

# Agile Frameworks in Construction Project Management: A Systematic Review

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**Summary** - The global production in the construction sector in 2020 was 10.7 trillion dollars and with a growth projection of 42% or 4.5 trillion dollars by 2030 to reach 15.2 trillion dollars, which will be a global engine for economic growth. For this reason, the present systematic review was based on the search and collection of exhaustive information; The main objective is to determine the state of the art of agile frameworks in construction project management over the past 15 years. Which consisted of searches of reliable database sources, where emphasis was placed on scientific articles in the civil construction sector using criteria of discarding and inclusion through the prism methodology for its filter, obtaining as a final result 37 articles between the years 2006 and 2023, One of the most important findings was the significant impact that agile frameworks have on improving efficiency and productivity in construction. By adapting to the dynamic and often unpredictable environment of construction projects, these frameworks allow for better resource management and faster, more effective decision-making. The results also highlight how implementing agile frameworks can help reduce costs and improve interpersonal and managerial skills, also known as "power skills." These benefits are clearly seen at all stages of the project, especially in the design phase, where flexibility and adaptability are critical.

**Keywords:** Agile frameworks, project management, construction, PMI

## 1. Introduction

Global output in the construction sector in 2020 was \$10.7 trillion and is expected to grow by 42% or \$4.5 trillion between 2020 and 2030 to reach \$15.2 trillion, which will be a global engine for economic growth and recovery from COVID-19, according to [1]

According to the Project Management Institute, 2017 in the world, project management is not something new, it has been used for hundreds of years. The Pyramids of Giza, The Olympic Games, The Great Wall of China, The Taj Mahal, the Panama Canal, among others.

According to [1], the Latin American market will register an expansion of (9.6%), higher than projected for emerging regions in general (7.2% in 2021). And the growth of this sector in the 2030s will be 35% more compared to what is recorded in the 2020s. Global construction GDP expansion is projected to average 4.5% from 2020 to 2025, the highest rate for the manufacturing and services sectors. These results will be driven by a strong recovery from Covid-19 and massive stimulus from governments.

According to [3] in Peru, the management of construction projects is carried out by engineers who play the role of project leaders, standing out in their positions for being good professionals, good communicators, and good planners. It is up to them to motivate their work team, set goals, and provide a budget for the start of the project. It can be said that project management lacks a holistic view because it focuses on costs and budget control, without constant feedback and measuring results based on deliverables regardless of the time used. This lack of a complete vision is manifested in the little use of technological tools for project control, in the lack of quality standards, and in frequent control points. This aspect is exacerbated by the technical-engineering approach of the projects to the detriment of management capacity. The projects are structured in five phases, which do not include the sale or commercialization of the works, which is because in most cases the projects have already been ordered by clients or it is a real estate company that is in charge of the sale. This limits the vision of the builders who do not cover the warranty within their schedule and therefore the satisfaction of the customers is not assured.

Projects According to [2] It is a temporary effort that is undertaken to create a unique product, service, or outcome. Projects are carried out to meet objectives through the production of deliverables. An objective is defined as a goal towards which work should be directed, a strategic position to be achieved, an end to be achieved, a result to be obtained, a product

to be produced or a service to be provided. A deliverable is defined as any unique and verifiable product, outcome, or ability to execute a service that occurs to complete a process, phase, or project. Deliverables can be tangible or intangible.

Project Management According to [2] is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. It is achieved through the proper application and integration of the project management processes identified for the project. Project management enables organizations to execute projects effectively and efficiently.

Agility According to [2] is a term used to describe a mindset of values and principles as set forth in the Agile manifesto. According to [4], "Agility is the ability to create and respond to change in order to make a profit in a turbulent business environment." According to [4] Agility is the ability to balance flexibility and stability.

Therefore, the present systematic review asks the following question: What is the state of agile frameworks in construction project management in the last 15 years?

The objective of this systematic review is to determine the state of the art of agile frameworks in construction project management over the last 15 years.

## 2. Method

According to [5] this research is a systematic review of the scientific literature for the reason that the researcher will be able to recognize, complying with the scientific paradigm, the current conditions and future challenges of various topics of business management and, from this, strengthen their theories, models, techniques, tools, attitudes, strategies, etc., to transmit them also through the teaching exercise. generate new products or services, help entrepreneurs internalize new or novel ideas regarding productivity, quality and competitiveness, among other dimensions, but also to become co-producers of their own training in this necessary lifelong learning.

According to [6] the method in research adopts the PRISMA 2020 guideline which facilitates the replication and updating of reviews, as well as the inclusion of systematic reviews in scoping reviews or reviews of systematic reviews and can be used for original systematic reviews, systematic reviews and systematic reviews updated or continuously updated. Eligibility Criteria and Search Inclusion Criteria Scientific articles from reliable websites and during the period 2008 to 2023 in English, Spanish and other languages.

The search exclusion criteria were: Articles that do not resemble the variables in my title, Year of age less than 2008, Thesis or other types of documents that are not reliable articles.

Sources of Information: This systematic review was carried out in the following databases: Redalib, Scopus, Dialnet, Google Academic, WoS. Scielo and ProQuest, which are used to review the accuracy, completeness and reliability of the information in addition to being up-to-date on the information of my research variables.

Search Strategies: For the search strategy, the variables of the title of the systematic review are taken into account, which must be related to the searches in the information sources where keywords were used and synonyms of these in the Spanish and English languages: "Build", "Construction", "Predictive", "Waterfall", "Hybrid", "Agility", "Agile", "Agile". For a quick search, connectors such as "AND", "OR", "and" were used, where through visual discarding the largest number of databases collected in matrix in Excel was achieved.

Study Selection Process: For the selection of records, the prism methodology was used, in which, as a first phase, a massive search was carried out in relation to the variables of the title of the systematic review in the databases mentioned above, storing them in a folder where duplicates were automatically excluded. Subsequently, they were typed in an automated Excel to select those that are within the years 2008 to 2023 and others where they do not have origin, year or other variable were excluded. As a second phase in the Screening, those that were not related to the title and those that could not be accessed since they request a means of payment were excluded. Subsequently, the inclusion criteria that respond to the research question and that are related to the objective of the systematic review were taken into account. Finally, in the Included phase, all the records that were left as a result of the exclusion of the previous phases are taken for data extraction. Below is the flowchart of the process.

Data Extraction Process: For the extraction of data from the study selection, Mendeley was used for the registration of all the articles selected by the Prisma method and the complete analysis of them and an Excel matrix to extract the

information considering the following parameters (Author, Title, Year, Journal, Keywords, Document Type, DOI, Country, Database).

### 3. Results

In this chapter, the result of the inclusion and exclusion criteria of the search for records in the databases mentioned in the methodology will be provided, then through the prism methodology the records included for the analysis will be identified and thus answer the research question.

The results of the initial search are provided below using the connectors of the title variables in the different databases and are represented in the PRISMA flowchart as shown in the following figure:

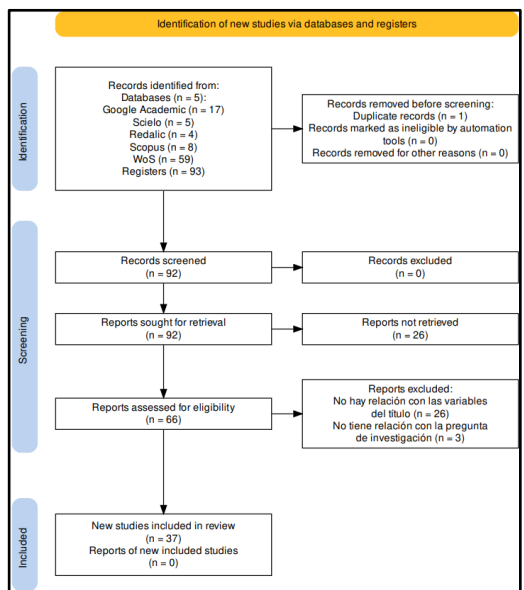


Fig.1: PRISMA flow

Also attached is the cloud link of the selected records: [Selected records RS](#)

Characteristics of the Studies: Additionally, the selected records are presented and stored in the cloud, where the bibliometric study is carried out, all based on the keywords and responding to the objective of this research of the state of the art.

Below is the analysis based on searchable databases:

Table 1: Database Analysis

Row Labels	Database Account
Google Academy	15
Redalyc	1
Scielo	1
Scopus	8
WOS	12
<b>Total general</b>	<b>37</b>

Table 1 shows that the databases with the highest number of published records are Google Academy with 15 and WoS with 12, It was also identified that in 2020 and 2022 7 investigations were carried out referring to keywords.

Table 2: Analysis by published country

Country	Quantity	Country	Quantity
Germany	2	Kazakstán	1
Australia	1	Malaysia	1
Brazil	5	Netherlands	1
Chile	1	Peru	2
Egypt	1	Portugal	1
Spain	1	United Kingdom	2
Germany	1	South Africa	1
Hungary	1	Switzerland	3
England	6	Turkey	1
Iran	1	USED	4
<b>Total general</b>		<b>37</b>	

Table 2 shows that the country with the highest published record is England, Brazil and the USA, with 6.5.4, vice versa.

Table 3 shows the analysis of the selected records according to the language of the country published:

Table 3: Analysis by language of the country published

Language	Quantity
English	31
Spanish	1
Portuguese	5
<b>Total general</b>	<b>37</b>

Table 3 shows that the language with the highest number of published records is English, with 31.

## Results of Individual Studies

According to [7] The influence of leadership and appropriate training form the key basis for the implementation of the AgiBuild framework. According to [8], an agile team structure can improve organizational agility when accompanied by empowering leadership along with specific competencies for the implementation of new work concepts. According to [9] use agile methodologies in the design phase of a civil engineering project to mitigate cost overrun and schedule and improve design phase delivery. According to [10] The strategy to overcome challenges and barriers is to support the implementation of techniques and mechanisms associated with interpersonal and agile relationships in the project, which can influence performance. According to [11] A strong trend in the integration of Lean Construction with agile methodologies such as Last Planner and the critical path method, give considerable improvements in quality, schedule, and cost management. According to [12] APM helps improve understanding of project complexity through disintegration and emphasizes the adaptability of a project system to ever-changing environments. In addition, the Interface Management technique helps immensely in the effective implementation of lean production and APM also helps to optimize the overall performance of construction projects. According to [13] The approach will be useful in situations where Lean needs to be more agile. These situations occur not only in the design phase of the project, but also in the execution phase of construction. According to [14] the proposal that lean and agile methods are revolutionizing project planning and scheduling. According to [15] Agility increases coordination, interface management, collaboration, and transparency in all design phases. According to [16] Scrum in a construction project potentially leads to better cost and schedule control, along with superior communication between multiple stakeholders. According to [17] Change management can be applied to agile management, especially in the design phase, and agile management is said to help reduce project failure by up to 8%, demonstrating improved efficiency and productivity.

According to [18] It better guides and supports current innovation in modular design and construction where it provides better design, more informed practice, and greater sustainability. According to [19] Concludes by implementing the Leagile approach, where design could be managed with Agile PM and execution with Lean construction. According

to [20] Lean is good for dealing with continuous flows, repeated tasks, and low-variety, high-volume products and that, in an environment of uncertainty, such as project management, Lean cannot be easily applied. So, they decided to combine lean and agile, creating a new project methodology they called AgiLean PM. According to [21] Techniques such as Scrum and metrics for transformation are for the positive influences in the construction industry to achieve better productivity, efficiency, quality, and integration of construction processes. According to [22] it is identified that Lean production pays special attention to formalization, seeking to structure or systematize processes, while agile project management pays special attention to the need for adaptation, through the implementation of more dynamic management routines. According to [23] The construction industry and artificial intelligence are very important issues that, if we merge them, would generate a very important impact in terms of construction, because many tasks and work time would be optimized, however, the human capacity for the management of technology must be taken into account, giving good results as soon as it advances, safety, quality and performance in the works, so it can be concluded that the technology optimizes time, costs and efforts in construction, so implementing it is a potentially viable alternative. According to [24] the implementation of the Scrum method and the concepts and tools of Lean Construction, based on a case study carried out on a construction site of a single-family house results in improvements in collaboration, communication and standardization of processes. At the same time, there was resistance to cultural change and the difficulty of adapting some tools to the work. According to [25], agile methodologies are presented as an option with high development potential in the market, providing important characteristics, such as the short execution time, the high quality standard of the final product and the low rate of losses and waste generated. According to [26] The use of project management tools is the driving factor, followed by the collaborative and common work of the data platform and the team-building institution are fundamental enablers for the adoption of a hybrid lean-agile system. According to [27] the agile management process, from creating a prioritized project backlog, planning sprints, reviewing sprints, to retrospective sprint and cycle time procedures, eliminates or mitigates many risks that lead to challenges and failures in projects. According to [28] using a BIM solution to adopt agile project management methodologies at the design stage of a building construction project, such as a software development project, there is potential to drive agile adoption. According to [29] motivation, leadership capabilities, business strategies, organizational capabilities is vital to transfer and share tacit knowledge in a lean and agile building process. According to [30] In agility, self-organizing teams play a partial mediating role between agile leadership and project success. According to [31] The key dates of a waterfall-based construction process simulation, set during the project planning phase, provide particular information to create a structure for agile and organized project execution. According to [32] Agile project management results in increased productivity, project performance, and schedule reliability. According to [33] The simultaneous use of Lean and Agile Management made it possible to achieve positive results for different environmental impact scenarios in the analyzed process and led to a reduction in costs due to the increase in formwork rotation According to [34], agility is a suitable strategy to improve performance indicators in the company's supply chain, as it has a high potential that could maintain balance and improve situations chaotic and unsustainable. According to [35] the lowest metric score for adapting to change was found to be for cost, as cost control would be difficult for any changes required after the design freeze stage. According to [36] Agility brings cost savings and environmental improvements for companies by abandoning the traditional employer-based work model. According to [37] Specific tweaks and refinements are recommended to enable adaptation from BIM to Scrum.

## **Synthesis Results**

In this systematic research, it was found that agile frameworks combined with other methodologies such as Lean, BIM or others bring positive results for the following dimensions:

Table 4: *Matrix of indicators*

Title	Research Question	Dimensions	Indicators	Scale
Agile frameworks in construction project management. A systematic review over the past 15 years	What is the state of the art of agile frameworks in construction project management over the past 15 years?	Design Phase	N° of Records Focused on the Design Phase through Agility / Total Records	Reason
		Productivity	N° of Records Focused on Productivity through Agility / Total Records	Reason
		Costs	No. of Records Focused on Costs through Agility / Total Records	Reason
		Power Skill	N° of Registrations Focused on Soft Skills through Agility / Total Registrations	Reason

In the dimension of the design phase, 12 articles were identified that recommend applying the agile framework in the design phase to have greater planning and mitigation of risks, waste, among others, adapting other methodologies for the other phases such as Lean.

In the dimension of productivity, 12 systematic reviews were identified, which obtained as a positive result in this, also adding improvement in time, quality, waste reduction, improvement of effectiveness and integration with processes, among other improvements.

In the cost dimension, 7 systematic reviews were identified that have savings in the project, mitigating risks, among other savings improvements.

In the dimension of power skills, 6 systematic reviews were identified in which these skills bring greater communication between the work team, cultural change, leadership, among other skills within management.

Table 5: *Summary of Indicator Matrix Results*

Dimensions	Quantity	%
Design Phase	12	32%
Productivity	12	32%
Costs	7	19%
Power Skill	6	16%

Table 5 shows articles related to the research dimension, each article is evidenced in the individual results.

#### 4. Conclusions

According to the research and experiences of the articles on the application of agile frameworks in project management in companies in the construction sector of the last 15 years, we conclude that it should be included in companies for greater productivity, cost savings, communication improvements and organizational climate contributing to project management in the design stage and adapting other methodologies such as lean in the other phases. It has a positive impact on environmental management.

By analyzing 93 articles, 37 were selected which met the inclusion criteria, bringing me closer to an answer to my research question. In these studies, some characteristics were considered, such as the database, the author, the year of publication, the country of origin and the title.

Likewise, characteristics such as reliable databases were analyzed, in which the largest source of information was obtained in Google Academic (40.54%), then Redalyc (2.70%), Scielo (2.70%), Scopus (21.62%) and WOS (32.43%); in which priority was given to the construction sector.

And finally, an analysis was made using indicators of my dimensions presented in the matrix of indicators; thus being able to answer the research questions.

It was possible to verify the influence of the implementation of agile frameworks in the design stage of the articles where the productivity of companies in the civil construction sector increased.

Limitations were found in some articles since to access them a prior payment had to be made; Incomplete articles were also found due to the author's rights.

The importance of this systematic review for future researchers in this area and the sector; They lead to the expansion of knowledge and form of research, in recommendation to other researchers they should delve into agile frameworks so that they can give greater knowledge to companies in project management and can apply it.

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