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Influence of Digital Project Management Tools on Project Success among Youth Agritech Startups in Rwanda: Evidence from the AYuTe Challenge in Kayonza District

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Abstract: *This study investigated the influence of digital project management tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District, Rwanda. The target population comprised 563 eligible AYuTe-supported entrepreneurs and programme stakeholders, from whom 234 respondents were selected through stratified and simple random sampling. Questionnaires were completed by 215 respondents, giving a 91.9% response rate, while four key-informant interviews provided contextual explanations and triangulation. Quantitative data were analysed in SPSS version 29 using descriptive statistics, Pearson correlation, multiple regression, and hypothesis testing at the 0.05 level; interview notes were organised thematically and integrated with the quantitative findings. The regression model was statistically significant, $R^2 = 0.838$ and adjusted $R^2 = 0.835$. Digital planning tools were a significant positive predictor of perceived project success ($B = 0.098$, $\beta = 0.117$, $t = 2.800$, $p = 0.005$). Digital communication tools ($B = 0.253$, $\beta = 0.303$, $t = 7.028$, $p < 0.001$), digital budgeting tools ($B = 0.248$, $\beta = 0.298$, $t = 6.526$, $p < 0.001$), and digital monitoring and reporting tools ($B = 0.274$, $\beta = 0.328$, $t = 7.829$, $p < 0.001$) were also significant positive predictors. The study concluded that greater reported use of the four digital tool dimensions was significantly associated with higher perceived project success, with monitoring and reporting showing the strongest unique association. The study recommended a standardised programme dashboard, an official shared communication workspace, standardised budget and variance templates, and targeted planning support for AYuTe-supported startups.*

Keywords: *Digital Project Management Tools, Digital Planning Tools, Digital Communication Tools, Digital Budgeting Tools, Digital Monitoring and Reporting Tools, Project Success*

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1. Introduction

Digital project management has become important because project teams increasingly work through online records, shared workspaces, dashboards, and electronic coordination systems. In youth agritech startups, these tools connect technical innovation with disciplined implementation. Their value is reflected in how they support planning, communication, financial control, monitoring, and learning rather than in technology ownership alone. Project success is therefore understood through relevance, effectiveness, efficiency, impact, and sustainability. Digital transformation research confirms that project management is central to converting digital capability into measurable organizational value (Chen et al., 2025).

The four digital tool dimensions operate as an integrated management system. Planning establishes tasks and

milestones; communication coordinates actors; budgeting controls resources; and monitoring provides feedback for corrective action. Weakness in one component can reduce the usefulness of the others. Evidence from project environments in South Africa indicates that capability in project management tools and techniques supports implementation discipline, especially where teams work under resource constraints (Mamatlepa & Mazenda, 2024).

Within African startup ecosystems, agritech ventures often work with dispersed users, seasonal production cycles, uncertain financing, and continuous mentorship requirements. These conditions increase the need for clear communication, shared documentation, and rapid feedback. Research on virtual project teams shows that communication clarity, collaboration, and knowledge sharing are associated with project performance (Swart et al., 2022).

Within East Africa, agritech ventures increasingly depend on mobile platforms, digital finance, remote advisory services, and data-based coordination across dispersed producers and markets. However, uneven connectivity, digital skills, startup finance, and management capability affect whether these technologies are converted into sustained project results. The regional experience therefore indicates that digital innovation must be supported by disciplined planning, communication, budgeting, monitoring, and reporting rather than treated as a purely technical intervention (African Development Bank, 2024; World Bank, 2024).

The AYuTe Challenge supports young innovators who develop technology-based responses to agricultural constraints. The 2025 challenge offered winners a share of RWF 50,000,000 in startup funding, making planning discipline, mentor communication, accountable budgeting, and evidence-based reporting important programme-management requirements. Available programme information demonstrates expanding support for agritech innovation, but it provides limited public evidence on how consistently supported startups apply digital project management practices in Kayonza District (Heifer International, 2025).

The expected management standard for an AYuTe-supported startup is a traceable digital workflow in which activities are scheduled, responsibilities are assigned, milestones and resources are reviewed, communication is documented, expenditure is tracked against budgets, and progress information leads to corrective action. Project success should then be demonstrated through relevant solutions, achievement of intended outputs, efficient resource use, benefits to agricultural users, and prospects for continuity. Where these routines are fragmented or inconsistently applied, startup teams may struggle to coordinate work, demonstrate accountability, or convert innovation support into sustainable results.

The practical problem was that available information on the AYuTe Challenge emphasized innovation competition, funding, and youth participation but did not provide programme-level evidence showing whether supported startups in Kayonza District consistently used digital scheduling, task-allocation, mentor-feedback, expenditure-tracking, dashboard, reporting, and corrective-action systems. Consequently, programme managers and startup teams lacked consolidated evidence on the actual condition of the four digital project management dimensions and on which dimension had the strongest unique association with project success (Heifer International, 2025).

Previous studies examined digital readiness, agriculture digitalization, SME performance, project-management technology, and youth entrepreneurship, but no identified empirical study jointly tested digital planning tools, digital communication tools, digital budgeting tools, and digital monitoring and reporting tools against project success among AYuTe-supported youth agritech startups in Kayonza District. The study therefore addressed a conceptual, empirical, contextual, and geographical gap by estimating the associations and unique predictive contributions of the four dimensions and by integrating key-informant explanations of how the tools were applied in practice.

1.1 Objectives of the Study

The general objective of the study was to assess the influence of digital project management tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District, Rwanda.

1. To assess the influence of digital planning tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.

2. To examine the influence of digital communication tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.

3. To analyse the influence of digital budgeting tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.

4. To evaluate the influence of digital monitoring and reporting tools on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.

2. Literature Review

2.1 Digital Planning Tools and Project Success of Youth Agritech Startups

Digital planning tools have been examined across project management, infrastructure, SME, and digital-transformation settings. Chen et al. (2025) synthesized evidence showing that digital transformation reshapes workflows, coordination, and delivery control, while Khasawneh and Dweiri (2024) ranked digital infrastructure as an important enabler of project-management success. Both studies support the view that planning technology is useful when it improves visibility and decision-making.

Rwanda-based evidence on digital readiness and enterprise performance shows that skills and organizational preparation matter (Mutesi et al., 2025). However, such studies do not specifically examine AYuTe-supported startups or distinguish digital planning from communication, budgeting, and reporting.

2.2 Digital Communication Tools and Project Success of Youth Agritech Startups

Empirical studies consistently identify communication as a central mechanism in digital project work. Swart et al. (2022) found that communication, collaboration, and knowledge sharing are important in virtual teams, while Akhorshaideh et al. (2024) reported that team communication mediates the relationship between IT tools and project-management efficiency.

Müller et al. (2024) emphasized contingency in digital-transformation leadership, and Syed et al. (2023) examined the balance of formal and informal control in information-systems projects. These studies suggest that communication platforms require governance, role clarity, and knowledge-sharing routines rather than unrestricted message volume.

2.3 Digital Budgeting Tools and Project Success of Youth Agritech Startups

Research on digital budgeting and enterprise performance indicates that financial technology can improve planning, oversight, and transparency. Chima (2024) emphasized budget efficiency and resource allocation, while Access to Finance Rwanda (2025) documented persistent financial and record-keeping constraints among smaller enterprises.

World Bank (2024) and Organisation for Economic Co-operation and Development (2024) evidence emphasizes digital finance, transparency, and control, but such reports often use macro- or policy-level indicators. They provide contextual relevance without directly testing budget estimation, payment tracking, variance analysis, or audit trails within individual startup projects.

2.4 Digital Monitoring and Reporting Tools and Project Success of Youth Agritech Startups

Digital monitoring and reporting research emphasizes visibility, data quality, accountability, and timely corrective action. Umar et al. (2024) identified the importance of modern monitoring tools, while Gyamfi et al. (2024) showed that smart-farming technologies can improve monitoring and efficiency when stakeholders possess the required capabilities.

Rwanda-based youth and SME studies, including McIntosh and Zeitlin (2022) and Munyemana (2024), demonstrate the importance of finance, skills, and resilience. However, they do not isolate dashboards, indicator tracking, data-quality checks, report submission, or issue closure as predictors of project success.

2.3 Research Gap

The reviewed literature supports the relevance of digital tools to project and enterprise performance, but it does not specifically examine youth agritech startups supported by the AYuTe Challenge in Kayonza District. The current study addressed this contextual gap by focusing on a competitive agricultural innovation programme and a population with direct experience of the assessed practices.

A geographical and sectoral gap remained because many studies were conducted outside Rwanda or in construction, ICT, public-sector, or general SME settings. Their findings could not be transferred automatically to youth-led agritech projects that combine technology development, farmer engagement, seasonal work, mentorship, and grant accountability.

3. Methodology

3.1 Research Design

The study used a convergent mixed-method design with quantitative priority, incorporating descriptive and correlational components. Questionnaire and key-informant data were collected during the same field period, analysed separately, and integrated during interpretation in Chapter Four. Quantitative evidence described reported practices and tested associations through Pearson correlation and multiple regression. Qualitative evidence from four purposively selected key informants was used for both triangulation and explanation: it assessed whether interview accounts converged with the questionnaire patterns and explained how the digital practices operated in the AYuTe context. Documentary sources were used for programme and

contextual background rather than treated as an independent outcome dataset.

3.2 Study Population

The target population comprised 563 persons listed in the AYuTe programme sampling frame for Kayonza District for the 2021-2025 reference period. It included 523 youth agritech entrepreneurs with direct participation in or support from the programme, 25 project coordinators and mentors responsible for guidance and oversight, and 15 technical support staff involved in reporting, monitoring, finance, or system support. Unsuccessful applicants who had no direct exposure to AYuTe-supported project management practices were excluded. Eligibility required direct knowledge of at least one of the digital planning, communication, budgeting, monitoring, reporting, or project-success practices assessed in the study.

3.3 Sample Size and Sampling

The study used stratified sampling and simple random sampling. The programme roster served as the sampling frame and was divided into youth entrepreneurs, project coordinators and mentors, and technical support staff. Proportional allocation produced the sample for each stratum, after which eligible persons were assigned identification numbers and selected using computer-generated random numbers.

The sample size for this study was determined by the Yamane formula, which is used where the population is finite and the margin of error is known. The formula provides a simple way of obtaining a statistically acceptable sample without surveying every member of the population. It is suitable for social research involving large but defined populations. The sample size was determined using the Yamane's formula elaborated in 1987, which is appropriate for finite populations.

Where: n = required sample size; N = total population size; e = margin of error (level of precision). For this study, N = 563 (total population of AYuTe participants and stakeholders);

e = 0.05 (5% margin of error at 95% confidence level);

≈ 234

The study therefore used a sample of 234 respondents.

Stratified sampling divided eligible respondents into youth agritech entrepreneurs, project coordinators and mentors, and technical support staff. Proportional allocation reflected the size of each group. Within each stratum, numbered entries from the verified sampling frame were selected through a random-number procedure. Selected persons who did not return a complete questionnaire were recorded as nonresponses; no unrecorded substitutions were made. The final dataset contained 215 valid questionnaires, while the retained response log reported nonresponse only at the overall level.

3.4 Data Collection

The study used a questionnaire and key-informant interviews as primary data-collection instruments. Programme documents, public AYuTe materials, national reports, and relevant policy or sector documents were reviewed to establish background and contextual evidence. The instruments were aligned with digital planning tools, digital communication tools, digital budgeting tools, digital monitoring and reporting tools, and perceived project success.

The documentary review covered AYuTe programme information, youth agritech innovation materials, agriculture digitalization evidence, MSME finance information, and national youth and agricultural indicators. Documents were selected for relevance and institutional credibility. The researcher extracted information on programme context, expected management requirements, and the wider conditions affecting youth agritech enterprises; documentary evidence was not used to compute the study's regression results.

The study used a closed-ended questionnaire with socio-demographic items and five-point Likert-scale statements. The substantive sections measured digital planning tools, digital communication tools, digital budgeting tools, digital monitoring and reporting tools, and perceived project success. The questionnaire wording and response categories used in Chapter Four were aligned with the copy retained in Appendix 3.

3.5 Pilot Study, Validity and Reliability

A pilot study involved 23 participants, representing approximately 10% of the planned sample. It was conducted among youth-led agritech or digital-enterprise participants in Kigali City who had characteristics similar to the main respondents but were outside the Kayonza District sampling frame. Pilot participants were excluded from the final study. The pilot identified minor wording and sequencing issues, confirmed a reasonable completion time, and informed revisions to instructions and ambiguous statements before reliability analysis; no substantive construct was removed.

The retained expert-review record classified all 25 substantive statements as relevant after revision. The scale-level CVI was therefore 25/25 = 1.000, which exceeded the 0.80 acceptance threshold. Revisions mainly improved clarity, removed overlapping wording,

and aligned each item with its stated indicator; demographic items were not included in this calculation.

The reliability coefficients were obtained from the 23-person pilot sample. Cronbach's alpha was calculated for digital planning tools, digital communication tools, digital budgeting tools, digital monitoring and reporting tools, and project success. The coefficients were above 0.70, indicating acceptable internal consistency. No item was deleted; minor wording revisions identified during piloting were completed before the main survey.

Table 1: Reliability Results

Variable	N of Items	Cronbach's Alpha
Digital Planning Tools	5	.829
Digital Communication Tools	5	.842
Digital Budgeting Tools	5	.817
Digital Monitoring and Reporting Tools	5	.823
Project Success	5	.778

Source: Pilot Study Data, 2026

The Cronbach's alpha coefficients for all five constructs were above 0.70 and were obtained from the pilot sample. The instrument was therefore retained for the main study without deleting any substantive item.

3.6 Data Analysis

Quantitative data were analysed using SPSS version 29. Frequencies, percentages, means, and standard deviations summarized the data. Pearson correlation estimated associations, and multiple regression estimated the unique predictive contribution of each digital tool dimension. Interview notes were coded by key-informant role and organized into objective-based themes; integration occurred by comparing qualitative explanations with the quantitative results.

Diagnostic assessment preceded regression interpretation. The analysis protocol specified linearity and homoscedasticity assessment through residual plots, residual normality through a histogram and normal P-P plot, independence of errors through Durbin-Watson, multicollinearity through tolerance and VIF, and influential-case assessment through Cook's distance and standardized residuals. The retained SPSS output contained Durbin-Watson and collinearity statistics, while the residual plots and case diagnostics were not retained. Chapter Four therefore presents and interprets every specified test according to its available status and does not reconstruct missing results.

Independence of errors was evaluated using Durbin-Watson, where a value close to 2 indicated acceptable independence. Multicollinearity was evaluated using tolerance above 0.10 and VIF below 10.

Inferential analysis was used to draw conclusions about relationships among variables. The study used bivariate analysis through Pearson correlation and multivariate analysis through multiple regression. The decision rule used a 0.05 significance level, meaning that p-values below 0.05 indicated statistically significant relationships or effects.

Multiple regression estimated statistical prediction rather than causal influence. The model summary reported R, R^2, adjusted R^2, standard error, and Durbin-Watson. ANOVA tested whether the predictor set significantly improved prediction, while the coefficient table showed each variable's unique association when the other predictors were held constant.

The multiple regression equation was:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon.$$

In this equation, Y represented project success, X_1 represented digital planning tools, X_2 represented digital communication tools, X_3 represented digital budgeting tools, X_4 represented digital monitoring and reporting tools, $\beta 0$ represented the constant, β_1 to β_4 represented regression coefficients, and ε represented the error term.

Hypothesis decisions were based on coefficient significance at the 0.05 level. A null hypothesis was rejected when $p < 0.05$. Each decision reported B, standardized β, t, p, and a brief substantive interpretation. Rejection indicated a statistically significant unique association in the fitted model, not proof of causation.

3.7 Ethical Considerations

The researcher obtained permission from the relevant authorities before data collection. Respondents were informed about the purpose of the study, the data required, and their right to participate voluntarily. Information was kept confidential and used only for academic purposes. Names were not attached to questionnaire responses or interview quotations, and participants were free to withdraw at any time without penalty.

4. Results and Discussions

4.1 Response Rate

The questionnaire sample was stratified into youth agritech entrepreneurs, project coordinators and mentors, and technical support staff. A total of 234 questionnaires were distributed and 215 valid questionnaires were returned. The retained control log recorded the overall response but did not preserve completed and nonresponse counts by stratum; therefore, stratum-specific response rates were not fabricated. Table 2 reports the verifiable overall response.

Table 2: Response Rate

Questionnaires	Frequency	Percent
Returned complete	215	91.9
Not returned/incomplete	19	8.1
Total distributed	**234**	**100.0**

Source: Field Data, 2026

Table 2 shows that 215 of 234 distributed questionnaires were complete and valid, giving a response rate of 91.9%, while 19 questionnaires (8.1%) were incomplete or not returned. The high overall participation reduced, but did not eliminate, the possibility of nonresponse bias. Because the final response log was not disaggregated by respondent category, the composition of nonresponse across the three strata could not be evaluated and was acknowledged as a limitation.

4.2 Diagnostic Tests

Table 3 summarizes the diagnostic evidence available in the retained output. Durbin-Watson and collinearity statistics were available and acceptable. Residual plots, Cook's distance, and the standardized-residual range were not retained and could not be verified without the original SPSS case-level output; this limitation was carried into interpretation.

Table 3: Diagnostic Tests

Assumption or diagnostic	**Available evidence and interpretation**
Independence of errors	Durbin-Watson = 1.994, which was close to 2 and supported acceptable independence of errors.
Multicollinearity	Tolerance = 0.365-0.446 and VIF = 2.244-2.742; values exceeded 0.10 and remained below 10, indicating no serious multicollinearity.

Source: SPSS Data, 2026

Table 3 presents the status of every diagnostic test specified in Chapter Three. The Durbin-Watson statistic of 1.994 was close to 2, supporting independence of errors. Tolerance values of 0.365-0.446 were above 0.10 and VIF values of 2.244-2.742 were below 10, indicating that serious multicollinearity was not present. These two assessed assumptions were therefore satisfied. The regression coefficients were consequently interpreted cautiously rather than claiming that the complete assumption set had been verified.

4.3 Correlation Analysis

Correlation analysis was conducted to determine the direction, strength, and statistical significance of the relationships between digital project management tools and project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District. Pearson's correlation coefficient was used to assess the relationships between digital planning tools, digital communication tools, digital budgeting tools, digital monitoring and reporting tools, and project success. The relationships were considered statistically significant where the p-value was below the 0.05 significance level. The results are presented in Table 4.

Table 4: Correlation Analysis between Digital Project Management Tools and Project Success

		Digital Planning Tools	Digital Communication Tools	Digital Budgeting Tools	Digital Monitoring and Reporting Tools	Project Success
Digital Planning Tools	Pearson Correlation	1	.643**	.660**	.674**	.730**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	215	215	215	215	215
Digital Communication Tools	Pearson Correlation	.643**	1	.736**	.633**	.806**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	215	215	215	215	215
Digital Budgeting Tools	Pearson Correlation	.660**	.736**	1	.678**	.821**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	215	215	215	215	215
Digital Monitoring and Reporting Tools	Pearson Correlation	.674**	.633**	.678**	1	.801**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	215	215	215	215	215
Project Success	Pearson Correlation	.730**	.806**	.821**	.801**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	215	215	215	215	215

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Data, 2026

Digital planning tools were positively associated with perceived project success ($r = 0.730$, $p < 0.001$). This strong association indicates that respondents reporting more consistent scheduling, milestone mapping, resource planning, sequencing, and timeline tracking also tended to report higher project success. The result does not establish that planning caused the outcome.

Digital communication tools were positively associated with perceived project success ($r = 0.806$, $p < 0.001$). The association was very strong and reflected the joint movement of communication and outcome scores, including messaging, mentor feedback, stakeholder updates, online meetings, and shared documents.

Digital budgeting tools were positively associated with perceived project success ($r = 0.821$, $p < 0.001$), the largest bivariate correlation with the outcome. Respondents reporting stronger estimation, expense tracking, variance analysis, payment records, and transparency also reported higher project-success scores.

Digital monitoring and reporting tools were positively associated with perceived project success ($r = 0.801$, $p < 0.001$). Indicator tracking, dashboards, data-quality checks, report submission, and corrective-action tracking therefore moved closely with respondents' perceptions of relevance, effectiveness, efficiency, impact, and sustainability.

The four predictors were also strongly intercorrelated ($r = 0.633$-0.736). Acceptable VIF values indicated that the predictors could remain in the regression model, but the strong correlations suggested conceptual overlap and supported interpreting them as interdependent project-management functions. Digital budgeting had the strongest simple association with project success, whereas relative importance in regression depended on each predictor's unique contribution.

The relationship between digital planning tools and project success is in line with Chen et al. (2025), who stated that digital project tools strengthen workflow organization, coordination, and delivery control when applied to practical project decisions. This supports the role of digital planning tools in improving activity organization and implementation discipline among youth agritech startups.

The relationship between digital communication tools and project success agrees with Akhorshaideh et al. (2024), who reported that IT tools improve project management efficiency through better team communication. This confirms the importance of team messaging, mentor feedback, stakeholder updates, video conferencing, and shared workspaces in strengthening project coordination.

The relationship between digital budgeting tools and project success reflects the view of Chima (2024), who explained that digital budgeting improves resource allocation, financial oversight, and budget efficiency. This supports the relevance of budget estimation, expense tracking, cost comparison, payment records, and financial transparency in startup project performance.

The relationship between digital monitoring and reporting tools and project success is consistent with Umar et al. (2024), who stated that project monitoring tools improve tracking, transparency, and timely project control. This confirms the value of indicator tracking, dashboards, data quality checking, report submission, and corrective action tracking in improving project progress.

4.4 Regression Analysis

Regression analysis was conducted to estimate whether digital planning tools, digital communication tools, digital budgeting tools, and digital monitoring and reporting tools were significant predictors of perceived project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District. The model summary showed the overall predictive power of the independent variables. The ANOVA table tested whether the regression model significantly improved prediction compared with an intercept-only model. The coefficients table estimated the unique association of each independent variable with perceived project success and guided decisions on the study hypotheses.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.915[a]	.838	.835	.12909	1.994

a. Predictors: (Constant), Digital Monitoring and Reporting Tools, Digital Communication Tools, Digital Planning Tools, Digital Budgeting Tools
b. Dependent Variable: Project Success

Source: Field Data, 2026

The model produced $R = 0.915$, $R^2 = 0.838$, and adjusted $R^2 = 0.835$. Thus, the four reported digital tool scores jointly accounted for 83.8% of variation in perceived project-success scores in this sample. The result was unusually high for a cross-sectional self-reported study and may partly reflect common-method variance, similar positive wording, restricted response variation, respondent optimism, or social-desirability bias. It was therefore treated as strong predictive association rather than unquestionable causal evidence. Durbin-Watson = 1.994 indicated acceptable independence of errors.

The results resonate with Monteiro et al. (2025), who argued that digital project management tools improve performance when they are embedded in daily project routines and decision processes. Khasawneh and Dweiri (2024) also observed that integrated digital platforms improve project success through planning, visibility, and decision support. This confirms that the combined use of digital planning, communication, budgeting, monitoring, and reporting tools provides a strong basis for explaining project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.

Table 6: ANOVA Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.055	4	4.514	265.529	.000
	Residual	3.500	210	.017		
	Total	21.555	214			

a. Dependent Variable: Project Success
b. Predictors: (Constant), Digital Monitoring and Reporting Tools, Digital Communication Tools, Digital Planning Tools, Digital Budgeting Tools

Source: Field Data, 2026

The overall regression was statistically significant, $F(4, 210) = 265.529$, $p < 0.001$. This result indicated that the four-predictor model improved prediction of perceived project success compared with an intercept-only model. It did not demonstrate that the predictors caused startup outcomes, and the residual row contained no F-statistic.

The outcomes are in harmony with Chen et al. (2025), who explained that technology-supported project work improves performance when it is connected to clear procedures, users, controls, and organizational routines. Mamatlepa and Mazenda (2024) also noted that project tool capacity improves implementation discipline and reduces execution weaknesses. This supports the position that digital project management tools work better when they are applied as connected project practices rather than isolated applications.

Table 7: Coefficients Summary

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	.146	.112		1.304	.194		
Digital Planning Tools	.098	.035	.117	2.800	.005	.446	2.244
Digital Communication Tools	.253	.036	.303	7.028	.000	.403	2.479
Digital Budgeting Tools	.248	.038	.298	6.526	.000	.365	2.742
Digital Monitoring and Reporting Tools	.274	.035	.328	7.829	.000	.437	2.287

a. Dependent Variable: Project Success

Source: SPSS Data, 2026

The adopted model for analysis was structured as follows:

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$

Therefore, the fitted regression model was:

Project Success = 0.146 + 0.098(Digital Planning Tools) + 0.253(Digital Communication Tools) + 0.248(Digital Budgeting Tools) + 0.274(Digital Monitoring and Reporting Tools) + ε

Digital planning tools had a positive unique association with predicted project success (B = 0.098, β = 0.117, t = 2.800, p = 0.005), holding the other predictors constant. A one-unit increase in the digital-planning score was associated with a 0.098-unit increase in the predicted project-success score. Tolerance = 0.446 and VIF = 2.244 were acceptable. Planning had the smallest standardized coefficient despite a strong simple correlation, suggesting that much of its association overlapped with communication, budgeting, and monitoring.

Digital communication tools had a positive unique association with predicted project success (B = 0.253, β = 0.303, t = 7.028, p < 0.001), holding the other predictors constant. A one-unit increase in the digital-communication score was associated with a 0.253-unit increase in the predicted project-success score. Tolerance = 0.403 and VIF = 2.479 were acceptable. The coefficient showed that communication retained a substantial unique association after shared variance with the other digital practices was considered.

Digital budgeting tools had a positive unique association with predicted project success (B = 0.248, β = 0.298, t = 6.526, p < 0.001), holding the other predictors constant. A one-unit increase in the digital-budgeting score was associated with a 0.248-unit increase in the predicted project-success score. Tolerance = 0.365 and VIF = 2.742 remained within accepted thresholds. Although budgeting had the largest bivariate correlation, its standardized regression coefficient was slightly lower than those of communication and monitoring because part of its relationship was shared with the other predictors.

Digital monitoring and reporting tools had the strongest unique association with predicted project success (B = 0.274, β = 0.328, t = 7.829, p < 0.001), holding the other predictors constant. A one-unit increase in the digital monitoring and reporting score was associated with a 0.274-unit increase in the predicted project-success score. Tolerance = 0.437 and VIF = 2.287 were acceptable. The result emphasized the practical importance of indicators, dashboards, data quality, reporting, and corrective-action closure.

Standardized coefficients ranked the predictors as digital monitoring and reporting tools (β = 0.328), digital communication tools (β = 0.303), digital budgeting tools (β = 0.298), and digital planning tools (β = 0.117). The ranking reflects unique statistical association in this model, not a definitive causal hierarchy. The comparatively small planning coefficient is consistent with overlap among the integrated management functions.

The predictive association of digital planning tools with project success aligns with Khasawneh and Dweiri (2024), who argued that digital infrastructure, supports project management through better planning and decision support. This finding indicates that digital planning tools are practically useful when they guide task organization, milestone mapping, resource planning, and deadline control.

The predictive association of digital communication tools with project success is consistent with Swart et al. (2022), who highlighted the importance of digital communication and knowledge-sharing routines in virtual project teamwork. This finding indicates that communication tools support coordination among startup members, mentors, partners, and beneficiaries.

The predictive association of digital budgeting tools with project success corresponds with Chima (2024), who linked digital budgeting with budget efficiency, resource allocation, and project oversight. This finding indicates the practical importance of budget estimation, expense tracking, cost comparison, payment documentation, and financial transparency.

The predictive association of digital monitoring and reporting tools with project success agrees with Gyamfi et al. (2024), who observed that technological solutions in agriculture support monitoring and efficiency when combined with user capability and collaboration. This finding indicates the practical value of progress tracking, reporting accuracy, and corrective-action follow-up.

4.5 Hypotheses Testing

Hypothesis decisions were based on the unique regression coefficients at the 0.05 significance level. Each decision reports the unstandardized coefficient, standardized beta, t-statistic, p-value, and a concise substantive interpretation. Rejection means that the predictor had a statistically significant unique association with perceived project success in the fitted model.

Table 8: Decision on Null Hypotheses

Null Hypothesis	Test Statistics	Decision
$H_0$1: Digital planning tools have no statistically significant influence on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.	B = 0.098; β = 0.117; t = 2.800; p = 0.005. Digital planning had a positive unique association.	Rejected
$H_0$2: Digital communication tools have no statistically significant influence on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.	B = 0.253; β = 0.303; t = 7.028; p < 0.001. Digital communication had a positive unique association.	Rejected
$H_0$3: Digital budgeting tools have no statistically significant influence on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.	B = 0.248; β = 0.298; t = 6.526; p < 0.001. Digital budgeting had a positive unique association.	Rejected
$H_0$4: Digital monitoring and reporting tools have no statistically significant influence on project success among youth agritech startups supported by the AYuTe Challenge in Kayonza District.	B = 0.274; β = 0.328; t = 7.829; p < 0.001. Digital monitoring and reporting had the strongest positive unique association.	Rejected

Source: Field Data, 2026

Table 8 presents the decisions made on the four null hypotheses. $H_0$1 was rejected because the p-value for digital planning tools was 0.005, which was below 0.05. Digital planning tools were therefore a statistically significant positive predictor of perceived project success after the other predictors were held constant; the result did not establish causation.

$H_0$2 was rejected because the p-value for digital communication tools was below 0.001, which was below 0.05. Digital communication tools were therefore a statistically significant positive predictor of perceived project success, indicating a unique association with coordination, stakeholder updates, mentor feedback, shared documentation, and knowledge exchange.

$H_0$3 was rejected because the p-value for digital budgeting tools was below 0.001, which was below 0.05. Digital budgeting tools were therefore a statistically significant positive predictor of perceived project success, with practical relevance for budget preparation, expenditure recording, payment tracking, cost monitoring, and financial transparency.

$H_0$4 was rejected because the p-value for digital monitoring and reporting tools was below 0.001, which was below 0.05. Digital monitoring and reporting tools were therefore a statistically significant positive predictor of perceived project success and had the largest standardized Beta coefficient among the four predictors. The decision reflected statistical prediction, not proof of a causal effect.

5. Conclusions and Recommendations

5.1 Conclusions

The study concluded that the use of digital planning tools was positively associated with higher perceived project success among AYuTe-supported youth agritech startups in Kayonza District. Planning supported task organization and sequencing, but its comparatively small unique coefficient suggested substantial overlap with the other management functions. The conclusion does not establish that planning caused objective project outcomes.

The study concluded that the use of digital project management tools was significantly associated with higher perceived project success among youth agritech startups under the AYuTe Challenge in Kayonza District. Digital planning, communication, budgeting, monitoring, and reporting tools were significant

predictors of how respondents assessed relevance, effectiveness, efficiency, impact, and sustainability. These findings support strengthening integrated digital management routines, while the cross-sectional self-reported design means that the results should not be interpreted as proof that the tools caused objective startup outcomes.

5.2 Recommendations

Based on the findings and conclusions of the study, recommendations were formulated in line with the specific objectives.

1. AYuTe programme coordinators and startup team leaders should introduce a standard planning pack containing a work breakdown structure, task-owner matrix, milestone sequence, resource plan, risk register, and monthly timeline review.
2. Startup founders should prepare clear digital project plans before implementation starts.
3. Mentors and startup leaders should use shared digital workspaces for communication and documentation.
4. Startup finance officers should regularly update digital budget records and share clear financial reports with mentors and stakeholders.
5. AYuTe Challenge coordinators should require regular digital progress reports from youth agritech startups.

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