Wrap up lecture

Purpose of the class

- We want to jointly teach you the process of
  - Developing a good product
  - Developing a good business
- Assignments and lectures are coordinated

Enterprenurship and IPPD

- Entreprenurship
  - ..seeks to understand how opportunities to bring into existence "future" goods and services are discovered, created, and exploited by whom and with what consequences

    Venkataraman "The distinctive domain of entrepreneurship research"
- IPPD
  - seeks to discover, and create future goods and services

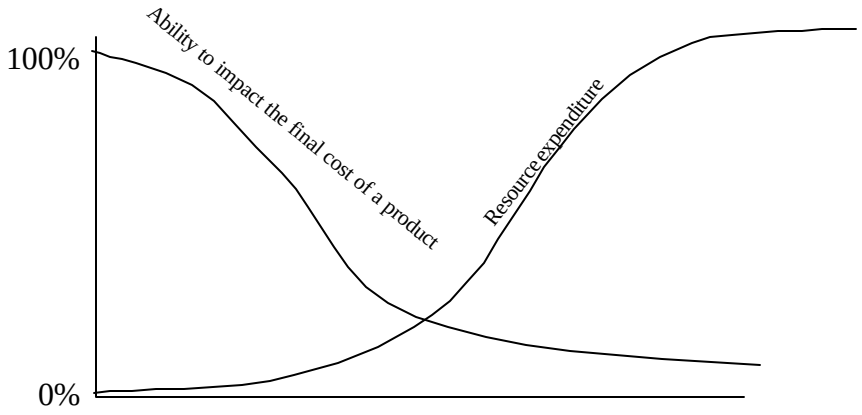
Our challenge

- All of the material is tightly coupled
- We want to teach you everything twice
- You will see things before you learn them.

IPPD

- Course introduction

Motivation for up-front design



80% of the final cost of the product is set in the first 20% of the design process

To do up-front analysis

- Must understand the downstream impact of decisions
- Must understand the constraints, cost models and requirements of other functional groups
- Need to design for
  - Product customers
  - The customers for your work (manufacturing, sales, marketing, field service)
  - The business you are developing

Definitions of IPPD

- Definitions
  - *Integrated Product and Process:* The tradeoffs and coupling between functional needs (i.e., product and process)
  - *Development*: The tools and methods used throughout the development cycle to enable to identify IPP tradeoffs and make the “best” decisions.

What does IPPD gain you

- Reduced cycle time
  - Move from a sequential process to a simultaneous process
  - Reduced time to integrate the product
- Improved quality
  - Fewer adjustments
  - More manufacturable
  - Less inspection
- Reduced costs
  - Reduced rework, scrap and repair
  - Appropriate selection of manufacturing processes
  - Optimization of the entire product, not individual functions

Understand IPPD and TE

- In product development
  - who to go to talk with
  - what are the key issues
  - what tools to use to make tradeoffs and decisions
  - what are the implications and effects of your decision
  - what are the risks
- Enterprenurship - what makes a good business
  - appropriability
  - legal issues
  - technology trends
  - issues about new firms
  - customer requirements

Assumptions

- Product development is a process of tradeoffs
  - Every decision made will effect the ability of another member of the PD team to achieve their goals
  - There are tools that can highlight tradeoffs
- Cost is the ultimate metric
- Decisions are made in an environment of uncertainty, the uncertainty results in risk
- Decisions are impacted by
  - technical issues
  - cost impact
  - organizational structure

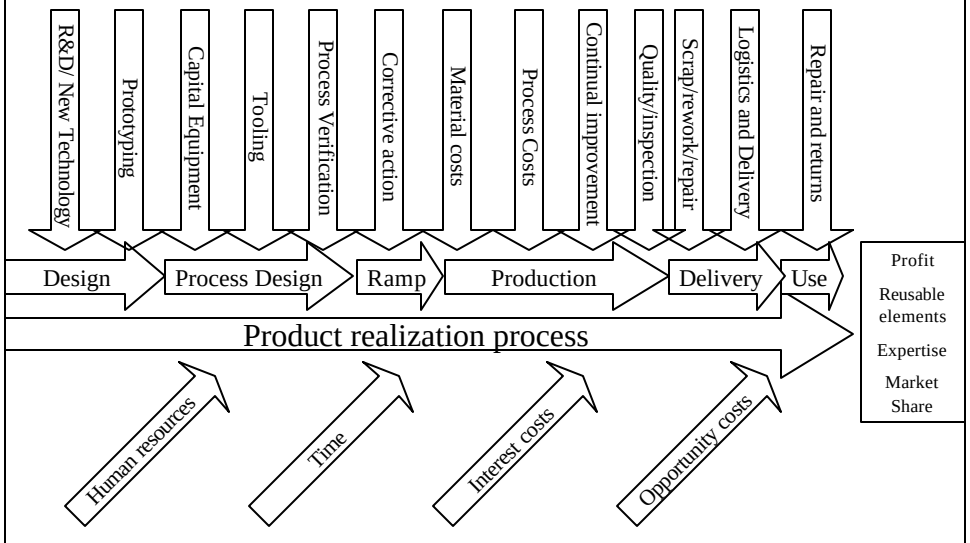
Products and platforms not parts

- Multiple product
- New technologies
- Pushing the edge of process capability
- Systems integration is hard
  - Many intended interactions
  - Many unintended interactions
- Many people and significant time to develop

IPPD as risk management

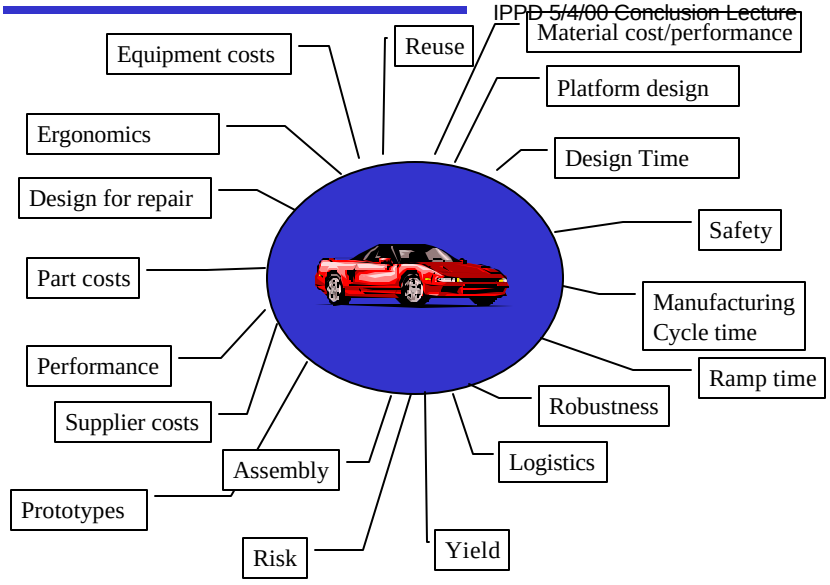
- Risk is the probability that the outcome you want won't happen
- Risk mitigation strategies
  - Risk avoidance
  - Risk reduction through
    - information gathering
    - better practice
  - Risk dispersion through
    - avoiding "all of the eggs in one basket"
    - transfer risks to other players

PD is a resource intensive process



Tradeoffs

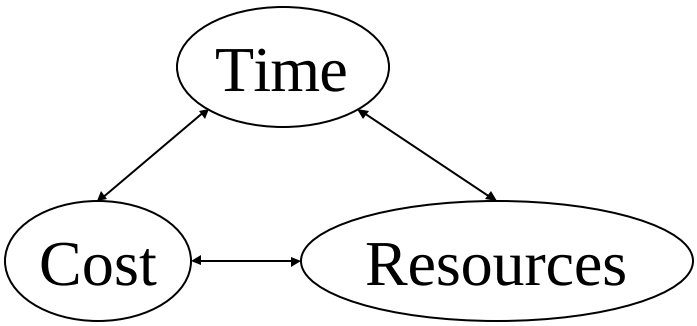
IPPD 5/4/00 Conclusion Lecture



15

Key tradeoffs

IPPD 5/4/00 Conclusion Lecture



Goal is to find creative ways to create *synergies* instead of *tradeoffs*

16

Conundrum

- Production
  - "It is just as easy to build a bad product as it is to build a good product" *Deming*
  - Most press on product improvement in production
    - TQM, 6Sigma
  - Benefits immediately seen
- Design
  - It is *much* harder to design a good product than a bad product
  - Don't see the results for years
  - Never know if it was worth the effort

Lectures and what you should have learned

- Product architecture and variety
  - What is the architecture, how do you select between architectures
- Existence and identification of opportunities (3DP)
  - Asymmetries: Why opportunities arise and why certain people can take advantage of these opportunities
  - What are the issues around taking advantage of opportunities
- Understanding Customer Needs (sweet water)
  - Understand how to elicit and quantify customer needs
  - Understand how to quantify Market Size
- Methods For Managing Customer Needs
  - FMEA and HoQ
  - Benefits and limitations of these methods

Lectures continued

- Target Costing, Pricing And Techniques For Managing Cost (Toyota)
  - What is target costing - why is it important - what skills are involved
- The Evolution of Markets and Patterns of Technology Changes (EMI case)
  - S curves
  - Diffusion
  - Adopter categories
- The Impact Of New Technology On Product Development (Cannon and EMI)
  - Driven by uncertainty
  - Methods to mitigate risks (multiple applications,
- Incumbent Failure And New Firms (continuous casting)
  - Innovator's dilemma
  - Why large firms can not innovate

Lectures continued

- Prototyping (BMW and Team New Zealand)
  - Prototyping categories from conceptual to manufacturing
  - Strategy paralleling development strategy
- Scheduling and concurrent engineering
  - Problems with "Murphy" and overlapping tasks
  - Critical chain scheduling being dependant on resources and time
  - Types of tasks that can be overlapped
- Teams
  - Types of teams
  - Interaction with architecture, product development process
  - Problems and benefits of Teams
- Protecting Intellectual Property (CVD vs. Markam)
  - Patent, Trademark and Copyright - what are the benefits and problems of each

Lectures continued

- Manufacturing Strategy And The Impact Of Design Decisions (ITT automotive)
  - Interaction between manufacturing, delivery, product architecture, quality
  - Copy exactly vs. local optimization
- Appropriability: Profiting From Innovation (Beta golf)
  - License, joint venture, solo venture
  - Complimentary assets and their role in the maturity of the technology
  - Innovator vs. follower
- Make Buy Decisions Supplier Relations
  - Close vs. arm's length relationships
  - The role of the product feature in the supplier model

Lectures cont.

- Dfx
  - Design for X models and types of tools
- Variation Risk Management, The Role Of Quality
  - What is variation and how should it be managed in the design and production processes
- Conclusion

Thanks!