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Technological Infrastructure as A Strategy for Profitability in A Construction Company, Peruvian Case

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Abstract

The objective of the study was to determine the relationship between technological infrastructure and profitability in a construction company in Chiclayo, 2024, the methodology was based on an applied study, quantitative approach, non-experimental design, longitudinal and correlational scope, included 12 financial statements for the years 2018 to 2023 and 32 workers; the technique was documentary review of financial statements and the instrument with the data collection form and the survey with two questionnaires, the results showed a regular level of technological infrastructure (53.1%), the economic profitability went from 0.68 in 2018 to 7.22 in 2023, while the financial profitability from 4.59 to 7.22 and the sales profitability went from 1.87 to 13.19; The direct significant relationship between technological infrastructure and profitability in a construction company in Chiclayo was demonstrated; that is, the more the company focuses on improving its investment in the acquisition of technological tools, the greater the profitability of the organization; on the contrary, when the company does not give sufficient importance to improving technology, the company's profitability also decreases.

Keywords: *Profitability, ROA, ROE, Technological Infrastructure.*

Introduction

Companies that give little importance to the use of technology generate stagnation in their growth, due to low adaptability to market needs, loss of market share, lack of added value for the customer, increased production times, increased costs and lost profits (Kwok et al., 2024). Furthermore, construction projections have a 14% delay in the fulfillment of construction project deliveries and low investment in technology affecting efficiency, collections and long-term profitability levels (Khahro et al., 2023). With high difficulties in incorporating new technologies and little capital for investments, factors that can condition these companies in their quest for financial survival because it does not allow them to grow (Bhattacharya et al., 2021; Sales et al., 2024).

From the perspective of Zhu and Ning (2023) indicate that in China the construction industry can not get as much revenue as before, because they stick to traditional ways, which inevitably leads to limited business profits eroding their competitiveness and profit margins; on the other hand, they have not been able to take good advantage of technologies and affects on efficiency and increases production costs (Xu & Liu, 2023). And they have not been able to generate higher profit margins because they have not achieved cost reduction, low capacity to innovate (Tian & Lu, 2023). Meanwhile, in Uganda 74% of local construction business owners are not satisfied with the profitability achieved (Buhamizo et al., 2023).

In Peru, companies still do not recognize the importance of innovations to improve the financial situation, this is evidenced by their low investment in technology, finance, purchasing, information, this distances them from achieving efficient operations with difficulties to adapt to what the customer needs, as well as to improve or meet the established delivery deadlines achieving the optimization of processes (Rivero & Barrueta, 2024; Román, 2024).

In the local context, in the construction sector company located in Chiclayo, it is observed that its goal is to increase its participation and grow in the medium and long term; however, it still continues to perform manual operations at the administrative and operational level, in the first one, the handling of paper

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information is evident, both to communicate with users and suppliers, as well as a slow introduction of equipment and infrastructure in the construction projects, this causes a longer delivery time for the construction works, generating a greater use of human and material resources, causing an increase in costs and a reduction in profits.

In addition, the company has certain problems to comply punctually with the payments to suppliers and personnel, its collection times are prolonged, this situation shows that it is not able to reduce costs, because it does not use efficiently the technological resources; if the company continues with the problem it will affect the satisfaction of the clients and its permanence in the market.

The study was justified in its theoretical approach because it sought to generate a contribution in the field of accounting, likewise it allows determining if the companies obtain profits by investing in technological infrastructure, the same that drive to a greater growth, competitiveness and efficiency of the construction sector; being its practical contribution for the managers in the decision to make a greater impulse of the technologies and measure the impact of the same in the profitability; finally, the methodological contribution will be evidenced in the development of new instruments that will serve for future studies with the same investigative line.

The general objective of the study was to determine the relationship between technological infrastructure and profitability in a construction company in Chiclayo, 2024.

Literature Review

In the studies Dainelli et al. (2024) established that the implementation of technologies in logistics increased the profitability of companies. Charoenwong et al. (2024) found a significant difference in profits with a higher IT budget ($p<0.001$). While Chhaidar et al. (2023) found a positive and significant relationship between digital investment and profitability with an R-squared value of 0.850, culminating that in some way the size of the company is related to investments in financial technology, being higher in large companies, which had a higher performance.

The technological infrastructure variable according to Solow and Romer's theory of technological change in 1976, approaches the theory with an economic meaning as a model of change based on a continuous process of variation, selection and retention resulting from minor changes, which can distinguish two forms, one based on sustainable (or incremental) technologies and the second on disruptive technologies (or radical innovations) (Chiffi et al., 2022). Meanwhile, profitability is a term used to evaluate the economic efficiency of a company, it is a measure of the relationship between total economic performance and total invested capital (Magni, 2021).

The hypothesis of the study is that there is a direct and significant relationship between technological infrastructure and profitability in a construction company in Chiclayo, 2024.

Material and Methods

The type of study was applied, because its purpose was to increase knowledge but through responding to a specific objective, whose findings were a contribution and help for basic research (Oslo Manual of the Organization for Economic Cooperation and Development [OECD], 2018). In addition, it followed the guidelines of a quantitative approach, due to the fact that it was responsible for demonstrating a hypothesis of a concept or phenomenon through a numerical tool such as statistics, in addition, the objectivity of reality predominated. Of non-experimental design, because no manipulation of the concepts was carried out, the researcher limited himself to observing the phenomenon without generating a change to the current situation. At the same time, its data collection was attributed to the longitudinal type because the data were evaluated at various times; finally, of correlational scope, because it sought to demonstrate a hypothesis in which the relationship of two concepts was determined, without indicating causality. The research included two study variables; variable 1 called technological infrastructure, according to Neri (2022) technological

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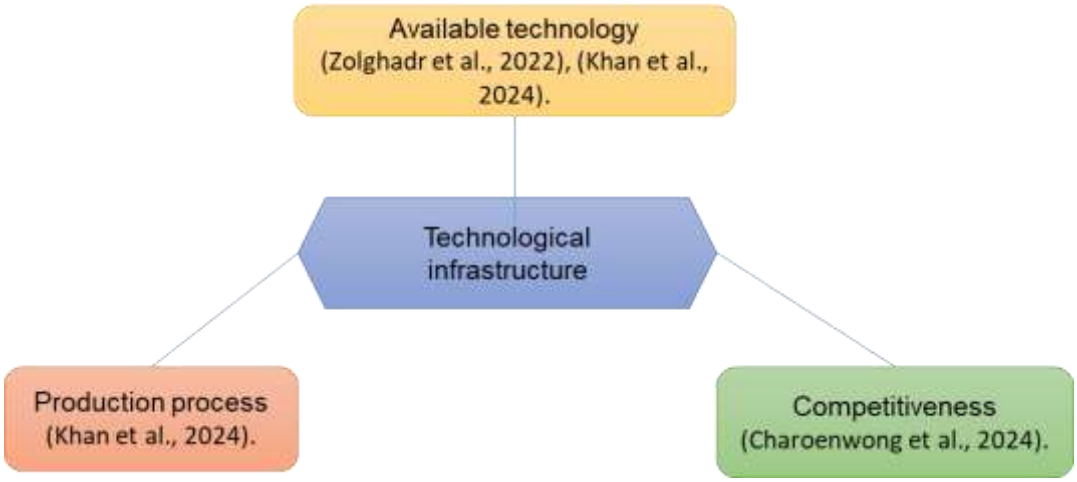
infrastructure is the technology available in a business line and that contributes to the production or service process favoring competitiveness. It was measured with the dimensions available technology, production process and competitiveness.

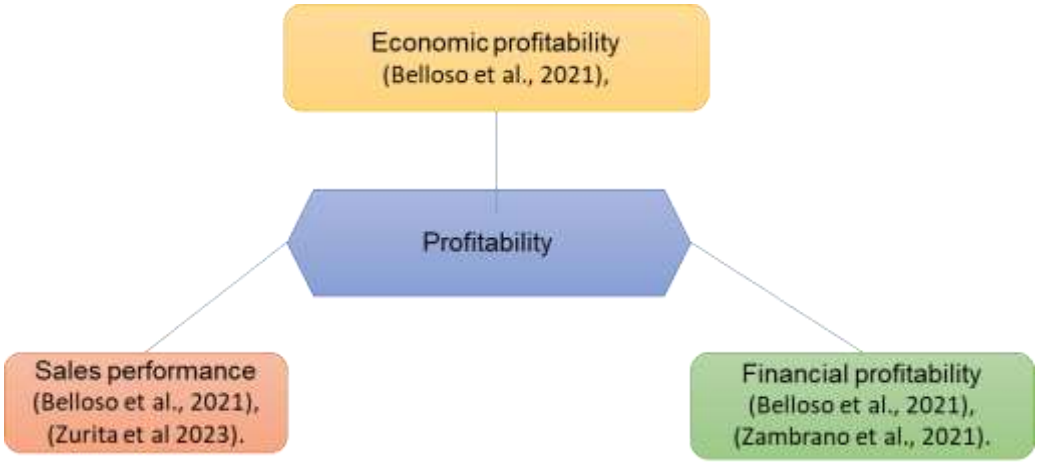
Figure 1. Dimensions of the Technological Infrastructure



Note: Prepared by the authors with data from the review of the concepts.

Variable 2, was profitability, with its conceptual definition by Magni (2021), which evaluates the economic efficiency of a company as the ratio between total economic return and total invested capital. It was measured with the dimensions economic profitability, financial profitability and sales profitability.

Figure 2. Dimensions of Profitability



Note: Prepared by the authors with data from the review of the concepts.

In the study the population consisted of 12 financial statements of the last 6 years (2018 - 2023) and 32 workers of the company, in the inclusion criteria were considered the financial statements of the period, the personnel with at least 3 months in the company and sign the informed consent, the financial statements before 2018, personnel who were on vacation, on leave or on leave were excluded. The sample was census because the entire population was considered, this means that the financial statements of the last 6 years (2018 - 2023) and 32 workers of the company were included; the sampling method of the study was non-probabilistic. The study technique was the survey and documentary analysis, with respect to the instrument corresponding to the questionnaire, it was made up of 20 questions to evaluate the technological infrastructure and 15 for profitability with an ordinal scale. The questionnaires were subjected to a reliability

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test using Cronbach's Alpha coefficient, being 0.894 for the technological infrastructure questionnaire and 0.960 for the profitability questionnaire; they were also validated by experts with extensive experience in the variables under study, who were in charge of reviewing each of the items and approving them with the validity signature.

The data analysis method was carried out with the SPSS 27 program for the processing of the questionnaires, in a first phase with descriptive statistics in which tables with frequencies and percentages were presented for each variable. Then the inferential test, in which previously the normality test with Shapiro Wilk was performed because the participants were less than 50, according to this the Pearson test was chosen, in case it is proven that the data follow a normal distribution, or the Spearman's Rho coefficient if the data do not follow a normal distribution or two types of normality will be found, in this study the relationship was accepted if the significance is less than 0.05; while the financial statements were performed with the analysis test in Microsoft Excel 2019 program and compared with infrastructure assets and profitability.

The ethical aspects of the study were based on the code of ethics of the principles of scientific integration, in which the researchers ensured the integrity of the research, showed honesty, responsibility and respect for scientific standards, were objective and impartial, showed the existing reality through the results, and with transparency regarding the findings of the study without facing conflicts of interest, since it has no funding from the company under study. For autonomy, care was taken to ensure that participants have information on the objectives of the study, as well as the risks and benefits expressed through informed consent, care for the environment; care was taken to generate the least use of resources such as paper, for this the questionnaires were issued with digital media and efficient energy consumption. With respect to fairness, all participants were treated equally, without discrimination or detracting from anyone's participation, and respect for intellectual property, which was evidenced by the recognition of the contributions of the different authors by citing their ideas and verifying them through an anti-plagiarism program.

Results and Discussion

In Figure 3, 53.1% of the personnel indicated a fair level with respect to the technological infrastructure and 46.9% an adequate level, the findings show that the company is still in the process of improving and being at the forefront with the latest innovations in technologies for the operational processes of construction, being necessary improvements in the medium term in the company.

This is due to the fact that the company has been concerned in recent years with improving its digital tools, replacing personnel activities with technological tools, and investing in equipment and machinery for operating processes and administrative processes with improvements in computer equipment, which helps to better monitor construction.

The production process dimension was evaluated by 68.8% at a regular level, due to the fact that the company is still making improvements focused on the production process of the construction projects, there are few efforts to eliminate tasks that do not generate value, but they do highlight the use of design programs.

59.4% of the personnel evaluated competitiveness at a fair level; the company is still making little effort to implement technologies, improve personnel competencies to increase income and have a better position in the market and be more competitive.

Figure 3. Level Of Technology Infrastructure In A Construction Company In Chiclayo, 2024

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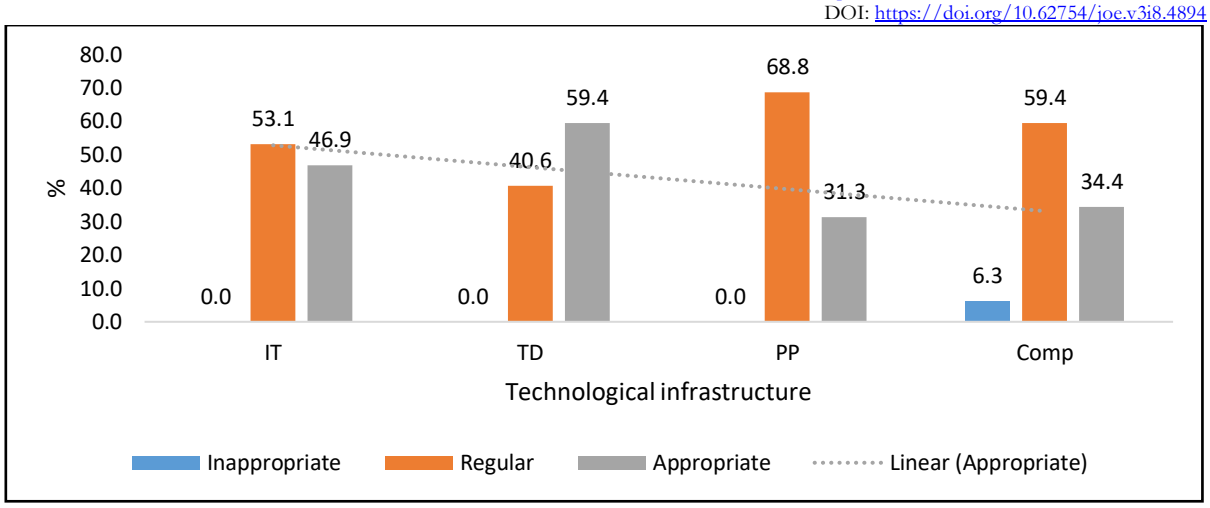


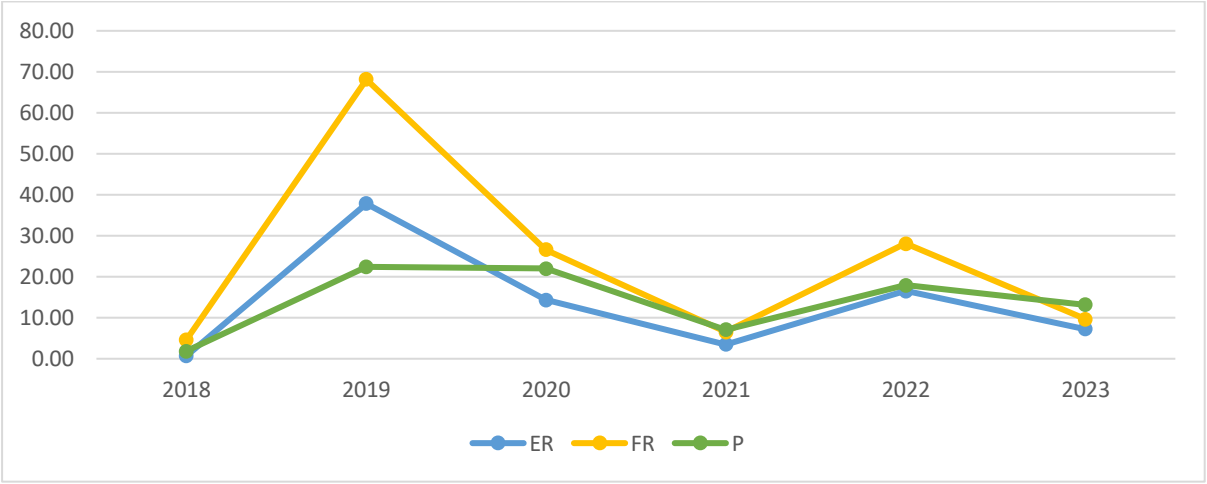
Note: IT, technological infrastructure; TD, available technology; PP, production process; Comp, competitiveness.

Figure 4 shows the variation of the economic profitability that went from 0.68 in 2018 to 7.22 in 2023, an increase in 2019 to 37.81 in 2019, with a decreasing trend from 2020 to 2021, to increase again in 2022 and with a decrease in 2023, but still higher than the 2018 figure.

The financial profitability went from 4.59% in 2018 to 7.22% in 2023, with a growth in n 2019 to 68.12%, then decreased for 2 years, to rise again in 2022 to 28.12%.

Finally, the profitability in 2018 went from 1.87 in 2018 to 13.19 in 2023, being the same behavior of the economic profitability and financial profitability.

Figure4. Profitability Level in a Construction Company In Chiclayo, 2024



Note: ER, economic profitability; FR, financial profitability; R, profitability.

In Table 1, the significance level was 0.002, a value lower than the expected bilateral significance of 0.05; sufficient information to accept the alternative hypothesis and reject the null hypothesis; Therefore, there is a direct and significant relationship between technological infrastructure and profitability, at the same time the Pearson coefficient of 0.517 indicates a direct relationship of moderate degree, the findings show that if the company makes improvements, acquires technology and promotes innovation in its productive processes of construction, this has an impact on improving the levels of profitability of the company, because it improves processes, facilitates the work of personnel and increases productivity.

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Table 1. Testing Of Assumptions Of Technological Infrastructure, Available Technology, Production Process And Competitiveness On Profitability, Economic Profitability, Financial Profitability And Sales Profitability

Variables	Sigma bilateral	Pearson	Hypothesis testing
Technology infrastructure vs. profitability	.002	0.517	h1 is accepted
Available technology vs. profitability	,741	,061	Reject h1
Production process vs profitability	,000	,583	h1 is accepted
Competitiveness vs profitability	,002	,528	h1 is accepted
Technological infrastructure vs. economic profitability	,011	,442	h1 is accepted
Technological infrastructure vs financial profitability	,009	,457	h1 is accepted
Technological infrastructure vs sales profitability	,009	,454	h1 is accepted

Note: Elaborated with SPSS V.27 data.

The significant relationship of technological infrastructure and profitability was established, demonstrated with the Pearson coefficient of 0.517, being the direct relationship of moderate degree; therefore, when in the company improvements and investments in technology are made, the same happens in profitability, very similar with the study of Mego (2022) confirmed a moderate relationship with a Pearson Coefficient of 0.571 of the implementation of a BIM technology with profitability in a construction company; however, it differs with Lee et al (2020) by not establishing relationship of technological innovation and income. This is because a good investment of the company in technologies usually have a higher valuation of profitability because the company has better results. In addition, with the contribution of Solow and Romer's theory of technological change, it is evident that making minor changes with technologies or at incremental or radical levels can have an impact on a company (Chiffi et al., 2022).

The technological infrastructure is regular in the construction company, although there is more technology available, but not in production processes and competitiveness; these data differ with Andino (2022) in which 100% of the staff indicated the innovation and automation of the company especially in cybersecurity technology. This indicates that investments in technological infrastructure in companies are usually very varied, because they are not given enough importance, also because of the lack of knowledge of the benefit in companies, also because of the resistance to change, problems with human resources, the size of the company, the culture and ability to implement (Wang et al., 2021).

Also, it was found that the company has had a very varied trend in economic profitability went from 0.68 to 7.22, while financial profitability went from 4.59% in 2018 to 7.22% in 2023, Finally, the profitability of sales, in 2018 went from 1.87 to 13.19 in 2023. Lower than the finding of Pintado et al. (2024) in which they established a profitability of 66.7%; for his part, Paricahua (2022) established that managers of construction companies disagreed with the profitability of the company. The findings show the variability of profitability in this type of company, because they are companies of different sizes.

The main limitation of the study is that few periods were considered, which could affect the final findings, so it is important not only to perform the evaluation with questionnaires, but to accompany it with information from the financial statements because the recovery of the investment can be long term. Also, the variations of the assets destined to the acquisition of the technology should be included.

Conclusions

The study showed that there is a significant direct relationship between technological infrastructure and profitability in a construction company in Chiclayo; that is, the more the company focuses on improving its investment in the acquisition of technological tools, the greater the profitability of the organization; on the other hand, when the company does not give sufficient importance to improving technology, the company's profitability also decreases.

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It was identified that the technological infrastructure is regular, showing that the company has several deficiencies in the use of available technology; Likewise, the production and competitiveness processes were regular, indicating that they do not optimize the processes, do not comply efficiently with the elaboration of project designs and that the workers lack digital competencies, causing that they do not comply with reducing unnecessary tasks at the time of executing their work functions; on the other hand, the available technology was valued as adequate, revealing that the areas of risk have been reduced, thus improving the satisfaction of the clients' needs.

It was evaluated that the level of profitability is good, because in the year 2023 there was a much higher growth than the data recorded 6 years ago, but it is lower than that recorded in 2019, 2020 and 2022, this was evidenced in all ratios of economic, financial and sales profitability, confirming that the company has managed to maintain a good level of profitability over the years.

It was described that the available technology, production process and competitiveness are significantly related to the company's profitability; that is, if there are more technologies available, at the same time the automation of the production processes is favored and with a good production capacity, it achieves a decrease in the delivery times of the projects, which improve competitiveness against other companies; this in turn has an impact on higher revenues and profits.

It was explored that the technological infrastructure was significantly related to economic profitability, financial profitability and sales; that is to say, if the company invests in technology it will achieve a reduction in production times and a greater impact on sales, thus resulting in a better return and greater utility and profits for the company.

Authors' Contributions

All authors have contributed to the development of the research instrument, Smith Cubas and Melva Diaz were in charge of the elaboration, editing and revision of the introduction, literature and methodology, Victor Puican was in charge of the elaboration and revision of the data analysis, discussion, conclusions and recommendations. Melva Diaz was in charge of editing and revising the article to English.

Author Ethical Declarations

Researchers confirm that the work is their own and has not been published anywhere

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Conflict of Interest

The authors state no conflict of interest.Declaration of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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