**ORIGINAL ARTICLE** 

# Agile methodologies and their relationship with efficient project management

#### ABSTRACT

Organizations are continually searching for new ways to manage their projects efficiently, in order to be more competitive in the market. For this reason, this paper aimed to determine the relationship between agile methodologies and project management efficiency. The methodology used is correlational and cross-sectional, with a non-experimental design. The sample consisted of 139 developers of information technology projects from banking entities. The data was collected through two surveys; one of them measured the agility of the projects and the second measured the effectiveness of project management. Each questionnaire had 20 items on a Likert-type scale. The resulting value was 0.858 for the Spearman's Rho coefficient, which demonstrates that there is a relationship between the implementation of an agile methodology and efficient project management. The relationship between the dimensions of customer collaboration, functional deliverables, response to change, and individuals and interactions with efficient project management was also demonstrated. This allows us to conclude that properly implementing an agile method increases the probability of successfully completing a project. However, it is necessary to have a trained work team to carry out the implementation, in addition to having the necessary resources to support management; all of this will allow the organization to achieve the desired results.

Keywords: agile methodology; project management; agility.

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Submitted: 03/11/2024 - Accepted: 08/01/2024 - Published: 12/30/2024



#### Online ISSN: 1728-2969 Print ISSN: 1560-9081 Facultad de Ciencias Administrativas UNMSM

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#### **INTRODUCTION**

The first project management methodologies were oriented towards the development of technological projects, due to the high demand from society. Later, they were changed; because, over the years, the Internet and, in general, technology, generated a great dependency in society (Ashmore and Runyan, 2014), with CO-VID-19 being one of the drivers for many projects to be developed in distributed environments, which accelerated virtual work (Holz *et al.*, 2020).

In this context, all organizations that aspire to be world leaders in the industry seek to successfully complete their projects; however, only a third have the capacity to deliver value to their customers and accept change (Project Management Institute [PMI], 2018); others fail to meet the defined scope, cost and time (Gallo *et al.*, 2022). There is even difficulty in choosing an appropriate methodology (Molina *et. al*, 2018).

In accordance with the above, the search for efficient project management aiming at disseminating these good practices to the world has led to the generation of multiple methodologies and frameworks for their management (Arias, 2020); specifically, there are more than 45 methodologies (Molina *et. al*, 2018). While it is true that there is no single methodology to follow, the choice of one of these will depend on the complexity and size of the project (Parada *et al.*, 2020). In this regard, implementing it would provide a competitive advantage to the organization with respect to its competition (Castro *et al.*, 2018).

Agility is an essential factor in the development of a product that is constantly evolving. It has its origin in the changes that occur due to the existence of increasingly competitive markets, high demand, more demanding customers, digital transformation and the advancement of technology (Hallstedt *et al.*, 2020). As a result of these changes linked to uncertain and unpredictable environments, traditional methods experienced a deterioration in their performance (Paluch *et al.*, 2019), which is why agile project management approaches emerged as an alternative (Cooper and Sommer, 2018). Although agile principles were initially designed to support the project management of a specific industry, which involved small teams and unambitious results (Zasa *et al.*, 2021), the successful application of agile management methods is due to the fact that it evolved from being a software project management specific method to becoming an innovative and flexible method that allows managing all types of projects (Cooper and Sommer, 2020). This is the reason why we see growth in industries that have chosen to manage their projects by implementing these methodologies to improve the performance of their projects (Azanha *et al.*, 2017).

Recent studies agree that managing a project through an agile methodology results in the delivery of value to the customers, facilitates adaptation to changes and customer collaboration (Roshan and Santhosh, 2021). Likewise, Moloto et al. (2021) demonstrated that implementing an agile framework influences achieving project success, which can be seen in the reduction of planning, technical feedback and iterative deliveries. For their part, Tam et al. (2020) identified team capacity and customer participation as success factors. Similarly, Silva and Lotero (2018) demonstrated that using an agile framework has a positive effect on customer satisfaction. This is due to their active participation in the development of the product, team motivation, and time and costs, which allows greater speed and efficiency in projects.

In this context, Patrucco *et al.* (2022) recognize that the cultural component of the project team is a fundamental factor when deciding to manage a project using an agile method. Likewise, Wulandari and Raharjo (2023) argued that agility provides benefits to projects because it promotes collaboration, rapid iteration, and flexibility, which makes them adaptable and responsive to challenges, including skills, technological, and management gaps.

This paper aims to demonstrate whether the implementation of an agile methodology is related to efficient project management in the banking sector. On the other hand, it seeks to demonstrate the existence of a relationship between the following dimensions: customer collaboration, response to change, functional deliverables and individuals, and their interactions with project management. Likewise, the benefits of implementing the agile approach in organizations will be presented based on the review of studies and theories by various authors on the subject at hand.

# Agile manifesto

The Agile Manifesto was created in 2001 as a proposal of values and principles that proposes to value:

- Individuals and their interactions before processes and tools.
- Functional deliverables over detailed documentation.
- Customer collaboration before contract negotiation.
- The response to change over a rigid plan.

Product development is oriented towards an iterative flow and making incremental deliveries of the product through short iterations (Patanakul *et al.*, 2015). Various investigations study agile methodologies, thus De Souza *et al.* (2014) identified the characteristics of organizations that develop successful projects using agile methods, finding that their success lies in the capacity of their work teams, the communication they establish with their customers, and the relationships that workers establish with external personnel. For its part, the PMI (2018) reports that more than 70% of companies that use agile methods have seen their competitiveness increase.

# The agile method

Being agile refers to having the ability to react in real time to the various changes that the market undergoes, since these go hand in hand with the changing needs of customers, with the integration of skills and new resources that favor the development of products more quickly (Böhm, 2019). It is for this reason that the agile community recommends the name agile framework instead of agile methodology; this new culture is based on the values present in the agile manifesto with the following characteristics:

- The teams that are formed are small, multifunctional, stable and self-organized (Sutherland, 2014).
- Work is done based on needs and not requirements. A requirement is understood as a fixed characteristic and a need can vary over time (Sutherland, 2014).
- Velocity is understood as work completed in a cycle or sprint (Sutherland, 2014).
- Meetings are held to analyze performance and improve upon it (Schwaber and Sutherland, 2020).

# Most used agile methodologies

Agile methods, also called agile frameworks, are not only applicable and efficient, but have a series of advantages such as being adaptable to change, with short development times, constant evolution and immediate response (Kamepally and Nalamothu, 2016).

Among the most commonly used metho-dologies are:

# Scrum

It is the most popular agile methodology that is characterized by its iterative and incremental way of working (Thilak *et al.*, 2015). In addition, it is considered an agile framework that prioritizes developing the maximum potential of its team to carry out functional deliverables (Almseidin *et al.*, 2015). Thus, projects are developed during sprints that have a defined duration, with increments in each of them. Each sprint begins with prioritized requirements and changes are not accepted to guarantee the stability of the project (Gunga *et al.*, 2013).

Scrum was designed to ensure the delivery of value to the customer through rapid responses throughout the entire project (SCRUM study, 2022). Scrum is based, on the one hand, on empiricism that rescues knowledge that comes from experience and, on the other hand, on lean thinking that seeks to reduce waste (Schwaber and Sutherland, 2020).

### Kanban

The Kanban method is used in project management and was first introduced by Toyota, where it was implemented to manage its production lines (Japan Management Association, 2017). Kanban is based on the idea that work in progress must be completed before starting a new one (Colla, 2016). This term refers to the system by which information is visualized to be more efficient in the execution of tasks in a project. It is based on three rules: visualizing the workflow, setting a limit to the work in progress, and measuring the time it will take (Kirovska and Koceski, 2015).

Kanban takes on the role of an agile method and a tool whose objective is to comply with pre-established rules. As it is also a tool, it is easy to implement, and having the team understand it and apply it correctly will suffice; it can even be adapted to different development approaches (Gaete *et al.*, 2021).

#### Benefits of using agile methodologies

Among the benefits that come with the implementation of agile methods are reducing processes, reducing times, increasing productivity, improving the quality of the deliverable, and being predictable through risk management (Parada *et al.*, 2020).

It is important to highlight that agility allows for the reduction of equally efficient processes, avoiding the accumulation of work. On the other hand, high levels of quality can be achieved with the minimum functionality that allows the work to be carried out. In addition, being agile allows to prioritize risks, which ensures compliance with delivery times. Likewise, the tests carried out allow for the identification of failures in early stages, which generates quality deliverables and productive teams (Parada *et al.*, 2020).

It is worth noting that an agile approach is easy to learn and facilitates planning, organization, and distribution of work. It also allows problems to be solved, makes pending work visible, and encourages teamwork (Gaete *et al.*, 2021).

# Agile versus traditional methodologies

Under traditional methods, the requirements defined at the start of a project cannot be changed; any change would entail returning to the initial stage of the project. However, the agile method is scalable in each iteration; therefore, changes can be made according to the customers' needs. On the other hand, while in the traditional model it is necessary to wait until the project is completed to verify if there are errors, in the agile model this verification is carried out from the initial stage (Choudhary and Rakesh, 2016). It should be noted that by using an agile method the project can be completed in less time, even increasing quality (Lalband and Kavitha, 2019).

In general, organizations lean toward agile methods because they are convinced that the principles and values mentioned in the agile manifesto are the best practice (Hohl *et al.*, 2018). However, managers are not always aware of the different agile methods that exist, leaning toward the Scrum framework as the only alternative, which leads them to a misinterpretation of agility (Klünder *et al.*, 2017). Failure to address the existing gaps in organizations results in the failure of the adoption of an agile method.

On the other hand, opting for an agile method is an efficient alternative due to the versatility of this type of methodologies, which are ideal in a changing environment like the current one. Generally, projects have a high degree of uncertainty and their requirements tend to vary over time, which brings with it the need to include changes that would be very costly under a traditional approach (Gaete *et al.*, 2021).

#### **Project management**

When managing projects, planning, organization, monitoring and control activities are considered. On the other hand, corrective actions must be included that lead to achieving the objectives set in the project (INTE-ISO 10006, 2017). On the other hand, the processes that allow managing and organizing the resources required to meet the scope, complying with the agreed time and quality, must also be considered (Samset and Volden, 2016). For their part, Radujković and Sjekavica (2017) highlight the importance of measuring project performance through cost, quality and time constraints. According to Sommerville (2005), proper management does not always guarantee a successful project; however, inadequate project management can lead to failure. Therefore, it is vitally important to carry out proper project planning, with the project manager being called upon to foresee any difficulties that may arise and propose solutions. To manage a project, one must have knowledge, techniques and tools that allow the various activities to be carried out to meet the established requirements; this results in efficient projects (PMI, 2017).

#### **METHODS**

The research carried out is considered applied because it seeks to achieve the proposed objective, which is to determine the relationship between agile methodologies and the efficiency of project management, and because it establishes procedures, proposes strategies, and estimates its practical value (Cano, 2019). It is correlational because it aims to establish the relationship between the study variables using inferential statistics. Its design is non-experimental because the variables did not undergo any alteration; it is cross-sectional because it was carried out during the year 2023. In the cross-sectional design, the data is obtained in a single period of time (Hernández et al., 2014).

The population on which the study was conducted consisted of 215 developers from the main banking entities in the city of Lima. The study population was considered based on pre-established criteria and its accessibility. On the other hand, the sample or group in which the data collection instruments were applied consisted of 139 developers from the total population. To select the study participants, probabilistic sampling was used; in this way, a representative sample was sought, only developers who use or have used some agile method in the management of their projects were considered. Personnel who perform the same functions in savings banks or other financial entities of lesser scope or who work only under traditional management methods were not considered.

The sample calculation was carried out using the following formula.

$$n = \frac{Z^2 * N * P * Q}{(N-1) * d^2 + Z^2 * p * Q}$$

On the other hand, the survey technique was used, which consisted of the application of two questionnaires. The first questionnaire was used to evaluate the agility of the projects, and consisted of 20 questions focused on evaluating four dimensions: customer collaboration, functional deliverables, individuals, and interactions and response to change. The first dimension consists of 4 items; the second, of 6 items; the third, of 5 items, and the fourth, of 5 items. The second questionnaire, which was used to evaluate the efficiency of the projects, consisted of 20 questions focused on evaluating four dimensions: people, processes, products, and technology, where the first dimension consists of 5 items; the second, of 6 items; the third, of 4 items, and the fourth, of 5 items.

Both questionnaires were based on a Likert scale, whose structure allows participants to respond in a timely and clear manner. The instruments were adapted and validated by four experts. Furthermore, the reliability that provides the degree of consistency of the results was guaranteed by means of the Cronbach's Alpha coefficient. Thus, the tool that allowed the evaluation of project agility obtained a Cronbach's Alpha equal to 0.951 and the tool that allowed the evaluation of project efficiency obtained a Cronbach's Alpha equal to 0.972, which shows that both tools are reliable.

The data collection process started using Google forms and inviting employees to participate anonymously and voluntarily. With the total number of surveys required, the results were consolidated in a spreadsheet, and then the results were analyzed with statistical software SPSS, using descriptive statistics and inferential statistics.

#### RESULTS

To obtain the results, inferential statistics were used using Spearman's Rho coefficient, which showed a value of 0.858; a value of P. = 0.000was also obtained, thus confirming the existence of the relationship between the application of agile methodologies and project management effectiveness. At the same time, the descriptive results indicated that the level of agility is "medium", which shows that the implementation of the agile methodology applied should be improved (see Table 1).

Likewise, a second result showed a value of 0.800 for Spearman's Rho coefficient and a value of P. = 0.000, thus confirming the existence of the relationship between the dimension individuals and their interactions and project management effectiveness. On the other hand, the descriptive results indicated that the level of the dimension individuals and interactions is medium, which shows that the selection of development team members and the form of assertive communication between them must be improved (see Table 2).

Furthermore, a third result showed a value of 0.756 for Spearman's Rho coefficient and a value of P. = 0.000, thus confirming the existence of the relationship between the functional deliverables dimension and project management effectiveness (see Table 2). In addition to this, a fourth result showed a value of 0.715 for Spearman's Rho coefficient and a value of P. = 0.000, thus confirming the existence of the relationship between the customer collaboration dimension and project management effectiveness (see Table 2).

Finally, a fifth result showed a value of 0,829 for Spearman's Rho coefficient and a value of P. = 0.000, thus confirming the existence of the relationship between the response to change dimension and project management effectiveness (see Table 2).

Descriptive results were also determined. Figure 1 shows that the descriptive results indicated that the level of agility reached a medium level for 37.4% of respondents and a high level for 28.1% of respondents, which shows that the implementation of the agile methodology used must be improved to achieve an optimal implementation.

Figure 2 shows that the level of project management effectiveness reached a medium level of 37.4% and a high level of 28.1%; therefore, it

#### Table 1

Nonparametric Correlations between	variables (Spearman's Rho)
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			Project Management	
Spearman's Rho	Agile Methodologies	Correlation coefficient	,858**	
		Sig. (two-tailed)	0.000	
		Ν	139	

Note. \*\*. Correlation is significant at the 0.01 level (two-tailed). Prepared by the authors, 2024.

#### Table 2

Nonparametric Correlations between Dimensions and Project Management (Spearman's Rho)

			Project management
Spearman's Rho	Customer collaboration	Correlation coefficient	,715**
		Sig. (two-tailed)	0.000
		Ν	139
	Functional deliverables	Correlation coefficient	,756**
		Sig. (two-tailed)	0.000
		Ν	139
	Individuals and interactions	Correlation coefficient	,800**
		Sig. (two-tailed)	0.000
		Ν	139
	Response to change	Correlation coefficient	,829**
		Sig. (two-tailed)	0.000
		Ν	139

Note. \*\*. Correlation is significant at the 0.01 level (two-tailed). Prepared by the authors, 2024.

can be stated that although project management effectiveness achieved is above average, work still needs to be done to reach the desired level of effectiveness.

Table 3 shows the frequency distribution obtained for each of the agile methodologies dimensions: customer collaboration, functional deliverables, individuals and interactions, and response to change.

The results indicated that the level of the individuals and interactions dimension is me-

dium, which shows that the selection of development team members and the assertive form of communication between them must be improved. Likewise, it was found that for two out of three respondents the level of the functional deliverables dimension is between medium and high, which shows that meeting functional deliverables is one of the strengths of efficient project management. On the other hand, the level of the customer collaboration dimension is medium, which shows that work must be done to integrate customers as part of



**Figure 1** Level of Agile Methodologies (Agility)

Note. Prepared by the authors, 2024.



Figure 2

Project Management Level of Effectiveness

Note. Prepared by the authors, 2024.

Dimension		F				%		
	Low	Medium	High	Total	Low	Medium	High	Total
Customer collaboration	56	83		139	40.3	59.7		100
Functional deliverables	50	43	46	139	36.0	30.9	33.1	100
Individuals and interactions	61	78		139	43.9	56.1		100
Response to change	59	80		139	42.4	57.6		100

# **Table 3**Frequency Distribution of Dimensions

Note. Prepared by the authors, 2024.

the development team; this is important if their requirements are to be met. In addition to this, the level of the response to change dimension is medium, which shows that the acceptance of changes by stakeholders must be improved.

#### DISCUSSION

The general objective of this research was to determine the relationship between agile methodologies and the efficiency of information technology project management in the banking sector. The results obtained show the existence of a significant relationship between the implementation of agile methodologies and project management efficiency. This means that agile methodologies positively influence the results obtained from a project, thanks to their ability to adapt to the changing needs of customers. These findings coincide with Moloto et al. (2021), who demonstrated that implementing an agile method is related to the success of the project. Likewise, Flores et al. (2022) confirmed the relationship between the application of an agile methodology and project management efficiency, thus validating the proposal of the Agile Project Management Interdependence Declaration that seeks to improve the effectiveness of projects through agility (SCRUM study, 2022). The above explains why more and more companies are opting for agile methods to achieve optimal performance levels (Azanha et al., 2017).

Similarly, regarding the dimension of individuals and their interactions, a significant relationship was demonstrated with project management efficiency. This is because teamwork makes it easier to achieve the established goals. This result is supported by De Souza *et al.* (2014), who consider the relationships established within the development team and all stakeholders as a success factor for a project. For their part, Wulandari and Raharjo (2023) recognize the collaboration between members of the project development team as a benefit of agility.

In relation to the functional deliverables dimension, a significant relationship was demonstrated with the efficiency of project management. This means that deliveries that provide value to the customers positively influence their satisfaction. These results coincide with Patanakul *et al.* (2015) who highlighted the importance of delivering functional products, deliveries that must be incremental and must be carried out over short periods.

Regarding the dimension of customer collaboration, it was shown that there is a significant relationship with project management efficiency. This is because constant communication with customers allows the development team to better understand their needs, know their expectations and adapt to their changes. According to Navarro *et al.* (2013), it is important to maintain communication with customers because this is considered a characteristic of a successful organization (De Souza *et al.*, 2014). On the other hand, it is worth recognizing the importance of the cultural component (Patrucco *et al.*, 2022).

Regarding the response to change dimension, a significant relationship was demonstrated with project management efficiency. This was due to the fact that corrective measures were introduced to respond in a timely manner to the deviations that affected the projects, taking change as an opportunity for improvement. For their part, Hallstedt *et al.* (2020) see agility as a response to change which, in turn, is a consequence of technology advancement and other factors such as increasingly rigorous demand and customers. The above brings with it a great challenge, because one of the most common problems is precisely resistance to change (Flores *et al.*, 2022).

#### CONCLUSIONS

Based on the results obtained, it is concluded that there is a significant relationship between agile methodologies and the efficient management of Information Technology (IT) projects in the banking sector of Lima. This is based on the fact that a statistically significant relationship was found between the variables mentioned, with a Spearman coefficient of 0.858, which demonstrates a high association. On the other hand, it was also demonstrated that the selected agile method must be implemented rigorously to obtain an optimal level of effectiveness.

It is also concluded that there is a significant relationship between communication with the customers and efficient project management. This is because the human factor is a fundamental element in the successful management of a project. However, it was shown that it is necessary to address the difficulties that arise during the coordination and communication of the development team.

It is also concluded that there is a significant relationship between the response to change and efficient project management, demonstrating that responding in a timely manner to changes allows the development of products that satisfy the customers' needs, and it is of vital importance that the development team includes and accepts the changes suggested by the stakeholders.

Furthermore, it is concluded that there is a significant relationship between people and their interactions and efficient project management, which shows that it is necessary to find ways to integrate customers with the development team and achieve their active participation throughout the entire project. In addition to this, it is concluded that there is a significant relationship between functional deliverables and efficient project management. This is because it is important to make deliverables that provide value to the customers on an ongoing basis, which brings with it the need to commit the team to make these deliveries.

#### **Recommendations**

It is recommended that, before carrying out any implementation, trained personnel be available to minimize the impact of existing risks, and to take as a basis the lessons learned from previous projects.

Before carrying out any research project, it is important to carry out prior work to raise awareness among all those involved in the study, in order to obtain reliable data that guarantee the veracity of the results.

Finally, it is suggested to carry out research work involving other sectors of the industry; for example, the educational sector, where agile methods have much to contribute because they focus on people and their capabilities.

#### Limitations

Which agile methodology is the most efficient has not been determined, but rather various criteria are analyzed to determine why the appropriate choice of one of them would result in efficient project management.

Projects from different industries have not been analyzed, rather the research focuses on IT projects, as these types of projects generally employ agile methods in this environment.

A detailed management methodology has not been proposed, but rather a reference framework that adapts to the needs of each organization.

#### REFERENCES

- Almseidin, M.; Alrfou, K.; Alnidami, N., & Tarawneh, A. (2015). A Comparative Study of Agile Methods: XP versus SCRUM. International Journal of Computer Science and Software Engineering (IJCSSE), 4 (5).
- Arias, E. O., (2020). Integración de Lean, Design Thinking y Agile en la gestión de proyectos. SIGNOS-Investigación en Sistemas de Gestión, 12 (2), 161-174. https://doi. org/10.15332/24631140.5942

- Ashmore, S. & Runyan, K. (2014). *Introduction to agile Methods*. Addison-Wesley Professional.
- Azanha, A.; Tiradentes, A.; Batista, J., & Domingos, P. (2017). Agile project management with Scrum: A case study of a Brazilian pharmaceutical company IT Project. *Int. J. Manag. Projects Bus.*, 10 (1), 121–142. DOI: 10.1108/ IJMPB-06-2016-0054
- Böhm, J. (2019). Erfolgsfaktor Agilität: Warum Scrum und Kanban zu zufriedenen Mitarbeitern und erfolgreichen Kunden führen. Springer Vieweg Wiesbaden.
- Cano, C. (2019). Dos visiones diferentes de entender la investigación, para la formación en educación superior. *Revista Atlante: Cuadernos de Educación y Desarrollo, 109,* 113-120. https:// www.eumed.net/rev/atlante/2019/07/investigacion-educacionsuperior.html
- Castro, H.; Velásquez, T., & Rojas, M. (2018). Adoption of project management methodologies in Colombia project manager's perspective. *J. Phys. Conf. Series 1126.* https://iopscience.iop.org/ article/10.1088/1742-6596/1126/1/012032/ pdf
- Choudhary, B., & Rakesh, S. (2016). An approach using agile method for software development. In 2016 International Conference on Innovation and Challenges in Cyber Security (ICICCS-IN-BUSH). 155-158. IEEE.
- Colla, P. (2016). Uso de opciones reales para evaluar la contribución de metodologías *Kanban* en desarrollo de software. En: Simposio Argentino de Ingeniería de Software (ASSE 2016)-JAIIO 45. https://sedici.unlp.edu.ar/ handle/10915/57165
- Cooper, R., & Sommer A. (2018). Agile–Stage-Gate for Manufacturers: Changing the Way New Products Are Developed Integrating Agile project management methods into a Stage-Gate system offers both opportunities and challenges. *Res. Technol. Manag.*, *61* (2), 17–26. DOI: 10.1080/08956308.2018.1421380
- Cooper, R., & Sommer A. (2020). New-product portfolio management with agile: Challenges and solutions for manufacturers using agile development methods. *Research-Technology Management.*, 63 (1), 29–38. DOI: 10.1080/08956308.2020.1686291
- De Souza, P.; Zambalde, A.; Tonelli, A.; Souza, S.; Zuppo, L., & Rosa, P. (2014). Agile principles and achievement of success in software development: A quantitative study in Brazilian organizations. *Procedia Technology*,

16, 718-727. https://doi.org/10.1016/j. protcy.2014.10.021

- Flores, F.; Sanhueza, V.; Valdés, H., & Reyes, L. (2022). Metodologías ágiles: un análisis de los desafíos organizacionales para su implementación. *Revista Científica*, 43 (1), 38-49. https:// doi.org/10.14483/23448350.18332
- Gaete, J.; Villarroe, R.; Figueroa, I.; Cornide-Reyes, H., & Muñoz, R. (2021). Enfoque de aplicación ágil con Scrum, Lean y Kanban. *Ingeniare. Revista chilena de ingeniería*, 29(1), 141-157. https://dx.doi.org/10.4067/S0718-33052021000100141
- Gallo, J.; López, L.; Duque, G., & Galeano, A. (2022). Nuevos desafíos de las pequeñas y medianas empresas en tiempos de pandemia. *Tecnura*, *26*(72), 51. https://doi. org/10.14483/22487638.17879
- Gunga, V.; Kishnah, S., & Pudaruth, S. (2013). Design of A Multi-Agent System Architecture For The Scrum Methodology. *International Journal of Software Engineering & Applications (IJSEA), 4* (4). DOI: 10.5121/ijsea.2013.4401.
- Hallstedt, S.; Isaksson, O. & Rönnbäck, A. (2020). The need for new product development capabilities from digitalization, sustainability, and servitization trends. *Sustain.*, *12*(23), 1-26. https://doi.org/10.3390/su122310222
- Hernández, R.; Fernández, C., & Batista, M. (2014). Metodología de la investigación. Sexta edición. McGraw-Hill/Interamericana Editores. https://www.esup.edu.pe/wp-content/uploads/2020/12/2.%20Hernandez,%20Fernandez%20y%20Baptista-Metodolog%C3%A-Da%20Investigacion%20Cientifica%20 6ta%20ed.pdf
- Hohl, P.; Klünder, J.; van Bennekum, A.; Lockard, R.; Gifford, J.; Münch, J.; Stupperich, M., & Schneider, K. (2018). Back to the future: Origins and directions of the "Agile Manifesto" - views of the originators. *Journal of Software Engineering Research and Development, 6*(15). https://doi. org/10.1186/ s40411-018-0059-z
- Holz, B.; Brian, D.; Hyde, P.; Kenefick, S.; Dayley, B., & Matheny, K. (2020). *Guía de planificación* 2021 para desarrollo de software ágil y DevOps. Gartner. https://www.gartner.com/en/documents/3991565
- INTE-ISO 10006. (2017). Sistema de gestión de la calidad - Directrices para la gestión de la calidad de proyectos. (3ª ed.). https://webstore.ansi. org/preview-pages/ISO/preview\_ISO+10006-2017[S].pdf

- Japan Management Association. (2017). Japan Management Association: Kanban y Just in time in Toyota. La dirección empieza en las estaciones de trabajo. Productivity Press. https://books.google.com.pe/books/about/Kanban.html?id=NvdKDwAAQBAJ&redir\_esc=y
- Kamepally, A., & Nalamothu, T. (2016). Agile Methodologies in Software Engineering and Web Engineering. *I.J. Education and Management Engineering*, *5*, 1-14. DOI: 10.5815/ijeme.2016.05.01
- Kirovska, N., & Koceski, S. (2015). Usage of Kanban methodology at software development teams. Journal of Applied Economics and Business, 3(3), 25-34. http://www.aebjournal.org/article030302.php
- Klünder, J.; Schmitt, A.; Hohl, P., & Schneider, K. (2017). Fake news: Simply agile. *Bonn: Gesellschaft für Informatik*, 187-192.
- Lalband, N., & Kavitha, D. (2019). Software Engineering for Smart Healthcare Applications. *International Journal of Innovative Technology and Exploring Engineering*, 8(6S4), 325-331.
- Molina, B.; Vite, H., & Dávila, J. (2018). Metodologías ágiles frente a las tradicionales en el proceso de desarrollo de software, *Espirales Revista Multidisciplinaria de Investigación, 2*(17), 114-121. https://doi.org/10.31876/re.v2i17.269
- Moloto, M.; Harmse, A., & Zuva, T. (2021). Impact of Agile Methodology Use on Project Success in South African Banking Sector. *Lecture Notes in Electrical Engineering, 733 LNEE*, 157-173. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85107347011&doi=10.1007%2f978-981-33-4909-4\_12&partnerID=40&mDOI: 10.1007/978-981-33-4909-4\_12
- Navarro, A.; Fernández, J., & Morales, J. (2013). Revisión de metodologías ágiles para el desarrollo de software. *Prospectiva*, 11(2), 30-39. https://www.redalyc.org/articulo. oa?id=496250736004
- Paluch, S.; Antons, D.; Brettel, M.; Hopp, C.; Salge, T.; Piller, F., & Wentzel, D. (2019). Stage-gate and agile development in the digital age: Promises, perils, and boundary conditions. *Journal of Business Research.* 110, 495–501. DOI: 10.1016/j. jbusres.2019.01.063
- Parada, C.; Puentes, P., & Rodríguez, J. (2020). Análisis de las Metodologías Ágiles para el Desarrollo de Software. *Investigación e Innovación en Ingeniería de Software, 3*, 9-23. https://www. tdea.edu.co/images/tdea/galeria/sello\_editorial/ebooks/investigacion\_innovacion\_ingenieria\_software\_2.pdf

- Patanakul, P.; Henry, J., & Leach, J. (2015). *Project Management ToolBox.* Willey. DOI:10.1002/9781119174820
- Patrucco A.; Canterino F., & Minelgaite, I. (2022). How do Scrum Methodologies Influence the Team's Cultural Values? A Multiple Case Study on Agile Teams in Nonsoftware Industries. *IEEE Transactions on Engineering Management*, 69(6), 3503-3513. DOI: 10.1109/ TEM.2022.3146717
- Project Management Institute (PMI). (2017) La guía de los fundamentos para la dirección de proyectos (Guía del PMBOK). (6ª ed.). https://www. academia.edu/42902135/GU%C3%8DA\_DE\_ LOS\_FUNDAMENTOS\_PARA\_LA\_DIRECCI%-C3%93N\_DE\_PROYECTOS\_Gu%C3%ADa\_del\_ PMBOK
- Project Management Institute (PMI). (2018). Success in Disruptive Times: Expanding the Value Delivery Landscape to Address the High Cost of Low Performance. *Pulse of the profesión*. 1-31. https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leaders-hip/pulse/pulse-of-the-profession-2018.pdf
- Radujković, M., & Sjekavica, M. (2017). Project Management Success Factors. *Procedia Engineering*, 196, 607-615. Doi: https://doi.org/10.1016/j.proeng.2017.08.048
- Roshan, E., & Santhosh, V. (2021). Adoption of Agile Methodology for iMproving it project performance. *Serbian Journal of Management*, *16*(2), 301-320. https://www. scopus.com/inward/record.uri?eid=2-s2.0-85122260273&doi=10.5937%2fS-JM16-26854&partnerID=40&md5=3262DOI: 10.5937/SJM16-26854
- Samset, K., & Volden, G. (2016). Front-end definition of projects: Ten paradoxes and some reflections regarding project management and project governance. *International Journal of Project Management*, 34(2), 297-313. Doi: https://doi. org/10.1016/j.ijproman.2015.01.014
- Schwaber, K., & Sutherland, J. (2020). La guía SCRUM. La Guía Definitiva de Scrum: Las Reglas del Juego. https://scrumguides.org/docs/ scrumguide/v2020/2020-Scrum-Guide-Spanish-European.pdf
- SCRUMstudy (2022). Una guía para el cuerpo de conocimiento de SCRUM (Guía SBOKTM). https:// scrumstudy.mx/descarga-la-4ta-edicion-2023de-la-guia-sbok-scrumstudy-book-of-knowledge-en-espanol/

- Silva, K., & Lotero, L. (2018). Metodología ágil para la gestión de proyectos en la empresa de soluciones de tecnología "XX". *Epistemus*, *12*(25), 47–57. https://doi.org/10.36790/epistemus. v12i25.84
- Sommerville, I. (2005). *Ingeniería de Software*. Séptima edición. Pearson Educación S.A.
- Sutherland, J. (2014). *Scrum: The Art of Doing Twice the Work in Half the Time.* Crown Publishing Group.
- Tam, C.; Moura, E.; Oliveira, T., & Varajão, J. (2020). The factors influencing the success of on-going agile software development projects. *International Journal of Project Management*, 38(3), 165-176. https://www.scopus.com/inward/record. uri?eid=2-s2.0-85080884524&doi=10.1016%-2fj.ijproman.2020.02.001&partnerID=40&m-DOI: 10.1016/j.ijproman.2020.02.001
- Thilak, V.; Devadasan, S., & Sivaram, N. (2015). A Literature Review on the Progression of Agile Manufacturing Paradigm and Its Scope of Application in Pump Industry. *The Scientific World Journal.*
- Wulandari, H., & Raharjo, T. (2023). Systematic Literature and Expert Review of Agile Methodology Usage in Business Intelligence Projects. *Journal of Information Systems Engineering* and Business Intelligence, 9(2), 214-227. DOI: 10.20473/jisebi.9.2.214-227
- Zasa, F.; Patrucco, A., & Pellizzoni, E. (2021). Managing the hybrid organization: How Can Agile and Traditional Project management coexist? *Research-Technology Management*, 64(1) 54– 63. DOI: 10.1080/08956308.2021.1843331

#### **Conflict of Interest**

The author has no conflicts of interest to declare.

#### **Author Contribution**

Angela Maria Briceño Agurto (lead author): conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, validation, software, supervision, writing (original draft, review and editing).