Reflection on Readings and Manufacturing

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Thoughts on Readings

Don’t take all readings as truth; take the best elements and put them in your Global Engineer’s toolbox
Govindarajan, Trimble, *Reverse Innovation*

CREATE FAR FROM HOME, WIN EVERYWHERE

Foreword by Indra K. Nooyi
CHAIRMAN AND CEO, PEMICO INC.

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- Performance
- Infrastructure
- Sustainability
- Regulatory Preferences
- Disruptive Opportunities
Glocalization

- Accept small markets
- Decrease performance to decrease price

vs Reverse Innovation

- Innovate for unique needs
- Adjust/maintain performance while decrease price
Local Growth Teams

- Know market
- In market
- Read market-specific factors

Ex) “How GE is Disrupting Itself”
High Economies of Scale in Low-Volume Products

Ex) Harman Kardon Infotainment
Use Materials/Parts Easy to Replace/Service

Ex) GE MAC 400
Govindarajan, Trimble, *Reverse Innovation*

**Reverse Innovation**

*Create far from home, win everywhere*

Foreword by Indra K. Nooyi, Chairman and CEO, Pepsico Inc.

Ex) GE MAC 400 vs MAC 800
Constraint-driven innovation

Cost

Performance

Disruptive Innovation

Reverse Innovation
Opportunity in adversity
Do more with less
Think and act flexibly
Keep it simple
Include the margin
Follow your heart
Opportunity in adversity
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Radjou, Prabhu, Ahuja, Jugaad Innovation
Jugaad
Ex) Soda bottle skylight

Not Jugaad
Ex) Nokia 1100
Jugaad
Ex) Soda bottle skylight

Not
Jugaad
Ex) Mahindra XUV
“Thinking Differently: The State of Indian Innovation”

Radjou, Prabhu, Ahuja, Jugaad Innovation
Jugaad Engineering

Ex) Renault Logan
Poor People Have $,
Value/Pleasure Matters

Ex) “TV more important than food”
Subsidies Affect Different Stakeholders Differently

Ex) Vaccinations (gov't vs family)
Giving People Good Soln by Default is Effective

Ex) Gram Vikas, Iron-Fortified Flour
Status Matters

Ex) Investing in “smart” child, gov’t desk job, aspirational products
Supply vs Demand-Driven Solutions

Ex) Contraceptives - demand-driven
Manufacturing in Developing/Emerging Markets
Mfg Considerations

- Utilized stamped steel (had to consider scale)
- Riveted vs welded
- Made close to where used (less importation)
- Side note: easy to use increased adoption
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Mfg Considerations

- Injection molding
- Sheet forming
- PCB/surface mount components
- Super high-scale manufacturing
- Interchangeable parts
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Mfg Considerations

Envirofit
- Stamping
- Drawn/Hydroformed
- Welding
- Sand Casting
- Injection Molding
- Painted
- Designed for scale

Darfur Stove
- Bent on a break
- Riveted
- Sand cast bottom
- Designed for fast, local production
Mfg Considerations

• Local repairability (bike parts and mild steel)
• Made in central location for scale, local distribution
• Quality control major challenge now (small batches, different product for fabricator)
Mfg Considerations

• Jugaad Innovation - 1960’s materials in India, available labor and mfg processes

• New, PU Foot injection molded, higher product, uniform product, lighter construction

• Failure points in both
Mfg Considerations

Jaipur Foot Socket
- HDPE Pipe
- Mfg in clinic and camp, made with little electrical power
- Cost-driven
- Shipping primarily in India

ICRC Socket
- Polypropylene sheet
- Many heat-bonded elements
- More alignment
- Injection-molded pylon
- Shipped worldwide to clinics
- Low-cost, but less so than Jaipur Foot
Punchline

Most any type of manufacturing is available in emerging markets - you need to consider context and usage of product.