

From Digital Access to Strategic Discipline? Computer Use, Women's Ownership, and Sales Targeting in Ghana's Informal Economy

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ABSTRACT

Digital technology is often presented as a route through which women entrepreneurs can overcome resource, information and mobility constraints. Less is known about whether basic computer use is connected to the internal management discipline of informal enterprises. This study examines whether computer or tablet use changes the relationship between women's ownership and setting a sales target for the next year. It also distinguishes target adoption from target review and tests related written-management practices. We analyzed the Ghana World Bank Informal Sector Enterprise Survey 2022. The primary strict-eligibility sample contained 3,320 confirmed informal enterprises in Accra, Kumasi and Tamale. Weighted logistic regression controlled for enterprise size, business age, owner age, owner experience, education, electricity requirements, machinery use, city and activity. Only 5.2% of represented enterprises used a computer or tablet, 65.8% were women-owned, and 11.2% set a sales target. Women-owned enterprises had a lower adjusted probability of computer use than man-owned enterprises (3.7% vs 7.5%), odds ratio = 0.41, $p < .001$. Without computer use, women-owned enterprises also had lower odds of sales targeting (odds ratio = 0.70, $p = .014$). Computer use was positively associated with sales targeting among man-owned enterprises (odds ratio = 3.01) and more strongly among women-owned enterprises (odds ratio = 9.68). The ownership-by-computer interaction was positive (odds ratio = 3.21; 95% confidence interval [1.58, 6.55]; $p = .001$). Adjusted target-setting probabilities were 11.4% for non-computer man-owned enterprises, 25.4% for computer-using man-owned enterprises, 8.6% for non-computer women-owned enterprises and 40.4% for computer-using women-owned enterprises. The probability difference-in-differences was 17.8 percentage points ($p = .007$). The interaction remained significant under all World Bank weights, unweighted and Firth models, Internet-use substitution, written-record controls, sales controls, weight trimming and most subsamples. A 1,000-replication stratified bootstrap produced a positive mean interaction but a percentile interval that narrowly included zero. Computer use also had a stronger association for women owners with written monthly budgets and annual profit-and-loss statements. However, among target-setting enterprises, computers did not improve target-review frequency for women; monthly review was uncommon in the small computer-using women-owned subgroup. The findings identify digital strategic activation with an important follow-through boundary. Computer use appears to help women-owned informal enterprises cross the threshold into explicit planning, but a device does not automatically create a complete data-driven management cycle. Cross-sectional associations cannot establish causality or distinguish whether strategic entrepreneurs adopt computers or computer use changes strategy. Policy should combine affordable devices and connectivity with practical training in target design, record integration, monthly review and corrective action.

Keywords: women entrepreneurs, computer use, sales targets, management practices, informal enterprises, digitalization, Ghana

INTRODUCTION

Digital technologies are changing how small enterprises communicate, receive payments, record transactions and make decisions. For a microenterprise, the relevant technology may not be artificial intelligence or advanced analytics. It may be a basic computer or tablet that lets the owner keep information, compare figures, and plan

beyond the current trading day. These simple uses can bridge digital access and strategic discipline.

The potential importance is especially high for women entrepreneurs. Women-owned enterprises in developing economies often operate with less capital, fewer employees, weaker business networks and greater household constraints. Informality can add institutional uncertainty and reduce access to services that support planning and growth (Ejaz et al., 2023; Islam & Amin, 2023). Digital tools may help women work around some of these constraints by lowering information costs, supporting remote interaction and making business data easier to organize.

However, access to technology and its strategic use are not the same. A computer may be used only for communication, entertainment or customer transactions. It may also remain unused because the owner lacks skills, electricity or relevant software. Digitalization research increasingly argues that benefits depend on how technology becomes embedded in business routines rather than on simple device ownership (Bar-Gill et al., 2024; Eekhout et al., 2023; Senyo et al., 2023).

Sales targeting is one such routine. A target converts a general desire to grow into a stated future benchmark. It requires the owner to estimate demand, consider capacity and define an expected result. A target can then support budgeting, record-keeping, performance review and corrective action. In very small enterprises, the existence of a target is therefore a direct indicator of forward-looking management rather than a sophisticated corporate-control system.

Recent experimental evidence shows that women-owned microenterprises can improve business practices when managerial capability is developed through structured training and mentoring (Bakhtiar et al., 2022). Digital tools may provide a complementary capability because they reduce the effort required to store, retrieve and compare business information. However, technology can also deepen inequality if women have less access to devices, skills and supportive networks.

Ghana's informal economy offers a valuable setting for examining this relationship. Informal enterprises are central to livelihoods and urban commerce, but they commonly operate with small workforces, limited written records and low adoption of formal planning. Women own a large proportion of these businesses. At the same time, computer use is rare, allowing the analysis to examine a meaningful threshold between enterprises that use a device and those that do not.

This study uses the Ghana World Bank Informal Sector Enterprise Survey 2022 to ask three questions. First, are women-owned informal enterprises less likely to use computers or tablets? Second, does computer use change the gendered pattern of sales-target adoption? Third, does the same pattern extend to written records, budgets, profit-and-loss statements and the review of actual sales against targets?

The article contributes in five ways. First, it studies internal strategic discipline rather than treating digital use only as a predictor of sales or productivity. Second, it tests gender and technology as a configuration. Third, it uses direct ownership and computer-use measures without gender or digital proxies. Fourth, it separates target setting from target review, which prevents an overly broad claim about data-driven management. Fifth, it applies the World Bank's strict informal-enterprise weight, alternative eligibility weights, penalised estimation, probability interpretation and stratified bootstrap analysis.

The findings reveal a strong but bounded pattern. Women-owned enterprises are less likely to use computers. Among non-users, they are also less likely to set a sales target. Where women owners use computers, this gap is reversed, and target adoption is especially high. Computer use is similarly linked to monthly budgeting and profit-and-loss preparation among women owners. However, target-review frequency does not show the same advantage. The evidence therefore supports digital strategic activation rather than complete digital management.

The study uses associational language throughout. Strategic owners may choose computers because they already plan more carefully. Computer use may also mark capital, education, or growth orientation that is not fully observed. The cross-sectional data cannot determine causal direction.

THEORETICAL BACKGROUND AND HYPOTHESES

Gendered Constraints and Computer Adoption

Women's informal entrepreneurship is embedded in gendered institutional and household conditions. Women may enter sectors with low capital requirements, operate from home, carry greater unpaid-care responsibilities and have weaker access to finance or technical networks. These conditions can shape both enterprise scale and technology adoption (Ejaz et al., 2023; Ogundana et al., 2021).

Digital tools can reduce some constraints, but access itself is unequal. Device cost, electricity, digital skills, safety concerns and social expectations can limit women's use of technology. Digital entrepreneurship research therefore distinguishes technology's potential affordances from the resources required to realise them (Kang, 2022; Suseno & Abbott, 2021).

In informal enterprises, a computer or tablet represents a larger commitment than owning a mobile phone. The device requires capital, electricity, skill and a business purpose. Women-owned enterprises with fewer workers, less machinery and lower average scale may therefore be less likely to cross this adoption threshold.

The expectation is not based on lower technological ability. It reflects differences in enterprise resources and gendered opportunity structures. Controls for size, education, age, experience, electricity, machinery, city and activity reduce but cannot eliminate these structural differences.

Hypothesis 1: Women-owned informal enterprises are less likely than man-owned informal enterprises to use a computer or tablet for business.

Computer Use and Strategic Sales Targeting

A sales target creates an explicit reference point for future performance. It requires the owner to move from reacting to daily transactions toward estimating what the enterprise should achieve. The target can guide purchasing, working capital, staffing and marketing decisions.

Digital tools can support this practice in several ways. They reduce the cost of recording past sales, make calculations easier and allow information to be stored across time. Even without advanced software, a spreadsheet, document or digital record can help the owner translate experience into a numerical plan.

Bar-Gill et al. (2024) show that giving small online sellers access to analytics can improve data-driven decision-making, although value depends on how owners use the information. Senyo et al. (2023) similarly show that digital systems can create new organising logics in Ghana's informal economy. The relevant mechanism is not the device alone but the shift toward information-based routines.

Computer use should therefore be positively associated with sales-target adoption. The association may reflect direct capability, strategic selection or both. Because the data are cross-sectional, the hypothesis concerns conditional association rather than technological causality.

Hypothesis 2: Computer or tablet use is positively associated with setting a sales target for the next year.

Digital Strategic Activation in Women-Owned Enterprises

The central argument concerns complementarity. Women owners may face a larger gap between business knowledge and formal strategic routines. They often manage customer relationships, household responsibilities and day-to-day operations simultaneously. Information may remain in memory or dispersed across paper notes and mobile messages.

A computer can be especially consequential where the baseline level of formal planning is low. It can make records easier to organise, support calculations and provide templates for budgets or statements. Digital tools

may therefore release strategic capability constrained by time, information-processing costs, or a lack of formal administrative support.

Research on women's digital entrepreneurship shows that technology can help women overcome boundaries and mobilise resources, but benefits remain contextual (Kang, 2022; Singh et al., 2023; Suseno & Abbott, 2021). The expected result is not that women are inherently more strategic users. Rather, the marginal organisational value of a device may be larger where women-owned enterprises start with lower access to formal management resources.

If this activation mechanism is present, computer use should narrow or reverse the ownership gap in target setting. The same pattern may appear in related written-management practices. However, reviewing actual sales against targets requires an additional routine. The owner must update data, interpret deviations and take action. Computer access may help target adoption without completing this cycle.

Hypothesis 3: Computer or tablet use positively moderates the relationship between women's ownership and sales-target adoption.

Research Question: Does the ownership-by-computer pattern extend from target adoption to written records, budgets, profit-and-loss statements and target-review frequency?

METHODS

Data Source and Survey Design

The study used the Ghana World Bank Informal Sector Enterprise Survey 2022. The survey covered informal business activities in Accra, Kumasi and Tamale. The enterprise was the unit of analysis. The public-use file contained 4,571 observations and 179 variables.

The Informal Sector Enterprise Survey uses area-based methods to locate businesses that do not appear on conventional establishment lists. The Ghana documentation provides strict, median and weak eligibility weights. The strict weight represents confirmed informal enterprises and was selected before analysis as the primary population weight. We used the median and weak weights for sensitivity analysis.

Regression weights were normalised to a mean of one. This retained relative population representation without treating weighted totals as additional independent observations. We used the World Bank stratum variable for within-stratum bootstrap resampling.

We inspected questionnaire labels, routing, negative response codes, and ranges before analysis. Labelled "do not know" responses and structurally routed blanks were treated as missing rather than substantive values.

Analytical Sample

The public-use file contained 4,395 enterprises that directly reported that they were not registered with the Registrar General. These enterprises formed the confirmed-informal domain.

The primary complete-case sample required valid female ownership, computer use, sales-target status, workforce size, business age, owner age, owner experience, education, electricity requirement, machinery use, city, activity, stratum and all three World Bank weights. The final sample contained 3,320 enterprises.

The sample included 311 target-setting enterprises, 147 computer-using enterprises and 2,172 women-owned enterprises. The smallest focal group contained 44 computer-using women-owned enterprises, of which 28 set a target. This cell was small but contained both outcomes, so complete separation was absent.

Secondary written-practice models used outcome-specific complete samples of approximately 3,300 enterprises. Target-review analysis was restricted to enterprises that reported a sales target and a valid review-frequency response, producing 309 observations. This smaller routed sample is interpreted cautiously.

Measures

Sales-target adoption. The primary outcome, ir7, asked whether the enterprise had a sales target for the next year. Yes was coded as 1 and no as 0. The measure is direct and forward-looking, but it does not show whether the target was realistic, written or achieved.

Women's ownership. The focal ownership variable, b2a, equalled one when the main owner was female and zero when the main owner was male. It is a direct owner-sex measure.

Computer or tablet use. The digital variable, c42a, equalled one when the enterprise used computers or tablets and zero otherwise. The question measures actual enterprise use, not household ownership, mobile-phone possession or digital skill.

Target review. The routed item ir8 recorded how often the enterprise compared actual sales with its target. We constructed two outcomes among target-setting enterprises: any comparison at least yearly versus never, and monthly-or-more-frequent comparison versus less frequent or never.

Related strategic practices. We examined four direct secondary outcomes: written business records, a written monthly cost budget, a cost budget for the next year, and preparation of an annual profit-and-loss statement. We did not create a composite index because these practices can move differently.

Control variables. Primary models controlled for logged workforce size, business age, owner age, owner experience, four education groups, electricity requirement, machinery or equipment use, city and activity type. These controls capture scale, maturity, human capital, infrastructure, productive capital and operating context.

Statistical Analysis

Weighted descriptive statistics first compared women-owned and man-owned enterprises. A weighted logistic model then estimated whether women's ownership predicted computer adoption.

Three hierarchical logistic models predicted sales-target adoption. Model 1 contained controls. Model 2 added women's ownership and computer use. Model 3 added their interaction. HC1 robust standard errors were reported.

Conditional odds ratios estimated the ownership relationship separately for computer users and non-users and the computer relationship separately for women-owned and man-owned enterprises. We calculated average adjusted probabilities for all four combinations, averaging over the observed controls.

We used six thousand simulations from the coefficient covariance matrix to generate intervals for adjusted probabilities and probability differences. The probability interaction was the difference in computer-use change between women-owned and man-owned enterprises.

Robustness tests used the median and weak World Bank weights, unweighted estimation, reduced controls, business Internet use instead of computer use, any worker computer skill, Internet and written-record controls, reported monthly sales controls, solo and multiworker subsamples, city and activity subsamples, weight trimming, a weighted linear-probability model and influence deletion.

An unweighted Firth bias-reduced logistic model assessed small-cell bias. We drew 1,000 bootstrap samples with replacement within World Bank strata and estimated them with strict eligibility weights. Ten-fold stratified cross-validation assessed discrimination and Brier score.

Separate logistic models examined written records, monthly budgets, next-year budgets, profit-and-loss statements and target review. These analyses test whether the primary pattern represents broader strategic discipline or only initial target adoption.

All tests were two-sided. Results are associations and should not be interpreted as causal effects of computers or women's ownership.

Ethical and Data Management Considerations

The study used anonymised secondary enterprise data under the World Bank Enterprise Surveys access conditions. The authors did not contact any owner or attempt to identify an enterprise. Only aggregate results are reported. The authors did not redistribute the firm-level dataset.

RESULTS

Sample Characteristics and Digital Access

Only 5.2% of represented informal enterprises used a computer or tablet. Women owned 65.8% of enterprises, while 11.2% set a sales target for the next year. The weighted enterprise employed 1.82 people and had operated for 6.72 years.

Women-owned enterprises had lower unadjusted computer use, sales targeting, workforce size, experience, electricity requirement and machinery use. Their weighted computer-use rate was 3.3%, compared with 8.8% in man-owned enterprises. Their sales-targeting rate was 9.2%, compared with 15.2%.

After controls, women's ownership remained negatively associated with computer use, OR = 0.41, 95% CI [0.29, 0.59], $p < .001$. Adjusted computer-use probabilities were 7.5% for man-owned enterprises and 3.7% for women-owned enterprises. Hypothesis 1 was supported.

Table 1 Weighted Characteristics of the Primary Sample

Characteristic	N	Weighted % or M	Weighted SD
Sales target for next year	3320	11.24	
Uses computer or tablet	3320	5.16	
Woman-owned enterprise	3320	65.83	
Workers last month	3320	1.82	1.69
Business age, years	3320	6.72	6.45
Owner age, years	3320	40.39	10.06
Owner experience, years	3320	8.02	6.98
Requires electricity	3320	47.62	
Uses machinery or equipment	3320	34.41	
City distribution			
1.0	1454	53.8	
2.0	1287	34.1	
3.0	579	12.1	
Activity distribution			
1.0	474	17.9	
2.0	2149	59.7	
3.0	697	22.4	

Note. N = 3,320. Estimates use the World Bank strict-eligibility weight for confirmed informal enterprises. Binary means are shown as percentages.

Table 2 Ownership Profiles and Adjusted Computer Adoption

Measure	Man-owned	Woman-owned	Adjusted comparison
Computer use	8.8%	3.3%	
Sales target	15.2%	9.2%	
Mean workers	2.05	1.69	
Mean business age	7.69	6.22	
Mean owner experience	9.43	7.28	
Requires electricity	52.7%	45.0%	

Uses machinery	48.6%	27.0%	
Adjusted computer-use probability	7.5%	3.7%	OR = 0.41, $p < .001$

Note. Unadjusted profile estimates use the strict weight. The adjusted computer-use model controls for size, age, experience, education, electricity, machinery, city and activity.

Sales-Targeting Patterns

The unadjusted target-setting pattern showed a clear crossover. Among enterprises without computers, 12.4% of man-owned enterprises and 7.6% of women-owned enterprises set a target. Among computer users, the rates rose to 45.1% and 56.6%, respectively.

Computer use was rare in both groups, but it was especially rare among women owners. Consequently, the high target-setting rate among computer-using women describes a small but strategically distinct subgroup rather than the typical women-owned informal enterprise.

Table 3 Sales-Target Adoption by Women's Ownership and Computer Use

Woman owner	Computer use	n	Target setters	Weighted sample %	Weighted target %
No	No	1045	122	31.2	12.4
No	Yes	103	43	3.0	45.1
Yes	No	2128	118	63.7	7.6
Yes	Yes	44	28	2.1	56.6

Note. Rates are unadjusted and use the World Bank strict-eligibility weight.

Hierarchical Target-Setting Models

Adding ownership and computer use substantially improved fit. In the additive model, women's ownership was negatively associated with target setting, while computer use was strongly positive.

In the interaction model, women's ownership among non-computer enterprises was associated with lower target-setting odds, OR = 0.70, 95% CI [0.53, 0.93], $p = .014$. Computer use among man-owned enterprises was associated with three times the odds, OR = 3.01, 95% CI [1.88, 4.82], $p < .001$.

The ownership-by-computer interaction was positive and significant, OR = 3.21, 95% CI [1.58, 6.55], $p = .001$. Among women-owned enterprises, the conditional computer-use OR was 9.68 (95% CI [5.55, 16.89]), $p < .001$. Among computer users, women's ownership was positively associated with target setting, OR = 2.26, $p = .019$.

The primary model supported Hypotheses 2 and 3. The interaction improved AIC and weighted discrimination, although the model remains an explanatory association rather than proof that computers cause target setting.

Table 4 Hierarchical Survey-Weighted Logistic Models Predicting Sales-Target Adoption

Predictor	Model 1 OR [95% CI]	Model 2 OR [95% CI]	Model 3 OR [95% CI]
Woman owner		0.81 [0.62, 1.06]	0.70 [0.53, 0.93]*
Computer or tablet use		5.19 [3.57, 7.55]***	3.01 [1.88, 4.82]***
Woman owner $\times$ computer			3.21 [1.58, 6.55]**
Logged workforce size	1.58 [1.29, 1.93]***	1.46 [1.18, 1.81]***	1.43 [1.16, 1.77]***
Business age	0.96 [0.93, 0.99]*	0.96 [0.93, 0.99]*	0.96 [0.93, 0.99]*
Owner experience	1.08 [1.05, 1.11]***	1.08 [1.05, 1.11]***	1.08 [1.05, 1.12]***
Requires electricity	2.08 [1.58, 2.73]***	1.74 [1.33, 2.29]***	1.73 [1.32, 2.27]***
Uses machinery	0.83 [0.63, 1.09]	0.76 [0.58, 1.01]	0.78 [0.60, 1.03]
AIC	2026.6	1951.8	1943.7
Weighted AUC	0.774	0.795	0.798
Weighted Brier	0.088	0.084	0.084

Note. N = 3,320. All models include owner age, education, city and activity. Entries are odds ratios with HC1 robust 95% confidence intervals. *p < .05. **p < .01. ***p < .001.

Adjusted Probabilities and Conditional Effects

Adjusted target-setting probability was 11.4% for man-owned enterprises without computer use and 25.4% for man-owned computer users. The corresponding probabilities for women-owned enterprises were 8.6% and 40.4%.

Computer use was associated with a 14.0-percentage-point increase among man-owned enterprises and a 31.8-percentage-point increase among women-owned enterprises. The probability-scale difference-in-differences was 17.8 percentage points, with a 95% simulation interval of [5.7, 30.3] and p = .007.

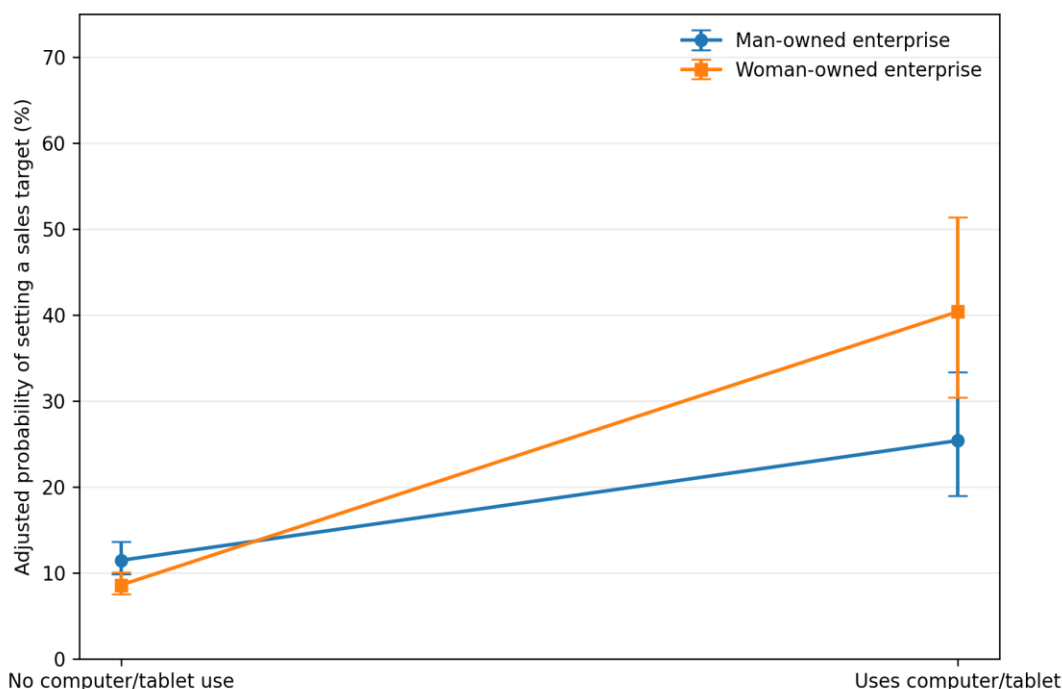
Without computer use, women-owned enterprises had a 2.9 percentage-point lower adjusted target probability. With computer use, women-owned enterprises had a 14.9 percentage-point higher probability. The pattern therefore moved from a gender gap to a women-owned advantage within the small computer-using subgroup.

Table 5 Conditional Odds Ratios and Average Adjusted Probabilities

Conditional comparison	OR or predicted %	95% CI	p
Woman-ownership association without computer use	0.70	[0.53, 0.93]	.014
Woman-ownership association with computer use	2.26	[1.14, 4.46]	.019
Computer-use association in man-owned enterprises	3.01	[1.88, 4.82]	< .001
Computer-use association in woman-owned enterprises	9.68	[5.55, 16.89]	< .001
Adjusted probabilities			
Man-owned, no computer	11.4%	[9.8, 13.6]	
Man-owned, computer use	25.4%	[19.0, 33.3]	
Woman-owned, no computer	8.6%	[7.5, 10.0]	
Woman-owned, computer use	40.4%	[30.4, 51.4]	
Probability difference-in-differences	17.8 pp	[5.7, 30.3]	.007

Note. Predictions average over observed values of all controls and use the strict survey weight. Intervals are based on 6,000 coefficient simulations. pp = percentage points.

Figure 1 Adjusted Sales-Target Probability by Women's Ownership and Computer Use



Note. Error bars show simulated 95% confidence intervals from the primary strict-weight interaction model.

Robustness and Diagnostic Results

The interaction remained significant under the World Bank median- and weak-eligibility weights, with ORs of 3.24 and 3.28. It was larger in the unweighted model, OR = 5.70, and in the Firth bias-reduced model, OR = 5.54. Reduced controls and exclusion of the highest 1% of strict weights did not change the conclusion.

Replacing computer use with business Internet use produced a positive interaction, OR = 3.04, $p < .001$. Controlling for Internet use left the computer interaction significant. This suggests that the focal relationship is not merely a connectivity effect.

Having any worker with computer skill did not produce a significant interaction. Actual enterprise computer or tablet use appears more relevant than the presence of a person who reports computer skill. This difference is consistent with the view that strategic capability requires applied use, not latent skill alone.

Controlling for written records did not remove the interaction. Adding reported monthly sales in the smaller complete-sales sample reduced the effect but left it significant, OR = 2.46, $p = .027$. The pattern therefore cannot be explained solely by larger current sales among computer users.

The interaction was strong among multi-worker enterprises and nonsignificant among solo enterprises. It was significant in Accra and reselling activities, but not in Kumasi or service provision. The manufacturing estimate was large but imprecise because few computer users were available. These differences indicate that digital strategic activation depends on work organisation and market context.

The weighted linear-probability interaction. The effect of digital strategic activation on performance was positive but nonsignificant. This is a scale-related caution. The logistic probability difference-in-differences was significant, but the linear model's robust interval was wider.

The 1,000-replication within-stratum bootstrap produced a positive mean coefficient and a two-sided p -value of .064. Its percentile odds-ratio interval ranged from 0.92 to 14.42. Thus, the interaction was positive in most weighted resamples but did not satisfy the most conservative bootstrap criterion.

The maximum Cook's distance was .024. Deleting the most influential observation left the interaction significant. Deleting all 207 observations above the 4/N heuristic produced an implausibly large coefficient and is not treated as evidence because mechanical deletion changed the sample composition.

Ten-fold cross-validation produced a weighted AUC of .767 and Brier score of .088. The model closely reproduced the observed target rate. It is useful for explaining group patterns but is not intended for predicting individual enterprises.

Table 6 Sensitivity of the Women's-Ownership-by-Computer Interaction

Specification	N	Interaction OR	95% CI	p
Primary strict-eligibility weight	3320	3.21	[1.58, 6.55]	.001
Median-eligibility weight	3320	3.24	[1.58, 6.63]	.001
Weak-eligibility weight	3320	3.28	[1.60, 6.73]	.001
Unweighted logistic model	3320	5.70	[2.50, 12.98]	< .001
Reduced controls	3320	3.10	[1.51, 6.37]	.002
Internet use instead of computer	3318	3.04	[1.77, 5.22]	< .001
Any worker with computer skill	3183	1.43	[0.81, 2.53]	.220
Control for business Internet use	3318	3.23	[1.53, 6.80]	.002
Control for written business records	3314	3.18	[1.49, 6.79]	.003
Control for reported monthly sales	2287	2.46	[1.11, 5.48]	.027
Solo enterprises	1928	1.71	[0.47, 6.20]	.417
Multiworker enterprises	1392	4.48	[1.78, 11.28]	.001
city=1	1454	4.57	[1.36, 15.30]	.014

city=2	1287	1.92	[0.63, 5.88]	.253
activity=2	2149	4.94	[1.75, 13.93]	.003
activity=3	697	0.30	[0.04, 2.01]	.214
Exclude top 1% strict weights	3287	3.85	[1.89, 7.83]	< .001
Drop most influential observation	3319	3.46	[1.69, 7.07]	< .001
Unweighted Firth correction	3320	5.54	[2.41, 12.75]	< .001
Stratified bootstrap	1000	—	OR interval [0.92, 14.42]	.064

Note. Internet and computer-skill rows use the corresponding digital variable and interaction. City 1 is Accra, city 2 is Kumasi, activity 2 is reselling, and activity 3 is service provision. The bootstrap uses 1,000 within-stratum resamples and strict weights.

Related Strategic Practices

Computer use was positively associated with every written-management practice examined. The association among man-owned enterprises ranged from OR = 3.76 for a written monthly budget to OR = 5.44 for a next-year cost budget.

The computer relationship was more positive for women owners in two outcomes. The interaction OR was 2.76 for a written monthly-cost budget, $p = .009$, and 2.67 for an annual profit-and-loss statement, $p = .010$. The written-record interaction was positive and marginal ($p = .051$). The next-year budget interaction was absent.

These findings suggest that the primary target-setting pattern is part of a broader movement toward basic financial discipline, but not every planning practice is gender-contingent. Computer use has a strong general relationship with written management across both ownership groups.

Table 7 Computer Use, Women's Ownership, and Related Written-Management Practices

Outcome	N	Woman owner OR	Computer-use OR	Interaction OR	Interaction p
Written records	3343	0.50	4.05	2.07	.051
Written monthly-cost budget	3343	0.69	3.76	2.76	.009
Next-year cost budget	3324	0.76	5.44	0.91	.802
Annual profit-and-loss statement	3337	0.78	4.17	2.67	.010

Note. Each outcome is estimated separately with the primary control structure and strict weight. Odds ratios are conditional on the interaction model.

Target Review: A Follow-Through Boundary

Setting a target is only the first part of strategic discipline. Among 309 target-setting enterprises with valid review information, 233 compared actual sales with the target at least yearly and 63 did so monthly or more frequently.

Computer use did not produce a significant women-owner advantage in any review. The interaction OR was 0.57, $p = .499$. The monthly-review interaction was negative and marginal, OR = 0.18, $p = .069$.

Descriptively, 51.2% of computer-using man-owned target setters reported monthly review, compared with 11.6% of computer-using women-owned target setters. This women-owned subgroup contained 36 enterprises, so the estimate is unstable and should not be read as a general disadvantage.

The result establishes an important boundary. Computers are strongly associated with women owners adopting explicit targets, written monthly budgets and profit-and-loss statements. However, the survey provides no evidence that these targets are reviewed more frequently. Digital access may initiate a management cycle without ensuring continuous performance control.

Table 8 Target Review among Enterprises That Set a Sales Target

Outcome	N	Woman owner OR	Computer-use OR	Interaction OR	Interaction p
Compares sales with target at least yearly	309	0.46	1.31	0.57	.499
Compares sales with target monthly or more	309	0.70	2.77	0.18	.069
Weighted monthly-review rates					
Man-owned, no computer	138	—	82.8% any	25.5% monthly	
Man-owned, computer use	50	—	88.2% any	51.2% monthly	
Woman-owned, no computer	142	—	70.2% any	25.8% monthly	
Woman-owned, computer use	36	—	72.8% any	11.6% monthly	

Note. The review sample is routed through Target Adoption and contains only 309 enterprises. Results are therefore exploratory. “Any” means at least once yearly; “monthly” means monthly or more often.

DISCUSSION

Interpretation of the Findings

This study examined whether computer use changes the relationship between women’s ownership and strategic sales targeting in Ghana’s informal economy. The findings reveal both a digital divide and a pattern of digital strategic activation.

Women-owned enterprises were less than half as likely to use a computer or tablet after accounting for observable enterprise and owner differences. This result is consistent with gendered constraints in capital, scale, infrastructure and technology access. The adjusted adoption gap was modest in absolute terms because computer use was rare for everyone, but it was large proportionally.

Among enterprises without computers, women owners were less likely to set a sales target. This gap may reflect smaller scale, shorter planning horizons, resource constraints, household demands or weaker access to formal managerial support. The controls rule out several explanations but cannot capture all gendered conditions.

Computer use changed the pattern sharply. It was associated with target adoption in both ownership groups, but the association was much larger among women-owned enterprises. The adjusted probability for women owners rose from 8.6% to 40.4%. Among computer users, women-owned enterprises were more likely than man-owned enterprises to set a target.

The result is compatible with digital strategic activation. A computer may allow women owners to organise sales information, calculate future needs and move knowledge out of memory into an explicit plan. It may also mark a subgroup with stronger growth orientation, education, capital or external support. The cross-sectional data cannot distinguish activation from selection.

The broader-practice results provide partial support for the activation interpretation. Computer use was more strongly associated with women owners’ written monthly budgets and annual profit-and-loss statements. These practices require information organisation and repeated calculation, functions that computers can support.

However, the target-review analysis shows that adoption is not completion. Computer-using women owners were not more likely to compare actual sales with targets, and monthly review was uncommon in the small-routed subgroup. A target can be created once and then ignored. Strategic discipline requires recurring data entry, interpretation and action.

The difference between computer use and computer skill is also important. Having someone with computer ability did not generate a significant interaction, while actual enterprise use did. Capability appears to depend on integrating technology into business routines, not merely possessing individual skill.

The bootstrap and linear-probability results require caution. The primary logistic interaction was significant under all three weights, unweighted estimation and Firth correction. However, the stratified bootstrap interval narrowly included zero, and the linear-probability interaction was nonsignificant. The pattern is strong in point estimates and several specifications, but exact population magnitude remains uncertain.

Theoretical Implications

First, the study connects digital entrepreneurship with microenterprise management practice. Digital research often focuses on market access, communication or finance. The present evidence shows that computers may also be linked to internal strategic routines such as targets, budgets and statements.

Second, the findings support a configurational gender perspective. Women's ownership was associated with lower strategic discipline when computers were absent, but higher target adoption when they were used. Average gender coefficients conceal this crossover.

Third, the article distinguishes access, skill, use and routinisation. Women's digital inclusion cannot be measured only through device ownership or the presence of a skilled person. Strategic value emerges when a device is used in the enterprise and connected to management practices.

Fourth, the target-review boundary refines data-driven decision-making theory. Digital access can make information practices possible without creating a complete feedback loop. The firm must still record actual outcomes, compare them with the target and respond to deviations.

Fifth, the multiworker result suggests that digital activation is connected to organisational complexity. When the owner works alone, a target may remain informal and personally understood. Once other workers are involved, explicit targets and computer-supported information may become more valuable for coordination.

Sixth, the study contributes to women's informal entrepreneurship research by locating agency within institutional and technological conditions. The women owners who use computers appear strategically distinctive, but the low adoption rate shows that this route remains unavailable to most women-owned informal enterprises.

Managerial Implications

Informal-enterprise owners should treat a computer as a management tool, not just a communication device. A simple spreadsheet can record monthly sales, calculate average performance and compare results with a target.

Owners should write targets in a specific form: the expected amount, the time period, the assumptions behind it, and the actions required. Without these elements, a target is hard to review.

Target review should be scheduled. A monthly routine can compare actual sales, identify the gap, explain the reason and select a corrective action. This routine is more important than creating an elaborate dashboard.

Women entrepreneurs adopting computers may benefit from templates designed for very small enterprises. Complex accounting packages can discourage use. Simple tools should connect sales records, monthly costs, cash needs and target review.

Owners should separate personal and enterprise information. Digital records should use passwords, backups and clear file names. Data loss or unauthorised access can destroy trust in the technology.

Business associations and mentors should evaluate use, not attendance. Training should ask whether the entrepreneur has created a target, entered actual figures, reviewed the gap and taken action.

The findings should not be used to describe non-computer women owners as unstrategic. Many manage through memory, notebooks and social knowledge. The managerial objective is to reduce the effort and risk of formalising useful information, not to dismiss existing practices.

Policy Implications

Digital-inclusion policy for women entrepreneurs should combine affordable devices, reliable electricity, connectivity and applied management training. Providing a device without a relevant business routine may produce little strategic change.

Public and private programmes can develop lightweight sales-target and budgeting applications in simple English and major Ghanaian languages. Offline capability is important where connectivity is unreliable or costly.

Women-focused enterprise programmes should include a full target cycle: establish a baseline, set a realistic target, record actual sales, compare monthly and decide on corrective action. The present study suggests that follow-through is the weakest stage.

Microfinance institutions can offer optional digital record-keeping and planning support without making complex software a condition for credit. Overly demanding digital requirements may exclude the smallest women-owned enterprises.

Training schedules and locations should consider care responsibilities and market hours. Short modular sessions, peer groups and assisted practice may be more accessible than long classroom programmes.

Policy evaluation should report computer adoption, actual business use, target creation, review frequency and outcomes separately. Combining these stages into a single digitalisation score would hide where the process fails.

Future informal-enterprise surveys should measure the applications used, frequency of computer use, who enters data, whether targets are written, whether actual results are recorded, and what actions follow review.

Limitations and Future Research

The first limitation is the cross-sectional design. We measured computer use and sales targeting at the same time. Strategic owners may adopt computers, computers may encourage strategy, or both may reflect unobserved capability.

Second, computer use is binary. The survey does not identify whether the device is owned or shared, which applications are used, how frequently it is used or whether it stores business records.

Third, sales-target adoption is binary. It does not indicate whether the target is written, realistic, ambitious, achieved or connected to employee incentives.

Fourth, the computer-using women-owned group contains only 44 complete-case enterprises. Although the interaction survived Firth correction and several models, larger samples are needed for precise subgroup estimates.

Fifth, the target-review sample is selected and small. Only target setters answer the review question. The negative monthly-review interaction may reflect small-cell variation and should be replicated.

Sixth, the data cover Accra, Kumasi and Tamale rather than every Ghanaian informal enterprise. Rural businesses and enterprises in other cities may face different digital constraints.

Seventh, women's ownership is binary. It does not measure multiple owners, household control, decision authority or whether another person manages the technology.

Eighth, omitted variables may include growth aspiration, prior training, access to mentors, device cost, digital self-efficacy, household care responsibilities and business security.

Future research should use longitudinal or experimental designs. A useful intervention would provide women owners with a basic device, a sales-record template and repeated coaching, then measure target adoption, monthly review, action and performance separately. Qualitative work should examine how women integrate digital planning with household and market routines.

CONCLUSION

This study examined whether computer use changes the relationship between women's ownership and sales targeting in Ghana's informal economy.

Women-owned enterprises were substantially less likely to use computers and were less likely to set sales targets where computers were absent. Where women owners used computers, the target-setting gap was reversed, and adjusted target adoption reached 40.4%. Computer use was also more strongly linked to women owners' monthly budgets and profit-and-loss statements.

The advantage did not extend clearly to target review. Digital access appears to activate explicit planning, but it does not automatically create a continuous data-driven management cycle.

The strategic lesson is that technology and management practice must be built together. A device can lower the cost of planning, but discipline emerges only when targets, records, review and action become a repeated organisational routine.

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APPENDIX A

Variable Coding and Reproducibility Summary

Table A1 Variables and Coding

Construct	Survey variable	Coding or transformation
Woman owner	b2a	1 = owner is female; 0 = owner is male; labelled nonresponse excluded
Computer or tablet use	c42a	1 = enterprise uses computers or tablets; 0 = no
Business Internet use	GHAc2a	1 = Internet used for business; 0 = no; sensitivity analysis
Sales target	ir7	1 = has a sales target for next year; 0 = no
Target review	ir8	Any review = yearly or more versus never; monthly review = monthly or more versus less frequent/never
Written records	ir4	1 = keeps written business records; 0 = no
Monthly budget	ir6	1 = has a written budget for monthly costs; 0 = no
Next-year budget	ir9	1 = prepared a cost budget for next year; 0 = no
Profit-and-loss statement	ir10	1 = prepares a statement at least yearly; 0 = no
Enterprise size	sc2	Natural logarithm of people working in the previous month

Business age	b3 and a14y	Survey year minus start year
Owner age	b9	Valid owner age in years
Owner experience	b10	Years of business experience
Education	GHA b11	Primary or less; junior high; senior/vocational; tertiary
Electricity requirement	c31	1 = electricity required for goods or services; 0 = no
Machinery or equipment	n3	1 = uses machinery or equipment; 0 = no
City	city	Accra, Kumasi or Tamale
Activity	a41a	Making goods, reselling goods or providing services
Primary weight	wstrict	Strict-eligibility weight for confirmed informal enterprises, normalised in regression
Alternative weights	wmedian and wwweak	Median- and weak-eligibility sensitivity weights
Survey strata	strata	Used for within-stratum bootstrap resampling

Note. The primary complete-case sample contained 3,320 confirmed informal enterprises. We treated labelled negative codes and routed blanks according to the questionnaire and data dictionary.

Analytical Sequence

1. Inspect identifiers, survey labels, routing, value codes, eligibility weights and focal cross-tabulations.
2. Restrict the domain to enterprises that directly reported not being registered with the Registrar General.
3. Construct direct ownership, computer-use, target, review and written-practice variables.
4. Estimate weighted computer-adoption and hierarchical target-setting models with strict eligibility weights.
5. Calculate conditional odds ratios, adjusted probabilities and probability-scale interactions.
6. Re-estimate with alternative eligibility weights, unweighted and Firth models, Internet and skill measures, sales and record controls, subsamples, weight trimming and influence checks.
7. Examine written records, budgets, profit-and-loss statements and target review as distinct outcomes.
8. Conduct 1,000 within-stratum bootstrap replications and ten-fold stratified cross-validation.