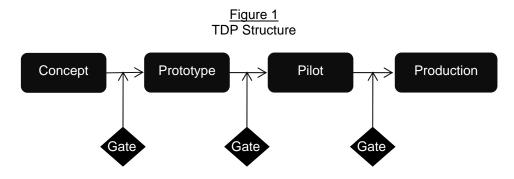
Blog - MEMS New Product Development, The Technology Development Process and Design Review Checklist, *David DiPaola*, *DiPaola Consulting*, *LLC*, *www.dceams.com*

After a functional A-sample prototype is built, it doesn't take long for a project to gain traction that has market pull. This is usually the point that a project becomes highly visible within a company and it enters the Technology Development Process (TDP). The TDP is made up of multiple phases including concept, prototype, pilot and production with gates at the end of each phase. Design and process reviews are required at each gate but may also occur within a phase. These reviews are an open forum for communication of project progress and gaps towards technological, business and schedule milestones. Furthermore the product is constantly evaluated against the market need and potential changes in market that may have occurred. The audience for the reviews at a gate include peers and management who provide feedback on the project to date and collectively decide whether additional work is needed to complete the current phase or the completed work is sufficient to allow the project to proceed to the next phase with additional funding. In certain instances, a project that has not met all of the deliverables may be allowed to proceed to the next phase but under strict conditions that must be fulfilled within a given timeline. The goal of the TDP is to focus the team on high quality execution, effectively screen projects allowing only the best to proceed and hence accelerate successful innovation and profitability.

The MEMS Industry Group (MIG) Technology Development Process Template is an excellent tool for companies to use to implement the TDP within their organization (Marty et al. 2013). The goal of the TDP was to create a simplified frame work that could be easily customized to fit a company's needs. The TDP structure shown below is a slightly modified version of the TDP developed by MIG. In this version there are four major phases including concept, prototype, pilot and production with three major gates.



The concept phase is where ideas are generated and the initial A-samples are developed. It is also where the business case is first generated and the market need is defined. It is highly desirable to have market pull at this point. The prototype phase is where the design is developed in detail and B-samples are fabricated to support various levels of validation. The outcome of the prototype phase is to have design that can be manufactured in volume production. Towards the end of the prototype phase, production tooling is often released. The pilot phase is where production tooling is built and qualified. In addition, the product is made on production tooling (C-samples) and revalidated. It is important to note that there should be no change in the product design between the last revision in prototype and the first samples off the production tooling. The production phase is low to high volume production ramp. Often customers will require revalidation of products in production once a year for the life of the product.

At each gate, there is a design and process review for the project. In order for the team to be focused and efficient, there needs to be a clear set of deliverables defined for completion of each phase. These deliverables range from business and market definition to project technical details to production launch. The following checklist provides an in-depth set of deliverables for the design reviews at each gate that can be tailored to the specific needs of an organization. It is

noted that a fourth gate is common 3-6 months after production launch to review project status but is not depicted in Figure 1.

<u>Figure 2</u> Design Review Checklist

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PM - Program Manager

*Note all of this information cannot be displayed in one review. This document highlights critical areas and its up to the engineers/managers to decide the most meaningful information to include. However, all of this information should be completed and available to address potential concerns.

This table can be downloaded from the following link in PDF format (http://www.dceams.com/Assets/Design%20Requirements%20for%20Product%20to%20Pass%20a%20Phase.pdf). Many of the items listed above are self explanatory. Others are explained in more detail in previous blogs posts such as DFMEA and tolerance stacks.

The Technology Development Process is an essential element of successful MEMS new product launches. The Design Review Checklist can also provide a frame work for discussion between management and engineers on required deliverables to pass a particle gate. With improved communication and efficient execution of technology development, the TDP is a great tool for accelerating innovation and profitable MEMS products. In next month's blog, the necessary attributes of a MEMS engineer for new product development will be discussed.

Works Cited:

Marty, Valerie, Dirk Ortloff, and David DiPaola. "The MIG Technology Development Process Template." MEMS Industry Group, Mar. 2013. Web. 28 Apr. 2013.

Updated Bio:



David DiPaola is Managing Director for DiPaola Consulting a company focused on engineering and management solutions for electromechanical systems, sensors and MEMS products. A 17 year veteran of the field, he has brought many products from concept to production in high volume with outstanding quality. His work in design and process development spans multiple industries including automotive, medical, industrial and consumer electronics. He employs a problem solving based approach working side by side with customers

from startups to multi-billion dollar companies. David also serves as Senior Technical Staff to The Richard Desich SMART Commercialization Center for Microsystems, is an authorized external researcher at The Center for Nanoscale Science and Technology at NIST and is a Senior Member of IEEE. Previously he has held engineering management and technical staff positions at Texas Instruments and Sensata Technologies, authored numerous technical papers, is a respected lecturer and holds 5 patents. To learn more, please visit www.dceams.com.