Can Smart Technology Systems Improve Direct Benefit Transfer Performance and Increase Participation? Evidence from MGNREGA in India
Pre-Analysis Plan

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1   Introduction

Countries across the world increasingly use social protection programs to redistribute gains from economic growth and provide poor households basic protection from downturns. By 2015, the average developing country had 20 social safety net programs, and benefits reached nearly 2 billion people globally (**?**). Many of these benefits are now transferred through digital payments systems, which have been found in multiple contexts to be more efficient and less prone to corruption than previous cash-based or low-tech systems (**??**). However, even under high-tech digital regimes, state capacity is often inadequate to administer these programs effectively and without corruption. Inefficiency in safety net delivery also has potentially important welfare implications, as the worst off may both be those most in need of the benefits and most likely to be exploited.

In this study, we investigate how a new internet- and mobile-based management and monitoring platform aimed at improving the administration of a large government workfare scheme in India can facilitate effective benefits delivery. Our immediate measure of interest is time to payment delivery for program participants. We will also provide evidence on how the impacts of the platform are mediated by individual-level cognitive and personality characteristics of platform users. Depending on receipt of necessary funding, we may field a household survey to additionally examine downstream impacts on labor patterns, income, and consumption.

2 Background

Our study focuses on India's Mahatma Gandhi National Rural Employment Guarantee Act, or MGNREGA, a workfare policy that mandates the provision of up to 100 days of annual unskilled labor employment per rural household. In 2015-16, 51 million rural households benefited from the program at a cost of approximately US $8.8 billion. Multiple studies document MGNREGA's positive impact on rural households' well-being (see, for instance, (**?**), (**?**)), but implementation failures - as captured by large payment delays - continue to limit the program's potential (**?**).

Despite government stipulations requiring MGNREGA participants be paid within 15 days of working, MGNREGA suffers from severe delays in worker wage payment delivery. National data from 2014-2015 showed the average worker waited 53 days to receive payment, and average delays exceeded 160 days in some states.[1] These delays reduce the ability of poor rural households to manage economic uncertainty (**?**), and are recognized both at the highest levels of government and in the press as a critical challenge for the program.[2] Payment delays have also been popularly identified as a reason for reduced participation by the poorest in MGNREGA, since work is supposed to be provided upon request (or in the program parlance, "demand") of poor households.

A variety of efforts have been undertaken in attempts to curb these delays, including: warning overseeing officials and mandating penalties be paid by officials overseeing areas with delays, providing delayed payment compensation to beneficiaries, using social audits to increase community accountability, and allowing individuals to register complaints. The introduction of improved electronic financial architecture has, in itself, not proven to be the solution to reduce delays for capacity constrained areas. While an RCT found that making workers' payments via biometrically authenticated bank cards both reduced leakage and payment delays in Andhra Pradesh, a state with high administrative capacity (**?**), national averages suggest that, overall, the transition to electronic payment systems has been associated with higher payment delays. In addition, a large-scale RCT from Bihar, one of Indias most poorly administered states, showed that while a digital transfer initiative lowered leakage, it actually increased payment delays (**?**).

3 Intervention and Experimental Design

3.1 MGNREGA Payment Process and PayDash

Following the completion of labor on MGNREGA projects, multiple steps precede transfer of funds to workers, as illustrated in Figure 1: (1) Local (Gram Panchayat,[3] or GP) workers enter worker names on attendance lists and GP leaders approve these lists; (2) engineers verify work completed; (3) project details and funds requests are uploaded to the online management information system (MIS); and (4) following two approvals from block officials, banks release payment.

MGNREGA-affiliated district and block officials are therefore the key government actors overseeing field-level workers and engineers who must take specific steps to process each payroll, known

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[1]Data from the MGNREGA MIS for Madhya Pradesh, Jharkhand, and Chhattisgarh in 2016-2017 showed workers there waited 36 days for payment on average.

[2]"Supreme court pulls up centre over delay." May 14, 2016. Indian Express

[3]A Gram Panchayat typically includes a cluster of villages and is the lowest government administrative unit for most public scheme implementation. Gram Panchayats are part of blocks, whlie blocks comprise a district.

Figure 1: MGNREGA Payment Process
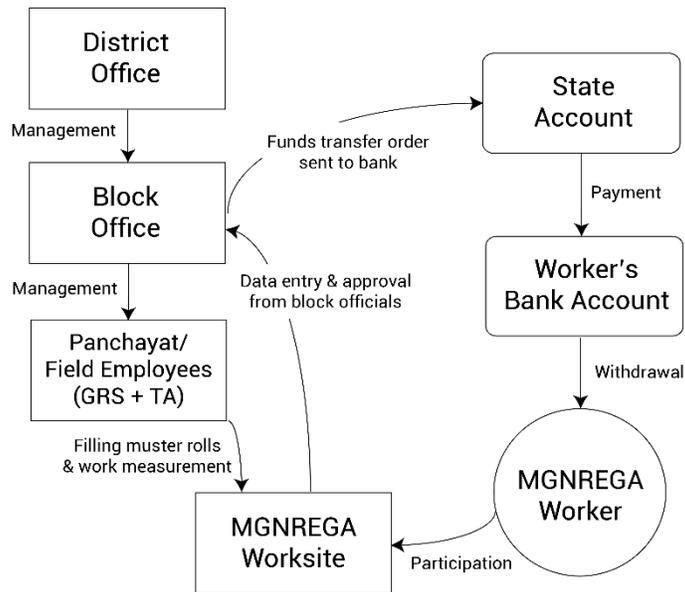
as a muster roll. District officers have an overarching administrative role and are a step removed from the funds flow process. As shown in the figure, block officers, in addition to managing field-level workers, evaluate and provide approvals for funds requests.

Our intervention, PayDash, is a mobile- and web-based application for district and block MGN-REGA officers. PayDash relies on timestamped data noting when each sub-step occurs in the payment process to help officials more quickly process pending wage payments. Importantly, this process is automated and not prone to tampering. It is built on APIs that feed real-time information on details of delayed payments, with linked information on employees responsible for each administrative step at GP and block levels, to MGNREGA administrators. Illustrations of the mobile phone version of PayDash (also known as PayDroid) are shown in Figures 2 and 3.

PayDash decreases the cost (in staff time and effort) of information acquisition to help administrators identify and monitor poorly performing sub-regions and employees.[4] It clearly identifies where and at what payment steps delays are originating and who could help address the delay.

For each step in the payment process, the block officers' version of Paydash provides real-time lists of pending documents along with contact information of responsible employees, allowing block officials to easily send information on delayed documents to field staff via WhatsApp or follow up with a direct phone call. A "contact" button next to the employee's name serves to nudge the officer to take immediate action on the delayed documents by either calling or sending a message via WhatsApp that is pre-filled with details of the relevant documents. The version of PayDash provided to district officials is similar to the version provided to block officials, but focuses on pro-

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[4]While information relevant to payment delays is accessible through the MGNREGA website, it is not provided in a format tailored to the needs of program officers. For example, pending muster rolls can be viewed online, but they are displayed on a different page for each GP. Therefore, an officer must visit 20 or more individual web pages to understand which muster rolls are pending in his/her block, for example. PayDash packages this information on a single page, making information actionable by grouping pending muster rolls according to the employee responsible for the pending step.
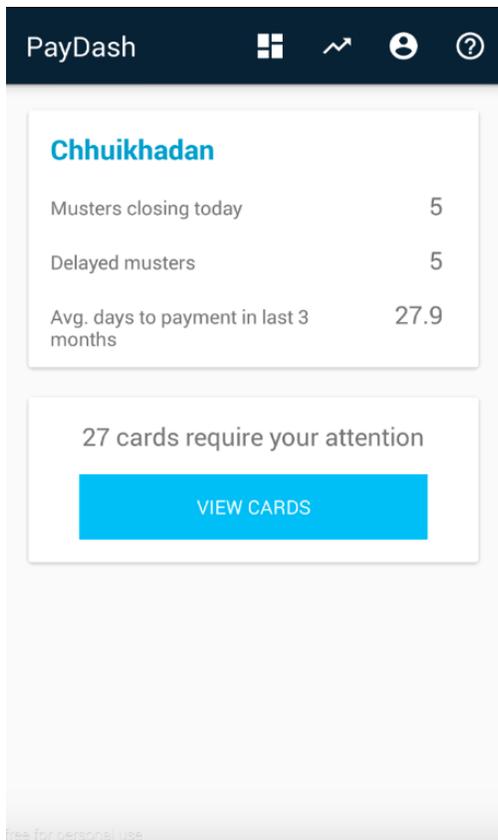
Figure 2: The landing screen of Pay-Dash provides an overview of the block's performance.
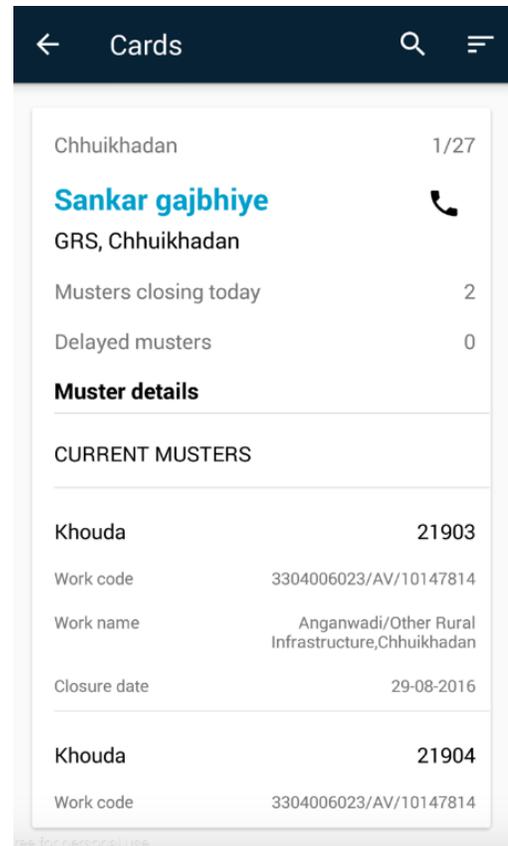

Figure 3: "Cards" show documents pending and offers the option of directly contacting the employee responsible for processing the document.

viding block-level summaries on time to payment and number of documents delayed at each step along with a "contact" function that allows district officials to get in touch with the appropriate block official via phone or WhatsApp message. PayDash provision may also signal to district and block officials the importance of addressing delays, and comparisons to mean payment time at different jurisdictional levels are possible through PayDash's graph page and may spur attention or effort to address delays through comparison to peer groups.

3.2 Study Design and Randomization

Access to PayDash is randomized at the district level; log-ins are user-specific so officers can only log into the platform using their own credentials, and they view summary information on payment delays for areas under their jurisdiction. Treatment arms are designed as follows:

1. Control: District and block-level MGNREGA administrators do not have access to PayDash

2. TD: PayDash provided to district-level MGNREGA administrators only

3. TB: PayDash provided to block-level MGNREGA administrators only

4. TDB: PayDash provided to both district and block-level MGNREGA administrators

For logistical reasons, the PayDash platform is being rolled out sequentially across our sample states, Madhya Pradesh and Jharkhand. The first rollout state is Madhya Pradesh (MP). In MP, the four treatment categories (Control, TD, TB, TDB) were randomly assigned across 51 districts (which exclude the pilot district) in equal proportions at the district level, stratifying by above/below the state-level median values for average monthly person days worked and average monthly days to payment over the period April 2015 to April 2016. In the second rollout state, Jharkhand, the four treatments categories were randomly assigned across 23 districts (which exclude the pilot district) in approximate proportions of Control: 1/3; TD: 1/6; TB: 1/6, TDB: 1/3, stratifying by above/below the state-level median values for average monthly person days worked and average monthly days to payment over the period April 2015 to June 2016. Additional states may be added in the future, depending on government interest and funding availability.

3.3 Intervention Training and Provision

To introduce officers to PayDash, we invited all relevant government officials in the study area - typically a permanent district officer overseeing multiple development schemes in their district, the contract district worker specifically overseeing MGNREGA, a permanent block officer overseeing multiple development schemes in the block, and a contract block officer specifically overseeing only MGNREGA in the block - to a half-day session.

Both control and treatment officials go through the same roll-out process, with the exception that only treatment officials are introduced to and provided PayDash. First, we collect baseline survey data from all officials through a self-administered, paper survey.[5] Then we conduct a session outlining data-based management tools available to officials in the MGNREGA MIS and ask officials

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[5]For the most senior group of officials, we sometimes administer a shortened version of the baseline survey in-person, either because the official is too busy to fill out the entire survey or because s/he has a strong preference not to fill out the survey personally.

to share about their work and professional challenges they face. After this, control officials are dismissed. In sessions with treatment officers, the training continues with an additional 1.5 hour session where officers are introduced to PayDash and its mobile platform, and they download the app and conduct preliminary exercises on the platform to ensure it is functional and they understand how to use it.

To avoid treatment contamination, officers from treatment areas are trained on separate days and/or locations from those in control areas. To encourage survey response and PayDash coverage, we make extensive efforts (by calling multiple times, and the state sends a letter telling all officials to report for this official training) to ensure all officers are present at the training session during the state roll-out. For those officials that do not attend the group-based training, we conduct individual surveying and onboarding to PayDash (when relevant). To avoid sensitivities related to officials' seniority, we conducted sessions separately not simply for treatment and control officials, but also for block and district-level officials within these groups.

Since officials may be transferred to or from PayDash treatment localities throughout the study period, we collect monthly data on officer transfers and then provide access to PayDash, along with individualized or group training, depending on the need each month within geographically proximate localities, or suspend access to PayDash for officers moved to control areas. Access for those moving from one treatment locality to another is updated so the information officials are provided is based on the new locality under their jurisdiction. To collect information on transfers, we rely on a combination of data updates provided through the MGNREGA MIS and short phone interviews with district-level officials.[6]

3.4   Key Data Sources

1. **MGNREGA MIS Data:** This information includes the number of person-days worked and total expenditures at the block-month level.

2. **MGNREGA Payments API Data:** This dataset, gathered on a daily basis through an API, summarizes the length of the MGNREGA payment process, both overall and for each of seven payment substeps for all blocks and districts in our sample.

3. **Baseline Survey:** Baseline surveys of PayDash recipients, described above, cover officers' demographic characteristics, previous positions and time working with the government, familiarity with technology, workload and work habits, management practices, and perceptions of MGNREGA and field-level employees. Additionally included are questions aimed to elicit officers' propensity toward corruption, as well as standard measures of public service motivation, Big 5 personality traits, and abstract intelligence (Raven's matrices). A module on officials' professional and personal social networks captures information on the extent and regularity of their interactions with officials from the district down to the GP level.

4. **Usage Data:** Since PayDash is an internet- and mobile-based platform, we collect data directly from the system on the frequency and length of usage by officers over time. This includes data on steps officers took to follow up on delays from the platform, such as calling or messaging a subordinate employee from their mobile phone.

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[6]We primarily contact the contract district MGRNEGA official, with a protocol that dictates additional district-level officers to contact if this information cannot be obtained from this individual.

5. **PayDash Access data:** This data set, built by our team on an ongoing basis, collates data at the official-month level and provides a monthly record indicating whether officers have access to PayDash, as well as the locality they oversee during each period. It includes data on their start and end access dates, which may be shorter than the duration of the study since some officers with access to PayDash are occasionally posted to different localities.

6. **Endline/Exit Survey:** Depending on budgetary and logistical constraints, we expect to conduct follow-up officer surveys that look similar in format to the baseline survey. We may also conduct a short exit survey for officers that transition into or out of treatment after a set time period.

4 Empirical Analysis

4.1 Outcomes

As a first stage, we will measure officer usage upon being provided access to the PayDash platform. Assuming officer usage occurs, our primary outcome of interest is average payment delay–both overall across substeps under officer purview and per payment substep–at the locality-month level, weighted by the number of transactions within the unit of observation. We will also consider effects on variability of time to payment delivery (average absolute deviation). Since delays may also reduce requests to work under MGNREGA, we will additionally examine impacts in future periods on the total number of person-days requested and worked, and the number of individuals worked and total expenditure. To better understand the means by which Paydash affects timely payments, we will also examine outcomes related to information and management practices (e.g. accuracy in knowledge of payment timelines under officers' jurisdiction, contact network structure, use of postive and negative performance incentives) across treatment arms.

4.2 Experimental Balance

To test for experimental balance, we will regress pre-treatment MGNREGA-related characteristics and officer characteristics on treatment status and randomization strata, clustering standard errors at the district level. We will test for individual differences across treatment arms and conduct a joint test that the coefficients grouped across all treatment arms is not significantly different from that in control areas. We will test for balance examining the following variables:

1. Locality-specific characteristics (year prior to PayDash launch)

   (a) Average overall days to payment
   (b) Average standard and absolute deviations in days to payment
   (c) Number payment transactions processed
   (d) Total person-days of work requested
   (e) Total person-days worked
   (f) Total expenditure on MGNREGA

2. Officer-specific characteristics

   (a) Gender

(b) Age

(c) Education level

(d) Social group (SC/ST/OBC/General)

(e) Years in government service

(f) Months in current posting

(g) Type of government service (IAS, state service, other)

(h) Whether has more than one government posting

(i) Whether has another non-governmental job

(j) Income in previous year

(k) Summary measures of intrinsic motivation

(l) Summary personality characteristics (Locus of control, reciprocity, corruption propensity, Big 5, public service motivation)

(m) Summary of social networks (number of connections at each level, summary of frequency of interactions) – if piloted module yields usable data

4.3 Empirical Specification

Our basic specfication is as follows:

$$Y_{bdt} = \theta_b + \theta_t + \beta_1 TD_{dt} + \beta_2 TB_{dt} + \beta_3 TBD_{dt} + \epsilon_{bdt} \tag{1}$$

where b is a block in district d in month t, θ_b and θ_t are block- and month-level fixed effects, and Y is an outcome of interest. TD is an indicator variable equal to 1 if only District PayDash has been provided to the district in which block b falls and 0 if the block falls in a control district, TB is an indicator taking a value of 1 if only Block PayDash is provided to all blocks in district d, and TBD is an indicator taking a value of 1 if both District and Block PayDash have been provided to district d. We will also consider a specification that includes additional controls for time-varying characteristics at the level of district or block, such as district- and block-level officer characteristics that may change over time due to officer transfers unrelated to our intervention. Standard errors will be clustered by district, the level of treatment assignment. If we are able to obtain more geographically disaggregated payments data from the government, we will also consider an analogous specification with observations at the panchayat-month level.

This design allows us to evaluate the impacts of district- and block-level provision of PayDash separately, as well as complementarities that may exist between them. We will also examine how effects evolve over time using an event study framework.

4.4 Main Hypotheses

We hypothesize the following related to main PayDash impacts:

1. We expect District-level PayDash provision to weakly improve total information availability to district officials and to strongly improve ease of information access and reduce costs of communication with block officials. If these are constraints to district officers' ability to monitor/incentivize block-level officials, we expect that District-level PayDash provision will decrease time to payment.

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2. We expect Block-level PayDash provision to weakly improve total information availability to block officials and to strongly improve ease of information access and reduce costs of communication with subordinate officials. If these are constraints on block officers' ability to take effective action, we expect that Block-level PayDash provision will decrease time to payment.

3. Complementarities in PayDash's provision may exist, in which case District + Block Pay-Dash will further decrease time to payment as compared to District-only and Block-only areas.

4. If longer time to payment constrains worker interest in MGNREGA participation, we expect that, conditional on payment delays decreasing due to PayDash, future requests for MGN-REGA work, actual MGNREGA work, and expenditures on MGNREGA will increase.

4.5 Heterogeneity

While the specification above will capture average effects of PayDash across all officer types, personality traits and cognitive ability of officers may have an important influence on the platform's impacts. Recent studies in a variety of developing country settings have used batteries of personality measurement questions and laboratory-type games to generate measures of such personality traits for public sector employees and provided experimental evidence of their relevance to policy outcomes (**???**). To examine how the impact of PayDash varies with officer type, we will augment our primary specification with interactions of the treatment indicators and block- and district-level officer characteristics (reflecting cognitive ability, personality, and the administrative environment in which they operate). The Appendix lists the personality characteristics and cognitive ability measures of primary interest for the heterogeneity analysis.

5 Appendix

5.1 Officer characteristics

1. Raven's test: we will use both the total score across relevant questions and a cutoff indicator based on the distribution of scores within the populations of officers

2. Locus of control: we will use both the total score across relevant questions and a cutoff indicator based on the distribution of scores within the populations of officers

3. Propensity for corruption: we will use the mean score across relevant questions and a cutoff indicator based on the distribution of scores within the populations of officers

   We will examine each trait in the following sets separately (as the mean score across questions related to each) and in summary index form (average standardized effects for each set of measures):

4. Big Five: agreeableness, conscientiousness, extroversion, emotional stability, openness

5. Perry Public Service Motivation (PSM): attraction to public participation, commitment to public values, compassion, and self-sacrifice