FRUGAL INNOVATION AND RE-ENGINEERING OF TRADITIONAL TECHNIQUES

Fraunhofer ISI
in co-operation with Nesta, UK
Structure

- Frugal innovation: Concepts
  - What is frugal?
- Central preconditions for frugal innovation
  - How can frugal innovation come to flourish?
- Frugal innovation as an opportunity for Europe
  - Why do we need frugal innovation (if we do)?
- The role of technology for and in frugal innovation
  - How can technological capacities become a means to frugal ends?
- Outlook
  - Will there eventually be convergence between classic & frugal solutions?

Eventually: Policy Recommendations
Types of Frugal Innovation

- Local solutions to identify and meet potential demand on less developed markets (examples: water filter powered by motorbike, solar light bulb).
- Local solutions for sustainability challenges on less developed markets (examples: agricultural innovation in developing countries).
- Product based frugal engineering, “mass frugal” based on de-featuring (examples: Tata Nano, Gillette Guard).
- Product based frugal innovation, increased utility by robustness and sustainability (Examples: Solar Lamps, Nokia 1100, Jaipur Foot).
- Process based cost reduction, Frugal investment goods? (example: textiles from Asia).
- Mass customised solutions for frugal markets developed by local partners (examples: household appliances for frugal markets).
- Standardised frugal solutions with customised delivery concepts (examples: healthcare devices for frugal markets).
- Transformative solutions to challenges first identified in frugal environments (examples: Skype, e-bikes, mobile phone banking).
Bottom-of-Pyramid vs. Emerging Middle Class
Business Proposition vs. Sustainability

Source: Brem and Wolfram, 2014

Source: own figures from internal report
What is Frugal Innovation?
Some general lines of thought...

1) Customer orientation through reducing unneeded functionalities
2) Identification of latent, relevant, low-threshold needs
3) Targeted use of available knowledge in the process of production
4) Use of new technologies for networking and knowledge sourcing
5) Resource efficient use of materials (incl. circular economy)
6) Redesign of entire systems (health sector, maker movement)
Frugale Innovation: more than just cheap

Fraunhofer ISI / Nesta Definition

**Product Dimension**
- Simplicity / De-featuring
- Context-Specific Utility
- Robustness / Long Service Life

**Process Dimension**
- Creative Response to Contextual Challenges
- Integrated in Localised Delivery Concept
- Scaling from Local Context to wider Markets

**(Socio-Economic) Context Dimension**
- Affordable
- Resource Efficient
- Systemically Transformative
Central preconditions for frugal innovation

- **Frugal Innovators think different**
  - perceiving opportunities in limitations
  - willingness & ability to re-interpret rules and question practices
  - highly creative & down-to-earth

- **Frugal Innovators need an environment**
  - at the firm level, ideally at high level
  - external reference groups are crucial for inspiration and reality check
  - national culture matters but is not decisive

- **Frugal Innovation needs to move beyond context**
  - context is useful but also limiting
  - value proposition needs to be generalised (not necessarily: standardised)

- **Scaling frugal innovations to diverse markets needs qualifications**
  - mere entrepreneurial vision and intuition will not suffice
  - mere technological knowledge does not help to understand markets
  - those who finally scale are often not the inventors themselves

- **Institutions can be both barriers and enablers**
  - existing standards may protect incumbents, but there are usually niches
  - market fragmentation is still an obstacle to scaling
Emerging markets offer huge opportunities for European firms.

Source: Roland Berger, 2014

**SIEMENS “SMART”**
Simple, Maintenance-friendly, Affordable, Reliable, Timely-to-market
Opportunities for Europe

- There is increasing demand for frugal innovation in Europe
- Frugal innovation could help to tackle common public policy challenges in Europe
- Europe has a frugal tradition and the notion is not alien to culture and philosophy…
  - Mass frugal: Volkswagen, 2CV, …
  - In economies of scarcity: Eastern Block, during wartime…
  - At local level through traditional techniques …
- There are new trends toward frugal preferences…
  - Aspiring lower middle class in emerging economies…
  - Willingness to buy frugal out of choice, even in high-income economies…
  - Persistent crisis in Eastern and Southern Europe…
  - Public policy challenges under budgetary constraints…
  - Focus on ecological sustainability and resource efficiency in the population…
Challenges for Europe

Frugal Innovation is not on a generic level incompatible with European culture
But it does conflict with a currently **prevalent business culture**, developed across the 20th century

- approach of limiting resources or functionalities conflicts with general premises that engineers (and their managers) have been trained to take for granted,
- technological development is often perceived as a linear process in which considerations on product characteristics are secondary to technology and enter late,
- executives may be cautious of developing entry-level products through fear that they may ‘cannibalize’ more expensive line
- many executives do not believe that technological investment in frugal products with small margins can pay off – at least not on small markets (but increasingly so?)
Worth a thought....

Europe: \textbf{cost} + profit = price

U.S.: \textbf{profit} + cost = price

China/India: \textbf{price} – cost = profit
Innovation without technology is in fact commonplace...

- (Customer) value oriented strategies
- Stepwise or gradual innovation,
- Architectural innovation
- Process specialisation
- Modular innovation

Results

- seemingly inferior solution displays better fit with customer demand, can even be “disruptive”
- architectural innovation may appeal to more discerning customers (“reverse innovation”)

This is NOT new: cf. Schumpeter, Kline/Rosenberg, Oslo Manual,

- the first step always is to see what is already there, yet:
- solutions may at all stages require infusions of original technological development
Main Issues:

- **How can return on investment be achieved**
- **How can mentality of “linear development” be overcome**

- Technologies that have been readily developed to TRL9 and implemented into non-frugal products can be adapted and modified to make them relevant for frugal solutions,
- Specific platform technologies can be developed and later exploited in various areas of application, allowing for a distributed recuperation of development costs,
- Transformative technologies which are developed with the specific purpose to reduce cost can or even have to be first launched in frugal markets to demonstrate their viability.
- New ubiquitous technologies can be reinterpreted, in particular by infusing them with new software applications such as medical apps on smartphones
The role of technology III

*Dedicated development*

**Frugal innovation can be a testing field**

- to implement need-oriented, innovation processes and market driven innovations;
- to raise awareness for market specificity and application requirements;
- to bear in mind and address issues like price/cost and regulation from the beginning;
- to test and pursue innovation processes jointly with stakeholders from ecosystems;
- to avoid a stratification of competences and resulting over-engineering;
- to pilot and consolidate new concepts like mass customization.

➢ *The learning effect of engaging in frugal innovation may prompt changes far beyond the development of a particular solution*

➢ Relevant contributions to address the European Paradox and TRL1-9 linear thinking may thus be made – that can be translated to other areas of technological development
From ‘mass frugal’ to ‘networked sourcing and delivery’?

- „modernity“, **low-cost production = standardised mass production**; the customer became an object in the system of production
- **Traditional frugal techniques and solutions became replaced** by standardised mass products
- If, as the new discourse **on Makers, Open Innovation, Prosumers, We-Economy** etc. proposes, **mass production can in the future be customised**, all this may change
- Enabling technologies: **Additive Manufacturing, Digital Factories**
- **Decentralised production becomes cheaper (3-D Printers)**
- New, inclusive structures of joint development are set up, lowering the threshold to participation (FabLabs)
- In the future, industrial production may be restructured as well and economies of scale may diminish or even vanish (**The Economist**)

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On mentality
- A mentality for frugal innovation and technological recombination is not exclusive to emerging economies.

On markets
- The opportunity in emerging markets is obvious. Also, trends on European markets spur increasing demand for frugal solutions - based on needs and out of choice.

On routines
- Current routines of technology development will have to be substantially re-thought to enable frugal solutions.

On openness
- Successfully creating frugal solutions will require firms to shift innovation practices towards more open models – both within Europe and in international cooperation

On technological transformation
- Key enabling technologies (KETs) and LEIT will open up new avenues for frugal innovation. Newly available technologies open up new options for frugal products processes
Technologien mit Frugalem Bezug

soundandvisioncentre.co.uk

www.smitthermalsolutions.com

androidauthority.net

Source: Otto Bock Stiftung
Frugale Innovation im Kontext
Sozialer und Industrieller Herausforderungen

www.fablabs.io

suricattasystems.com

https://www.ge.com/

frugalinnovationhub.com
Thank you!

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