Avoiding Endless Design Loops In New Product Development

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Endless Design Loops

- **A recent industry survey we conducted on NPD indicated endless design loops and finding unexpected risks are significant concerns.**
  - **These two ideas are connected**

Why the Challenge?

- **Optimism that first prototype will be close to final answer**
- **Reducing planned prototypes to save "scheduled time"**
- **Urgency to get a demonstration unit out**
- **Risks get documented, but may get lost in translation to detailed execution**

Agenda

- **What causes design loops**
- **Options for Solution**
  - **How should we handle prototypes**
  - **Simulations can reduce testing – right?**
- **What methods and tools can improve performance**

Causes for Design Loops

- **Performance short fall**
  - **Design or clinical**
- **New requirement**
- **New customer need**
- **New technology available**
  - **Part of design evolution (maturity)**
- **Risks develop and are not noticed**
- **Intellectual Property issue**
- **Manufacturing issue**
- **Prior redesign had an unintended consequence**

Thoughts on Loops

- **The option to cut a design loop without making other changes – assuming the loop is "waste" - is dangerous and risky**
  - **System changes need to take out what has typically been causing the need for more.**
  - **Or support and resources are needed to allow changes and improvements to be made to improve the design process**
- **Could we keep the loop, but shorten the duration? Maybe have a "lesser" prototype? Learn faster? Jump into the next prototype sooner by assuming what will change and not change?**

Options for Solution

- **Reasonable planning expectations, based on risk**
- **Carry multiple concepts (set based design)**
  - **Flexible prototypes could allow evaluation of options, compared to building "single setting" products**
- **Use of simulations**
  - **Get the most from these as well, knowing the limitations**
  - **But the quicker to prototypes is the quicker to "real" learning**
- **Planned, quick turn prototypes to maximize learning**
- **Design Of Experiments (DOE) approach – with prototypes and simulations**

What Tools?

- **Requirements definition tools**
  - **Quality Function Deployment (QFD)**
- **Risk management tools**
- **Strategic program planning**
  - **DOE tools**

Requirements

- **Understanding customer needs up front can avoid last minute changes**
- **What is your process for gathering these needs**
  - **Process for gathering requirements**
  - **Templates for requirements definition**
    - **Or is it just a list or book of requirements**
  - **QFD tool set**
    - **Which one?**
- **It has been said that 70% of project failures are caused by poor requirements**
  - **"Excellence Framework for NPD," Parendo, 2011**

Risk Management

- **During the planning stage, the realistic risks need to be incorporated and monitored.**
  - **People tend to be optimists.**
  - **How can a project "see" the uncertainties?**
  - **This does not have to be with an outsider, but at least someone with experience who can extract risks – in a non threatening manner – and put together a project strategy to work with it**
- **List of potential risk issues can be generated (reference "Is Risk Management Valuable for Me," Parendo, 2010) which can initiate discussions that may not otherwise take place**

Strategic Project Planning

- **Remove technology development from product development path**
  - **It can feed the pipeline, but cannot be allowed to stop a product from getting to market.**
    - **The new technology may not be needed, or the product may have entirely different needs to fill… first**
- **Contingency planning**
  - **Use of "management reserve" funding**
- **Learning focus**
  - **Avoid gold plating**

Gold Plated Product

- **Making a perfect product is a potential waste**
- **The gold plating costs more, takes longer – and we have no idea if anyone really cares**
- **Many organizations have pre planned product improvements. Thus if good ideas come up, determining a required time to implement it can be found**
  - **Does not have to be done on this launch**

Why a DOE Approach?

- **Helps provide powerful decision making**
- **Can support concept choices**
- **Saves materials**
- **Saves time on testing**
  - **Including production equipment, which is often not available**
- **Understand design space, not just select points**
- **Consider more variables and variable combinations**
- **Ultimately, this all saves schedule!**
  - **One month class projects have documented savings of 3 calendar months**

Learning Focus

- **You can learn more from your prototypes and simulations using a DOE approach**
  - **And can learn more from your computer modeling and simulation tools by extracting DOE information from them as well**
    - **This has been done in computer models – war games, batteries, Finite Element Analysis**
    - **This has been done with general, early stage conceptual prototype hardware/ processes that translate successfully to production operation**
  - **Reference: "DOE In Industrial Testing," Parendo, 2009**

DOE Examples

- **Thermal forming**
  - **Yield issues were hampering production growth**
  - **"The answer has to be in here some where"**
  - **Found equipment set up issue**
- **Injection molding**
  - **New project for company. Wanted to get it right the first time**
  - **Could not fill part! Change tool quickly, avoiding process loops**
- **Medical product works most of the time**
  - **New, implantable technology**
  - **Not capable of working all of the time**
  - **Manufacturing process not capable either**

Conclusion

- **Design loops are a major contributor to NPD delays**
- **Modification to NPD approaches are needed to balance the business and technical needs**
  - **Requirements, risk and planning components are needed**
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