


Strengthening Manufacturing Capacity in East Africa: ApproTEC'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



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Terms: Formal and Informal Sectors

Formal



Kenya Vehicle Manufacturers, Thika

Informal



Jua kali on Outer Ring Rd, Nairobi

metalworking sectors

Jua kali: 'fierce sun'

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KVM in Thika



Deogun in Nairobi



Makeiga in Nairobi



Karam Engineering in Arusha, TZ

Formal Sector

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Synergetic Engineering, Nairobi



Jua kali auto repair, Nairobi



Outer Ring Road, Nairobi



Material transport, Nairobi



Informal Sector

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Terms: Fundi and Artisan



Magnum Engineering, Nairobi



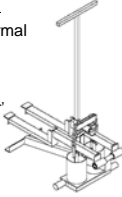
Comrade Engineering, Nairobi

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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



Q: Are there any manufacturing problems you face day to day?

- Δ:
1. Demoralized
 2. Material problems
 3. Bottleneck at previous station
- Not enough equipment/tools
Power rationing
Tooling/equipment needs repair
Unsafe working conditions

Data: **Qualitative and quantitative**

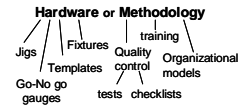
- Relationship with informal sector
- Evaluate success of previous transferred manufacturing techniques
- Work conditions
- Manufacturing obstacles and other supporting data

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Baseline Study Data Collection



Manufacturing techniques: hardware or methodology that improves productivity and/or profitability



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

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Key findings from Baseline Study: Sector overlap and technique transfer

Sector overlap was significant

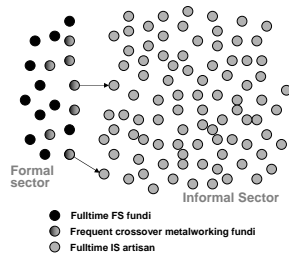
- 32% are currently moonlighting
- 68% of fundis have informal sector experience

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.

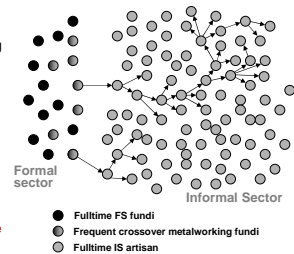
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What happens once the technique reaches the informal sector?

It depends on the applicability and utility of the technique.

- Imitation (Kabecha)
- High competition (Kabecha, King and others)
- Clustering (McCormick)
- Family ties and social networks (Borsutsky)

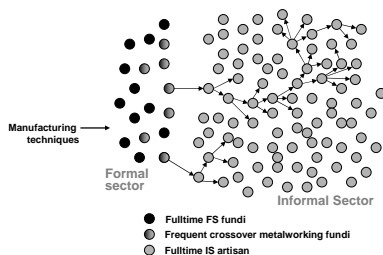
A useful applicable technique will then auto-propagate throughout the informal sector, or demand increased product value.



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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.



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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!

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Overview of the Field Experiment

Goal: 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 18



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
- Onsite
- No incentives offered or requested
- Worked with two research assistants



Quality control data

Inspection log books with rework and reject information

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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.

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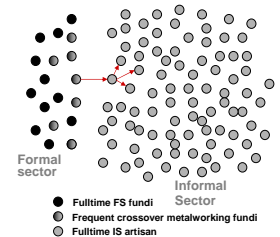
Was capacity improved in the Field Experiment?

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.

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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

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Asante sana - Thanks very much



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