

**NPTEL Online Lecture**

**on**

**Product Engineering and Design Thinking**

**Module 08: Industrial Design, Design Entrepreneurship and Design Thinking**

**Lecture 36: Design-Driven Innovation**

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## **Value Proposition and Design-Driven Innovation (DDI)**

- ❖ **A sound Value Proposition**, among other things, **consists of three salient attributes**;
  - **a well defined offerings,**
  - **its addressing and relieving the user's pain-points and**
  - **how it is differentiated from the competition's offerings**
- ❖ Design-driven research carried out during the front end of technological development is most impactful; however, it remains a challenge for the designer to obtain meaningful, or rather foresight-bracing, feedback from users when developing futuristic product concepts, involving assumptions.

The above is aimed to be coped with Design-driven Innovation.

- **The ‘value proposition’ is the primordial causality that drives a buyer to own the product.**
- **It is precisely the statement that effectively determines the ultimate success or failure of the producing entity and is crucial in a competitive market.**
- **This is central to ‘Business Model (Canvas)’.**

## DDI vis-à-vis Design Thinking Strategy

- ❖ Design Thinking, focused on the stated or explicit need, helps to decipher the assumptions concerning user needs, however, it is argued that such assumptions are not easy to validate before product launch. There are viewpoints that concept of developing Minimum Viable Products (MVPs) can effectively address this gap.
- ❖ DDI, focused on implicit needs, relies that worth of a product is by orienting towards individual's experience, and not by imposing new technology. Though both DDI and design thinking, begins with user research, customers (users) have limited engagement in the case of former, unlike design thinking.
- **For HCD/ DT the strategy is ‘outside-in’, where the primacy is to observe what the customer wants, so as to find and offer the solution, and for DDI the strategy is ‘inside-out’, where one first develops the product, and then creates the desire for it in customers. The ‘inside-out’ capability is built through internal R&D and knowledge acquisition.**
- **The ultimate objective is to create a sustainable difference, by identifying unmet or implicit needs and designing or improving new products around it.**

## DDI: Creating 'meaning' in product

- ❖ **Innovation is not essentially or just about new technology, rather it is determined by for the usefulness of a product; the meaning (defined as the 'why' of a product) it creates, the purpose it serves, for which people buy.**
- ❖ The focus of DDI (Radical in nature) is on discerning what builds-in 'sense of purpose' or meanings to things (products) through Design Discourse; engaging in in-depth analysis and critiquing, the ethos not categorically stressed in the case of Design Thinking.
- ❖ Consequently, DDI aims to address the users' inferential motives and provide meaning to things (product).
- ❖ In view of the above, DDI may be cited as a push strategy, while some authors present it as a third strategy (R. Verganti), besides 'market pull' and 'tech-push' strategies.
- **Real-world experiences a shift from physical to digital products or reverse, which is the order of the present time.**
- **The challenge remains, in this event, to add value and create a new meaning, and experience as a result of redesigning.**

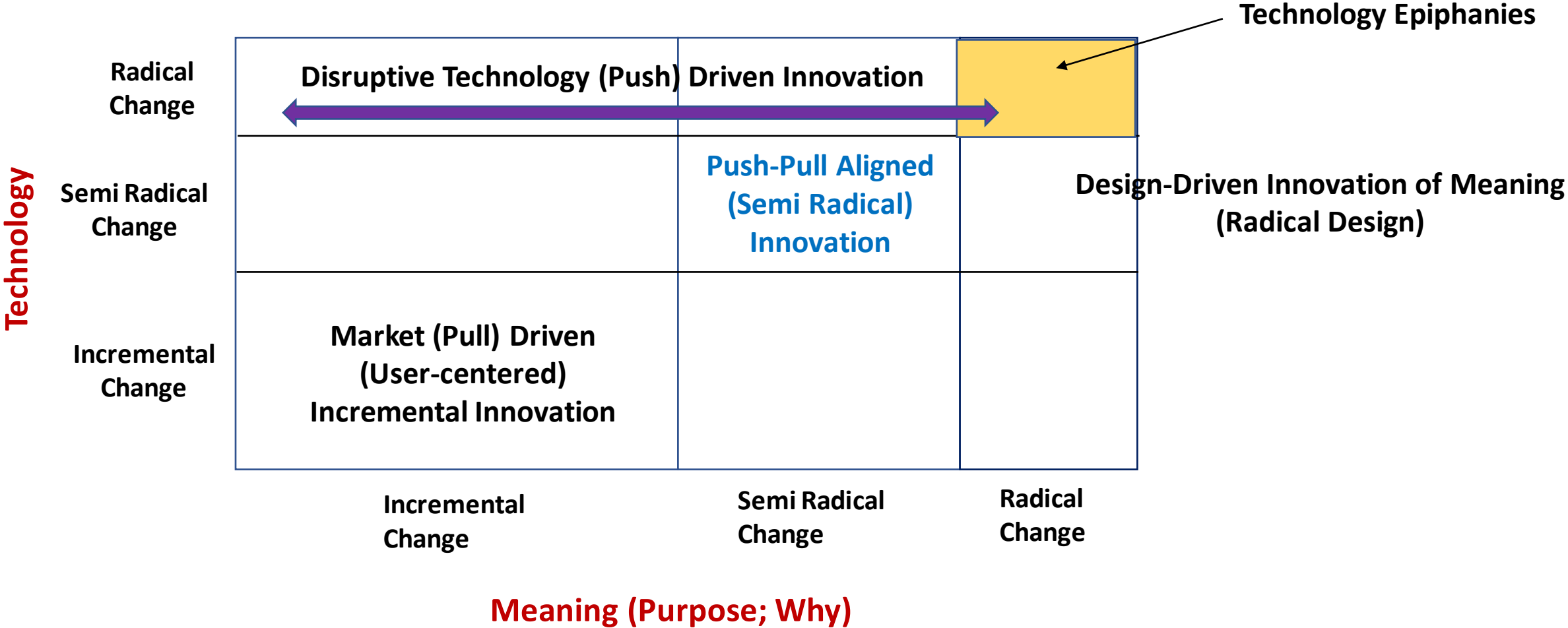
## **DDI: The radical perspective and Steps**

- ❖ DDI doesn't emerge from by current unperceived users needs, but from a new and radical perspective, on which the proposal (for creating/ changing meaning through radical design intervention) is educed by the manufacturer that redefines what a product may potentially mean for the customers.
- ❖ Companies that succeed in grasping the above achieve longer product life cycle, establish brands while leading innovation.

### **DDI method is construed to have three steps:**

- Gathering information and data (by listening and absorbing) regarding how people associate sense of purpose, the 'Why', as meanings to things.
- Interblending such information/ data (accumulated in the initial step) with the insight to build a quintessential design.
- Addressing the proposition (proposal) and make it more rounded
- DDI strives to create new wants by instilling in the customers a propensity; and thereby create new markets and businesses.

The Strategy of Design-Driven Innovation: Radical approach based on change of meaning



Inspiration: Concept presented by Roberto Verganti

## An example of Design-Driven Innovation (DDI): Fiat Panda

- ❖ According to studies, its design considerations are based on high-degree of rationality and accessibility and it incorporates ‘smart solutions’ for practical utility, versatility, and ease of use, at an affordable price, amongst the product portfolios.

### The Design Innovation Features are as below:

- Visibility Enhancement
- Designing uncluttered ‘Interior’
- Weight and cost reduction
- Abrasion/ corrosion resistance
- Electronic Braking-Assist
- Electronic Communication connectivity
- In-building full-dress sanitizing system
- HEV Versioning



Fig: Credit: MotorBeam



Fig: Credit: Fiat

- In the Small Car Segment, Fiat Panda is sustaining over 40 years (starting from 1980)
- - due to the continual stream of innovation and creative solutions that designers and engineers strived to achieve during every (new) iteration of the model.

## Explication of Feature Improvement: Fiat Panda

- ❖ **Uncluttered Layout-Design despite small ‘Interior’:** Despite being a small car, the interior does not appear cramped as spaciousness was created by rearrangement; all furnishings and the roof lining are done away with, along with the springs for the rear seats, where a tension canvas hanging on metal bars is placed instead. Also, the panels and dashboard are kept uncluttered to the best possible extent.
- ❖ **Weight and cost reduction:** Dispensable components like ‘drip rails’ (for snow/ rain) had been removed and the front grill was made out just by cutting a steel sheet which not only reduced the weight but also the manufacturing became simpler and cost-economic, for affordability.
- ❖ **Abrasion and corrosion resistance:** A protective band around the lower half of the car body in the initial model, as is in several industrial vehicles, was put to safeguard against minor impact and abrasion which is not uncommon in city driving and also to prevent corrosion. This band became a symbol of aesthetic design, giving it a unique and attractive look.
- ❖ **Electronic Braking Assist:** This design segment/ platform first introduced ‘braking assist’, employing LIDAR sensor to detect an imminent impact (range: 12 m), for applying brakes.



- ❖ **Electronic Communication connectivity:** As communication connectivity, became a vital requirement this model in its segment was first to provide a ‘Cradle Smartphone Holder’ and a ‘navigation’ (created by Waze) feature into its app (created by UConnect) with a built-in Wi-Fi (created by Wind Communications) purposing the application as a mobile hotspot.
- ❖ **In-building full-dress sanitizing system:** During recent pandemic, an all-in sanitizing system was fitted into, comprising of air purifier with filter in passenger compartment and UV lamp, called ‘D-Fence’ pack, developed by Mopar, the parts and accessories division of FCA (Fiat-Chrysler Auto).
- ❖ **HEV Versioning:** Now this range offers Hybrid (Mild) cars, focusing on the electric vehicles segment (Hybrid Electric Vehicle, HEV).
- **Concept, including product architecture and component sizing, is engineered to adopt key components from the existing product lines, downscaling dependence on new technology, and making it more design-driven.**

## **An example: Genesis of ‘listening to music on the go’**

- ❖ Prior to iPod, endeavors of the companies, to advance in the pursuit of ‘listening to music on the go’, was by technology substitution; for instance, only replacing the MP3 player instead of a CD walkman.
- ❖ Notably, the Rio PMP 300, first portable consumer MP3 digital audio players of Diamond Multimedia Inc., was with limitation that could contain only 30 minutes of music, stored in a 32 MB device, however, it was much smaller than a CD walkman and obviated the need of carrying a bunch of CDs.
- ❖ Subsequently, ‘Diamond/ MP3 Association’ developed the software, and yet it was meant to get digital content onto the player. It was not central to the immersive experience of listening to music.
- ❖ **‘Apple Inc.’ recognized that existing solutions were mere technology replacements and strived to develop a product with a new meaning.**
  - Steve Jobs at Apple, keenly listened to and observed the industry and interpreted a new meaning for digital music with “a thousand songs in the pocket” solution (iPod).
  - Diamond Multimedia acquired Xing Technologies, for the hardware, besides the online music publishers, GoodNoise, MP3.com and MusicMatch, to emerge as ‘MP3 Association’.

## **An example of Design-Driven Innovation (DDI): iPod (Apple Inc.)**

- ❖ Apple's solution enabled users in converting their music bouquet to a high-quality digital format, legally purchasing digital music flexibly and affordably, managing digital music libraries, storing much more songs on a single device by tapping into the latest information storage technology, which initially was available with 5GB or 10GB options.
- ❖ The strategy to play with design is the focus of DDI, and not simply chasing for new technology in every department or specialism.
- ❖ **Playing on the Hard-Drive:** The iPod used a 'hard drive' that was originally designed for laptop computers, which is why the storage capacity got determined (5 GB or 10 GB).
- ❖ A meaning could be interpreted and such was created by re-purposing the 'hard drive' that was co-created with the vendor to enable its suitability for the iPod, which turned out to be a radical differentiator.
- This hard drive-based differentiation strategy privileged 'Apple' in claiming that the iPod was the trailblazer digital music player that permitted, "a thousand songs in your pocket"

## **Application of three-phase participating paradigm in the design discourse (proposed by Veraganti): The Apple Inc example case**

- ❖ **Listening:** Acquiring knowledge for gaining insight for possible product meanings)
- ❖ **Interpreting:** Developing vision and proposition for new meaning, referred to as ‘proposal’)
- ❖ **Addressing:** Disseminating and sharing the vision with other networked Interpreters and influencing.
  - Apple’s way of managing the digital content acquired new meaning and proposition to the customers.
  - With the success of the iPod, the ‘meaning’ was worked in for other products, such as, MacBook, iMac, or for the iPhone (smart phone).
  - These products embodied the tools that help users manage and tag along the way of using digital things.
- **These led to and are technology ‘epiphanies’ that go way beyond technology substitutions.**

**Now, considering yet another example from the ambit of video games (Nintendo Wii)**

- ❖ Where **technologically advanced consoles** were already available with **Sony PlayStation** and **Microsoft Xbox**, and in that market, Nintendo held a different outlook by focusing on democratizing the gaming experience and it changed the meaning when a shift from ‘individual expertise’ orientation to a more user friendly one, where families could play together even with nominal expertise for the product Wii.
- ❑ In the case of design-driven, or, in other words, design-pushed strategy, the innovation is driven by the ingenuity to cognize, foresee and effectuate the creation of new product meanings.
- ❑ The uniqueness, characterized in consequence of the ‘meaning’ and the ‘design language’, is more impactful, than with the functional conformity and technology.

- ❖ **The issue: how will the ‘customer-focused’ modality work if there is no market yet for iPod or Ford’s car?** in other words, how can the design team verify the wants for radical innovation and be potentially productive, depending on the customer, who is unable to construe a future vision, bogged down with immediacies.
- ❖ It may be contextual to put **Henry Ford’s famous quote**: *“If I had asked people what they wanted, they would have said faster horses.”*
- ❖ **A similar view is also from Steve Jobs (Apple Inc)**: *“Here's to the crazy ones. The misfits, the rebels, the troublemakers, the round pegs in the square holes, the ones who see things differently. They're not fond of rules, and they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignoring them. Because they change things - they push the human race forward”.*
- This apparent conflict is addressed by Verganti, who coined the term ‘Design-Drive Innovation’.
- - Customers from who the feedback is intended are effectively ‘**Interpreters**’ (**Interpreting is creating vision and proposing for new meanings**), who lead the design discourse; able to connect between a manufacturer, its products and the network of stakeholders and build new meanings.

## Coupling of Paradigms

- ❖ There are views that in some settings, the combination or symbiosis between the two approaches produce effective outcome;
- ❖ Design-Driven Innovation (DDI), that is associated with uncertainties and adoption risks,  
and
- ❖ Human Centered Design (HCD), more acceptable due to its simplicity, often addressed through Design Thinking paradigm  
And, together can bring in complementary strengths.
- ❖ DDI for radical innovation and HCD for incremental innovation, that is incremental would follow radical for most the desirable outcome.
- ❖ Also, Sometimes, the radical change of ‘meaning’ through DDI is combined with a radical technology change through Tech-push Innovation (TPI) to bring in high-order excellence.
- Products developed based on the precepts of **design-driven** processes **often allows premium pricing** because they are differentiated from the competitor’s offerings and this helps **increase the margins and hence provides a sustainable competitive advantage.**

## Design-Driven Innovation: A Roadmap

- ❑ The activities concerning DDI methods can be considered as here-in-under, however, these may not follow a strict linear sequence, and often are undertaken in parallel, depending on the ground realities:
  - ❖ Defining the problem
  - ❖ Drawing up interpreters-network
  - ❖ Identifying user needs
  - ❖ Involving interpreters
  - ❖ Vision and Concept planning
  - ❖ Screening and verification
  - ❖ Concept Selection
  - ❖ Concept to MVP
  - ❖ Testing and commercialization
- The design-driven innovation (DDI) process serves to identify new product opportunities, drawing on user insight and the actionable assistive tools in this process are; preliminary plans, bare-bones, prototypes and solution drafts.
- DDI Method helps to reveal user behavior, practice, capability and potential needs, to conceptualize solutions that are novel, using product engineering competence that merits incorporation into the research, design and development, purposed for commercialization.



## **Elaboration: Activities (a) through (e)**

**(a) Defining the problem:** The foremost and decisive step is to correctly define the problem, basal for creating new solutions, that necessitates rigor for firm and user.

**(b) Drawing up interpreter-network:** Track down and denote the innovation and development support network as well as the knowledge share strategy so as to identify the potential interpreters for providing necessary inputs for design based radical innovation and development.

**(c) Identifying user needs:** The purpose of this step is to identify both the explicit and implicit needs, typically done through user observations and interviews.

**(d) Involving Interpreters:** Involving selected interpreters for current information and sharing knowledge about the market and industry trends as well as the future design possibilities and support developing novel and value-driven products.

**(e) Vision and Concept planning:** Concretising product vision and firming-up the design concepts to feed product development and foster commercialization.

## **Elaboration: Activities (f) through (i)**

**(f) Screening and verification:** Several ideations-based proposed solutions are analysed at this stage and the top two or three concepts are earmarked, jointly by the experts and users, for prototyping and evaluation.

**(g) Concept Selection:** The proposed solutions are tested at this stage and the one with the greatest potential along with associated challenges, if any, are selected jointly, as the product concept for taking it forward for development.

**(h) Concept to MVP:** The concept, developed based on the insight gained from user research is utilized to develop solution alternatives, and the ‘bare bones’ (preliminary draft)/ MVP of future products are created.

**(i) Testing and commercialization:** The outcome, if satisfactory, is moved forward for final prototyping, testing, and commercialization.

## **Conclusion**

This presentation begins with the context, associated with Value Proposition and Design-Driven Innovation (DDI) and compares its strategy with the one in Design Thinking. Then it delineates the radical perspectives and steps in DDI, followed by examples with explication of its features. This lecture covers participating paradigm in the design discourse of DDI and also touches upon the ‘coupling’ of design paradigms as practiced and as possible and closes with the ‘Application Roadmap’ for Design-Driven Innovation .

## **References**

1. Product Engineering and Design Thinking Lecture Notes by Pranab K Dan and Prabir Sarkar.