Strengthening Manufacturing Capacity in East Africa: ApprTEC's Micro-irrigation Pumps

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Outline of Presentation

Background: Introduction of terms
Baseline Study: Study of metalworkers in Nairobi, the development of the auto-propagation theory and predictive models
Field Experiment: Tests strengthening manufacturing capacity using auto-propagation and the validity of the predictive models
Conclusions

Terms: Formal and Informal Sectors

Formal

Informal

metalworking sectors

Jua kali: 'fierce sun'

Terms: Fundi and Artisan

Fundi

Artisan
Overview of the Baseline Study

Goal: To provide comprehensive baseline data on formal sector manufacturing at the level of the individual

- Time frame: August–September 2000
- n=78 fundis from 4 firms (2 unionized)
- Manufacturing a common product: the ‘Super MoneyMaker’
- Participated in similar training
- Pump manufacturing experience: 1 mo. – 2 yrs
- Skills ranged from helper to highly skilled welders

Relationship with informal sector
- Evaluate success of previous transferred manufacturing techniques
- Work conditions
- Manufacturing obstacles and other supporting data

Data: Qualitative and quantitative
- Relationship with informal sector
- Evaluate success of previous transferred manufacturing techniques
- Work conditions
- Manufacturing obstacles and other supporting data

Baseline Study Data Collection

Manufacturing techniques:
- Hardware or methodology that improves productivity and/or profitability

Jigs
- Fixtures
- Templates
- Go/no-go gauges
- Quality tests checklists

Organizational models

Methodology: Interviews
- Directed open-ended
- Average length: 12 minutes
- 70% partly or entirely in Swahili
- Onsite: very noisy
- No incentives offered or requested
- Worked with a research assistant

Key findings from Baseline Study: Sector overlap and technique transfer

Sector overlap was significant
- 32% are currently moonlighting
- 68% of funds have informal sector experience
- Of those with informal sector experience, 53% do a similar type of work to their formal sector work

Technique transfer was evident
- For ‘Jigs & Fixtures’: 69% Comprehension
- 11% inter-sector transfer (independent application)

Useful and applicable manufacturing techniques will be transferred from the formal to the informal sector without further intervention.

Auto-Propagation theory

Broadly useful manufacturing techniques introduced to the formal sector will transfer to and throughout the informal sector because of natural social mechanisms that support information and skill transfer.

Auto-Propagation theory: What is the potential? Who would be interested?

What is the potential?
- Auto-propagation offers a means of building manufacturing capacity:
  - at low cost
  - with minimal intervention
  - consistent with LIE constraints and opportunities
  - sustainably (techniques are selected as appropriate by users)

Who would be interested?
- Government economists and policy makers
- Donors and multi–lateral organizations
- Non-governmental organizations
- Fundis and artisans

Need to test it!
Overview of the Field Experiment

Goals: introduce manufacturing techniques to formal sector fundis and see what happens

Hypothesis: Manufacturing capacity can be improved at the individual, firm and industry levels by introducing techniques to the formal sector.

Scope: Formal sector metalworkers in Kenya and Tanzania

Sample: sample and semi-control groups
- Sample group: took part in manufacturing training where four new techniques were introduced (n=15, 2 firms, Kenya)
- Semi-control group: did not receive training – thus not introduced to techniques (n=16, 1 firm, Tanzania)

Both contracted to produce the same product

Field Experiment Methodology

Four techniques introduced: based on needs determined from Baseline Study

Data collection: longitudinal at 0, 3, 4.5, 12 months and collected primarily through interviews and quality control data

Interviews
- Directed open-ended
- Two types of interviews: baseline (t=0) and change (t=3, 4.5, 12)
- Average length: 18 minutes, 7 minutes
- 90% partly or entirely in Swahili

No incentives offered or requested

Worked with two research assistants

Interviews
- Semi-control interviews, TZ

Four techniques introduced: based on needs determined from Baseline Study

Mini-inspectors

Quality control data
- Inspection log books with rework and reject information

Findings: Industry-level capacity

Tracking of any technique transfer to informal sector and possible resulting propagation

Three transfers were reported by one fundi (#27)

(Answers reflect his responses to “Do you use anything you learned from making the hand pump training when you work in the jua kali?”)

1. “jigs & fixtures”: he was in the process of designing a fixture for producing window grills “faster, more accurate, easier”

2. “the importance of proper material”: recognition of the value of using more consistent material in production. He claimed to be more discriminating when purchasing stock.

3. “about the [design] process”: relationships between the hand pump function, its design features and relative hardware design.

Any propagation could not be verified.

Key point:
- Transfers of techniques were conceptual rather than the specific embodiments of the techniques.

Was capacity improved in the Field Experiment?

Hypothesis: Manufacturing capacity can be improved industry-wide by introducing techniques to the formal sector

Individual-level: conceptual comprehension high

Firm-level: reject/rework rates were lower for sample firms

Industry-level: three transfers by one fundi observed, propagation could not be verified

The findings suggest yes.

Conclusions

Baseline Study
- Sector overlap and transfer between sectors found to be significant

Field Experiment
- Manufacturing capacity was improved through introduction of techniques to the formal sector

Strengthening manufacturing capacity in LIEs
- Unique social mechanisms in LIEs, such as overlap, can promote technique transfer and propagation
- Conceptual capacity improvements at individual, firm and industry-level are possible with manufacturing technique introduction to the formal sector
- The auto-propagation theory offers a promising means of strengthening manufacturing capacity sustainably

Asante sana - Thanks very much

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