Product Life Cycle Management Guideline

EDM-P-200

Predictive Product Life Cycle Management
of Electronics

"A White Box Approach"

V2.2
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The Product Life Cycle Management Guideline

The Product Life Cycle Management (PLCM) Guidelines intend to provide guidelines for the overall management of the life cycle of electronics and of the electronics' aspects of products containing electronics with focus on the design, manufacturing, operation, reliability and end-of-life aspects. Marketing and business development aspects lie outside the scope of the guidelines.

- The recommendations given in the guidelines are intended to help the user in the Product Life Cycle Management of electronics and products with integrated electronics.
- The PLCM guidelines promotes the use of scientific methods such as physical modeling, physics-of-failure based accelerated testing, simulation, virtual prototyping, etc. Physical models extend the capability of predicting the designed product's properties and behavior beyond experience. This provides a cutting-edge innovation advantage over an experience and test-based development approach.
- Physical models reduce the development cost and time by reducing product testing and, especially, the number of design iterations.

Product Life Cycle Stages and Phases

The following Product Life Cycle stages and phases are distinguished.

Innovation Stage New Product Exploration
1. **Problem Research**
   Evaluation of the product idea by experts and stakeholders on its technological feasibility, its viability of providing a solution to a user problem and its business potential. Brainstorming, expert consultancy and literature study form the basis of a low-cost evaluation methodology in this phase. It delivers a **Product Research plan** with a rationale and a budget proposal for more in-depth evaluation and validation of product options, priorities and opportunities.
2. **Product Research**
   Validation of most viable product options using functional software and hardware evaluation kits or test models, product mock-ups, etc. The output of this phase is **Validated Concept**, demonstrating the desirability, feasibility and viability of the product solution.

Innovation Stage New Product Planning
3. **Product Specification**
   Based on the Validated Concept and in-depth understanding of the stakeholder needs and business opportunities, the requirements for the product are created. The output of the Specification phase is a high-level description of the product to be designed: the **Product Requirements Document (PRD).**
4. **Product Planning**
   The planning phase creates a business, operations and development plan for the product. It contains the main targets and their critical milestones and timing specified in a comprehensive **New Product Introduction (NPI) plan**.

Innovation Stage New Product Introduction
5. **Architecture**
   Based on the PRD the product's architecture is defined, the **Detailed Product Specification** and the **detailed NPI project plan** are created.
6. **Design**
   Execution of the detailed design based on the output of the Architecture phase, evaluation of engineering solutions using simulations and engineering prototypes. Specification of the new product including manufacturing instructions for the product prototypes.
7. **Prototyping**
   Design evaluation and product qualification on product prototypes.

8. **Industrialization**
Preparation of the regular production of the product and hand-over to operations.

Product-to-customer Stage
9. **Production**
Product manufacturing including quality management throughout the operational lifetime of the product.
10. **Distribution**
Distribution of products from the production warehouse(s) to the customer(s).

Product-at-customer Stage
11. **Installation**
Installation and start-up of the product at the customer's site.
12. **Product Operation**
Product operation including aspects like reliability and maintenance throughout the operational lifetime of the product.

Retirement Stage
13. **Decommissioning**
Actions taken to end the product's use.
14. **The End**
Re-use, recycling and/or waste handling of products that have been decommissioned.

Product Life Cycle related and supporting activities

The following related activities are identified:
1. Technology Development (product independent)
2. Component Development (product dependent)

The following supporting activities applicable to a class of products are identified (not limiting):
1. Technology qualification program
2. Design methods and guidelines
3. Product verification, validation and certification
4. Qualified supply chain
5. New Product Introduction Program
6. Product Change Program
7. Quality Control Program
8. Maintenance Program
9. Decommissioning Program
10. Re-use, recycling and waste handling

Acknowledgement

Table of Contents

1. Applicable Documents

This Product Life Cycle Management Guideline refers the most recent version of the following documents:

MIL-HDBK-217	Reliability Prediction of Electronic Equipment
IEEE Std 1413	IEEE Standard Framework for Reliability Prediction of Hardware
ANSI/VITA 51.2	Physics of Failure Reliability Predictions
ISO 13485	Medical Devices Quality Management Systems
ISO/IEC/IEEE 12207	Systems and Software engineering – Software life cycle processes
ISO/IEC/IEEE 15288	Systems and Software engineering – System life cycle processes
ISO/IEC/IEEE 24748-1	Systems and Software engineering – Life cycle management – Part 1: Guidelines for life cycle management.
2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) (recast)
2000/53/EC	Directive on end-of life vehicles (ELV)
1907/2006	Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
2012/19/EU	Directive on waste electrical and electronic equipment (WEEE) (recast)
EDM-D-008	Technology and Manufacturing Capability Mapping of PBA Designs
EDM-Q-200	Technology Qualification
EDM-P-212	New Product Introduction

2. Applicability of the PLCM Guideline EDM-P-200

2.1. EDM-P-200 describes a physics-based approach to Product Life Cycle Management.

2.2. The PLCM guideline applies to electronic products and products integrating electronics.

2.3. For the latter, the PLCM guideline focusses on the electronics' PLC. The integration aspects of the electronics' PLCM in the PLCM of the final system, e.g. a car or machinery, lies beyond the scope of this guideline.

2.4. This PLCM guideline describes a top view on the product programs that support a comprehensive product life cycle management. A detailed discussion of the activities of the product support programs is the subject of complementary PLCM guidelines.

2.5. This guideline defines activities (programs) and responsibilities (responsible, management, authority, team). Although all the identified activities and responsibilities need to be covered by the organization, this does not mean that they need to be taken up by different organizational units and/or persons. Especially for small organizations, multiple activities and responsibilities can be taken up by a single team or even a single person.