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FACTORS GENERATING SCHEDULE DELAYS AND COST OVERRUNS IN CONSTRUCTION PROJECTS

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ABSTRACT

Delays and cost escalations in construction projects are problems that have been approached by many researchers through time, developing a significant body of literature. This paper developed a literature review to examine 30 research papers published since 1988 in the Web of Science database to identify the main factors causing these deviations. The results show that articles are covering different continents, decades, and project types (infrastructure-building). There are more articles regarding time deviation, and most of the articles belong to Asia and Africa. A list of 73 factors reported in the papers and also the top 10 most common factors. Factors were grouped considering the project life cycle stages, listing those related to Planning/Design (17), and Construction (46) and ten additional factors related to external causes were included.

Keywords: *delays, overruns, construction projects, literature review.*

1 INTRODUCTION

Delays and cost overruns represent a common problem, in construction projects, that have been approached by many researchers through time. Many uncertain factors have a potential impact on time and cost, and the influence of uncertainties is more prevalent than in other industries (OLAWALE; SUN, 2015). Negative consequences of cost and time overruns may include arbitration, litigation, or even total abandonment of the project (SAMBASIVAN; SOON, 2007).

Worldwide, several researchers have addressed this topic. An early study in Hong Kong revealed that the mean percentage of time overruns is 9% for government building projects, 17% for private building projects, and 14% for infrastructure projects (KUMARASWAMY; CHAN, 1998). Other research established that over 40% of Indian construction projects are facing time overruns (IYER; JHA, 2006). It has been established that 9 out of 10 transport infrastructure projects around the world present this deviation (FLYVBJERG; HOLM; BUHL, 2002). 50% of transportation projects in the United States have overrun their initial budgets (SHANE et al., 2009). Considering that a significative body of knowledge, reporting factors causing time and cost overruns, has been developed the objective of this research is to identify the main factors reported and

to find trends. Thirty articles reporting the factors of delays and cost overruns in construction projects were gathered from the Web of Science database.

2 METHOD

This section included two main activities, articles gathering and the analysis of them that allowed identifying main factors reported and comparing results.

2.1 Data gathering

First, a detailed search was developed in the Web of Science database, including the search [construction OR construction projects] AND [Cost overruns OR time delays OR construction time overruns] under the ‘title’ field option. The search results were refined to include articles in English, published in journals with an assigned quartile.

Next, papers were screened selecting those that reported factors causing delays and cost overruns in construction projects. This screening included a review of the titles and abstracts, and it allowed to verify that the papers met the goal of the research and to eliminate those that did not apply.

2.2 Articles analysis

The first reading of each paper was done obtaining the main information such as year, journal, type of deviation reported, project type and sector. Then, a profile of the publications was developed.

Next, a detailed reading of the papers was developed identifying the top ten factors reported in each case, considering that the articles included in this research presented a ranking of the factors reported. A classification of these main factors is presented grouping factors according to the project’s life cycle stages, plus external factors that do not belong to a specific stage.

3 RESULTS

This section includes a publications profile and the list of articles included in this research. Then, the list of the factors extracted, the top ten factors identified and a classification of them.

3.1 Publications profile

As a first stage, a general search on the Web of Science Core Collection was developed, finding 208 articles. The search was refined limiting the category to “Engineering Civil” and “Construction Building Technology” obtaining 77 results. The title and abstract screening resulted in 52 valid documents, selecting those reporting factors causing delays and cost overruns. Thirty articles were selected for this research, taking into account that they included results related to different types of projects and sectors, as well as from different continents.

The set of 30 articles included papers from 1988 to 2018 as seen in Figure 1 (left-hand side). Concerning geographic location, the majority of publications belong to Asia and Africa (Figure 1 right-hand side).

Then, the project type included in each one of the papers was extracted as well as the type of deviation reported. With respect to project type, part of the literature included only building projects (BU) or infrastructure projects (IN), another portion considered both

project types together and a percentage of the papers do not report this attribute (see Figure 2 – left-hand side). Concerning the type of deviation reported, there are papers reporting only time deviations (the majority), only cost deviations or both, as displayed in Figure 2 right-hand side.

Figure 1 – Number of publications per decade and per continent

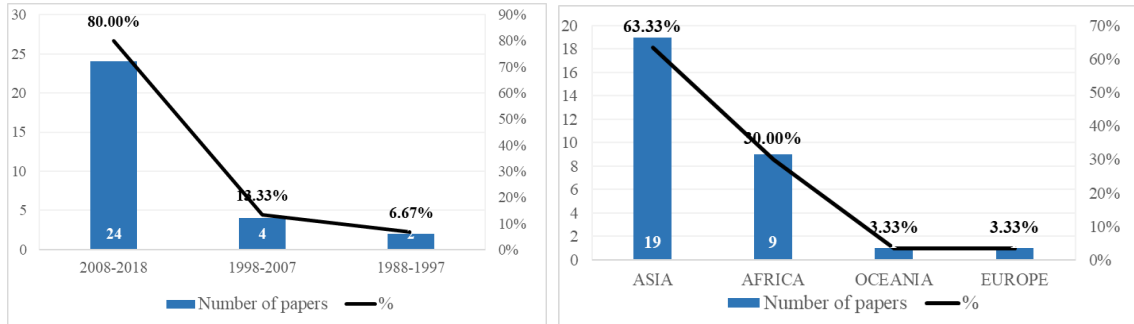
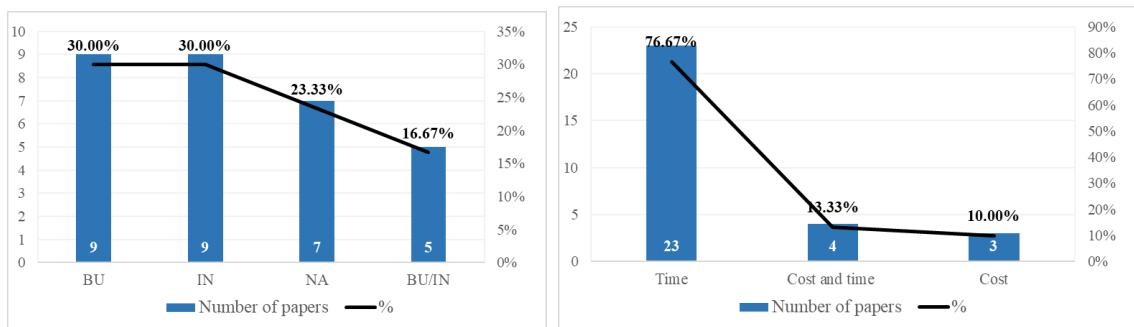


Figure 2 – Number of publications per project type and deviation reported



The papers included in this research were published in 10 journals, as seen in Figure 3. Journal of Management in Engineering has been the preferred journal for this kind of topic. The complete list of papers included in this research is included in Table 1, divided by continent and country.

Figure 3 – Number of publications per journal.



Table 1 – List of papers included in the literature review.

CONTINENT	COUNTRY	PAPERS	REFERENCES
ASIA	Iran	3	(FALLAHNEJAD, 2013) (DERAKHSHANALAVIJEH; TEIXEIRA, 2017)(SHAHSAVAND; MAREFAT; PARCHAMIJALAL, 2018)
	Turkey		(KAZAZ; ULUBEYLI; TUNCBILEKLI, 2012) (GUNDUZ; NIELSEN; OZDEMIR, 2013) (GUNDUZ; NIELSEN; OZDEMIR, 2015)
	China	2	(LO; FUNG; TUNG, 2006) (CHIU; LAI, 2017)
	Different Countries	2	(AHSAN; GUNAWAN, 2010) (RUQAISHI; BASHIR, 2015)
	India	2	(IYER; JHA, 2006) (DOLOI et al., 2012)
	Vietnam	2	(LE-HOAI; LEE; LEE, 2008) (KIM et al., 2017)
	Cambodia	1	(SANTOSO; SOENG, 2016)
	Pakistan	1	(BATOOLO; ABBAS, 2017)
	Palestine	1	(MAHAMID; BRULAND; DMAIDI, 2012)
	Saudi Arabia	1	(ASSAF; AL-KHALIL; AL-HAZMI, 1995)
	United Arab Emirates	1	(MPOFU et al., 2017)
AFRICA	Nigeria	3	(OKPALA; ANIEKWU, 1988) (ELINWA; JOSHUA, 2001) (AIBINU; ODEYINKA, 2006)
	Benin		(AKOGBE; FENG; ZHOU, 2013)
	Burkina Faso	1	(BAGAYA; SONG, 2016)
	Egypt	1	(ABD EL-RAZEK; BASSIONI; MOBARAK, 2008)
	Malawi	1	(KAMANGA; STEYN, 2013)
	Tanzania	1	(SAMBASIVAN et al., 2017)
	Zambia	1	(KALIBA; MUYA; MUMBA, 2009)
EUROPE	Denmark	1	(LARSEN et al., 2016)
OCEANIA	Australia	1	(DOLOI, 2013)

3.2 Factors identified

Through the literature review, the top 10 factors reported in each one of the selected papers were identified. Seventy-three factors were extracted, and they are included in Table 2. Factors were grouped according to the project's life cycle stages: first, those factors related to the planning and design stage of the projects; then, factors related to the construction stage and, finally, external factors that are not related with a specific stage. Factors were included exactly as reported in the literature.

In the initial/design stage, there are factors related to errors in the feasibility studies, in the initial cost and time estimation, in the bidding and award process, and errors and delays in design. In the construction stage, the main factors are related to resources (material, equipment, labor), to planning and scheduling and project management, to communication and conflict between project parties, to technical performance, and construction processes. Other factors are related to external causes such as natural calamities, weather, government, and society.

Table 2 – List of factors

GROUP	FACTOR
PLANNING/ DESIGN	Delays in decision making
	Insufficient feasibility studies and survey before investment
	Burocracy/ Inefficient internal processes
	Non utilization of professional construction/contractual management
	Underestimation of time for completion
	Underestimation of cost projects
	Inadequate definition of substantial completion
	Inadequate cost estimating approach
	Contractor’s deficiencies in planning and scheduling at tender stage
	Consultant recruitment delay
	Errors in project biding and award
	Inexperienced contractor/ consultant
	Duration of contract period
	Preparation/ Approval of designs
	Design changes
	Design errors
CONSTRUCTION	Extent of completion of pre contract design
	Land acquisition delay/ Late site delivery
	Low speed of decision making
	Poor contract management
	Ambiguous/errors contract information
	Noncompliance with conditions of contract
	Poor planning and scheduling
	Poor site management/ supervision
	Schedule delays (causing cost overruns)
	Quantity increased measure
	Resumption/accommodation works
	Works in conflict with existing utilities
	Remote location costs
	Project staff hiring delay
	Project administration cost increase
	Poor project management assistance
Lack of communication/integration	
Low level of professional skills	
Tendency to pass on the blame to others	
Conflict between project parties	

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GROUP	FACTOR
CONSTRUCTION	Poor technical performance
	Methods/techniques of construction
	Delay in performing inspection and testing
	Complexity of works
	Change orders/ scope change
	Contractor's financial problems
	Financial difficulties by the owner
	Delays in progress payment
	Partial payments during construction
	Subcontractor's financial problems
	Nonperformance/ problems subcontractors
	Poor management of contractors' schedules
	Shortage of contractors
	Delay in material procurement (action by the contractor)
	Poor interaction with vendors in the engineering and procurement stages
	Delay in material to be supplied by the owner
	Delay in approving sample materials
	Improper control over site resource allocations
	Shortage of labors
	Unqualified work force/ productivity
	Shortage of materials
	Material procurement/delays
	Shortage of fuel
	Shortage of foreign currency
	Poor quality of equipment
	Shortage of equipment
	Environmental impacts mitigation
EXTERNAL	Weather
	Natural calamities
	Unforeseen ground conditions
	Government pressures/ policies
	Strikes
	Government procedural delay/ permits
	Society concerns
	Public Order Situation
	Political situation
	Inflation/ Economic problems

Finally, these factors were ranked, according to those repeat the most. The top 10 of the most common factors are included in Table 3, including the number of documents in which they are mentioned and the percentage (respect to the 30 articles). The top 10 includes factors of different nature like financing, resources and project management.

Table 3 – Top 10 factors reported

Factor	Number of papers	Percentage
Change orders/ scope change	17	56.67%
Poor site management/ supervision	16	53.33%
Poor planning and scheduling	15	50.00%
Delays in progress payment	14	46.67%
Contractor´s financial problems	14	46.67%
Material procurement/delays	11	36.67%
Nonperformance/ problems subcontractors	11	36.67%
Design changes	11	36.67%
Delays in decision making	10	33.33%
Unqualified work force/ productivity	10	33.33%

4 CONCLUSIONS

Even though time delays and cost escalations have been thoroughly studied, there seems to be no evidence of a reduction of these deviations in construction projects and the number of articles published in leading journals in recent years has grown.

Concerning geographic location, Asia and Africa reported the majority of the analyzed papers. Increasing the number of investigations in Europe, America and Oceania is necessary. Some journal articles do not include complete information about the project type, minimizing the understanding of the results and hindering the comparison with similar studies.

An analysis of the research related to factors causing delays and cost overruns in construction projects has been developed in this paper. This research included journals articles since 1988, showing an increase in the number of publications during the last decade. Delays and cost overruns in construction projects have been a topic of interest among authors developing a significant body of literature, but most of the research has been focused on time deviations. Seventy-three factors were identified, and most of them belong to the construction phase, including factors of different nature including resources, technical performance, project management, relationships between people and financing. The top ten factors reported change orders, poor site management and supervision and poor planning and scheduling in the first places. Future research should include other kinds of databases and conference papers to expand the literature review and find new trends.

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