FRUGAL INNOVATION AND RE-ENGINEERING OF TRADITIONAL TECHNIQUES

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in co-operation with Nesta, UK

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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*

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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).

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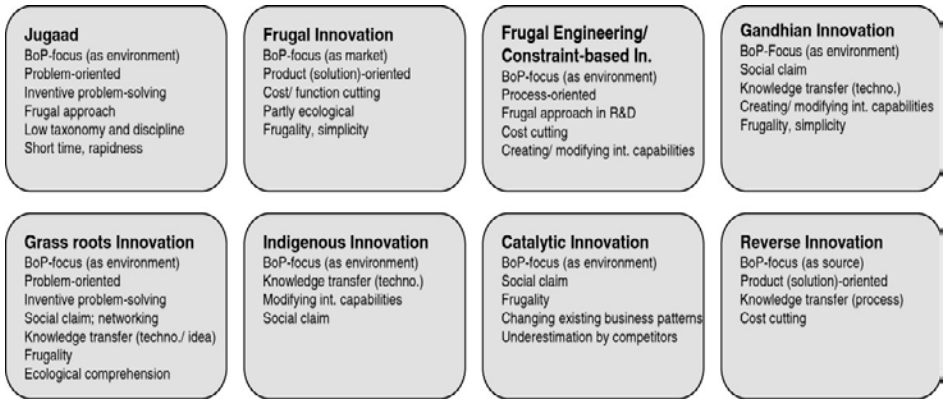
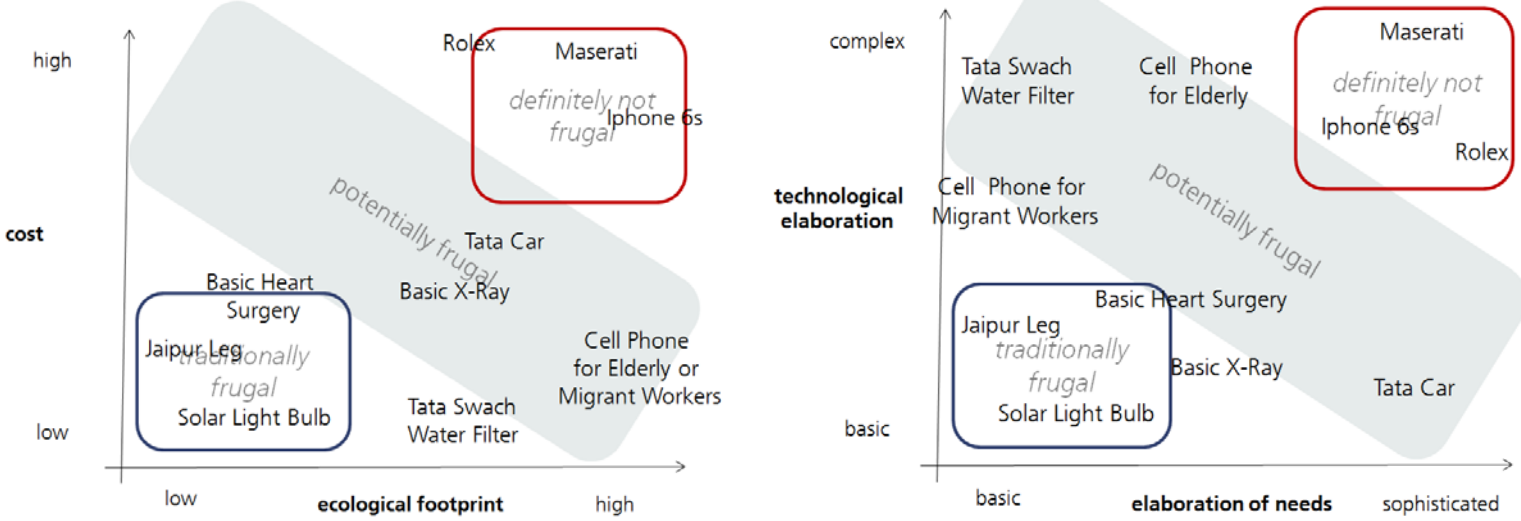
Bottom-of-Pyramid vs. Emerging Middle Class Business Proposition vs. Sustainability



Source: Brem and Wolfram, 2014



Source: own figures from internal report

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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) Ressource efficient use of materials (incl. *circular economy*)
6) Redesign of entire systems (health sector, maker movement)

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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

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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

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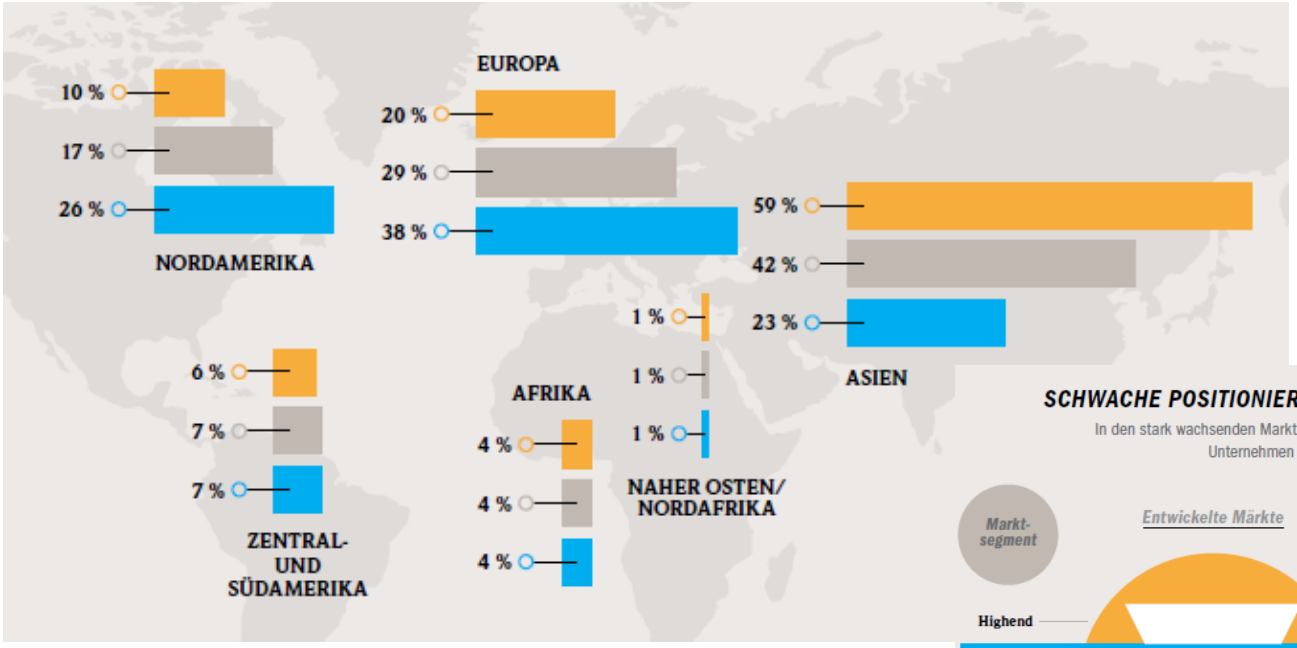
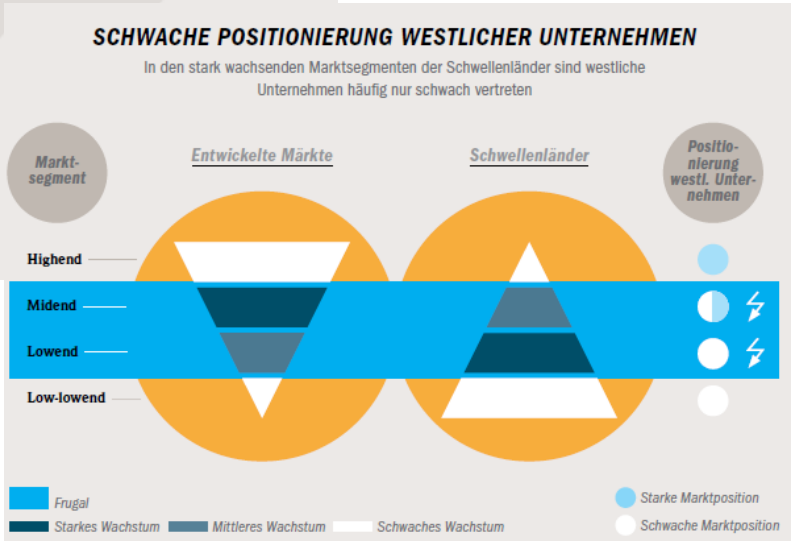
Opportunities for Europe

- **Emerging markets offer huge opportunities for European firms.**





Source: Roland Berger, 2014

SIEMENS "SMART"
Simple, Maintenance-friendly, Affordable, Reliable, Timely-to-market

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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…

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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?)

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Worth a thought....

Europe: **cost** + profit = price

U.S.: **profit** + cost = price

China/India: **price** – cost = profit

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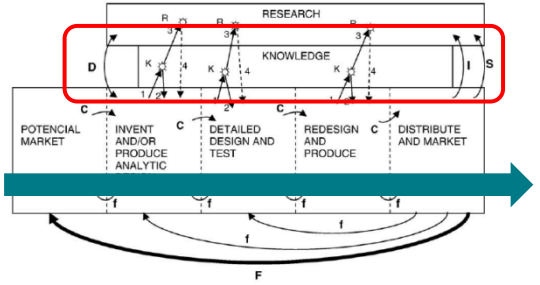
The role of technology
Frugal integration

- 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



Kline/Rosenberg, 1986

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The role of technology II
Dedicated 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

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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

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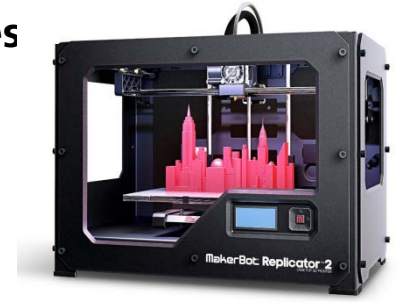
From ‘mass frugal’ to ‘networked sourcing and delivery’?

- „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

thesun.co.uk

- 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**



topmaxtech.net

- **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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Conceptual Conclusion

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

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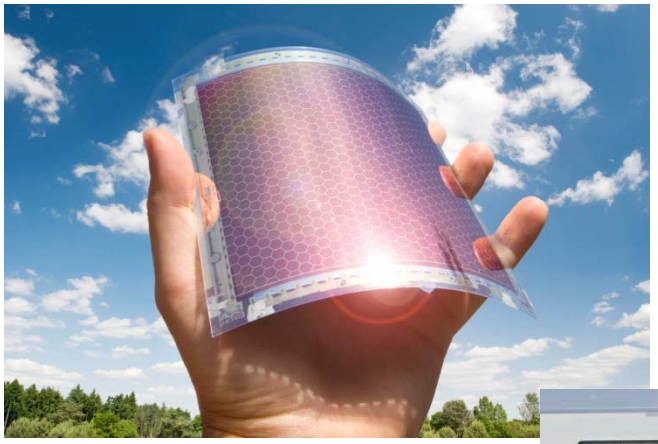
Technologien mit Frugalem Bezug

soundandvisioncentre.co.uk



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Source: Otto Bock Stiftung

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Frugale Innovation im Kontext Sozialer und Industrieller Herausforderungen

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Frugal InnovationHub

SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING

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Thank you !

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