, private capital raising, and war booty.	Funding is through government spending; the financial market "industry"; joint capital raising between organizational entities, including public, private, and partnership-type initiatives; allocation of funding priorities using a portfolio or program management approach; and raising funds through business mergers and acquisitions.	<p>A cynic may observe that little has changed. The label on the process may have changed. War reparations may not be a common way of funding projects, but the reallocation of resources through a merger-and-acquisition exercise would inevitably lead to "liberating" resources for projects.</p> <p>The main change is contemporary expectations of transparency and governance. A cynic could point to political intervention that defies logic—see, for example, Flyvbjerg's work (Flyvbjerg, Holm, &amp; Buhl, 2002; Flyvbjerg, Rothengatter, &amp; Bruzelius, 2003), where today's economy with "the truth" and use of unrealistic estimates is not in effect very different from decisions made by the Imperial Fiat in Roman times.</p>
2. Decision making follows a well-recognized hierarchy from the Emperor to Frontinus to those delivering projects. Frontinus uses a panel of expert advisors to support in his decision making.	Recent literature extols the virtues of program and portfolio management (PMI, 2006a, 2006b) and stresses the need to align project decision making in terms of resourcing with strategic goals in mind (Archer & Ghasemzadeh, 1999; Morris & Jamieson, 2004; Norrie, 2008).	<p>Current literature stresses alignment with corporate goals through a strategy process that is often based on a prescriptive school of strategy (Mintzberg, Ahlstrand, &amp; Lampel, 1998; Walker, Art, &amp; Norrie, 2008).</p> <p>The role of a project management office (PMO) (Handler &amp; Magee, 1999; Hobbs &amp; Aubry, 2007; Kerzner, 2003; Müller, 2009) often provides the same kind of advisors used in Frontinus' time.</p>
3. Labor during the time of Frontinus was almost always outsourced. Contractors' failure to deliver promised project outcomes had potentially severe consequences—death or retribution on the contractor for literally generations. Slave labor was also used.	Outsourcing is the preferred option when it makes sense to do so from a practical or strategic point of view (Auguste, Hao, Singer, & Wiegand, 2002; Barthélemy, 2001; Domberger, 1998; Lobe, 1999; Walker, Stark et al., 2008). Slave labor is banned in developed nations, even though many people today work in conditions comparable with those of the slaves during Roman times. The current literature on work–life balance suggests that much could be improved in this area, and modern workers act at times as if they are slaves to their work (Lingard, 2003; Lingard & Francis, 2005a, 2005b).	<p>The outsourcing or firm-internal delivery choice may be made with more consideration today. The decision is more likely linked to a rationale today than what appears to have been the case in the time of Frontinus.</p> <p>Work–life balance literature does imply that much project work involves an inordinate amount of time and energy commitment to project delivery to the extent that the physical punishment of slaves has been replaced by more subtle career and job security tools (e.g., long hours of work). Many employers today, as in Roman times, have the power to financially destroy a person's life.</p> <p>Exploitation of migrant labor is also considered a problem today in the context of project management (Green, 2006).</p>

*(Continues on next page)*

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Frontinus' Era Practices	Contemporary Practices	Explanation of Changes
4. Knowledge transfer during the time of Frontinus was rare and almost wholly explicit, when it existed at all. Craftsmen transferred knowledge to their clans and close associates, but there was no formal or recognized system for this. Frontinus' decision to create a manual that might be of use to others in his post was unusual.	The contemporary literature suggests a keen interest in knowledge work and innovation diffusion, with knowledge being seen as a key asset and an important aspect of project management (Reich, 2007; Walker & Maqsood, 2008).	The best project management practices today stress designing-in systems to share and transfer created knowledge through projects so that all parties can continuously improve their project performance.
5. Legal frameworks that concerned Frontinus related to avoiding corruption and incompetence.	Although concern exists about corruption and mismanagement, these are currently seen through a corporate governance lens (Müller, 2009).	Today, stress is put on designing a system that flags the potential problems of corruption and the poor management of resources. There is a greater acknowledgment of systems failing rather than individual culpability, although this does not mean that individual acts of corruption are not considered potential problems.

Table 1: Comparison between the Roman case study exemplar of select best practices and the current common best practices.

things done”; today, there is a heavy focus on optimization and efficiency. The advent of cheap and ubiquitous computers is as unimagined in the Roman era as was the case only two decades ago. Computer technology has allowed not only the development of highly intricate planning and simulations to take place (time, cost, and financial modeling), but also for design modeling that provides visualization and simulation modeling through building information models (BIMs) (Aranda-Mena, Crawford, & Chevez, 2009). These enable a far greater ability to model alternative design to optimize costs and time, for example, than was conceivable until recently.

Table 1, therefore, primarily focuses on processes that can be compared with no evidence of the sophisticated design optimization tools and monitoring and control tools available until recently.

The story that emerges from the historical record and the discussion as outlined above suggests several main behavioral differences that are apparent between the Frontinus and contemporary eras. One major difference is the attitude toward authority, and the

other is the attitude toward project delivery performance, as shown in Table 2.

Conclusion

This article seeks to answer three questions relating to changes in project management best practices from almost 2,000 years ago until today. The study of a famous Roman “accidental project manager” has been compared with contemporary literature that outlines the current best practices in project management.

The discussion in this article provides evidence to support the conclusion that many project management processes that were written about by Frontinus share common goals with those of today. In that sense, little has changed; however, in terms of how these processes are enacted, the changes have been radical and significant. Many of the changes relating to *how* project management processes are undertaken over time can be seen as primarily caused by technological changes with the greater use of tools for optimization, planning, and monitoring for control. An additional change can be seen by shifts in the power balance

between parties and a cultural change, in which parties do not feel obliged to protect family honor and reputation.

The implications for project management practice have been provided. A main implication is that followers choose to be led these days, so that leadership style and the design of procurement systems to maximize and facilitate commitment at the affective “want to” level (Meyer & Allen, 1991) are essential, and this is because of a contemporary focus on effective dispute resolution. Not even a sound governance system that provides for penalties is as effective as not resorting to legal and contractual remedies to solve disputes or to attempt forcing improved performance. That said, a sound governance system should be used to make the system fair and encourage commitment and discourage exploitation by any party, as well as making performance and decision making transparent so that emerging problems can be dealt with before they become serious impediments to project delivery. The combination of outsourcing and insourcing should not be an automatic given but linked to strategic project delivery logic. In Frontinus’

Frontinus' Era Practices	Contemporary Practices	Implication of Changes
The project manager, sponsor, or champion was given the right to act in a highly authoritarian way, and this was accepted as legitimate. As long as that behavior did not cause a riot or mismanagement, resulting in famine, plague, or an uprising, then it would be supported by the power of the land.	Contemporary governance arrangements are rooted in a legal framework in most countries in a way in which "fairness" lies at the root of legitimacy rather than some form of decree from an emperor, king, or political leader. This governance regime is always open to challenge and revision if deemed to be unfair or biased.	Rome at the time of Frontinus was (to the common people who undertook the project delivery work, as well as its design), in essence, a dictatorship. Contractors and artisans were under threat of not only personal ruin, but also public disgrace that could have multi-generational consequences. Centuries of political change, particularly over the last century, have totally changed the political balance so that "fairness" now trumps "institutional power."
Project performance was required regardless of cost to the contractor. Once a contract was agreed on for the project delivery, then the contractor would complete it at the agreed-on terms. Asking for more money after agreeing to do the work was not an option.	Contractors who take on project work that they are unable to complete will declare insolvency or will leverage this possibility to gain more resources from a client. Project time and cost overruns are common. Although every contractor has an intention to complete the project as promised, it is not guaranteed. A legal system supports negotiation and a possibility for the contractor to abandon projects.	A client who is most likely to engineer success in a project will acknowledge the existence of power imbalances acting in both directions through inherent client power and contractor power. This translates into a system of governance, systems of dispute resolution, systems of joint problem solving, and knowledge sharing.  A best practice system allows transparency of project performance so that both the contractor and client can detect early-warning signals and address these so that project success is more likely.  Contractor motivation is far more short-term now than was the case in the time of Frontinus, so that clients need to harness the contractor's desire to perform well rather than demand performance.

**Table 2:** Implications for project management practice based on the Roman case study exemplar of select best practices and current common best practices.

time, the response was to tender for project work and then ruthlessly apply sanctions, and failure carried potentially life-destroying repercussions. The consequences of failure for the contractor could be financial ruin, which, for the Romans, could be as extreme as having to sell yourself into slavery to pay your debts. For the project manager, failure could invite accusations of corrupt behavior, legal prosecution,

loss of future public offices, or enduring disgrace to one's own family. This approach is not feasible or realistic today.

This leads to a question about the future trends in project management, based on this historical comparison. First, it must be acknowledged that in terms of project management tools and techniques, changes were glacial until only a matter of decades ago. Morris

(1994) provides a good history of project management and shows that the most commonly recognized project management techniques appeared during the twentieth century and, prior to that, had not changed much from the time of Frontinus. The major and radical change seems to have occurred as strategic orientation changes (Morris & Pinto, 2004), as well as in the procurement approach (Masterman, 2002;

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Rowlinson & McDermott, 1999; Walker & Hampson, 2003; Walker & Rowlinson, 2008; Winch, 2003). These approaches stress leadership that enhances commitment, better dispute resolution processes, and shared client–contractor, co-knowledge generation in facilitating better ways to deliver projects. Thus, the future lies with moving from coercion toward genuine shared values that result in co-commitment and more balanced reward and sanction systems to encourage and facilitate this process.

The project management loss for some clients (implied by Frontinus' era) is one of performance commitment, albeit from a highly normative (loyalty) or continuance (need to do so to survive or not lose out) perspective (Meyer & Allen, 1991). Some clients will regret and mourn their loss of power to compel contractors to deliver projects that have occurred over the centuries. That said, one of the attractive features of project management approaches in the time of Frontinus was their simplicity. Today, dealing with complexity and an array of stakeholder expectations is a serious problem that needs to be acknowledged and remedied.

We started writing this article as an interesting exercise to see just how much evidence there was to better understand project management from the perspective of somebody who would have been considered a project manager many centuries ago. Frontinus proved a good candidate because of his remarkable zeal in ensuring that the lessons learned could be shared and passed down to his successors. Aside from this being an admirable project management quality, it left a useful historical record. The historical evidence suggests that he wasn't a bad client (or client-side) project manager; rather, he worked with a system that automatically believed it was acceptable for a client and project manager hiring labor and contractors to have and use the institutional power that the culture of the time allowed. Frontinus' desire for a form of organiza-

tional learning was very cutting edge compared with that used today, while modern technology appears to be a defining difference between his era and ours. This technology and its ability to further democratize joint decision making between the client and project team may further shape the future. ■

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