

SMS Training and Micro-Entrepreneurship Performance*

PRELIMINARY AND INCOMPLETE VERSION

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Abstract

The paper provides evidence of the effectiveness of massively scalable automated SMS business training. The training has very low marginal costs and requires only basic cell phone coverage for enrollment. We conducted a large-scale Randomized Control Trial in which we randomly manipulated the timing of delivery of the training to small shopkeepers in Kenya. In particular, the treatment group obtained *financial resilience* training during the December 2020 holidays, while the control group obtained the same module in November 2020. This timing manipulation successfully led to a higher intensity of received training in the treatment group. We find that the treatment group reports larger monthly revenue, greater financial resilience, more extensive usage of formal book-keeping, and a better self-reported understanding of financial concepts.

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1 Introduction

Economic literature has long stressed the importance of business practices business for firm performance (see Abowd, Haltiwanger, Jarmin, Lane, Lengermann, McCue, McKinney, and Sandusky, 2005; Syverson, 2011). Well-managed firms have greater productivity, profitability, and ultimately higher survival rates (see Bloom and Van Reenen, 2007). Despite the potential benefit, the literature documents lack of adoption of even basic business practices among millions of small entrepreneurs and firms, who form an essential part of the economy in developing countries (see McKenzie and Woodruff, 2017). Consequently, significant public and private efforts are devoted to introduce modern business practices and to train small entrepreneurs in these countries. The challenge is to design and deliver cost-effective programs at scale that can reach millions of small and micro-entrepreneurs and improve their business outcomes.

Past training efforts mostly take the form of traditional in-person business training or intensive business consulting. However, as a recent review (McKenzie, 2020) documents, the existing evidence from studies across the world has generated skepticism about the cost effectiveness of these traditional in-person business training methodologies in improving outcomes for small entrepreneurs.¹ This paper provides the first experimental evidence that an interactive, automated, and scalable form of digital training based on SMS technology effectively induces the adoption of modern business practices, such as book-keeping and lending, and raises business profitability.

The experience of mobile money in Africa and other developing nations highlights the potential of digital communication technology such as SMS to revolutionize access to training. Like banking, traditional in-person training programs face several inefficiencies: First, in-person training programs have significant difficulty and cost of reaching intended audiences. This friction is substantial when the population is rural and geographically dispersed. Second, in-person training programs involve time investments from small business owners and may require them to take time off during business hours to attend the training. The requirement to take time off may lead to non-trivial opportunity costs of foregone business

¹For example, McKenzie and Woodruff (2014) review thirteen of the published studies and report statistically significant effects only in two studies.

resulting in low take-up rates.

Digital training through SMS technology has the potential to alleviate these inefficiencies due to its flexibility and its ability to deliver training at negligible marginal costs. Training may take place at the business owner’s choice of location and time, and the owner can decide to learn the content in smaller, more manageable packets. In this manner, training through SMS delivery can decentralize the learning to the business owner’s choice of what, when, and how much to learn, potentially leading to greater engagement. Although one might be skeptical of the effectiveness of SMS as a medium to teach business knowledge and to change behavior, there exists some evidence that over-the-phone solutions are effective. In particular, Cole and Fernando (2021) find that mobile phone advice hotline manned by human operators do improve intermediate inputs and the final output for farmers in Gujarat, India.² The effect is not as large as when consultants are deployed on-site (Bloom, Eifert, Mahajan, McKenzie, and Roberts, 2013) or when firms get intensive in-person training. However, given that the per-unit cost of the decentralized virtual solutions is significantly smaller (our SMS training costs Mastercard approximately \$2.30 per user), they may deliver comparable or higher returns per dollar invested than the more expensive in-person programs.

Compared with previously deployed virtual training, our training technology, in addition to being decentralized, is automated and does not require human trainers or consultants. This significant innovation further decentralizes access because the content is available at any time. Automation also removes the labor costs of trainers, which lowers the marginal cost of the deployment by an order of magnitude while providing significantly shorter time-to-market.³ Lastly, the SMS technology also enables reaching disadvantaged entrepreneurs who are at the fringes of the cellphone towers where robust voice reception is not supported but where SMS is still operational. Thus, even if the identified effects are modest, as compared to human-driven solutions, an automated, SMS-based solution may likely have a superior return on investment while improving inclusion.

²In addition, Anderson and McKenzie (2022) find that intermediate solution of mixing online and in-person classes may also be successful. In contrast to both these studies, the delivery of SMS training in this paper can be fully automated.

³Indeed, our partners were able to deploy the SMS training to thousands of entrepreneurs within a matter of weeks.

This paper presents the outcome of a large-scale randomized controlled experiment in partnership with Mastercard’s Center for Inclusive Growth and Arifu, a Kenyan-based company that creates digital content and interactive learning platforms. Arifu was responsible for developing the financial resilience SMS training. This training aimed to provide small micro-retailers with the necessary business skills, including financial management, merchandising, safe financial practices, and business funding options. In addition, the research team was engaged in designing and supervising the randomized control trial that would evaluate the effectiveness of the SMS training program. A vital component of this program was to demonstrate proof of concept for using automated digital platforms as an effective, low-cost, and scalable training solution for small merchants.

The SMS training platform is an interactive and technologically resilient learning solution. SMS messages with personalized learning content are sent to the learner, which triggers the opening of a menu on the phone that allows multiple-choice responses to the message. Based on the responses, relevant content are progressively served, making the learning process engaging. The experiment manipulated the timing of the training deployment. Specifically, the treatment group consisted of retailers who received the SMS training module during the December 2020 holiday period, while the control group was retailers who received it in November 2020. As we will demonstrate through relevant manipulation checks, the SMS training timed during December 2020 is associated with higher reported intensity of received training as intended by the experiment. Implementing a pure control with no training was impossible due to the research team’s equity concerns in providing resilience training during the ongoing COVID-19 pandemic. Instead, the treatment (holiday) effect of SMS training may be regarded as a conservative lower bound of the effect of training on the firm revenue and the adoption of business practices.

We measured the causal impact of training on three types of outcomes. First, we solicit self-reported manipulation checks that provide preliminary evidence that the training was more effective in the treatment group. In particular, more subjects in the treatment group reported that they received any business training, and more chose business training as the most useful type of assistance during the pandemic. In addition, more shop owners in the treatment group reported that SMS training impacted their business practice.

Beyond the manipulation checks, we measured two types of outcomes: intermediate inputs, and final business performance metrics. We find that treated entrepreneurs have higher revenue and are more resilient to the COVID-19 shock. In particular, 8 percentage points (p.p.) fewer entrepreneurs in the treatment group reported that they had liquidated their property to pay off their debts. We also find that significantly more entrepreneurs in the treatment group understand what is a financial interest, engage in some form of book-keeping, and more frequently check their retail credit card balance. This improvement in behavioral measures and business practices serves as a potential pathway to generating higher revenue and greater financial resilience.

Further, we collected longer-run performance measures to demonstrate the effect of training over time and rule out memory and salience effects. We deployed a shorter version of the survey 6 months after training and find significant impact of the manipulation on daily and monthly profits.

2 Experimental Design

The randomized field experiment manipulates the access to the Arifu SMS training deployed across Kenya. The experiment was executed as part of ‘Jaza Duka’, an innovative credit initiative for small micro-retail entrepreneurs launched at the beginning of 2019 by Mastercard in partnership with Unilever and KCB Bank Kenya Limited.⁴ Jaza Duka offers a credit line to small retailers to alleviate financial constraints by providing working capital to help the retailers to grow sales. Notably, the credit qualification of the retailers relied only on the history of purchases from Unilever. It did not require the retailer to have a prior credit history, bring collateral, or be part of a lending group. For these reasons, Jaza Duka became the first genuinely accessible loan for many small retail entrepreneurs. MasterCard offered the program to more than 40,000 retailers across Kenya, of which nearly 13,000 retailers opened the credit line.

Jaza Duka is a relatively complex credit product, resembling a credit card with a 17-day interest-free grace period and minimum payment requirements. For this reason, the

⁴‘Jaza Duka’ means “fill up your store” in Swahili.

rollout was accompanied by several training programs executed by MasterCard’s Center for Inclusive Growth. The training programs used varied from intensive, high-cost, traditional in-person business training to a lighter-touch, low-cost, scalable, interactive Short Message Service (SMS) training, which is the subject of this study.

The SMS training was designed and executed by Arifu, an experienced Kenyan interactive digital learning platform provider. The SMS training was executed as part of the COVID credit relief initiative for Jaza Duka merchants. As of September 2020, following decreases in sales after COVID restrictions, nearly 50% of the Jaza Duka credit lines were restricted for non-payment or closed entirely. In collaboration with Unilever, MasterCard designed a credit relief package that included credit relief, accounts top-ups, and financial resiliency training through SMS. The manipulation of the SMS training was part of a larger impact evaluation of the credit relief package.

The randomized controlled experiment consisted of three independent arms that manipulated the timing of SMS training and the offer of credit relief to the population of 7,400 retailers. Jaza Duka retailers who took credit under the program. First, a random 30% of retailers in the sample obtained both SMS training and credit relief in November 2020 (early training; early credit). Then, the second arm of a randomly selected 40% of the sample was given early SMS training in November 2020 and credit relief later in December 2020 (early training; later credit). Lastly, the remaining 30% obtained SMS training in December 2020 and credit relief in November 2020 (training later; credit now).⁵

Because of the urgent humanitarian need of the COVID resilience package and MasterCard’s objectives, we decided against obtaining a pure control group that does not receive training. Instead, we designed the study in a manner that helps to estimate a conservative lower bound of training effectiveness by comparing the performance of stores that receive the training in November versus in December. This timing is convenient for our purposes since December is a holiday period which brings into play mechanisms that can affect the impact of training; first, based on the anecdotal evidence from Arifu, SMS training during the December holiday period is associated with higher engagement. A higher level of en-

⁵In addition 5,138 retailers were not eligible for credit relief. These retailers were also randomized into November/December training arms with equal proportion. These retailers were not surveyed and are not included in the data used in this paper.

agement may occur because the holiday season offers more spare time and, therefore, more opportunities to engage with training. In addition, it may also be that the holidays being a favorable demand period in Kenya induces retailers to perceive greater value in training. Indeed, we conducted several manipulation checks to investigate whether or not the timing manipulation affected the intensity with which the retailers received the training as intended in the experiment.

The outcome measures were obtained using two telephone surveys of 1,500 stores proportionally distributed across the three experimental arms. The first survey was conducted in March 2021, and the second was conducted in starting 14th of July, 2021. The first survey population was randomly drawn from the available pool of subjects until we reached a target of 500 respondents per arm. The surveyors tried to connect with a potential subject up to three times. If the potential subject did not pick up the phone or their phone was immediately disconnected, they were replaced. The first survey was approximately 30 minutes and solicited basic demographic information, proxies for treatment intensity, and an array of outcome measures. The second survey aimed to measure the longer-run impact of the treatment was shorter (15 minutes) and contained only basic demographic information and a smaller subset of outcome measures. All respondents that completed the initial survey completed the second survey.

Table 1 contains summary stats. More than 95%, or 1,434 stores, completed the survey. The top panel of the table presents chosen summary statistics from the initial survey. First, we gauge if the shops remember receiving Arifu’s SMS training by asking, “Did you receive SMS training as part of Jaza Duka?.” We find that 88% of respondents said that they received SMS training. Based on Arifu’s records, approximately a similar proportion of subjects interacted with the SMS chatbot. Next, to obtain a self-reported measure of training efficacy, we asked the respondents the following question “*What types of assistance (financial or non-financial) do you think is the most important for you to survive in the business? Please list all that apply*”. The possible options were: (i) More loans, (ii) Rent or bill help, (iii) Wage subsidy, (iv) Business training, (v) Lower wholesale price, and (vi) Other (open-ended response). About 27% of respondents included business training as the most important type of assistance. Lastly, to all those respondents that report receiving SMS

	Mean	Std. dev.
Training during holidays	0.32	0.47
Earlier credit relief	0.66	0.47
What is your age?	37.81	14.56
Received SMS business training	0.88	0.32
Business training is the most useful	.27	.45
SMS training impacted business practice	.78	.42
Monthly revenue	137,212.96	508,070.65
Written financial records	0.76	0.43
Understands interest	0.80	0.40
Credit balance checking frequency	3.61	1.50
Liquidate property to pay back loans	0.09	0.28
Daily revenue longer-run	10,998.92	3,1641.84
Daily profit longer-run	1,227.77	2,596.08
Monthly revenue longer-run	190,346.70	758,187.13
Monthly profit longer-run	18,361.76	33,486.72
Credit purchase first week of November, 2020	599.66	1855.76
N	1,434	

Table 1: Summary stats

training, we posed the following question: “*How have your business practices been impacted by training?*” Nearly 78% (which is 88% of those that responded “yes” to the first SMS training question) reported an impact of the training on their business practices. Overall, these aggregate statistics provide some suggestive evidence of the respondent’s beliefs about the impact and the effectiveness of the SMS training.

The average monthly revenue of retailers in the sample was 137,213 Shillings, which as of the January 2022 exchange rate, amounts to approximately 1,200 USD. We asked if the store keeps written financial records and understands the concept of a loan interest. Nearly 80% of stores mention that they keep written financial records, and more than 80% of the retailers mention that they understand the concept of loan interest.

One of the frictions that retailers face in using Jaza Duka is that they may have attention costs of monitoring the credit card’s balance and monthly payment amounts. Therefore, a part of Arifu’s SMS training was designed to make the trainees more attentive to checking their balance and payments. To obtain insight into this possible friction, we asked, “When was the last time you checked your Jaza Duka balance.” The answers are reported in Table

When was the last time you checked Jaza Duka balance	No	Pct.
Earlier today	52	8.61%
Yesterday	99	16.39%
Earlier this week	227	37.58%
More than one week ago	116	19.21%
A month ago	40	6.62%
More than one month ago	37	6.13%
Never	21	3.48%
Total	604	

Table 2: When was the last time you checked Jaza Duka balance

2. We asked this question only to retailers that recalled using Jaza Duka (i.e., 604 stores). More than 35% did not check their Jaza Duka balance for more than a week despite using Jaza Duka. We constructed a checking frequency score by coding the responses from 0 to 6, where “earlier today” is 6 and never is 0. The average frequency score as reported in Table 1 is 3.61.

	(1)	(2)	(3)	(4)
	Female	What is your age?	What is your highest completed education level?	Credit purchase first week November, 2020
Training during holidays	0.00856	-0.551	-0.0567	-119.1
	(0.0280)	(0.823)	(0.0465)	(104.7)
N	1433	1432	1432	1434

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Randomization checks

The Jaza Duka credit line and the relief package, which included the SMS training, aimed to alleviate the liquidity problems that retailers faced due to the reduction in sales due to COVID-19. To estimate the extent of the liquidity gap, we asked “*Did you have to sell any of your belongings to pay back loans in the last 3 months?*” Approximately 9% of respondents answered “yes” to this question, which suggests a significant liquidity shortage.

The shorter follow-up survey was designed to estimate the longer-run impact of our intervention on business performance measures such as revenue and profits. The four measures are reported in the bottom panel of Table 1. According to the panel, the average revenue

increased from 137,000 to 190,000 Shillings. This increase is primarily due to seasonality and the easing of COVID-19 restrictions. We solicited both daily and monthly revenues and profits to decrease the possible measurement errors of the self-reported measures.⁶ Store owners may account for fixed costs differently when estimating daily and monthly profits. In particular, we conjecture that fixed costs are less likely to be included in the estimates of daily profits because of the monthly cost payment cycles. In contrast, fixed costs are more likely to be included in the estimates of monthly profits. Indeed, we find that the average margin of the store is approximately 11% and 9% when using daily and monthly numbers, respectively. Lastly, we obtained a pre-experimental measure of credit purchase volume in November 2020. This measure, as discussed below, would serve as one of the randomization checks and is reported in the third panel of Table 1.

Table 3 contains randomization checks. Since the urgency of the relief program precluded us from conducting a pre-treatment survey, we perform randomization checks using individual characteristics that are not affected by the treatment, such as gender, age, and education. In particular, 1,433 respondents answered questions about their gender, while 1,432 answered their age and education questions. None of these characteristics vary in a statistically significant way between treatment and control arms.

We also obtained the data from Mastercard on actual credit purchases in the first week of November 2020, which is before the treatment rollout. We compare these purchases across treatment and control for the population that responded to the survey and do not have statistically significant differences. These results suggest that we implemented the randomization correctly.

In addition to randomization checks, we also conducted manipulation checks to investigate if our timing manipulation affected the intensity of the SMS training received, as intended by the experiment. First, we investigate if there are any differences between the fraction of shop-owners that report receiving Arifu’s SMS training, depending on the timing, and we find no such differences across the timing conditions. In contrast, 2.7pp more subjects report receiving “business training” in the treatment group. These results are not

⁶Overall, daily numbers are consistent with monthly numbers after accounting for the fact that most stores are closed on weekends and for significant stock-outs. Specifically, the daily numbers are approximately 17 times smaller than monthly numbers.

	(1)	(2)	(3)	(4)
	Received any business training	Business training is the most useful	Received SMS business training	SMS training impacted business practice
Training during holidays	0.0267** (0.0114)	0.117*** (0.0284)	0.0136 (0.0211)	0.0432* (0.0223)
Gender FE	yes	yes	yes	yes
N	1433	1433	1432	1261

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Manipulation checks

surprising since all subjects in treatment and control received the invitation to SMS training. Given Arifu’s experience and information, most respondents interact with the SMS training at least for the first few messages. However, for the training to be considered as “business training,” the respondents will need to complete the initial steps and reach the business content. Thus, many respondents would remember receiving the invitation to the SMS training, but this would not be regarded as business training if they did not reach or barely started engaging with the business training content. The lower reported proliferation of business training in the control group, and the qual proliferation of SMS training, indicate that timing manipulation successfully varied the intensity of business content delivery for each SMS trainee.

Subsequently, we investigated the shop owners’ perception of whether the SMS training affected their business practice and found that 4.3pp more subjects reported an impact on their business practices in the treatment group. Similarly, we asked what kind of COVID assistance was the most useful.⁷ In this case, nearly 12pp more subjects in the treatment group report that business training was the most useful type of assistance they received. These results again suggest that our timing manipulation successfully manipulated the intensity of the SMS training program. In the next section, we discuss the impact of our manipulation

⁷Exact question was: “What types of assistance (financial or non-financial) do you think is the most important for you to survive in the business? Please list all that apply.”. The options are: 1. More loans, 2. Rent or bill help 3. Wage subsidy, 4. Business training, 5.Lower wholesale price 7. Other (open question). The focal outcome is a dummy variable equal to 1 if option 4. was one of the chosen options.

on business outcomes.

3 Results

As mentioned in the previous section, the experiment consisted of three arms that manipulated the timing of deployment (either November or December 2020) of training and credit relief: i.e., (training now; credit now), (training now; credit later), and (training later; credit now). We did not implement the training randomization independently from credit relief randomization. Therefore, we estimate the average treatment effects of deploying training during holidays in December 2020, keeping the credit deployment constant.⁸

	(1)	(2)	(3)	(4)	(5)
	Monthly revenue	Written financial records	Understands interest	Credit balance checking frequency	Liquidate property to pay back loans
Training during holidays	90034.3** (45143.0)	0.0699** (0.0276)	0.0748*** (0.0258)	0.489*** (0.141)	-0.0836*** (0.0311)
Earlier credit relief	-2722.7 (44885.5)	0.0558** (0.0272)	-0.0653** (0.0254)	-0.221 (0.142)	0.00689 (0.0321)
Gender FE	yes	yes	yes	yes	yes
N	1015	1432	1433	592	476

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Average treatment effects of deploying SMS training during holidays.

Table 5 contains the main results. The point estimates suggest that monthly store revenue increases by more than 90,000 KSh, constituting 60% of the average revenue. The point estimates are somewhat noisy, albeit statistically significant at a 5% level. The noisy estimates are likely caused by measurement error embedded in the shop owner’s monthly

⁸We also re-estimated our main results by comparing the (training now; credit now) and (training later; credit now) arms, and we obtained similar results as reported in this section. This result suggests that interaction between training and credit interventions was minor. The results are reported in the Online Appendix.

revenue estimates during the interview. A conservative measure, a lower bound of 95% confidence interval, would estimate a 1.5% impact on monthly revenue. However, beyond statistical conservatism, this measure is also an understatement of the impact of training because it uses a control group that also received the SMS training but not the December holidays. Thus, the monthly store revenue increase is a conservative lower bound of the treatment effect of SMS training.

We then look at the impact of training on less noisy measures, such as the maintenance of written financial records and the understanding of loan interest. Nearly 7 p.p. more shop owners report adopting financial record keeping after receiving the training during the treatment period (vs. receiving training in the non-holiday November period). In other words, we observe increases in the prevalence of financial records by approximately 10%. We observe similar effects on confidence about understanding financial concepts, such as an interest rate. Although studying credit relief is beyond the scope of this paper, we note that receiving credit relief earlier has a similar impact on financial records but has the opposite impact on the level of understanding of financial concepts. The examination of this dichotomy is left for further research.

Next, we measure the impact of training treatment on financial attention. We find that the attention score increases by 0.5. Lastly, we examine the impact of the training on the need to liquidate assets. Here, the impact is the most dramatic. Training during the holidays led to a more than 8 p.p. decrease in liquidating property to pay for debts. This decrease is particularly relevant since we delivered the training in the middle of the COVID-19 pandemic. The substantial decrease in asset liquidation shows that the seemingly light-touch SMS training intervention is vital in building micro-retail entrepreneurs' financial resilience to large demand shocks.

Table 6 contains estimates of longer-run effects of training.⁹ We find that 6 months after training deployment, it still affects business performance and increases daily and monthly profits by 20-30%. The estimates are noisy, which is expected when measuring longer-run

⁹Beyond estimation of longer-run effects themselves, we include this analysis because we want to rule out recency effects – training deployment closer to the first survey may cause memory or salience effects. Such effects may be potentially at play for revenue solicitation but should be less important for more objective measures, such as the prevalence of written records or property liquidation.

	(1)	(2)	(3)	(4)
	Daily revenue	Daily profit	Monthly revenue	Monthly profit
	longer-run	longer-run	longer-run	longer-run
Training during holidays	2006.3	356.0*	-45920.0	5677.8**
	(2388.7)	(204.1)	(58520.3)	(2667.8)
Earlier credit relief	-1395.1	-107.7	66457.2	-700.3
	(2363.7)	(201.7)	(57972.1)	(2649.1)
Gender FE	yes	yes	yes	yes
N	1064	1015	1042	988

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Average treatment effects of deploying SMS training during holidays, longer-run.

impact, albeit they are significant at 10% level. We cannot reject the possibility that the impact of training on revenue is zero, possibly due to large standard errors.

4 Conclusion

We have shown that SMS technology can provide the basis for automated training that is easily scalable, widely and readily deployable, and most importantly effective in changing behavior and outcomes in economically meaningful ways. Interestingly, in the context of the Covid 19 Pandemic, this training was more effective than credit relief in increasing future revenues and reducing the need to liquidate property to pay back loans.

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On-line appendix: constant credit relief, robustness checks.

	(1)	(2)	(3)	(4)	(5)
	Monthly revenue	Written financial records	Understands interest	Credit balance checking frequency	Liquidate property to pay back loans
Training during holidays	90037.1*	0.0698***	0.0747***	0.489***	-0.0835***
	(46544.5)	(0.0264)	(0.0262)	(0.142)	(0.0289)
Gender FE	yes	yes	yes	yes	yes
N	684	940	941	401	324

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Effect only for the group that received credit relief in November; i.e., the comparison between “Credit November, Training November,” and “Credit November, Training December.”