

Product Design and Manufacturing
Prof. J. Ramkumar
Dr. Amandeep Singh Oberoi
Department of Mechanical Engineering & Design Program
Department of Mechanical Engineering
Indian Institute of Technology, Kanpur

Lecture – 23d
Frugal Innovation

Welcome, to the next lecture on Frugal Innovation.

(Refer to Slide Time: 00:21)



So, frugal innovation is now the talk of the town when you are trying to talk about any of the product designs. So, frugal is also called as sustainable innovation. So, what is sustainable? Sustainable means we are trying to use minimum resources without sacrificing the customer's satisfaction. So, what is customer satisfaction? Whatever customer intended to make or get through a product, he should not find it difficult, he should still enjoy using the same product, but the resources which is involved in making the product has to be as economical as possible.

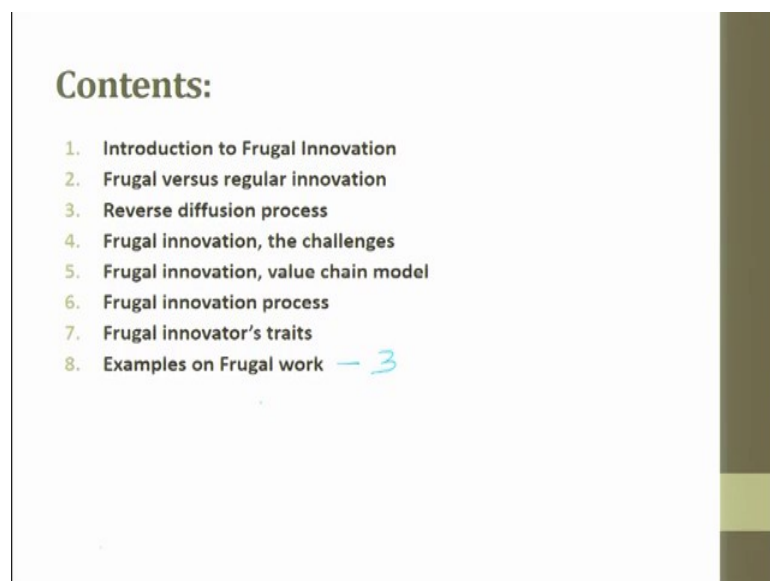
So, for example, modular design which is followed in product design is part of sustainable innovation where we talk about frugal innovation. It is a very important topic and there is a difference between frugal and Jugaad. Frugal means where you try to reproduce the same design same process and it has good repeatability and reliability, that

is frugal. When you say Jugaad; Jugaadis one time solution which need not be efficient which need not be economical, but it has temporarily given a solution where in which we do not bother about the effect.

For example, Jugaad, the plastic bags I would say it is a Jugaad technology. People wanted to have carry bags so, plastic came into existence. Now, everybody was happily using plastic bags then the cost became very economical because of competitive market. Today, the spreading of plastic is more and now we realise that it is now creating lot of damage to mother earth. So, it is a Jugaad solution and now people realise so, plastics is going to create a problem. So, slowly let us get away from this plastic, but frugal is a cloth bag. You make a cloth produce your cloth bag which is reliable repeatable and which is giving customer satisfaction so, everything. So, that is frugal.

There is several frugal successes which Indians have demonstrated which we will see in the last phase of this lecture.

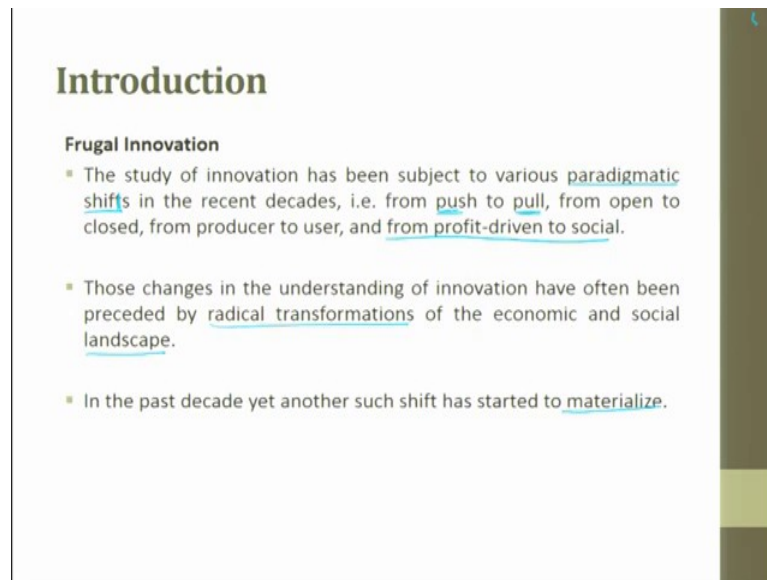
(Refer to Slide Time: 03:02)



| Contents: | |
|------------------|--------------------------------------|
| 1. | Introduction to Frugal Innovation |
| 2. | Frugal versus regular innovation |
| 3. | Reverse diffusion process |
| 4. | Frugal innovation, the challenges |
| 5. | Frugal innovation, value chain model |
| 6. | Frugal innovation process |
| 7. | Frugal innovator's traits |
| 8. | Examples on Frugal work — 3 |

So, in the frugal innovation we will be covering introduction to frugal innovation; frugal versus regular innovation, there is a difference between regular and frugal; reverse diffusion process; frugal innovation, the challenge; frugal innovation value chain model we will see; frugal innovation process and what are the traits required for a frugal innovator and the last we will see some three examples where in India successfully frugal innovation has been demonstrated.

(Refer to Slide Time: 03:33)



Introduction

Frugal Innovation

- The study of innovation has been subject to various paradigmatic shifts in the recent decades, i.e. from push to pull, from open to closed, from producer to user, and from profit-driven to social.
- Those changes in the understanding of innovation have often been preceded by radical transformations of the economic and social landscape.
- In the past decade yet another such shift has started to materialize.

So, when we talk about frugal innovation, the study of innovation has been subjected to various paradigmatic shifts, in the recent decade that is, from push to pull. So, what is push and what is pull? Push is there is a technology which is recently developed and people do not, the market does not understand whether that is needed or not. So, that the company tries to push into the market is push. So, it is always called as technology push; smart phone – technology push, right. So, pull, market pull; market pull is there is a needy customer there is a needy customer who wanted a solution and a customer wants. So, what we do is we try to move towards pull; from push to pull.

So, today when we talk about ERP system enterprise resource planning system it all works almost on the pull system. What customer wants they forecast and they start producing it for their requirements, from open to close, from producer to user, from profit driven to social? So, all these things are major paradigmatic shift which is happening in the recent market.

So, from profit driven to social. So, earlier people were thinking of making only profit. Plastic bags – company which make plastic bags they are looking for their profit but, they did not think of social cause. But, today there is here major shift in the companies look out profit driven to social. So, what they say is not that they are going to sacrifice their profit, but they are not going to give so much of weight-age to profit, but give weight-age to social those changes in the understanding of innovation has often been

preceded by radical transformation of the economy to the social landscape. From economy to social landscape is what the people are thinking for and for this, frugal innovation is important topic. In the past decade yet another shift has started was materialize.

(Refer to Slide Time: 05:51)

Introduction

Definition

- As a process frugal innovation discovers new business models, reconfigures value chains, and redesigns products to serve users who face extreme affordability constraints, in a scalable and sustainable manner.
- It involves either overcoming or tapping institutional voids and resource constraints to create more inclusive markets.
→ Bhatti, 2011
- Simply, frugal innovation provides functional solutions through few resources for the many who have little means. → Economic
↳ Custom

The definition is, as the process of frugal innovation discovers new business models, reconfigures value chain, redesigns product to serve user who face extreme affordability constraints, in a scalable and a sustainable manner. Extreme affordability constraint; for example, today in medical field the hospitals are giving good care, but the only thing is customers are not able to be happy after this care is because their costs are exorbitant. So, people are nowadays looking for good service, economical casting, ok.

So, if the frugal innovation discovers a new business model. So, you have to re-change the business model whatever you had from push to pull is an business model, reconfigure value chains, how should it be the market supply, should be used for resources which is available in some other country or should be look for resources locally. Government of India is now taking lot of initiatives in the construction industry, how to use the locally available resources for construction? For example, in north east, bamboo is available can we think of using bamboo exorbitantly instead of steel rods; we are looking forward.

So, reconfiguring the chains; redesigning products to serve user who face extreme affordable constraints. For example, let us take a smart phone, in a smart phone today

which is worth of 30000 rupees or 40000 rupees. The company gives an ad saying that my smart phone is used for more than 150 to 200 apps to operate on a smart phone is fabulous, but how many apps do we use? 10? Maybe 20. So, but you have given your cost of 40000 and got a higher rate smart phone wherein when you can run 150 apps whereas, your requirement was only 20 apps.

So, now, this frugal innovation says that if you want 20 apps to be operated by a product which can which can operate 40 apps. So, the cost comes down, the resources which is involved in developing the product comes low and the cost of the smart phone comes low, it becomes affordable, ok. The other thing is when you talk about medical industry what has happened is there are several successful stories in India which has been which has been demonstrated using frugal. What happens is in medical industry the ampoule whatever the doctor brakes, a patient might require half of the ampoule or three fourth or quarter of an ampoule.

And, so, the when the ampoule is broken if this ampoule of medicine could be served for two three people the cost which is involved for buying that will be divided into three or four. So, per person cost goes low, frugal. Second thing is there are there is a great demand of skilled doctors today or expert doctors today or specialist doctors today. If the specialist doctor is involved for making simultaneous operation for four – five patients, if his time is rationalized, six patients get benefited because of the sharing of the resources a skilled doctor. So, the cost per patient also goes low; the doctor is also able to offered his services to many patients simultaneously.

So, this is what is a frugal innovation model and what they do in this model is they train the paramedic to such a level such that they do half of doctor job, but they try to do it very meticulously and when they have four patients to be catered, the all the four can be catered simultaneously. So, the benefit is given a lot. So, the turn over time per bed in the hospital is also reduced; that means, to say they are able to they are able to cater to more patients in a given time. So, that is a new business model. So, this is what is frugal.

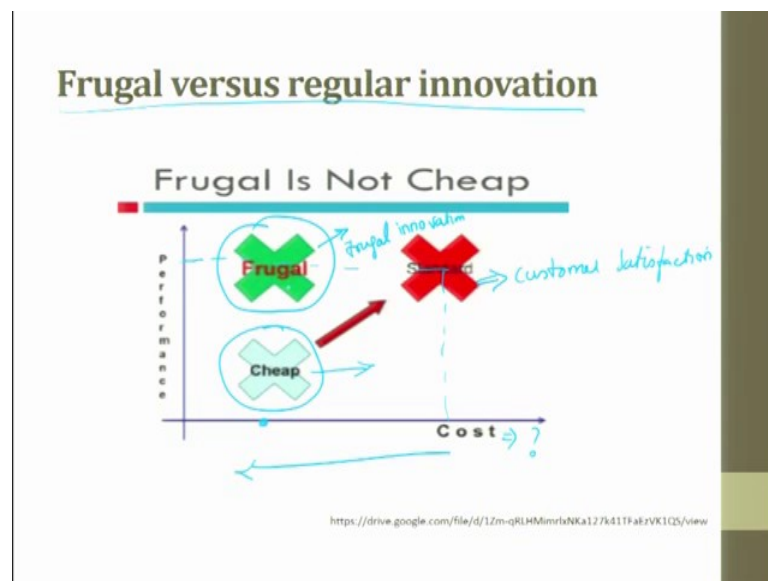
In a scalable and sustainable manner, sustainability is always a problem. Today, I buy a machine, I buy a machine, I buy a house; today, I am affordable, I have lot of money, I have lot of energy. So, I buy a house, buy a costly car, but over a period of time I realise the product needs regular maintenance, so, which is again expensive. So, which it is not a

sustainable model. So, we have to buy things wherein which we could maintain and take care that is sustainable manner.

It involves either overcoming or tapping institutional voids and resources constraints to create more inclusive market, this is what is the definition which is given by Bhatti in 2011. It involves either overcoming or tapping institutional voids and the resources constraints to create more inclusive market is another definition for frugal. Simply frugal innovation provides functional solution through few resources for many who have little means, very beautifully, very crisply define definition. So, functional solution through few resources for many who had little means; so, you are able to give satisfaction to so many customers in an economical way.

This is what is a very simple frugal definition.

(Refer Slide Time: 12:03)




So, performance and cost: if you see the performance and if you see the cost this the performance is low the performance is low the cost is low heat is called as cheap products or products which do not have repeatability, reliability and more of customer satisfaction and people would like to go from here to here; that means, to say they would like to have a higher performance higher performance from the same product at a higher price. So, this leads to lot of customer satisfaction.

But, the basic question is who will give the cost? Who will give the cost? So, people today are looking for, can I shift the cost to low here, but still have higher performance. So, this portion is nothing, but frugal innovation, ok.

(Refer to Slide Time: 13:15)

Frugal versus regular innovation



| | Frugal Innovation | Standard Innovation |
|---------------------------|---|--|
| ENVIRONMENT | Institutional voids and resource constraints | High quality institutions and slack resources |
| COST | Low cost input and Low cost output | High cost input and High cost output |
| DIFFUSION APPROACH | Bottom up approach | Top down approach |
| USERS | Late Majority, Laggards: Low income, limited education | Innovators, Early adopters: High incomes, high education |
| SOURCES | Entrepreneurs, Family Business Groups, Social Movements | Entrepreneurs, Large organizations |
| PROCESS | Open, Distributed | Closed (Open/Close) |
| CHARACTERISTICS | Primarily Architectural | Primarily Component |

<https://drive.google.com/file/d/1Bn2lRZmB-IPK8ZQxouXpbbiu-FHRH/view>

So, this graph clearly compares frugal versus regular innovation, is that is clear. So, higher performance and lower cost is frugal. This is what people are looking forward. It is a huge challenge by the way; it is a very huge challenge. It is not only in product design, it also goes into services. It also, you see in the when we buy products we also have packaging. So, many of the packaging's are made out of plastic. So, these plastics are not so eco friendly. So, now, people are looking for can we make an eco friendly solution for packaging, ok.

And, recently when I was reading through an article I saw people have started making waste into value added products. So, they say waste is now so are resource for making value added products. So, they take the waste convert the waste into a useful product and they start giving it to the customers. So, let us compare and see the frugal innovation versus standard innovation or a regular innovation.

When we compare so, these are the parameters where in which we compare these two; environment if you say institutional voids and resource constraints are there in frugal high quality institutions and slack resources are there in standard innovation. When we talk about cost it is always low cost input and low cost output. So, here it is high cost

input and high cost output, this is the comparison. So, if diffusion approach it is always bottom up approach, it is top down approach. So, what also frugal says as see the bottom of the triangle is very large. So, frugal always tries to attack here and standard innovation they try to attack in this portion, standard. So, this is the bottom of the triangle, right. So, it is always a bottom up approach when it goes for frugal, when standard it is always top down approach.

The users are lately majority, low income, limited education. So, think of it, when people have limited education how are you going to sell your product. I would I am always amazed with the product called cell phone. Cell phone came into existence in the last 20 years 20 to 25 years, right. So, in the last 20 to 25 years it came into existence, nobody was even aware of a cell phone. Today, everybody uses cell phone left and right.

For example, my son who is in eighth standard uses a cell phone, my another son who is in third standard uses a cell phone, my wife who is a school teacher uses a cell phone, my father in law who is not even a graduate so, he uses a cell phone, right. My milkmaid, milkman who is completely illiterate, who does not know to read and write also uses a smart phone. They all enjoy the app called the Whatsapp; everybody enjoys it. Nobody has undergone a training program, look at it. Nobody has undergone a training program, a legal training program.

If you look at it is really complex to understand how to login, how to start using a Whatsapp, how to communicate, how to receive message, how to convert your Whatsapp photo into an email, how to convert an email message into a pdf and then take it back to Whatsapp, all these things are a complex thing. We all do it is involuntarily you all do it involuntarily; that means, to say we are we are doing it without undergoing a training, just we found out there is a necessity and the device is so user friendly. So, we are able to move things up and down very fast. So, that is what is, talk about limited education.

Frugal innovation the smart phone is a frugal innovation by the way, it is an innovation. It has outwit and laptops; laptops at one point of time where around about a lakh. Today it has come down to 15000 and 18000. You have tab which competitive it is came into competition, now tab is slowly pushed out of the market because of smart phone, smart phone which was started initially for hello hello today hello hello has become very minor application of the entire smart phone.

So, look at it the user, limited education, income; my milkman who does not have an income more than 15000 holds a phone of worth of 8000. Half of his salary he invests on a cell phone, why? because he understood the importance of technology and the usage of it very well. When you go to user of standard innovator, early adopters, highly high income people and highly educated people start using it. Resources, entrepreneurs, family business group and social movements are the resources for frugal innovation. Entrepreneurs and large organisation come to standard innovation. The process is open and distributed, it is always closed. For example, bigger companies hold an IPR or they do not even file a patent, but they hold everything within them.

For example, innovation standard innovation is your Pepsi and Coke; the formula is not known to anybody, but the products are distributed, everything is done, right. The characteristics are primarily architecture, here it is primarily component; architecture means if it starts from the output and goes towards the input standard. Sometimes it start from the basic things and then goes towards an output product.

(Refer to Slide Time: 19:16)

Introduction

Frugal innovation versus social entrepreneurship

- The two are not mutually exclusive and nor is one a subset of the other.
- There can be overlapping concerns as frugal innovation and social enterprise commonly agree on who to benefit, but they differ on how this is best achieved.
- Social enterprise in general stems from a notion that the affluent, particularly those in the West, can promote development using business models that are self-sustaining.

The frugal innovation versus social entrepreneurship, these two are different. The two are not mutually exclusive and nor is one a subset of the other. Please understand the difference, very important. There can be overlapping concerned as frugal innovation and social enterprise commonly agree on who to who to benefit, but they differ on how this is best achieved.

So, frugal always talks about how do we best achieve; social enterprise is general stem from a from a notion that the affluent particularly those in the west can promote development using business models that are self sustaining, ok. This is social and this is frugal.

(Refer to Slide Time: 20:22)

Introduction

Frugal versus Quality

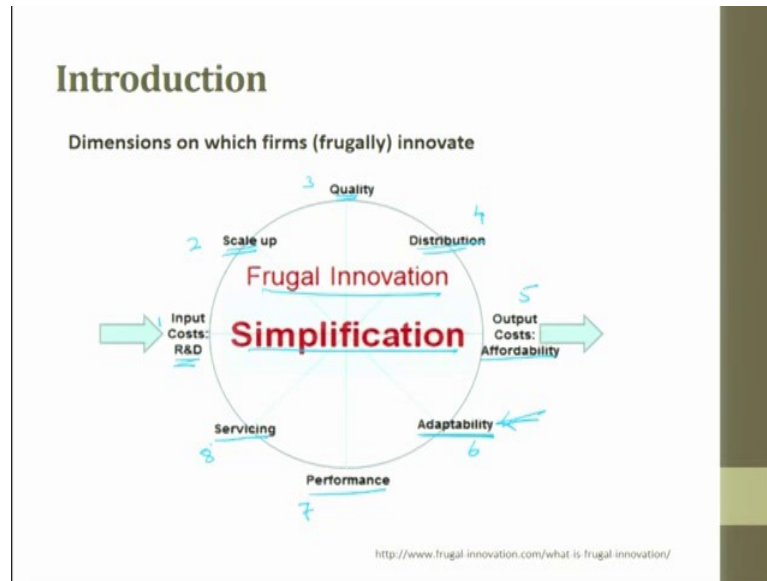
- On the contrary, it needs to be highly robust given the extreme environments in which the innovation functions.
- Further the innovation needs to be very intuitive to use and require very little servicing — what you might call “solutions for dummies”.

↓
USP → Frugal

Frugal versus quality on the contrary, it needs to be highly robust giving the extreme environments in which the innovation functions, ok. So, frugal does not mean that it is a poor quality, frugal means it is also good quality. Further the innovation need to be very intuitive to use and require very little servicing. The innovation need to be very intuitive to use.

The button should try to lead you to the usage, when it is the button should not be in such a way such that you have to really understand what are all the functions and then start using and require a very little servicing, that is what is frugal. You might call solution for dummies, this is a common USP for frugal. So, without even knowing the system by looking at the system if you can put a simple amount of logics and start moving you will be able to solve the problems.

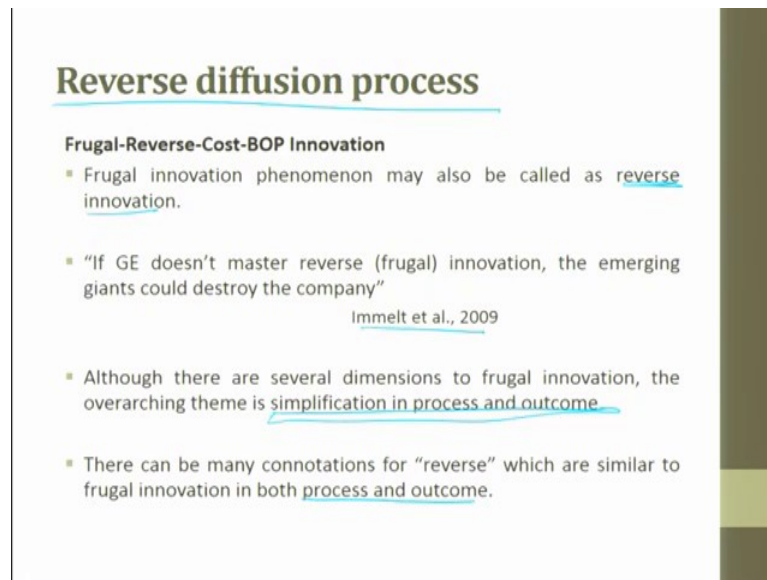
(Refer to Slide Time: 21:34)



So, the dimensions on which firms frugally innovate, you have these are the dimensions one is input costs and R and D, scale up scale up quality distribution, output cost and affordability, adaptability, performance servicing. Your model should always be adaptable; that means to say it has to look for mass customisation. The product should look for mass customisation. This should also be thought of when you try to develop the product, is that clear? So, when you talk about input cost, the output cost should be affordability.

Performance, you cannot sacrifice performance and quality, ok. High quality, poor performance, no. High quality, high performance is required servicing is also very important. If you follow the concept of modularity you throw away a part or you remove certain portions; it should not be 100 percent use and throw. You should be, given your freedom where in which you can start working on certain things and start using it. So, frugal innovation is nothing, but simplification these are the dimensions, please keep it in mind. Cost, scale up, quality, distribution, affordability, adaptability, performance and servicing.

(Refer to Slide Time: 22:58)



Reverse diffusion process

Frugal-Reverse-Cost-BOP Innovation

- Frugal innovation phenomenon may also be called as reverse innovation.
- “If GE doesn’t master reverse (frugal) innovation, the emerging giants could destroy the company”
Immelt et al., 2009
- Although there are several dimensions to frugal innovation, the overarching theme is simplification in process and outcome.
- There can be many connotations for “reverse” which are similar to frugal innovation in both process and outcome.

So, reverse diffusion process; this is called as reverse diffusion process. Frugal-reverse-cost-BOP-innovation. Frugal innovation phenomena may also be called as reverse innovation; frugal is otherwise called as reverse innovation. If GE does not master reverse innovation, the merging giant could destroy the company. So, this was a statement made.

Although there are several dimensions to frugal innovations, the overarching theme is simplification in process and outcome. So, this is what a bigger corporate company look forward and they get it done. There can be many connotations for reverse which are similar to frugal innovation in both process and outcome.

triangle. So, this is one. Then the second thing is capital enriching emerging market giants are gobbling up western firms. So, this one is the second thing.

So, what is happening is, the capital enriching emerging market giants are gobbling up the western firms and the third one is new emerging market MNCs with global reach are better equipped to full fill needs to all levels of the custom consumer pyramid in different markets. So, this is what that latest thing, which is coming up is, new emerging market MNCs with global reach are better equipped to fulfil needs at all levels of the consumer.

So, now the big companies what they are trying to do is they are trying to give solutions to all the three levels of the triangle. So, moving up the pyramid from emerging market leader versus traditional moving down, so, this was traditional and this is the latest need of the hour.

(Refer to Slide Time: 26:40)

Reverse diffusion process

Frugal-Reverse-Cost-BOP Innovation

Firstly, frugal or reverse innovation integrates specific needs of the bottom of the pyramid markets as a starting point and works backward to develop appropriate solutions which may be significantly different from existing solutions designed to address needs of upmarket segments

Silicon India, 2010

- The context in which this innovation is seen occurring in lies in developing markets.
- It is a clear adaptation to the often poor local infrastructure facilities with respect to energy delivery systems, water access, transport infrastructure, digital access.

The slide features a pyramid diagram with the word 'Solutions' handwritten in blue at the top. The pyramid is divided into three horizontal sections. The text on the slide describes the 'Reverse diffusion process' as starting from the bottom of the pyramid and moving upwards to develop solutions for higher market segments. It also notes that this process is often driven by poor local infrastructure in developing markets.

Firstly frugal or reverse innovation integrate specific needs of the bottom of the pyramid market as a starting point and work backward to develop appropriate solution which may be significantly different from existing solution designed to address needs of the up market segment. Firstly, frugal or reverse innovation integrates specific needs of the bottom of the pyramid market. First they always try to give a solution for the bottom of the pyramid market at the starting point and work backwards to develop appropriate solution, for them they try to develop solutions. These solutions can be completely new

from the existing ones which maybe significantly different from the existing solution design to address the need of the upper segment market.

So, you might in the triangle, you might have a solution for the upper segment there is a solution already available, but when you look at the bottom segment there has a huge mass there is a huge need. So, this can be this solution need not be brought down here, but revise the solution and bring it to them such that they are affordable and enjoy the product.


The context in which the innovation is seen occurring, it lies in developing market. It is a clear adaption to the often poor logical infrastructure facilities with respect to energy delivery system, water access, transport infrastructure and digital access. For example, people have would like to have a comfortable car drive in the city while commuting in the city. So, it is personalized vehicle where in which enough comfort is given in the car and then people use the car for commuting from their house to office. Then slowly the pollution start at the traffic jam started, people started taking long time to go.

Now, what has happened is lot of countries or developed countries developing countries metros have started metros have started. The metros have air conditioned environment and you have your own personalized equipments available today. So, the journey travelling by car is cut short and the comfort is more as compared to that of the car. So, now, people start looking for; this is a frugal solution, by the way this is a frugal solution and the solution car is now changed for mass is metro and people enjoy this metro and start moving here and there.

(Refer to Slide Time: 29:16)

Reverse diffusion process

Frugal-Reverse-Cost-BOP Innovation



- Secondly, there is a reverse process of diffusion among consumers.
- Innovation is often perceived in the developed world as technological revolutionary products tried and tested by innovators and early adopters. *cell phone + torch light*
- Trendy and expensive products are accepted by the top of the pyramid first which then get trickled down to the masses or early and late majority consumers.
- Professional groups in the highest income bracket in society that constitute the "tip" of the income pyramid act as the early adopters and the first try-out group, contributing to the innovation monopoly rents of the innovating firm.

Rogers, 1962

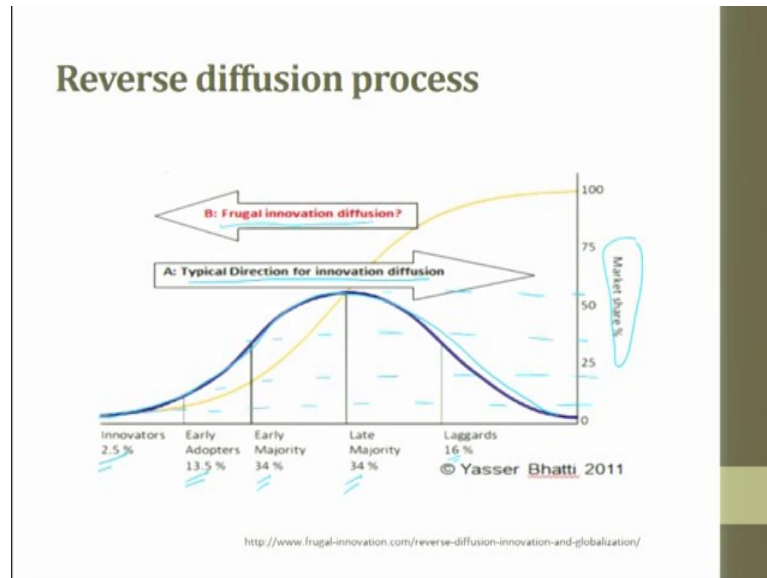
Secondly there is a reverse process of diffusion among consumers there is a reverse process of diffusion among consumers innovation is often perceived in the developed world as technological revolutionary products tried and tested by innovators and early adopters, ok. The innovation is often perceived in the developed world as technological revolutionary products tried and tested by innovators and early adopters.

For example, cell phone with a torch light is an example which was not there the torch light was not there when Nokia developed this design I was sitting in Finland it was tested, it was proved success, but when they came to India they realise the torch light is any necessary even to be present in the cell phone and they took it back and integrated today. So, the innovation is often perceived in the developed world as technological revolutionary products, ok, they accepted a cell phone, tried and tested by innovators and early adopter.

Trendy and expensive products are accepted by the top of the pyramid first when which then gets trickled down to the masses or early and late majority customers. Professional groups in the highest income bracket in society that constitutes the tip of the income pyramid acts as an early adopter and the first try-out group contributes to the innovation monopoly rents on the innovative firms.

So, they always try to make an innovative product and attack at the top end. For them it is affordable and they are the people with whom they are tested, but it has to happen here for frugal innovation.

(Refer to Slide Time: 31:19)



So, when we see the process. So, innovators are 2.5 percent, early adaptors are 13.5 percent, early majority are 34 percent, late majority are 34 percent; laggards are 16 percent. So, this is a typical direction for innovation diffusion to happen and any event to happen follows a binomial distribution.

And, when we look at the market share what happens is when it is innovator market it is always it is 2.5 percent it is very less. So, if you see the market is here, then when we talk about early innovators, it is here close to 25; when you talk about 30 35, it is here, when you talk about 50, it is here. So, this is a graph which talks about market share percentage market share percentage with respect to the developing, and if you see typically what happens this is how the innovation gets diffused, but what frugal wants is from here. So, laggards, late majority, they wanted to use and this is, a frugal innovation has to happen.

(Refer to Slide Time: 32:33)

Frugal innovation, the challenges

1. The first challenge, i.e. resource constraints, refers to the resource scarcity that prevails in the developed markets.
Either the necessary resources are simply not available or people lack the means to access them. *HR, materials resource, energy resource.*
2. The second challenge refers to a variation of resource constraints that rather than being faced at the upstream part of the value chain, concerns the downstream part.
With poverty being omnipresent, innovators have to realize that affordability constraints, i.e. the lack of purchasing power, can pose yet another barrier to innovation.

The first challenge the frugal innovation the challenges are the first challenge is that is resource constraints, refers to the resource scarcity that prevail in the developed market. Either the necessary resources are simply not available or people lack the means to access them. For example, human resource is also a resource apart from materials resource, and apart from energy resource. So, first challenge is the resource constraints refers to the source of scarcity, that prevails in the developed country.

The second challenge refers to a variation of resource constraints that rather than being faced at the upstream part of the value chain concerns the downstream part. With poverty being omnipresent innovators have to realise that affordability constraint, that is lack of purchasing power can pose yet another barrier for innovation, ok. The, this is the variation of resource constraints that rather than being faced at the upstream of the value chain concerned the downstream part.

(Refer to Slide Time: 33:53)



Frugal innovation, the challenges

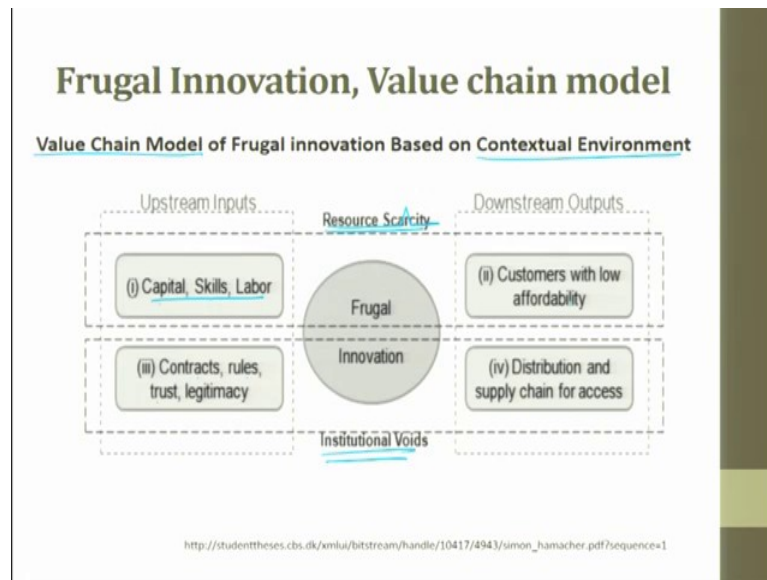
3. In moving beyond resource constraints, Bhatti (2012) addresses the institutional context as the third challenge to innovation that exists in emerging markets.

While the features generally stifle business activity by increasing transaction costs and therefore represent a major hurdle for MNC and entrepreneurs (Soni, 2013), they at the same time create an ideal context for rethinking one's prevalent assumptions about innovation (Bhatti & Ventresca, 2013)

The moving beyond resource constraints addresses the institutional contacts as the third constraint or a third challenge of innovation that exist in the emerging market. While the features generally stifle business activities by increasing transaction cost and therefore, represent a major hurdle for MNCs and enterprise they at some time create an ideal context of rethinking one's prevalent assumptions about the innovation while the features generally stifle business activities by increasing transaction cost, transportation cost and therefore, represent a major hurdle for MNCs and enterprises, they at at the same time create an ideal context for rethinking once prevalent assumptions about the innovation.

So, this is a big challenge institutional context, address the institutional contexts to the next challenge.

(Refer to Slide Time: 34:57)




When we talk about the value chain model value chain model of frugal innovation based on contextual environment is upstream input is capital skill and labour and these are the resource scarcities by the way these are the resource scarcities and you see upstream inputs and downstream inputs; downstream inputs are customer with low affordability is an is a downstream output. So, here it is upstream input is capital, skill, labour then we have contracts, rules trust and legitimacy. These are institutional voids. These are resource scarcity, these are institutional voids.

Contracts, rules, trust, legitimacy, distribution and supply chain for access. This in the innovation side, this is the institutional void. So, this is a graph or this is here figure schematic diagram or a block diagram or a schematic diagram a block diagram which talks about the value chain model of frugal innovation capital, skill, labour, contract, rules, trust, legitimacy, customer with lower affordability, distribution and supply chain for access.

(Refer to Slide Time: 36:14)

Frugal innovation process

- 1. Knowledge of the local context**
 - Various scholars conclude that the process of frugal innovation appears to require a high level of embeddedness in the local context of the target market.
- 2. Collaboration**
 - The collaboration with external partners throughout all phases of the innovation process, and often from various geographies and industries, seems to be another crucial part of the frugal innovation process
 - The reasons are manifold but mainly relate to cost reduction and knowledge access (table in the next slide).

The frugal innovation process starts with knowledge of the local context with various scholars conclude that the process of frugal innovation appears to require a high level of embedded-ness in the local context of the target of the target market. For example, whenever we start developing a product design what we do is we do lot of cut and paste from the data available from the websites available, we start looking at those things as reference material and we start developing it.

Many other reference document and material are all available in the developed countries and at few metros in India where the companies have their extension counter. If you are staying in a remote place,ok, remote place or in particular country like developing country like India there you might not get several of these resources which are used in the design which is available in the design to copy and do it in your product because those things are not available.

So, I had a good friend of mine professor Prashanth Kumar who always used to say moment you make a design then go to the market and look at the market and make a list of all available items which is in the market, then come back; sit on your design table and start relooking into the design with the locally available material and improvise your design. Why? because the cost is going to be affordable the time is not going to be expensive. So, you do not have to have a large waiting time and the third thing is you should understand the skill what is available with us.

So, in the local market what is a skill. So, that is what knowledge on the local context is very important. People think of constructing huge buildings, but if there is a scarcity for the construction material, then you cannot construct it; it becomes too expensive. So, the knowledge of the local context is very important understand the customer, understand the resources and start thinking for a product.

Collaboration – today’s world in innovation; innovation is a team effort. Innovation does not need intelligence. Innovation needs a problem solver; who can understand customer voice and sit down with people and start developing an output for that thing, collaboration. Collaboration with external partners throughout all phases of the innovation process and often from various geography and industries seem to be another crucial part of the frugal innovation process.

Collaboration with external partners; for example, you can develop a product design you can do POC, but selling it in market, sales is not your job. So, you cannot do sales. So, you look for a partner or you will while developing the product itself you establish some vendors who can machine it for you, make it for you. So, subcontracting collaborate with external partners throughout all the phases of innovate innovation process and often from various geographies and industries seem to be another crucial part of the frugal innovation. The reasons are manifold, but mainly related to cost reduction and knowledge access.

(Refer to Slide Time: 39:40)

Frugal innovation process

Purpose of External Collaboration in the Frugal Innovation Process

| Purpose | Elaboration |
|--------------|---|
| Cost | It (External Collaboration) helps considerably in reducing the cost of ownership for the consumer (Tiwari & Herstatt, 2012b). |
| Knowledge | It enables access to proprietary knowledge and crucial technical and/or market know how thereby shortening the learning curve, reducing the innovation risk and ultimately increasing the quality (Soni, 2013). |
| Promotion | It enhances the brand image and the quality perception among the population (Tiwari & Herstatt, 2012b). |
| Distribution | It allows improved access to an otherwise extremely dispersed customer base (Tiwari & Herstatt, 2012a). |

http://studenttheses.cbs.dk/xmlui/bitstream/handle/10417/4943/simon_hamacher.pdf?sequence=1

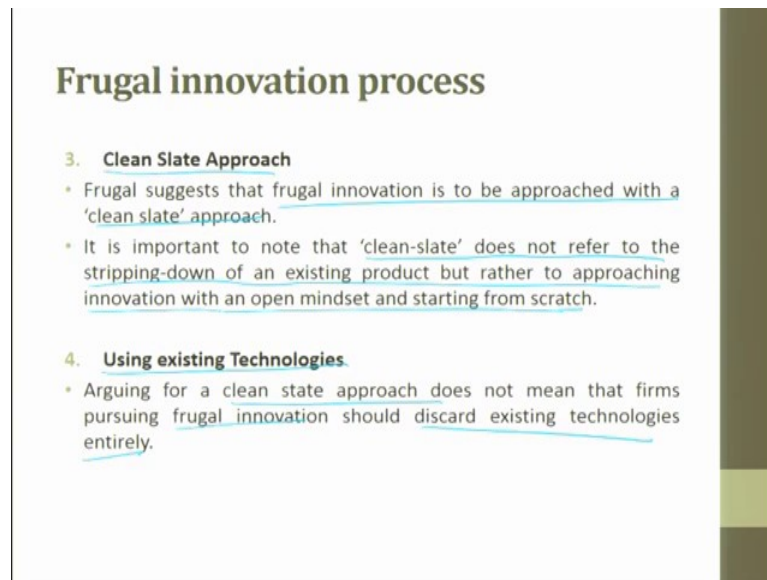
So, the purpose of external collaboration in frugal innovation process, these are costs. It helps considerable considerably in reducing the cost of the ownership of the customer. Knowledge – it enables access to the prior the proprietary knowledge and the crucial technical or market known how thereby shortening the learning curve reducing the innovation risk and ultimately increasing the quality. So, what happens today is, in almost all the government projects today which is released by Government of India they there is a provision of appointing consultant. So, consultant means who is who has a very good knowledge in a very narrow field which can be picked up and used to for your product development. So, that is what knowledge is.

Promotion, it enhances the brand image and the quality perception from the population. For example, brand image when somebody sees like this on a shoe, they always say it is a Nike shoe, the brand value is built in. So, they say if they see this model they say it is a good shoe, good quality shoe. If you can try to market with those people under their banner that is what is promotion where in which we always look for external collaboration.

Distribution, it allows improved access to another extremely dispersed customer based. For example, if you can make products and tie up with some of the big malls because big supply chain or big food chain vendors then it becomes easy for you to sell your product.

So, you need to have cost collaboration, knowledge collaboration, promotional collaboration and distribution collaboration for your frugal innovative product.

(Refer to Slide Time: 41:17)



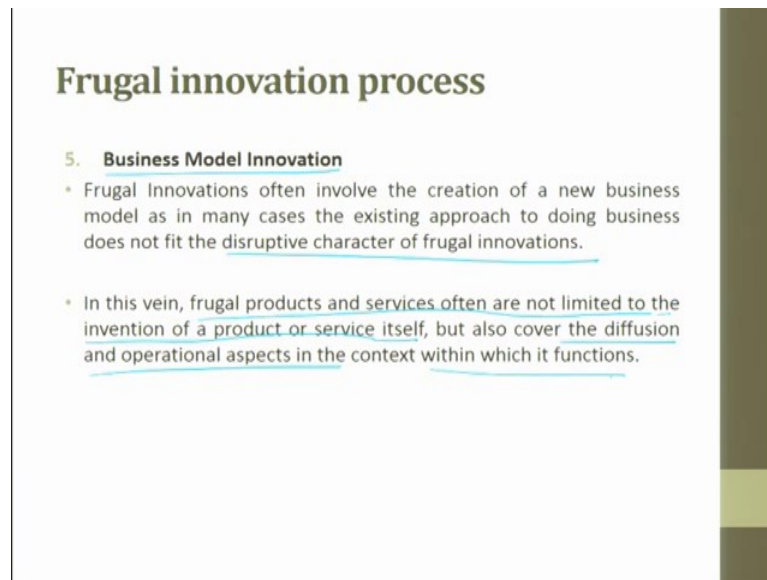
Frugal innovation process

- 3. Clean Slate Approach**
 - Frugal suggests that frugal innovation is to be approached with a 'clean slate' approach.
 - It is important to note that 'clean-slate' does not refer to the stripping-down of an existing product but rather to approaching innovation with an open mindset and starting from scratch.
- 4. Using existing Technologies**
 - Arguing for a clean state approach does not mean that firms pursuing frugal innovation should discard existing technologies entirely.

The third thing is going to be clean slate approach. When the clean slate approach is whenever you are trying to solve your problem do not go with preconceived solution, try to look at the problem from a clean slate, look at it from all perspective customers perspective and try to give a solution. Frugal suggests that the frugal innovation is to be approach from a clean slate approach. So, it is important to note that clean slate does not refer to stripping down of an existing product, but rather approaching innovation with an open minded innovation starting from the scratch, ok. It is not to criticize, it is only to start from the scratch and go solving this problem.

You using existing technologies do not try to reinvent the wheel that is what is here. Arguing for a clean slate approach does not mean that a firm pursues frugal innovation should discard the existing technologies extremely. You should not discard the technology; you should only start giving solution for the customer wise product. So, that is what is an extreme technology were talking about.

(Refer to Slide Time: 42:19)



Frugal innovation process

5. **Business Model Innovation**

- Frugal Innovations often involve the creation of a new business model as in many cases the existing approach to doing business does not fit the disruptive character of frugal innovations.
- In this vein, frugal products and services often are not limited to the invention of a product or service itself, but also cover the diffusion and operational aspects in the context within which it functions.

Business model innovation: the frugal innovation often involves a creation of a new business model as in many cases the existing approach to doing business does not fit that descriptive character of frugal innovation. For example, online purchase; today online purchase has come up to purchase big extend that people have start and start stopping to go to window shopping. So, the window shopping today it is done digitally. People look at the price, people look at comparison of the prices, people try to book it online and the delivery of the product happens at home. If the product is damage it is taken as return, it is reply it is new one is issued or the money is refunded.

So, these are all new business models which has completely made towards digitisation and people start enjoying it. Ola and Uber are a new business model innovation, ok. People are able to offered for the for the solution or for the service whatever they take and it is a sustainable solution. The driver gets the salary, the customer pays the money either through digital or through cash, he has a freedom and he knows what the waiting time is, he knows the route with which the car travels, everything is known to him.

So, this is a business model in this way the frugal products and services often do not limit to invention of a product or service itself, but also covers the diffusion and operational aspects in context with which it functions.

(Refer to Slide Time: 43:54)

Frugal innovator's traits

→ Reduce, Reuse, Recycle

- 1. Build circular value networks**
 - Most companies today operate linear value chains, in which products are designed, produced, sold and consumed and end up in landfills.
- 2. Crowdsource solutions**
 - Across sectors, businesses in the developed world now face "wicked" problems that are complex and messy.
 - Relying solely on in-house capabilities and resources will not work as a strategy.
- 3. Simplify structures and empower employees**
 - To save time and gain agility, companies must learn to flex their assets not just physical or service assets, but also human assets.
 - CEOs must simplify organizational structures by eliminating bureaucracy.

||||

So, what are the frugal innovator traits? Building circular value network most companies today corporate linear value chain in which the products are designed produced, sold and consumed and end up in landfills. So, here what we talk about is circular value network. So, for example, you buy a product. So, you try to. So, this is what it is in a very crude fashion it goes to reduce, reuse and recycle. So, what we are trying to talk about is these two, in particular recycle. So, it was a landfill. So, so what we do is the product which comes out goes back into the chain and keeps on moving, right.

So, crowd source solution: across sectors, businesses in the developed world now face wicked problems that are complex and messy. Relying solely on, in house capability and resources will not work as a strategy. So, crowd source solutions are something which is now talked about much. So, whatever is the existing solution locally available they lead to complex and messy solutions. So, people are saying that let us look at the solution which is available in other place. For example, agriculture in Israel where there is not much of water people do successful irrigation. So, that model can be copied to Indian system, but, however, it has to be customise to Indian scenario. So, crowd solutions, right; looking for solution available in different countries.

Simply structure, simplifying structures and empower employee. To save time and gain agility companies must learn to flex their assets not just physically or service assets, but also human assets. That means, to say they are the when you have to do frugal

innovation one of the biggest resources is human resource. So, you have to train the human resource to be flexible enough to work in different fields depending upon the requirements coming.

The CEO must simplify organizational structures by eliminating bureaucracy. If frugal has to happen the company has to should not have vertical structures, it should have a horizontal structure. So, that means, to say everybody feels it is their company, everybody feels it is their contributions, towards the welfare of the product. There is no verticals; it is all to be has horizontal bills for the institute.

(Refer to Slide Time: 46:35)

Frugal innovator's traits

4. Use KPIs to incentivize and sustain frugal behavior across the organization

- CEOs must create specific key performance indicators (KPIs) to drive frugal thinking and action at all levels.
- This includes recruitment, training, performance management and incentive systems.

5. Evangelize the 'do better with less' mantra

- Companies should not merely communicate their bold frugal innovation goals by issuing press releases.
- Instead, corporate leaders must put their personal reputations on the line by making major public announcements about these goals and restating them incessantly to employees, customers, investors and partners.

So, these institutes are very successful or companies are very successful use KPI to incentivise and sustain frugal behaviour across the organisation. The CEO must create simplified key performance indicator to drive frugal thinking and action at all levels. So, giving incentive is another thing when somebody does this, key performance indicators towards frugal. So, this includes recruitment, training, performance management and incentive system.

Evangelize the do better with less mantra. So, this is what is again frugal. Company should not merely communicate their bold frugal innovation goals by issuing press release. Instead, corporate leaders must put their personal reputation on the line by making major public announcements about these goals by restating them incessantly to

employees, customers, innovators and partners. Do better with less is the mantra which is used.

(Refer to Slide Time: 47:31)



Examples

1. **Mitticool**
 - A traditional clay craftsman, Mansukhbhai Prajapati, literally turned soil into gold.
 - He harnessed the cooling properties of clay and created a low-cost, biodegradable refrigerator made out of clay, Mitticool.
 - It became an instant hit in his village and since then, there is no looking back.
 - His factory is producing other kitchenware out of clay. This Village Entrepreneur has been recognised and awarded by national and international organisations.

Then now we will see three or four examples which have been done by frugal. One example is Mitticool. Mitticool mean it is a small refrigerator which is which is part of for people below the poverty line; so, during summer to maintain fresh vegetables and perishable items for a longer time.

So, Mitticool was a product which is very popular in India a traditional clay craftsman because an expert in the field understood there is a customer wise. He started redrafting the craft into yeah refrigerator from a pottery to a refrigerator. Prajapati, Mansukhbhai Prajapati literally turned soil into gold. He harnessed the cooling property of clay and created a low cost biodegradable refrigerator made out of clay called Mitticool. It became an instant hit in his village and since then there is no look back for him. His factory is producing other kitchenery because he knows how to convert clay into biodegradable refrigerator.

So, he has started understanding that there is lot of need in the below the poverty line kitchenware. So, he is other kitchenware is also made. This village entrepreneur has been recognised and awarded by national and international organisations.

(Refer to Slide Time: 49:55)

Examples

Mitticool



<https://edition.cnn.com/2013/06/25/tech/innovation/frugal-innovation-india-inventors/index.html>


So, he is the Prajapati and this is his products al the perishable items are kept inside. So, he pours water on the top and the clay has a property of cooling. So, through this property, he is able to maintain a cold environment, maintain the humidity to a large extend and also maintain the temperature. So, he has extended the life of the perishable goods. So, this is a frugal innovation.

(Refer to Slide Time: 49:22)

Examples

2. **Motorbike tractor**

- Mansukhbhai Jagani's motorbike-turned tractor is both cost-effective and fuel-efficient.
- In just 30 minutes, it can plough an acre of land with meager two liters of fuel.
- His 'Bullet Santi' has helped to increase productivity by cutting the cost of labor or bullocks to plough the land.
- His invention has earned patent in India and the US.



<https://steemit.com/juggad/@aarkay/10-inspiring-indian-frugal-innovations>

The next frugal innovation is motorbike tractor. So, a tractor is very expensive. Motorbike is the common vehicle a transport vehicle available in the villages. So, they

have integrated the tractor the tractor the device of tractor which is used to plough the field. So, they have in the integrated it to a bike. So, they have dismantled it, made an adaptor, so it can be used to for both. It follows the concept of modularity.

So, Mansukhbhai motorbike turned tractor is both custom effective and fuel effective it just takes thirty minutes it can plough an acre of land with meagre two litres of fuel this Bullet Santi has helped to increase the productivity by cutting the cost of labour and bullock carts. See, today machines are available for capital intensive machines are available for big farmers, but for a small farmer who owns 1 acre and 2 acre there is a lot of the developing agricultural implements for them. So, here is a frugal innovation which is made and it is very successful.

(Refer to Slide Time: 50:36)



So, Godrej Company came out with their innovation frugal innovation which is called as chhotucool and chhotuwash. So, this is this is a refrigerator and this is a small washing machine, ok. So, they came up with this Godrej. So, big companies have started investing in frugal and they have also produced products which can be done.

(Refer to Slide Time: 51:02)



Examples

4. Jaipur leg
 - Dr. P.K. Sethi, the Jaipur Foot, also known as the Jaipur Leg, is a rubber-based prosthetic leg for the people with below-knee amputation.
 - The invention led Dr. Sethi to win the Magsaysay Award for Community Leadership in 1981 and the Padma Shri by the Indian government in the same year.
 - The NGO Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS) based in Jaipur, Rajasthan, the world's largest organisation serving the disabled, is receiving government and voluntary support from home and abroad to enable the disabled to stand on their feet.

The biggest success which have had happened in India towards frugal is Jaipur legs. Sethi, the Jaipur foot owner or as also known as Jaipur leg is a rubber made prosthetic leg for a people with below knee amputation. So, this came up in a very big success and today people from several underdeveloped countries come to India copy this model and develop this idea to their take this idea to their country and Jaipur foot also hand holds them towards the this thing and people the patients come here and they get affordable rubber based per prosthetic legs for them.

The invention led the doctor Sethi won Magsaysay award for the community leadership in 1981 and PadmaShri which is which is given by the Indian government in the same here the NGO Bhagwan Mahaveer Viklang Shashwat Samiti BMVSS based in Jaipur Rajasthan the world's largest organisation serving disability is receiving government and voluntary support from home and abroad to enable the disabled to stand on their own feet.

(Refer to Slide Time: 52:23)

Examples

Jaipur leg



<https://steemit.com/juggad/@aarkay/10-inspiring-indian-frugal-innovations>


So, this is the Samiti which helps and this is a doctor who develop this foot and today, it is used for servicing. People with lower amputation for them it is a god's gift they could they could walk they could start walking and getting better things done.

(Refer to Slide Time: 52:34)

Examples

5. Pedalling washing machine

- Remya hated washing clothes but had no respite.
- She invented a washing-cum-exercise machine that used pedalling rather than electricity to wash and dry clothes.



<https://steemit.com/juggad/@aarkay/10-inspiring-indian-frugal-innovations>

The last example is pedalling washing machine which was developed. Remya hated washing clothes, but had no respite. She invented a washing cum exercising machine that used pedalling rather than electricity to wash and dry clothes this is a frugal solution which is made. So, she has taken the idea from a cycle. So, the cycle sprocket and wheel

with the chain, she sat down there and she does exercising for a foot and parallelly she has simultaneously she has also started washing the clothes inside this bin.

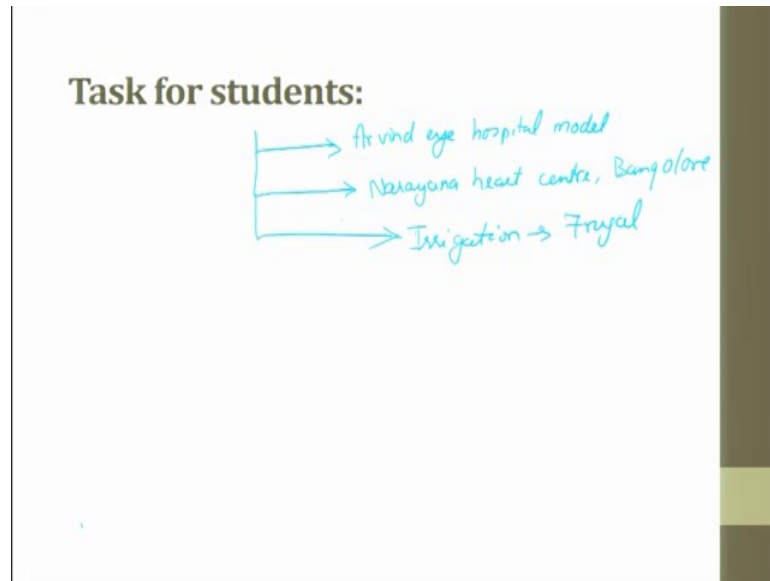
So, frugal innovation is something Indians are very successful and they are looking for an. Apart from that we have Arvind eye hospital, Hrudalaya hearts special hospital, there are Narayana Hrudalaya. So, so many hospitals and so many companies have started moving towards frugal innovation and India is one country which is more successful in frugal innovation. So, I would like all the students to look forward for frugal solutions for the existing problems.

(Refer to Slide Time: 53:39)



So, to recap what is frugal innovation we saw, how is frugal different from regular innovation we saw, what is reverse diffusion process, challenges faced in frugal innovation, value chain model and what is it we saw, how do we pursue frugal innovation. Then qualities in a frugal innovator – what all traits and qualities required and some of the frugal successful frugal innovators or innovation which happened in India we also saw very briefly.

(Refer to Slide Time: 54:13)



So, the task for the students are going to be the students are required to make or study three case studies one is Arvind eye hospital model; model which is a very successful frugal innovation model. There are many, but I am just taking you three cases. The next one is Narayana heart example heart centre it is called as Narayana Hrudayalaya. So, Narayana heart centre example this is at Bangalore and here also there is a case study which is available there are lot of YouTube videos available, TEDx talks are available and on top of it there is lot of pdf also available, please go through it and see how they do the frugal innovation.

And, the last one is going to be you are going to look at lot of irrigation models where in which frugal is now talked about, ok. So, these three examples or assignments are given to you. You are supposed to read it and note it down. So, this helps you to further appreciate the chapter whatever we studied on frugal innovation.

Thank you very much.