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INTERACTIVE EFFECTS OF AGILE PRACTICES AND PERFORMANCE-TO-CHANGE ON CONSTRUCTION PROJECTS IN MALAYSIAN BUILDING COMPANIES

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Abstract

Pandemic Covid 19 has altered the perspective on Construction Projects, making them more dynamic. Restriction of activity also exacerbates the challenges associated with construction projects; thus, it is vital to determine how projects may be sustained in their entirety. The purpose of this research was to ascertain the influence of Agile and Business Performance (BP) on Construction Projects (COP) in a period of pandemic covid-19 and community movement constraints. This study route is classified into two categories based on its analysis: direct and indirect influence. This research surveyed 146 respondents from numerous Malaysian construction companies. The study's primary conclusion is that Agile and Business Performance (BP) factors can influence and Construction Projects (COP) The research adds value because of the test outcomes. Ascertained that a strong management system, Agile, and Business Performance (BP) assistance will improve the performance of construction projects.

1. INTRODUCTION

Managers responsible for construction projects are expected to lead and manage their projects throughout their lifecycles. Due to the inherent hazards and unpredictability of construction projects, managing them as a manager is not a simple task. Turner (2014) asserts that building projects require adaptable leadership and management to accommodate the many changes that occur during their execution. To address construction project management issues during the last year, managers have relied on standard project management practices. However, due to the shortcomings of traditional project management methodologies, the agile project management technique was developed specifically for use in the construction sector (Turner, 2014). Nonetheless, its usage has been hampered by several hurdles, and it is necessary to understand these obstacles to improve its future use and hence the process of construction project management. A small number of studies have been conducted to determine the barriers connected with the usage of agile in construction and project design. As a result of their lack of awareness about the issues connected with agile, many managers find it difficult to apply it to design and construction projects. Thus, our study aided in resolving this issue by examining the difficulties inherent in implementing and potential solutions in the future. Even though the use of agile approaches in construction project management assists in resolving the flaws associated with traditional project management methodologies, its adoption continues to face certain challenges. The success of any construction project is highly dependent on the process of design and implementation. However, significant barriers exist in the design and construction of projects. For instance, a building's design may be required to be altered, resulting in resource waste. Additionally, the difficulties associated with implementing an agile methodology result in the failure of building projects.

Thus, it is necessary to conduct research into how design and construction barriers might be addressed in the future to improve project management efficiency. The data gathering approach was directed by the following research questions to solve the primary research problem:

A. How is agile methodology critical for construction project management?

B. What are the barriers to implementing an agile methodology in the design and development of projects?

C. How might the challenges connected with agile methodologies in design and construction be overcome in the future to increase the efficiency of managing construction-related projects?

Construction projects are extremely expensive, and their failure results in a significant loss of capital for an individual or institutional investor. Thus, efficient management of agile in construction projects for construction projects is crucial to achieving the intended objectives, particularly efficient resource utilization. 1) The purpose of this research is to determine how to fully address the barriers connected with the implementation of agile methodology in designing and construction projects to increase the success rate and efficient use of resources in these endeavors. 2) The study's conclusions are critical for improving the implementation of agile methodology in construction projects, hence minimizing resource waste and project failures caused by hurdles encountered while implementing this project management technique.

1.1. Definitions of Important Terms

Architecture—the science and art of designing structures such as buildings, bridges, roads, and other types of construction.

1. Construction—is described as the process of erecting a structure or infrastructure.

2. Agile is a project management style that divides large jobs into smaller activities that are accomplished in increments.

3. Project management is typically defined as the process of planning, initiating, directing, executing, and closing work performed by a team to accomplish certain goals using predefined success criteria.

1.2. Justification and Statement of the Issue

The application of agile approach to construction project management encounters several significant roadblocks that result in the project's failure or inefficient use of existing resources. Thus, the application of agile methodology in construction projects faces significant obstacles that must be overcome to improve its ability to ensure effective project management, thereby reducing the likelihood of a project failing or consuming significant financial, human, and technical resources that could have been saved. By resolving this research problem encountered during construction project the process of conducting and managing projects using agile methodology would become more effective in the future.

2. AGILE MANAGEMENT

Cane juice samples were subjected to centrifugation using a Remi R-8 C batch-type laboratory model. This was operated at 6000 rpm, attaining 2000g at the bottle tip. For every run it was set for 5 minutes. Optimization of the centrifuge operation is a function of design and so was not carried out. Only the various effective parameters due to centrifugation of cane juice have been observed in the present study. Purity measurement of cane juice was done using a Succor mat in a conventional way. A Brookfield RVT viscometer was used to measure the apparent viscosity difference at 50 rpm using spindle No.1 The ICUMSA color measurement was done using TEA-buffer and membrane filter as described elsewhere. The color measurements were carried out on an ELICO spectrophotometer. various types of projects (Chen, 2004). Turner (2014) notes that agile management is frequently considered as a broadening and generalization of ideas that have been effectively used in the past to software development and other areas of project management in the corporate world (Ahmed, M. Y., & Younis, H. 2021).

Agile project management implies that a project should be conducted in phases to ensure its success. The first phase is feasibility, during which extensive studies are conducted to ascertain the project's costs and advantages. After a feasibility study establishes that a project is viable, Chen (2004) states that the next phase is the design phase, during which the product to be manufactured is created with the relevant features (Ahmed, M. (2021).

The following step is construction, during which the building or infrastructure is constructed (Turner, 2014).

The final step of construction management is the closure phase, during which the project is thoroughly examined to determine whether the desired objectives were achieved (Hoda, Noble and Marshall, 2008).

The last phase is focused with establishing whether project costs were maintained or whether they.

2.1. Advantages of Agile Management

The available literature indicates that there are various advantages to implementing an agile methodology in building projects. According to Turner (2014), incorporating agile practices into project management significantly reduces the cost involved with the adoption process. According

to Hoda, Noble, and Marshall (2008), agile provides well-articulated processes that a management should follow, and the processes assist in minimizing errors that might increase the cost of a project. Thus, the many phases of agile management, such as design, contribute significantly to reducing unanticipated issues that can result in high project costs. Additionally, Chen (2004) states that the usage of agile methodology in construction management occurs during the closure phase, during which the project is thoroughly examined to determine whether the desired results were achieved (Hoda, Noble and Marshall, 2008). The last phase is focused with establishing whether project costs were maintained or whether they increased because of changes. A key part in boosting the ultimate product's quality. Agile methodology's steps ensure that projects are implemented according to specified criteria, which contribute to the end product's excellent quality (Turner, 2014). Gustavsson (2013) emphasizes the importance of agile management in building projects when it comes to client and business satisfaction. Turner (2014) asserts that the objective of any project management process is to ensure that the business's and clients' interests are adequately met. Thus, the adoption of agile management enables project managers to implement measures that support the client's needs being met throughout the project management process (Chen, 2004). Turner (2014) adds that agile management plays a critical role in ensuring that projects are highly productive. It guarantees that the project's employees' demands are met by implementing communication techniques and other strategies targeted at developing a satisfied and motivated workforce (Drury, Conboy and Power, 2012).

2.2. Obstacles to implementing Agile

According to Turner (2014), a fundamental impediment to agile management is a lack of flexibility. When agile is used in projects with a predetermined scope and timeframe, it is impossible to incorporate the flexibility that is a crucial component of agile methodology (Chen, 2004). On the other hand, Gustavsson (2013) notes that regulatory and contractual issues have a detrimental impact on the effective adoption of agile in project management. Contractual and legal constraints impair the capacity to allow for flexibility in specific areas of project management, which is crucial for ensuring that agile management is a successful tool for project management (Turner, 2014). For instance, if contractual responsibilities impose costs If the contract specifies that costs should not surpass a specific level, the project manager is compelled to avoid making changes to certain project design features out of fear of exceeding the estimated expenses, which would constitute a breach of the contract (Gandomani et al, 2013). According to Drury, Conboy, and Power (2012), making judgments on the various phases related with agile project management is a barrier to using this methodology. For instance, uncertainty on whether to proceed with a project when its design face is met with resistance or whether to restart the entire project planning process (Drury, Conboy and Power, 2012) Additionally, Guastavsson (2013) reveals that conflicting economic interests are significant impediments to the application of agile management in specific projects. Commercial interests may collide with project interests, and in most circumstances, project interests take precedence over business interests. Additionally, disagreements between multiple phases may render agile management unsuccessful in any type of project, such as building (Turner, 2014).

2.3. Business Performance in Construction

Construction performance is often measured in terms of time, cost, and quality (Ward et al., 1991; Love and Holt, 2000; (Kagioglou et al., 2001). Increasingly, the concentration is on the organizational level. As noted by the EFQM excellence model, KPIs, and the Balanced Scorecard are being used in UK construction businesses. For example, (Kagioglou et al. 2001) developed a modified Balanced Scorecard for construction; demonstrated how the EFQM might be used in construction; and identified and critically assessed KPIs in construction. Furthermore, Robertson

(1997) reported on balanced use of EFQM criteria in developing company KPIs used company KPIs in an EFQM context that cascaded from a strategic to an operational level modified both EFQM and Balanced Scorecard for construction contractors. Project and organizational success elements have been examined established important success indicators as the foundation for benchmarking. Whereas Sommerville and Robertson (2000) used a scorecard to measure performance and supported holistic quality management. Like the success map idea, identifying underlying relationships among success variables has been noted in construction management literature. developed a framework for measuring quality performance in contractors. Love et al. modelled causal linkages between important elements for construction rework (1999). This research employs performance assessment for internal management reasons, utilized the same technique to describe dynamic performance of construction organizations. created a methodology for assessing the commercial performance of UK construction enterprises based on the identification of success determinants. He could not discover the underlying links between the success elements.

2.4. Concept Framework and Hypothesis Instrument

Hypothesis Development:

H1: Agile has a significant positive effect on Business Performance.
H2: Business Performance study has a significant positive effect on Construction Project.
H3: Agile has a significant positive effect on Construction Project.

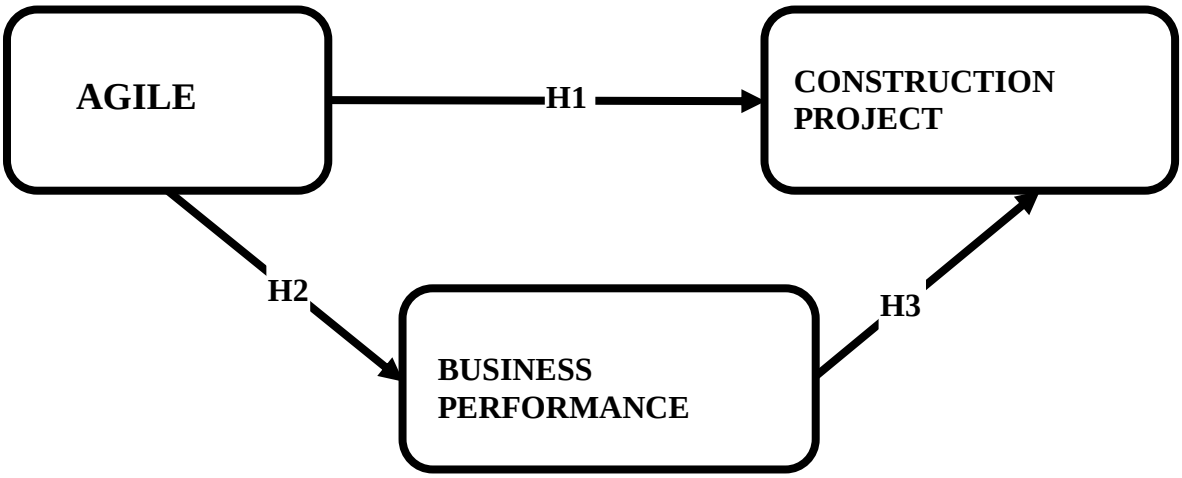

Figure. 1. Agile Concept Framework, Business Performance and Construction Project

2.5. Existing Literature Gaps

According to Dyb, Dingsyr, and Moe (2014), the extant literature on agile approach is primarily focused on its benefits for project management. As a result, less attention has been paid to its shortcomings when applied to project management, such as construction projects. The primary gap in the existing literature is a lack of relevant information on how to overcome existing barriers to the adoption of agile in building projects (Vijayasarathy and Turk, 2008). As a result, it is necessary to do research to close this gap in the literature on the application of agile methodology in building projects. The research should contribute to the generation of academic knowledge on the primary impediments to the use of agile in construction projects and how these impediments might be overcome in the future. Buschmann et al. (1996) point out that knowing the

factors that contribute to the difficulty of implementing agile in project management can help improve the process of implementing agile in future architecture-related projects. The purpose of this study is to fill a void in the literature by emphasizing some of the ways in which agile application difficulties in the construction sector can be completely addressed to improve project management using this methodology. The existing literature has not been successful in addressing the issue of obstacles associated with the use of agile methodology in project management, because most studies have concentrated on the benefits of agile methodology and success factors associated with its application in project management (Cohn, 2010). As a result, substantial study is required that focuses primarily on the issues connected with the implementation of agile methodologies in the management of construction projects Younus, A. M., Tarazi, R., Younis, H., & Abumandil, M. (2022).

3. Material and Method

This study employs an explanatory research design with the objective of examining the effect of Agile on business performance and building projects in Malaysian construction companies. As mentioned in the literature (Goldman et al., 2019), explanatory research aims to provide a causal explanation for a phenomenon using statistical data. The purpose of this study is to determine the causal links between variables in research problems. In addition to explanatory research, the study employed a causal approach to ascertain each variable's influence.

Sampling is conducted using a type of probability sampling using a simple random sample and is conducted randomly among Malaysian construction companies' managers and employees Managers and engineers have the same possibilities to collect data. Director, manager, first-line manager, coordinator, senior staff, and PIC are among the positions allocated as responses. The respondents totaled 146 and came from a variety of companies.

Table 1. Malaysian Construction Companies -Number of Respondents' Samples

No	Construction Companies	Respondents
1	Asia Baru Construction Sdn Bhd	53
2	Construction Research of Malaysia	32
3	Hock Seng Lee Berhad (HSL)	25
4	WCE Holding Berhad	22
5	YTL Corporation Berhad	14
Total		146

This study employs a partial least square (Smart PLS) data analysis technique with an evaluation model based on prediction measurement with non-parametric properties (Hair et al., 2020)

I was using an outer measurement model with reflective indicators evaluated using convergent and discriminant validity.

The reflection indicator block is written with the equation formula below:

$$X = \lambda x\xi + \varepsilon x$$
$$Y = \lambda y\eta + \varepsilon$$

X and y are indicators of exogenous latent (endogenous) variables $(\xi)\eta)$ whereas λ are pairs of loading matrices that explain the simple regression of variables and serve as interpreters of measurement errors. The second outer model compares relative weight and weight size to determine formative indications. The following table summarizes the case values for each latent variable, together with their associated Smart pls estimates:

$$\xi b = \Sigma kb^{W} kb^{X} kb$$

$$\eta\, i = \Sigma ki^{W} ki^{Y} ki$$

Σkb^{W} and Σki^{W} (2019, Biancolillo & Ns)

This is a more cautious method for determining the dependability of latent variable component scores. The AVE value should be more than 0.50. Stability of estimation is determined by bootstrapping statistic t values. elow: R^2

Equation model:

$$\eta = \beta o + \beta\eta + \tau\xi + \varsigma$$

The value η describes the exogenous variant (response) to latent variables and is the residual variable vector. $\xi\varsigma$ This model is also used to measure the validity and reliability of construct correlations by comparing square root values of extracted variance averages (AVE) (2019, Biancolillo & Ns) This is a more cautious method for determining the dependability of latent variable component scores. The AVE value should be more than 0.50. Stability of estimation is determined by bootstrapping statistic t values. Elow.

4. RESULTS AND DISCUSSION

This section offers and analyses primary data collected during fieldwork with Malaysian construction firms. The quantitative data collected is tabulated and analyzed statistically using descriptive, correlational, and analytical approaches. Following that, the demographic information of the respondents is analyzed, and the findings are compared to the study objectives This part concludes the analysis. All primary data were analyzed using Smart PLS and SPSS.A total of 146 surveys were given, with 146 being completed and returned correctly (Ahmed, A. M., & Younis, H. 2021). employees Managers and engineers.

4.1, Demographic of Respondents

Table 2. *Participants Demographics Information*

	Items	**numbers**		**Items**	**numbers**
Gender	Male	110	Current position	Managers (C)	21
	Female	36		Engineers (A)	45
Age	More than 50	10		Employees (B)	43

	40 – less than 50	40		Engineers (A4)	33
	30 – less than 40	65		Director (A3)	24
	Less than 30	31	Experience Years	More than 15 years	16
Academic qualification	B.Sc.	89		10 – less than 15 years	31
	Master	43		5 – less than 10 years	90
	Ph.D.	14		Less than 5 years	9

The researcher analyzed the respondents' demographic features to ascertain the rationale for their questionnaire responses. Respondents provided demographic information such as their gender, age, level of education, and duration of service with the organization. (Albright, Winston, and Zappe, 2010).

4.2. Qualifications And Position of Respondents

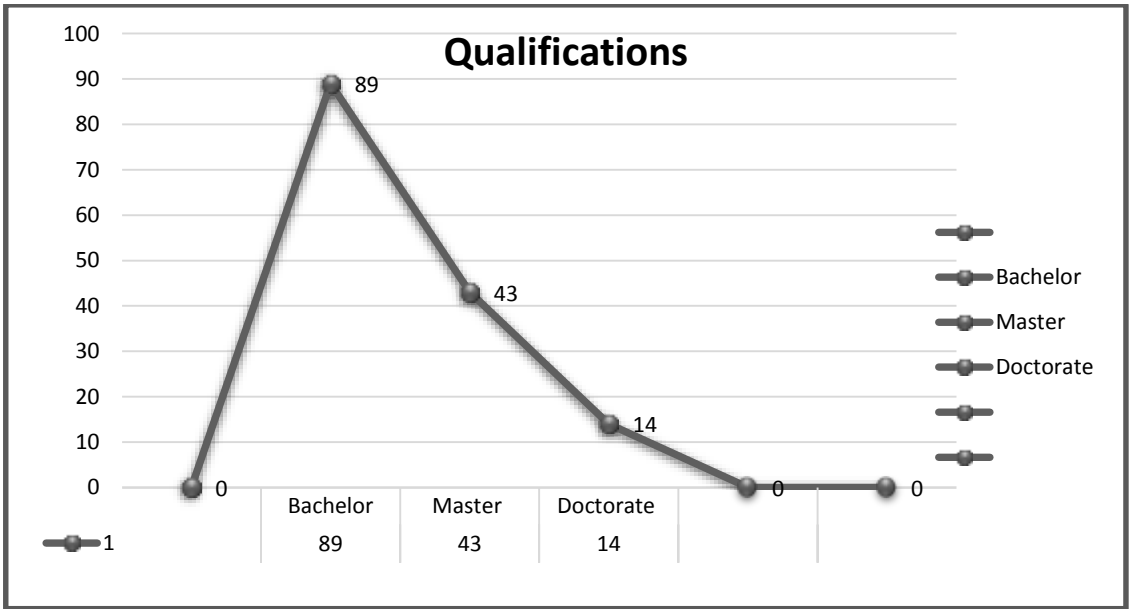

Figure .3. *Qualifications of Respondents Survey*

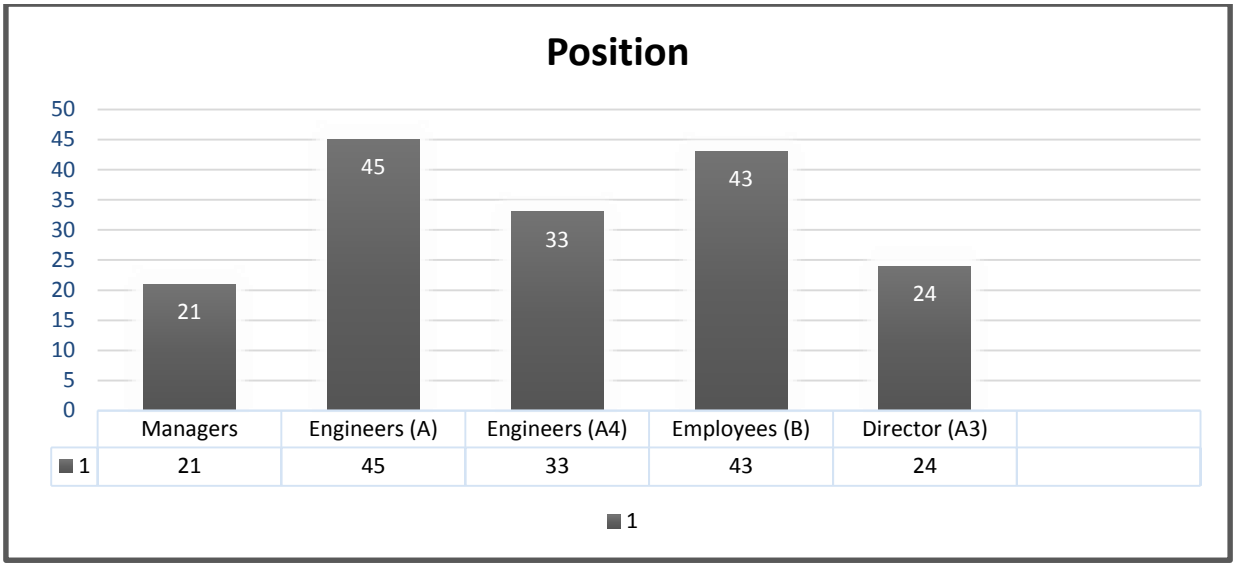

***Figure. 4**. Position of Respondents Survey*

According to the data above, most respondents have worked for their firms for at least six years. This demonstrated that most of the personnel surveyed have relevant experience and a working knowledge of Agile in Construction Projects. Mishra and Banerjee (2017).

Result testing is conducted using non-assumptive analysis methods that are not normally distributed nominal, ordinal, interval, and ratio scales are used. The first stage was conducting outer model testing to ascertain the value of convergent validity. By default, the value is greater than 0.5.

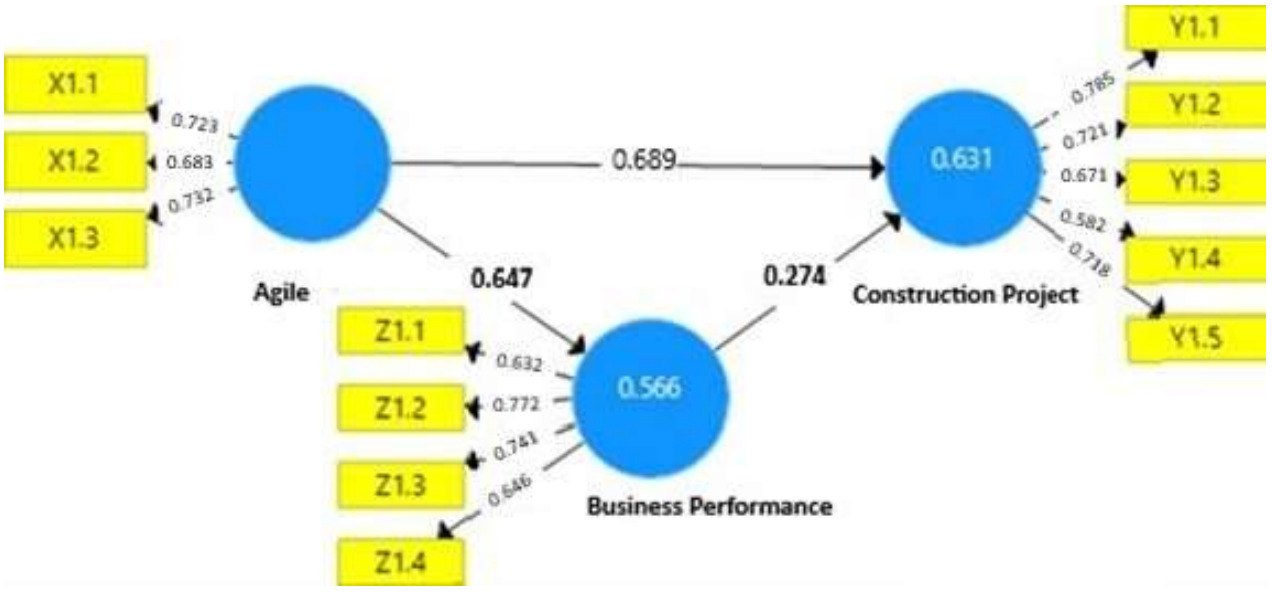

Figure. 5. The results of outer model from Smart PLS

The outer model's results indicated that all indicators of latent variables had significant validity values, allowing the investigation to proceed.

Table 3. Construct Reliability and Validity

Variable	Composite Reliability	Rho_A
Agile	0.822	0.722
Business Performance	0.809	0.709
Construction Project	0.810	0.719

The results of the reliability tests and the construct's validity demonstrated a composite reliability value of > 0.7, indicating that all indicators in this study were regarded to consistently measure latent variables. Additional testing is conducted to determine the presence/absence of variable influence using inner model and structural tests. This test made use of T-Statistic, which has a significance level of less than 0.05.

Table 4. The Summary of The Results

	Original Sample	T-Statistic	T-Table	P-Values
Agile ➔ Business Performance	0.647	13.604	1.9842	0.000
(BP) ➔ Construction Project	0.274	3.708	1.9842	0.005
Agile ➔ Construction Project	0.689	7.603	1.9842	0.000

Hypothesis:

H_0: X does not affect Y

H_1: X has a significant effect on Y By criteria:

If the P-Value < 0.05; then H_0 is rejected and H_1 is accepted If the P-Value > 0.05; then H_1 is rejected and H_0 is accepted

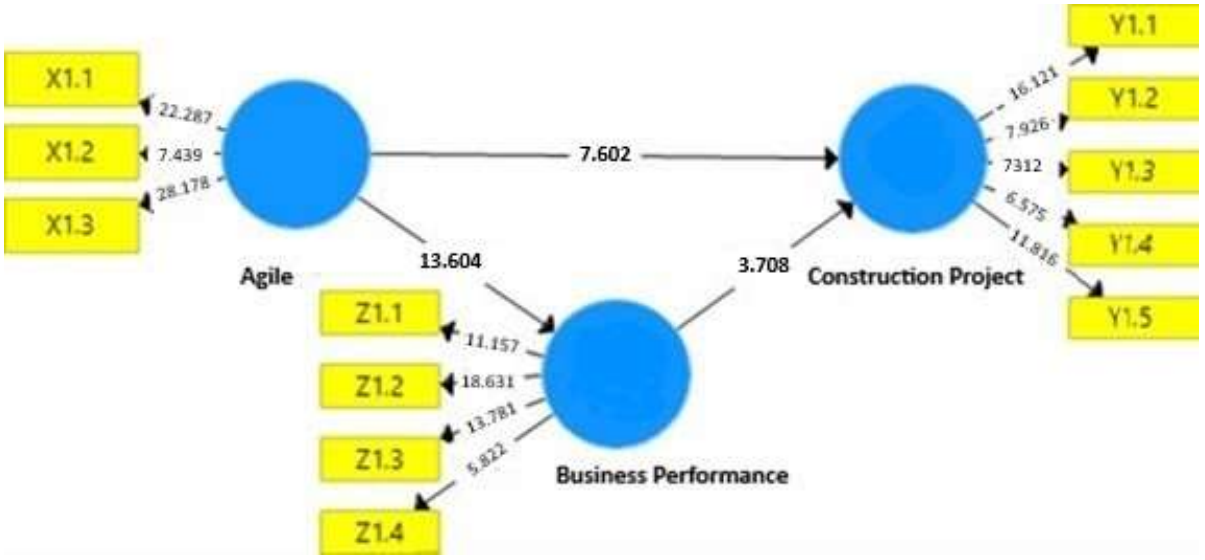

*Figure. **6.** Internal Model*
From Table 3 and Figure. 3, explained that.

a. Agile has a significant impact on Business Performance on construction companies in Malaysia, with a coefficient value of 0.647 and a positive value. With positive results, it can be concluded that the needs of construction companies' choice through Business Performance in the era of pandemic covid 19 can be fulfilled properly. This result is also supported by null T-statistic more > than T-table with significance below 0.05.

b. Business Performance has a positive impact on Construction Project, with a coefficient value of 0.274. This positive value gives an idea that the higher the value of Business Performance will drive Construction Project to be better. This result is also supported by T-statistic more > than T-table with significance below 0.05.

c. Agile has a significant impact on Construction Project in Malaysian construction companies, with a coefficient value of 0.689 and a positive value. With positive results, the higher the value of Agile, the child improves the performance of construction companies in Malaysia. This result is also supported by null T-statistic more > than T-table with significance below 0.05.

TABLE 5. The Summary of The Results

	Original Sample	**T-Statistic**	**P-Values**
Agile ➔ (BP) ➔ Construction Project	0.189	3.659	0.000

Table 6. **Determinant Coefficient**

	R Square	R Square Adjusted
Construction Project	0.633	0.625
Business Performance	0.667	0.653

The table of determinant coefficients shows that the magnitude of Agile influence on Construction Project is 0.633 or 63.3%. At the same time, Agile affects Business Performance by 0.667or 66.7%.

4.3. Discussion

The pandemic covid-19 has altered business perceptions, making them more dynamic and volatile; this research also presents an assessment considering government prohibitions on actions that will have a detrimental impact on enterprises. Changes to the Agile Method will assist the business in maintaining a high level of performance. Please keep in mind that this study demonstrates Agile indicators for overcoming obstacles that appear to be as severe as they are today. The researchers attempt to reframe the issue within Agile. These three indicators had a substantial impact on Malaysia's booming building industry. Numerous huge businesses have been shuttered due to their inability to apply, but retail businesses who have implemented these three signs have demonstrated their ability to survive and support the community's everyday needs. Additionally, Business Performance supports Construction Projects by utilizing Business Performance for projects and enterprises. The convenience provided by social constraints and human movement is extremely beneficial for projects. Additionally, this research discovered that the Agile mechanism, when combined with the support of projects' efficiency and forecasting accuracy and backed up by Business Performance indicators for a variety of outlet channels, including digital channels, significantly improved Construction Projects. The research's primary deliverables comprised creating a research proposal, doing a literature review related to the research problem, collecting data from the field, analyzing the field data, and presenting the study **findings**.

To properly solve the study problem, behavioral research was conducted, in which the project

managers' actions and the application of agile methodology were thoroughly explored to ascertain some of the hurdles encountered by the participants. Possible solutions to the problem were suggested based on the participants' experiences and behaviors. Ahmed, M. (2021). Ahmed, M. Y., & Younis, H. (2021).

5. CONCLUSION

The test results have shown that Agile significantly affected Business Performance when the level of significance is 0.05. It is also in line with what has been done by Zikopoulos and Tagaras (2015), which shows that Agile can deliver positive results by using. It is also supported with a T-statistic larger than the T-table. The second result have shown Business Performance had a positive and significant effect on Construction Project with a P-Value value below 0.05. This has answered the allegations that occurred whether, in the era of the pandemic system. Indirectly Agile with three indicators is also very influential on Construction Project facilitated by Business Performance as a supporting variable or mediator. This result is evidenced by the P-value of 0.000, indicating that Agile influences business performance positively and significantly.

The primary limitation of this study is the limited sample size. The usage of a tiny data sample has a detrimental effect on the study's reliability and validity. Additionally, prejudice among study participants may be a significant constraint throughout the study's completion, since it influences the quality of the data collected in terms of accuracy, hence diminishing its dependability (Cohen, Manion and Morrison, 2013).

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