Creating Affordable Access to Medical Equipment in Africa

USING SYSTEM DESIGN

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Healthcare in Africa

1 billion Population
50,000* Health Facilities

<5% of GDP is spent on healthcare in most African countries

71% Of global communicable disease burden

Most of the continent is still underserved with regards to medical devices

20% Of health spending is public

“patchwork of meagre public spending, heavy reliance on foreign donors and a large dependence on out-of-pocket contributions and user fees that place the greatest burden on the poorest members of society.” – The Economist

* Estimate
What is a medical device?

“An article, instrument, apparatus or machine that is used in the prevention, diagnosis or treatment of illness or disease, or for detecting, measuring, restoring, correcting or modifying the structure or function of the body for some health purpose.”
Types of Medical Equipment

CONSUMABLES

MEDIUM COMPLEXITY DEVICES

FURNITURE & ACCESSORIES

COMPLEX, LONG-LIVED DEVICES

Medical Device Challenges in Africa

High-quality life-saving medical devices are inaccessible to the vast majority of health facilities in Africa.

40% of equipment of equipment physically in possession of low-resource hospitals all over the world is not usable.
(Perry and Malkin, 2011)

41% of equipment of first level hospitals studied in Nigeria did not have a functioning radiograph
(Global Surgery 2030)
“Happy families are all alike; every unhappy family is unhappy in its own way.”

- Leo Tolstoy, Anna Karenina
Medical Devices Challenges

Africa’s Medical Equipment Unavailability

High capital cost
Low-income Patients
Low health insurance penetration
Macroeconomic conditions

Lack of financing options
Banks don’t understand the medical device industry
Trust deficiency
Lack of expert biomeds
Lack of spare parts

Poor service support
Lack of training
Existing Approach

- Equipment Donations
- Equipment Subsidies
- Ad hoc Equipment Purchases
- Frugal Innovation from US/EU OEMs
- Low-cost equipment from low-cost manufacturers
Equipment Donation

**PROS**
- Free for end users
- Tax rebate for donors
- Donors feel good about social impact

**CONS**
- Distort local medical devices market
- Little or no service support provided
- Poor product fit
- Regulatory Issues since NGOs are not local to places to donated to.
- Lack of understanding of local health context
- Many private facilities cannot get donations
- Not sustainable or scalable
- Contributes to the equipment graveyard
Equipment Subsidies

These organizations supply high quality equipment at discounted prices to hospitals.

PROS
- More affordable
- Available to both private and public hospitals
- Strong product fit
- Availability of service support via local partners

CONS
- Hard to scale because of “subsidies”
- Even with subsidies, this equipment is still unaffordable for many small and medium private hospitals
Adhoc Equipment Purchases

Individual hospitals reach out to independent medical equipment dealers across the globe to provide used or refurbished equipment.

Lead users?

**PROS**
- Hospitals get equipment at US secondary market retail prices

**CONS**
- Trial and error process: No prior equipment vetting
- No service support provided
- No spare parts provided
- The clients are usually not equipped to deal with shipping and logistics
- Only available to mid-income level hospitals
Frugal Innovations

New product development to provide cheap equipment to low income countries. This is done by stripping down features or redesign products in a new way. Optimizing for price doesn’t always translate to on-the-ground success.

**PROS**
- If successful, it will result to cheaper product

**CONS**
- Long product development times with no guarantee of success
- Many projects never scale globally
- Capital intensive to redesign all pieces of equipment that is needed
- Hospitals prefer full-featured equipment rather than stripped down devices
Low-Cost Equipment from Low-Cost Manufacturers

Manufacturers in SE Asia offer low-cost products targeted at Africa.

**PROS**
- Cheaper than US OEM alternatives
- Readily available in the market

**CONS**
- Breaks down easily
- No service support available in country
- Poor product fit
- Non-standardized parts
- Hard to find spare parts for repair
Trade Space of Existing Approaches

Five factors to achieve “scalability”

- Affordability
- Financing
- Local Service Support
- Product Quality
- Product Fit

Grace Kane, Designing a Product-service for repair & maintenance of medical imaging equipment in Africa, 2016. (Adapted)
Is there another way?

Business Model Scalability

Cost of Equipment
Using the Idealized Design Framework

IDEALIZED DESIGN
• Invented at Bell Labs
• Applied to Organization Design by Prof. Russel Ackoff
• Uses interactive planning which involves a 2-part process:
  - Idealization
  - Realization

RESTRICTIONS
• Must be legal
• Must be technically feasible
Using the Idealized Design Framework

- Ideal System State
- Current System State
- Past
- Present
- Future
- Time

Types of Planning:
- Reactive Planning
- Interactive Planning
- Preactive Planning
- Inactive Planning

Prof. Russel Ackoff Video: http://techtv.mit.edu/videos/09a1761fc0ce745f915192059121a69df8a82c75/private
6 Steps of Interactive Planning

IDEALIZATION
- Formulating the Mess
- Ends Planning

REALIZATION
- Design of Implementation
- Design of Control
- Resources Planning
- Means Planning
Formulating the Mess

Stakeholder Value Network Map

GOVT

NIGERIA MEDICAL ASSOC.

NAFDAC

LICENSED DISTRIBUTORS

LOCAL REP. OF MANUFACTURERS

CUSTOMS

CHINESE Manufacturers/Distributors

US/EU Manufacturers/Distributors

PRIVATE HOSPITALS

PATIENTS

PUBLIC HOSPITALS

DIAGNOSTIC CENTERS

TREATMENT

Government Health Policy

Advertising Fee

Regulations

Supports

Information about Devices

Patients

Financial Flow

Medical Devices Flow

Maintenance/Repair Services

DIAGNOSTIC CENTERS

LOCAL MAINTENANCE/REPAIRS

JUNKYARD

USED MD DEALERS/IMPORTERS

LOCAL REP. OF MANUFACTURERS

CHINESE Manufacturers/Distributors

US/EU Manufacturers/Distributors
# Formulating the Mess

## Top Two Priorities of Key Stakeholders

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Profits</th>
<th>Political Support</th>
<th>Profits</th>
<th>Access to technical resources</th>
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<td>Health Outcomes</td>
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<tr>
<td>Biomedical Engineers</td>
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Ends Planning

Creating an ideal medical equipment marketplace that operates across Africa

Local Presence
- Understand local hospital needs and requirements
- Understand and follows local medical devices rules and regulations

Equipment Inventory Access
- Provide appropriate equipment at affordable prices
- Has ready access to wide variety of medical equipment
- Can supply spare parts

Financing
- Provide financing/leasing/equipment rental directly to hospitals

Technical Expertise
- Provide local service support (maintenance contract & repairs)
- Access to technical resources (manuals & software)

Training
- Train local biomedical technicians
- Train clinicians on use of equipment

Reach
- Can start small but must be scalable into every African country
- Has a supply chain that can reach rural and peri-urban places
Ends Planning

- Central Operations
- Partner
- Joint Venture
- Franchise
- Subsidiary
Means Planning

Bridging the gap between the current reality and ideal marketplace
Means Planning

Why focus on USA for equipment supplies?

- High rate of equipment turnover
- Robust secondary equipment market
- Technical Resources
- Network effects
Resources Planning

Estimate how many resources (time, capital, effort) are needed and how to allocate across different activities

EXECUTE
Supply Chain
Marketing & Sales
Business Development
Operations
Equipment Rental
Training

PARTNER
Equipment Financing
Equipment Sourcing
Equipment Refurbishing
Train the Trainer

CONTRACT
Biomedical Services
Taxes & Accounting
Freight
Design of Implementation

1. Pick Location
2. Evaluate Medical Device Regulations
3. Business Registration Requirement
4. Secure Partnerships and Contracts
5. Choose Pilot Equipment
6. Choose Pilot Hospitals
Design of Control

How do you evaluate impact aside business KPIs?

- How many health facilities we serve
- How many pieces of equipment we have in the field
- Equipment uptimes
- Number of procedures done with MDaaS supplied devices
- Time it takes to service equipment after a breakdown
- Number of devices per population
Implementation Phase

- Launched MDaaS Nigeria in Jan 2016 with 3 pilot hospitals which later expanded to 6.
- Revenues of > $100,000 in the first year of operation in Nigeria
- Won healthcare innovation awards in Nigeria and US
- Secured partnerships with Independent med devices companies in the US and a financing company in Nigeria
- MDaaS-supplied devices has been used in 5,000 procedures and counting
Trade Space with MDaaS

Grace Kane, Designing a Product-service for repair & maintenance of medical imaging equipment in Africa, 2016. (adapted)
What does MDaaS offer?

“United Rentals” for medical equipment in Africa

High Quality Equipment
- Refurbished
- Lower price/feature
- Best market fit

Flexible Acquisition Options
- Direct Sales
- Payment Plans
- Leasing
- Equipment Rentals

Service Support
- 1-year warranty
- Free installation
- Maintenance & Repair
- Customer support
Lifecycle of an MDaaS Device

Suppliers

Acquire → Process/Refurbish → Rent → Install → Use

- Recycle/Decommission
- Sell
- Pre-planned Maintenance
- Lease
- Sell back
- Repair
Implementation Insights

- Tough macroeconomic conditions slowed down implementation
- Relationships matter
- Access to technical resources is very important
- Standardize processes as fast as possible
Next Steps

- Transition from pilot operations to full operations
- Fundraising
- Build out training component
Thank you!

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