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The Effect of Innovation on The Sustainable Performance: Evidence from Ethiopian Construction Sector in the Post-Pandemic Era

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Abstract: The Covid-19 pandemic has imposed challenges on several industries, including construction firms in Ethiopia. This industry has encountered the issue of enhancing its services to ensure the long-term sustainability of its activities. Thus, the purpose of this study is to investigate the impact of service innovation on the sustainable performance of Ethiopian construction firms. while considering information systems and employee productivity as mediating variables and innovation capability as moderators. Therefore, this study includes several managerial aspects and explores knowledge across various disciplines. 160 valid questionnaires were received and processed, and a linear structural equation model (LISREL) was used for investigation. It is found that employee productivity and information systems have mediating effects on the positive relationship between service innovation and sustainable performance. In conclusion, service innovation driven by information systems can enable construction companies in enhancing their sustainable performance by optimizing processes, minimizing waste, and maximizing resource efficiency. By leveraging information technology and employee productivity, construction companies can lower their environmental footprint and increase their profitability. According to the results of the study, service innovation to improve performance in construction firms needs to enforce the use of information systems and rely on its employees. In addition, the conclusions of this study can also provide a reference for other companies in other industries on innovation and operational decision-making in developing countries.

Keywords: Service innovation, Information system, Employee productivity, Sustainable performance

1. Introduction

Service innovation has become critical to the sector's sustainable performance (Ali AlShehail et al., 2022, Cheah et al., 2018, Pelli, 2021). As the world evolves, the construction industry must adjust to the "new status quo" in the post-pandemic era (PPE). The COVID-19 pandemic affected not only human health but also the operational health of businesses and organizations, the construction industry inclusive. Consequently, construction firms continue to incur losses, which influences the economy (Čábelková et al., 2022). It additionally impacted the transportation infrastructure, which has affected material supply. Many construction firms had gone through a financial recession, whereby companies were laying off a lot of their workers. Overall, the construction industry has taken a terrible turn. However, researchers, as well as businesses, are exploring new ways that firms could innovate their services to thrive in the post-pandemic era (Balbaa et al., 2021; Jiang, 2020; Pompurová et al., 2022; Saif et al., 2021). In that regards sustainable innovation in construction has become a paramount concern in the past few decades (Chen et al., 2017). Therefore, firms that can innovate would easily achieve their economic, environmental, and social objectives while minimizing the negative impacts on society and the environment (Jiakui et al., 2023).

With increasing awareness about the effects of construction on the environment and the importance of preserving natural resources for future generations, construction firms need to innovate their services toward sustainable practices to ensure sustainable performance, whereas (Waiganjo et al., 2021) explored the strategic planning and innovation during the pandemic. In regards to that recent studies argued that remote working has become the new norm, and this change is expected to remain steady post-pandemic (Batty, 2022; Delany, 2022). Whereby this transcends almost all sectors, for instance, construction firms could leverage teleconferencing (Smith, 2004), project management tools, virtual reality,

artificial intelligence, and other digital platforms to promote remote collaboration among stakeholders, including clients, suppliers, architects, and engineers.

The Ethiopian construction industry still faces several challenges in the post-pandemic. Therefore, this study seeks to investigate the effect of service innovation on the sustainable performance of the Ethiopian Construction sector. Moreover, the mechanisms through which service impacts sustainable performance are not well understood. This study aims to examine whether the effect of service innovation on construction firms' sustainable performance is mediated by employee productivity and information systems, firstly because high levels of productivity can lead to improved processes and services, with the right tools, training, resources, and support, employees can work more efficiently and effectively, driving service innovation to higher levels in construction firms. resulting in innovative solutions and increased firm performance with the right tools, training, resources, and support, employees can work more efficiently and effectively, driving service innovation to higher levels in construction firms; secondly, information systems are a key enabler of service innovation in construction firms. Using technology to improve communication, project management, data analysis, and construction techniques, construction firms can enhance their ability to deliver high-quality performance. By identifying the mechanisms through which service innovation impacts sustainable performance, this study aims to provide insights that can inform organizations' practices and policies toward achieving sustainability. This study adds to the current body of literature on service innovation and sustainable performance in the construction sector while considering the new status quo imposed by the pandemic. Most businesses in all sectors were compelled to adopt new business models to survive and compete in the market.

2. Literature Review

Sustainable performance is achieved through the development and exploitation of, intangible assets, and RBV theory can be used to explain service innovation for sustainable performance. Through the development of unique resources, a firm can create innovative services that can differentiate them from their competitors and create sustainability. There is an ongoing debate in management research about whether resource-based theory suggests that service innovation can be a source of sustained competitive advantage for a firm (Cuthbertson and Furseth, 2022; McWilliams and Siegel, 2011). According to the RBV – whether it is rooted in the economic view or the strategic view of the firm theory – The organization's tangible and intangible resources influence its creation, sustainability, and competitive advantage. According to Barney (1991), these resources are valuable, uncommon, unique, and irreplaceable(Khanra et al., 2022). One of the most significant criticisms of the RBV is that it does not offer strategies for acquiring the resources that can help organizations obtain a competitive advantage.

2.1 Service Innovation and Sustainable Performance

Innovations enhance organizational productivity, according to (Mohamed et al., 2019). Innovative firms have been successful in achieving and maintaining high-performance indices (Hull and Rothenberg, 2008). Hence, achieving and maintaining high-performance indices depend on service innovation (Opazo-Basáez et al., 2022). Organizations have focused more on performance evaluation as a result of the current competitive environment, mostly to review their current position and assist managers in creating and implementing new strategies (Opazo-Basáez et al., 2022).

According to some reports, two-thirds of the construction industry does not innovate (Opazo-Basáez et al., 2022). While others have demonstrated that this sector's historical reputation has hindered its ability to be innovative (Bygballe et al., 2015), this sector has historically been innovative. However, Orstavik et al. (2015) argued that recent publications have presented a distinct perspective on the subject, emphasizing the diversity and effects of innovation. These academics argued that new materials, designs, and business models are emerging, but innovation is not always observable because the industry does not innovate in the conventional sense. Therefore, traditional measures of innovation, such as R&D expenditures, do not reflect the sector's innovativeness. Moreover, many service innovations are the result of collaborations with consultants under specific circumstances; these innovations are unique to the project and are not used elsewhere (Orstavik et al., 2015). This study aims to determine whether service innovation affects the construction industry's sustainable performance.

H1: There is a positive effect of service innovation on the sustainable performance

2.2 Service Innovation and Information System

Certainly, service innovation is an important area of research in information systems. As It involves developing new and improved services that can better meet the needs of customers and doing so through the strategic use of technology (Chen et al., 2021). Although only a few IS publications claim the specific banner of "service innovation," much research in the information systems field can be related in some manner to the quest to better understand service innovation (Ahuja et al., 2023; Ersoy et al., 2022). One approach to service innovation in information systems is using design thinking (Chen et al., 2021). A wealth of IS research (theoretically focused as well as practice-based research) has investigated how IS services are improved, even transformed, within organizations and over time through new practices and new technologies (Kitsios et al., 2023; Kulatunga et al., 2023). However, there are limited quantitative studies on the effect of service innovation on information systems for the sustainable performance of construction firms. However, this study will verify the following hypothesis on the effect of service innovation on information systems.

H2: There is a positive effect of service innovation on information System

2.3 Service Innovation and Employee Productivity

Within the field, there is research on how collaboration with academia fosters process innovations, which develops a model for forming relationships (Orko et al., 2022). Other studies investigate how leadership promotes and changes innovations, showing that the leadership style, the consistency of that leadership style and the knowledge the leader adds to the group have a positive effect on the innovativeness of the employees (Alblooshi et al., 2021; Crawford et al., 2013; Malik et al., 2023; Wang et al., 2022). Meng and Brown (2018) found that innovation is present and embraced in the construction industry as well as an array of forces and strategies that drive and can be applied to innovations (Oladinrin et al., 2023). Recent literature links employee performance or productivity to service innovation (Ibrahim et al., 2022; Liu et al., 2023). Innovation is essential for achieving a competitive advantage and sustainable performance in startups and established companies (Lichtenthaler, 2020). Through innovation, employees can generate new product ideas to enhance the competitiveness of their firm (Kamal et al., 2023). As a result, innovative initiatives enhance the management of administrative tasks, boost productivity, and enhance effectiveness (Salman et al., 2023). Employees' fundamental role in service innovation, their knowledge of users as well as their understanding of organizational activities makes them valuable actors in service innovation (Smania and Mendes, 2021). However, we can seek further the idea on the role of employee productivity in service innovation and sustainable performance by hypothesizing that:

H3: There is a positive effect of service innovation on employee productivity

2.4 Information System and Sustainable Performance

Most of the studies on the role of information system involves working closely with customers to understand their needs and preferences, and then using this information to develop new service concepts that can be prototyped and tested. Another approach involves the use of agile development methodologies, which emphasize flexibility and responsiveness to changing customer needs. A study by (Nkundabanyanga et al., 2021) found that the use of information systems can improve the environmental performance of firms by reducing waste, improving resource efficiency, and enhancing environmental reporting. Whereas (Alraja et al., 2022) argued that information systems can contribute to sustainable performance by enabling firms to collect and analyze data on energy consumption, carbon emissions, and other environmental indicators. The study by Li et al. (Al-Hashimy et al., 2022) found that information systems can improve the social and economic performance of construction firms by enhancing transparency and accountability in their supply chains. By providing stakeholders with access to information about suppliers' labor practices, working conditions, and environmental performance, firms can demonstrate their commitment to social responsibility and build trust with customers and other stakeholders. This can help firms to identify opportunities for improvement and develop strategies to reduce their environmental impact.

H4: Information system has a positive effect on sustainable performance

2.5 Employee Productivity and Sustainable Performance

Some studies explore the impact of employee productivity on sustainable performance, whereby (Qureshi et al., 2017) investigate the link between working Conditions, Employee Productivity, and Sustainable Manufacturing Performance and found that improving working conditions led to an improvement in employee productivity, which in turn led to increased sustainable manufacturing performance. By focusing on employee well-being, such as providing a safe and comfortable work environment and supporting work-life balance, companies can increase employee productivity and, ultimately, achieve sustainable performance goals.(Tarigan et al., 2022) discusses how employee productivity impacts a company's financial, social, and environmental sustainability. For instance, it notes that companies with highly engaged

employees tend to have lower turnover rates, which reduces the environmental impact associated with hiring and training new employees, (Su et al., 2022). Most of the above research suggests that employee productivity can have a significant impact on sustainable performance outcomes. Thus, companies that focus on creating positive work environments and supporting employee well-being are more likely to achieve sustainable performance goals. However, we can seek to investigate the role of employee productivity on sustainable performance

H5: Employee productivity has a positive effect on sustainable performance

2.6 Mediating Effect of Information System

Various studies suggested information systems can serve as a mediator between service innovation and sustainable performance. For example, (Koç and Isgüzar, 2022) investigated the relationship between service innovation and sustainable performance in manufacturing companies and found that information systems played a significant mediating role. Their study showed that innovative services could only contribute to sustainable performance if they were properly supported by information systems. Similarly, (Shin et al., 2022) conducted a study on Korean firms and found that information systems mediated the relationship between service innovation and sustainable performance. There is a growing body of literature that suggests information systems play a mediating role between service innovation and sustainable performance (Pai et al., 2022). This implies that service providers should invest in information systems to ensure that service innovation initiatives can effectively contribute to sustainable performance.

H6: Information system partially mediates the effect of information system on sustainable performance

2.7 Mediating Effect of Employee Productivity

A study by (Chowdhury et al., 2022) examined the relationship between service innovation, employee productivity, and sustainable performance in South Korea's service sector. The results showed that service innovation positively affects both employee productivity and sustainable performance. Employee productivity was found to play a mediating role between service innovation and sustainable performance (Ibrahim et al., 2022), suggesting that service innovation leads to improved employee productivity, which in turn leads to better sustainable performance for the firm. Similarly, a study by Alkhatib and Valeri (2022) investigated the mediating role of employee productivity in the relationship between service innovation and sustainable performance in the hospitality industry (Alkhatib and Valeri, 2022). The results indicated that service innovation had a positive effect on both employee productivity and sustainable performance. Furthermore, employee productivity was found to be a mediator in the relationship between service innovation and sustainable performance.

Another study by Yang et al. (2020) examined the relationship between service innovation, employee productivity, and sustainable performance in the context of Chinese manufacturing firms. The results revealed that service innovation had a positive effect on both employee productivity and sustainable performance (Hanaysha et al., 2022). More importantly, employee productivity was found to fully mediate the relationship between service innovation and sustainable performance, indicating that the positive effect of service innovation on sustainable performance is fully explained by the mediating effect of employee productivity. However, we can seek further the idea on the role of employee productivity in service innovation and sustainable performance.

H7: Employee productivity partially mediates the effect of service innovation on sustainable performance

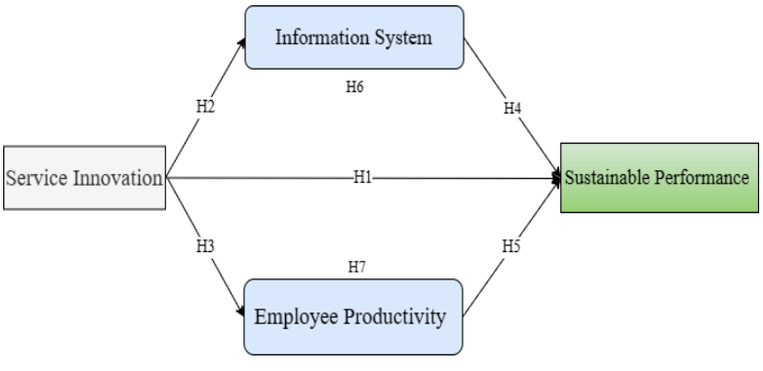

Figure 1: Conceptual framework

3. Research Methodology - Materials and Methods

3.1 Sample

Envisaging the possible population of this study, led to considering workers in executive roles representing Ethiopian construction firms. However, the challenging part lies in having the participation of the decision-makers. This, the population of interest was estimated based on the explicit limits of the study; composed of well-established accredited firms in regions whereby sustainable practices have been implemented and have available information on firms' activities. To estimate and determine the population size, the list of construction firms was retrieved from the Ethiopian firm database, and other relevant data were obtained from their annual reports and other government institutions. The information obtained helped in estimating the population size and the appropriate participants for the study. To determine the sample size for this study, we consider the context of this study, as it concerns a small population, it is recommended that we use the normal approximation to the hypergeometric distribution.

$$\boldsymbol{n = \frac{NZ^2pq}{E^2(N-1)+Z^2pq}} \tag{1}$$

Hence

(1). n is the desired sample size
(2). N represents the known population size
(3). p and q symbolize the population proportions. (Generally, set at 0.5. each)
(4). z represents the value that specifies the level of confidence at 95%, in this case, z is set to 1.96.
(5). E sets the accuracy of the sample proportions. E is set to 0.03.

$$n = \frac{250(1.96)^2(0.5)(0.5)}{0.03^2(250-1)+1.96^2(0.5)(0.5)} = 202 \tag{2}$$

Theoretically, n represents the ideal sample for this study, However, several reasons along with the previous studies support proceeding with 50 % percent and above in terms of response, while the 160 retrieved questionnaires exceed 50% of the expected sample. Firstly, it is important to note that in whatever sample frame, there is usually a proportion of the frame that is invalid. It's important to consider the errors and limitations that prevent the research to retrieve data according to the desired sample. The reason for using a small sample in survey research on construction firms could be due to a few different factors. One reason has been limited resources, such as time and finances, which prevented researchers from surveying a large number of construction firms. Another reason could be the difficulty in accessing a large sample of firms, especially as they are in different geographic regions. However, it is important to note that using a small sample size can also limit the generalizability of the research findings, which may be a consideration when interpreting and applying survey research to broader populations.

For instance, while retrieving the list of firms within the construction industry certain firms that were listed on the country database could not be reached either through emails, or phone numbers, whereby a certain proportion of the numbers thus generated are not assigned (No service), moreover certain firms their physical addresses couldn't be found, However, it might be due the country situation. However, the study was established on a sample of 160 respondents, from the various construction firms. Overall, 160 is the total number of respondents representing 160 firms. Initially, the research envisaged reaching out to 250 respondents/firms within the Construction industry, however, only 160 questionnaires were retrieved. This gives a 64 % response rate. Due to the bureaucracy in the company, we couldn't have a 100% of response rate.

The study was established on a sample of 160 respondents, from various construction firms, using simple random sampling as discussed above. Overall, 160 is the total number of respondents. Initially, the research envisaged reaching out to 250 respondents within the Construction firms, in their different branches, however, only 160 questionnaires were retrieved. This gives a 64 % response rate. Due to the bureaucracy in the company, we couldn't have a 100% of response rate.

Table 1: Questionnaire Response Rate

Questionnaires	Responses
Questionnaires sent	250
Questionnaire retrieved	160
Response rate	64%

3.2 Demographic Characteristics of the Respondents

Most participants are in executive roles in construction firms, with 40.3% holding a bachelor's degree, followed by 4 % with a master's, 47.5 %. Based on the composition of this educational level, it can be concluded that the participants have a solid grasp of the industry, as it has occupied a high managerial position. Around 55 % of respondents have been with the organization for less than five years, followed by 26 % with 6 to 15 years and less than 10% with more than 50 years of service. Most employees are between the ages of 20 and 29, with 18.9% between 30 and 39 and less than 10% over 50. Each respondent has a role related to their company's supply chain; thus, the participant was supposed to provide the response that best characterizes the firm's status.

Table 2: Demographic Characteristics of the Respondents

Variable	**Category**	**Frequency**	**Percentage**
Gender	Male	96	39.60%
	Female	63	60.40%
Age	20 to 29 years old	98	61.60%
	30 to 39 years old	30	18.95%
	40 to 49 years old	18	11.30%
	50 to 59 years old	9	5.70%
Level of Education	Diploma	20	12.50%
	First Degree	64	40 %
	Masters	76	47.50%
Experience	less than five years	88	55 %
	6 to 15 years	42	26 %
	Above 15 years	30	18.75%

3.3 Data Collection

A set of questionnaires were developed to specifically address the objectives of this work. However, the methods that were used are as follows: Firstly, a questionnaire was developed and distributed to obtain a maximum of answers in a fairly short period, and to allow managers and employees of different levels of studies to fully understand the concepts in question. The development of the questionnaire involved selecting measurement tools as well as questioning the structure of the questioning to facilitate completion by the respondents (Evrard, Pras, and Roux, 2003). In addition, a pilot study was conducted to evaluate the questionnaire's content validity. Content validity, also known as face validity, is determined by requesting a subject-matter expert to evaluate whether, in their opinion, a particular measure of query accurately measures what the researcher is interested in A Likert scale which ranged from 1 = strongly disagree to 5 = strongly agree was used. The questions used were adapted from previous researchers who have used similar questions in their studies.

3.4 Operationalization of Variables

The operationalization of variables consists of moving from the conceptual and abstract stage of research to that of observable behavioral manifestations. At the level of this study, we will begin the conceptualization of the variables from the literature by choosing the definition of the most suitable variable. This step consists of linking from theoretical concepts to empirical data The quantitative research methodology makes it possible to test the hypotheses of the model

elaborated. The service innovation construct is going to be measured using five items taken from the earlier study (Mahmoud et al. 2018; Rajapathirana and Hui 2018). Six items were used to evaluate the information system adapted. assessed by Items like "data integration between departments" are included. Application software is used on an as-needed basis in the field of information technology. Third, there is as-needed hardware for information technology. Informational reliability ranks as the fourth factor (Lacity et al., 2021). Items used to evaluate sustainable performance are drawn from (Adomako and Tran, 2022; Large and Thomsen, 2011).

4. Results

4.1 Measurement Items Reliability and Validity

This study employed CFA to validate the measurement items' validity. Through which the reliability and validity of the concepts were examined. According to a group of researchers, factor loadings in the 0.60 range are typically regarded as appropriate. To this purpose, we followed Hair et al guidance's and restricted our analysis to constructs with standardized factor loadings of 0.60 or higher (2017). Overall, the reliability of the study's measurements was considered satisfactory. All factor loadings were determined to exceed the 0.70 convergent validity requirement (Hoyle, 1995). There was considerable evidence of convergent validity since all constructs demonstrated high AVEs. The findings of the confirmatory factor analysis, reliability, and convergent validity are shown in Table 3.

Comparing the significant level of the key constructs with the average variance extracted (AVE) score of the reliability composite variables in our convergent validity test (Hair et al., 2016; Wu, 2010). Hence, AVE values larger than 0.5 indicate that the questionnaire has robust convergent validity (Fornell and Larcker, 1981).AVE measures to leverage the fact that measurement does not correlate well with others to establish its relevance (Farrell and Rudd, 2009). Cronbach's and CR were employed to examine the data's dependability. The values observed for CR ranged between 0.82 and 0.91. All CR values in our investigation were manifestly greater than the 0.6 thresholds advocated by eminent scholars (Hair et al., 2016). Cronbach's Alpha ranged between 0.70 to 0.87. Using AVE and factor loadings, this study also examined internal consistency to derive conclusions regarding the data's validity. The AVE varied between 0.54 and 0.67, which exceeds the permitted range of 0.5 to 0.6 ((Zhao et al., 2010).

Table 3: Measurement Items Reliability and Validity

Constructs	Items	Factors loading	Cronbach's Alpha	CR	AVE
Service Innovation	Se_Innov1	0.791	0.87	0.91	0.67
	Se_Innov2	0.787			
	Se_Innov3	0.776			
	Se_Innov4	0.859			
	Se_Innov5	0.894			
Information System	In_Syst1	0.596	0.78	0.86	0.56
	In_Syst2	0.857			
	In_Syst3	0.716			
	In_Syst4	0.816			
	In_Syst5	0.728			
Employee productivity	Emp_Pro1	0.636	0.83	0.89	0.67
	Emp_Pro2	0.859			
	Emp_Pro3	0.861			
	Emp_Pro4	0.909			
Sustainable Performance	Su_Perf1	0.598	0.7	0.82	0.54
	Su_Perf2	0.774			
	Su_Perf3	0.832			
	Su_Perf4	0.738			

4.2 Discriminant Validity

The results of a correlation analysis between the variables of the research are depicted in Table 4. We replace the ones ("1") on the diagonal with the square roots of its AVE and then test that the correlation between a construct and other constructs is less than the square root of its AVE. We observe that the requirement is met. We effectively established the study's discriminant validity (Henseler et al., 2015).

Table 4: Discriminant Validity

Variables	1	2	3	4
Se_Innov (1)	0.81			
In_Syst (2)	0.76	0.77		
Emp_Pro (3)	0.7	0.63	0.81	
Su_Perf (4)	0.36	0.56	0.58	0.73

4.3 Path Model Analysis

The path model was used to figure out how the study's latent constructs related to each other (Hair et al., 2017). Path analysis is used with LISREL to look at the path coefficient and figure out what it implies. Fig. 2 shows a structural model of how endogenous and exogenous variables work around each other. Weights, which are sometimes called "path coefficients," are used to figure out how significant a structural relationship is and how outside variables affect the dependent variable. According to the findings shown in the figure, the path estimates show that Se_Innov has a significant and positive effect on In Syst and Emp Pro, with weights of 0.77 and 0.76 respectively. The path analysis shows that service innovation affects the implementation of information systems and makes employees more productive. More importantly, the path model shows that Se_Innov has a positive and significant effect on SU Perf 0.60. Again, both In Syst and Emp Pro have a positive and significant effect on Sustainable performance (0.53) and (0.60), respectively. This means that putting in place an information system and having a productive workforce after a pandemic are both results of service innovation, which in the end improves sustainable performance. So, Se_Innov has a direct effect on Su_Perf, and In Syst and Emp Pro have an indirect effect on this performance by helping to improve it.

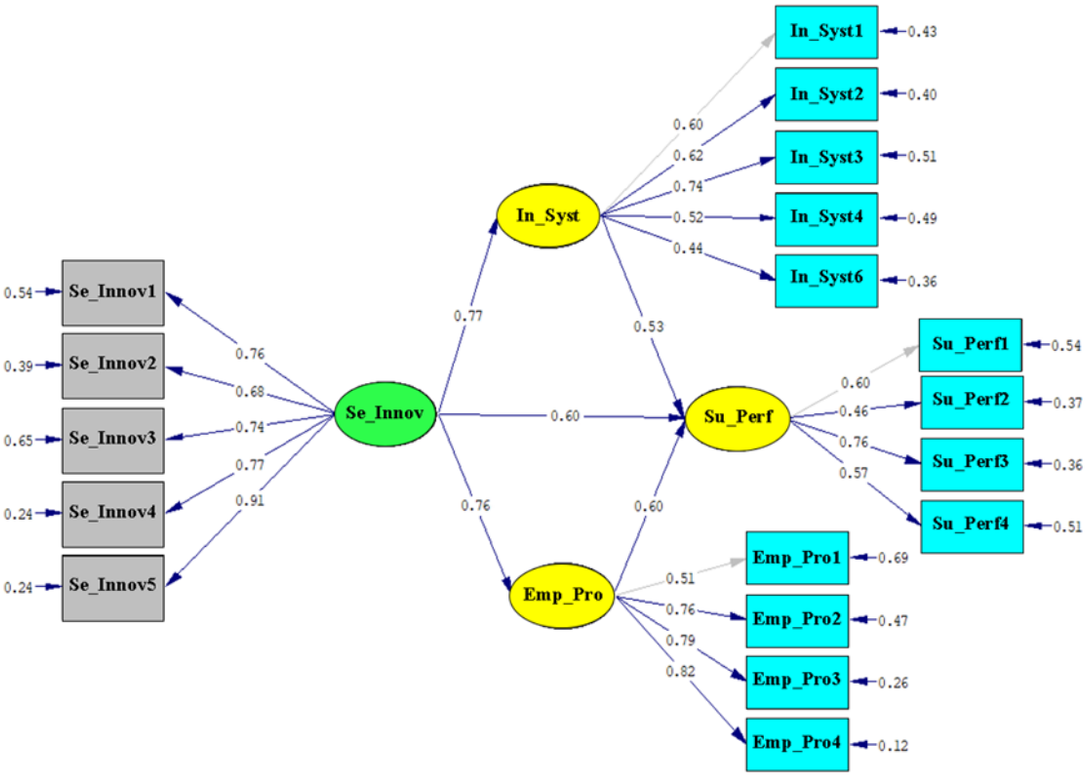

Figure 2: Path Analysis

There is a statistically significant difference between the latent variable and the observed, as indicated by the chi-square of the model fit, which is 586.5 with p 0.05. And 129 for the number of degrees of freedom, which is quite a bit; furthermore, it is required to validate the value of Chi-squared divided by the number of degrees of freedom. The ratio of Chi-Square to DF equals 4.5. Which passes the test rule, for which the critical value has been proposed to be x2 = 5. Thus, additional indices were also employed to examine the fit of the model, such as the Model AIC 670.54, and were found to be satisfactory in evaluating the fit of the model fit. This is because these indices are all within the suggested threshold, which shows an adequate fit of the model. It followed that the measuring model was approved.

4.4 Mediation Analysis

The mediation in this study is analyzed based on the range value of VAF, the total effects and indirect effects are projected through this mediation (Variance accounted for). The direct and indirect effects are summed together to get the total impact. They may also be referred to as the sum of powers of coefficient matrices. The direct effects are those effects in the model that do not pass via any other variables. Indirect effects are relationships between two variables that are mediated by one or more additional variables. The indirect impacts can also be determined by subtracting the direct effects from the total effects. Using the VAF score and the guidelines for the mediation effect provided by (Hair et al., 2013). VAF is (indirect effect/total effect)

i. No mediation if VAF is between 0 and 0.20.
ii. Partial Mediation if VAF is between 0.20 and 0.80.
iii. Full Mediation if VAF is greater than 0.80.

The following criteria were used for the mediation analysis. The first step is to measure the direct effect of the independent variable on the dependent variable. If the mediator is not included, this effect should be significant(Zhao et al., 2010). Second, if the first step's direct path is important, the mediator must be brought in for the next step to find out what the indirect path means. The conditions need to know why the two paths are important. After running the bootstrapping procedure, the indirect path can be checked, and if the indirect effect is found to be important, the mediator takes up some of the direct paths.

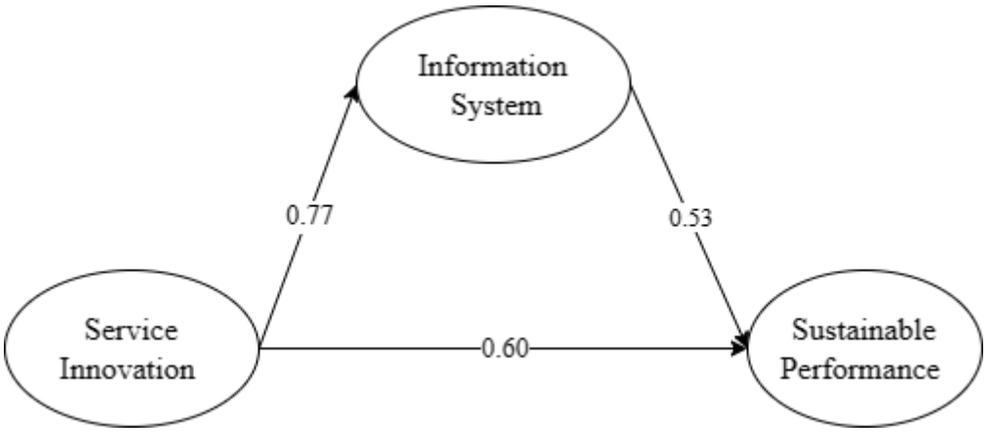

Figure 2: Mediation effect of Information System

In Figure 3 shown above, the Information system partially mediates the relationship between Service innovation and Sustainable Performance. A VAF value indicates that 40 % of the total effect of an exogenous variable on Sustainable performance is explained by indirect effect (Table 5). Therefore, the effect of service innovation on Sustainable performance is partially mediated through information systems. Therefore, firms in the construction sector need to rely on information systems to increase the effect of service innovation on sustainable performance in this post-pandemic era.

Table 5: Mediation Analysis Information System

Exogenous Variable	Direct effect	indirect effect	Total effect	VAF RANGE	Mediation
Service Innovation	0.60	0.40	1.0	0.4	Partial
Mediating variable: Information system; Endogenous variable: Sustainable performance					

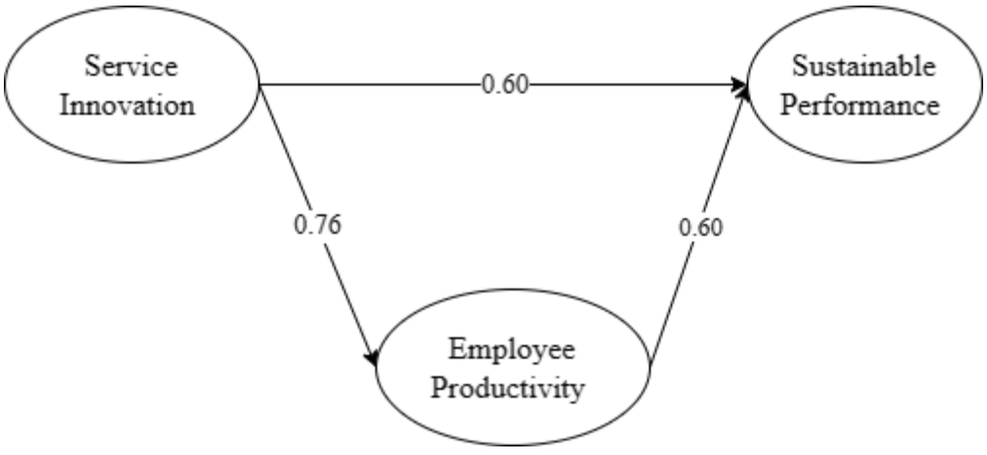

Figure 3: Mediation effect of Employee productivity

The above figure 4 depicts that Employee productivity mediates the relationship between service innovation and Sustainable performance. The VAF value here indicates that more than 45 % of the total effect of an exogenous variable on Sustainable performance is explained by indirect effect (Table 6). Therefore, the effect of service innovation on Sustainable performance is partially mediated through employee productivity. Service innovation will help workers to be more productive, for the firms to achieve better performance in their day-to-day operations.

Table 6: Mediation Test: Employee Productivity

Exogenous Variable	Direct effect	indirect effect	Total effect	VAF RANGE	Mediation
Service Innovation	0.53	0.45	0.98	0.45	Partial
Mediating variable: Employee Productivity; Endogenous variable: Sustainable performance					

4.5 Hypothesis Testing and Discussion

Table 7 below provides an overview of the study's hypothesis. We've checked, evaluated, and drawn conclusions based on statistical criteria. Considering the foregoing results, the H1 hypothesis is adopted, as it was stated that service innovation has a direct influence on S (P = 0.01). The 0.60 path coefficient suggests that a significant positive association exists. The argument that service innovation influences Sustainable performance is supported by a t-statistic of 7.37 and a P-value of 0.01, indicating a significant effect. The H2 hypothesis is also accepted, as the path coefficient value of 0.77 indicates a substantial positive association; hence, service innovation enhances information systems. The t-statistic for the H3 hypothesis, which states that service innovation influences employee productivity, is 0.76, whereas the P value is 0.01. In addition, the value of the route coefficient is 0.76, indicating that high service innovation will result in high employee productivity. The H4 hypothesis regarding the influence of information systems on sustainable performance is supported by a t-statistic of 3.44 and a P-value of 0.01. These results imply that the two factors have a significant relationship. Moreover, the path coefficient value of 0.53 implies a favorable link between the two variables. The more effective information system is implemented, the construction firms will benefit from their service innovation and have better performance. For the H5 hypothesis, which states that employee productivity influences Sustainable performance, the t-statistic is 3.42 and the P value is 0.01. This indicates that a considerable influence exists. In addition, the path coefficient value of 0.60 indicates a positive association, such as when an employee's productivity is increased the performance of the firm is improved sustainably. Consequently, H6 asserts that the indirect impact of service innovation

on Sustainable performance is mediated by information systems, and the results indicate a partial mediation. With a P value of less than 0.05, the indirect effect is statistically significant. Additionally, the path weight of 0.4 demonstrates a favorable association. Similarly, H7 reports a P value of 0.01 for the indirect effect of service innovation on sustainable performance through employee productivity. This demonstrates the significance of the indirect effect with an indirect positive effect of 0.45.

Table 7: Results of Hypothesis testing

Hypothesis	Path	Beta	t-Statistics	P_value	Decision
H1	Se_Inno→Su_Perf	0.60	7.37	0.01**	Accepted
H2	Se_Inno→ In_Syst	0.77	5.84	0.01**	Accepted
H3	Se_Inno→Emp_Pro	0.71	-2.46	0.01**	Accepted
H4	In_Syst → Su_Perf	0.61	3.44	0.01**	Accepted
H5	Emp_Pro → Su_Perf	0.6	3.42	0.01**	Accepted
H6	Se_Inno→In_Syst→ Su_Perf	0.46	2	0.03*	Accepted
H7	Se_Inno→Emp_Pro→ Su_Perf	0.42	2.1	0.01*	Accepted

5. Conclusion and Recommendation

This study investigated the influence of service innovation on the sustainable performance of construction firms in Ethiopia during the post-pandemic era. This study considers information stem and employee productivity as the mediating variables. The analysis results showed that service innovation has a positive effect on the implementation of information system in the construction sector and influence employees to be more productive in their tasks. in the company, which in turn leads to a positive impact on the sustainable performance of the firm. An exciting finding from this study is that service innovation directly improves sustainable performance, whereas the total effect is partially mediated using information systems and employee productivity.

In conclusion, service innovation driven by information systems can enable construction companies in enhancing their sustainable performance by optimizing processes, minimizing waste, and maximizing resource efficiency. By leveraging technology and employee productivity, construction companies can lower their environmental footprint and increase their profitability. As a recommendation, there is a need, for measures that will allow Construction firms to quickly adapt in this fast-changing world; however, the managerial role is very necessary for achieving a significant impact. Therefore, as a Construction firm, Construction firms also need to improve their operational performance to be able to compete in the global realm. This research recommends that for increasing the company's operational performance, senior managers ought to show a strong commitment to implementing the practices of supply chain management and the use of information systems (IS).To improve the company's operational performance, the top management should be involved in the day-to-day activities with strong commitment, so in turn they will enable the effective implementation of the practices of supply chain management and the use of information systems in improving the company's operational performance. In improving the sustainable performance of Construction firms. The management should start focusing on remote collaboration, health and safety, sustainable design, prefab and modular construction, and customer experience. Construction firms can attain a competitive advantage, stay profitable, and adapt successfully to the post-pandemic era's challenges.

There are many ways in which service innovation can be used to improve employee productivity using information systems in construction firms, such as developing a mobile application that allows employees to quickly access job sheets and order materials, check job progress, and communicate with project managers in real time. This would save time and reduce the number of errors associated with manual paperwork, also using software such as Artificial Intelligence (AI) and Internet of Things (IoT) devices. This would allow employees to focus on more complex tasks and increase their productivity. In this post-pandemic era, it's important to train employees on the latest technology and techniques specific to their job roles. This would help them to work more efficiently and boost their confidence in carrying out their duties.
As a limitation, this investigation was primarily constrained by time and resources. Consequently, it is essential to note that there is still some uncertainty regarding the quality of the measures of the variables, as measured by scales based on subsequent empirical studies and exploratory surveys. Similarly, certain measurement instruments were readjusted and adapted to meet the needs and context of the research, necessitating their reuse, or even improvement, in similar contexts to enhance their measurement qualities. This limitation stems from the fact that the responses from the questionnaire

might not accurately reflect reality. This difficulty is a result of the disparity between what is stated and what is done. Despite the efforts made to reduce this gap, it is prudent to use the results with caution due to this limitation. Despite the limitation, our analyses have been completed effectively, yielding significant results. However, these results cannot be generalized to industries other than construction firms. As the results appear to be representative, a larger sample of responses from various industries would be required to generalize this conclusion and reduce the previously mentioned bias. Regarding this, however, we strongly recommend that additional research be conducted in other sectors. this research sets prospects for the future researcher and new avenues for reflection in more studies; firstly, future research can consider, and distinctively investigate how the social performance of construction firms could also be improved through service innovation. While implying the indirect effects of information technology, or even other factors such as green practices and green innovation.

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