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面向大规模定制的产品协同开发链系统若干实施关键技术

Implementation Key Technologies of Product Collaborative
Development Chain For Mass Customization

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摘 要

在产品开发阶段让供应商和客户参与其中,对开发成本、质量和效率等具有积极意义,已成为一种越来越受关注的开发模式,企业及其供应商之间的这种协作关系可称为产品协同开发链。产品协同开发链的核心思想是通过产品、资源和过程的优化和管理,达到开发最优创新产品的目的。因此,开发链的核心内容就是研究如何根据市场需求和企业研发战略有效组织和管理开发链。

为解决产品协同开发链中的协同建模和分析问题,提出了一个基于参考模型的产品协同开发链协同框架。其中,顶层描述了设计链元模型,明确定义实体、属性和实体之间的关系,中间层描述了设计链参考模型和设计链模型,底层描述了设计链实例在产品开发周期过程中被初始化和反复执行。并依据设计链模型提出了产品协同开发链的实施方法论和使能技术。

产品开发过程中的各种关系协同与协调是协同开发链实施的一个关键内容。从信息机制、激励机制、支持机制及安全机制四个方面详细探讨产品协同开发链系统协调方法。产品协同开发链系统的协调能力是表征企业内外部各方面协同效应的能力,不仅影响到产品协同开发体系内部的组成关系,而且影响到产品协同开发链的效率,进而影响新产品的开发绩效。提出了有利于新产品开发绩效的系统协调环境因素与协调管理流程因素,建立起系统协调能力与新产品绩效的概念模型。通过设计调查问卷进行调研,并对问卷数据进行统计分析、整理,得出研究结论。

在进行大规模定制的产品族和模块化产品平台规划阶段,不仅要考虑功能、结构等传统模块化设计的影响因素,而且需要考虑客户、供应商等外部资源对产品规划的影响,使核心产品平台的建立能够综合反映企业内部、外部资源的整体能力。基于产品协同开发链产品平台的概念和特点,通过需求分析、产品平台设计、产品族设计详细分析了面向跨企业产品协同开发的产品平台与产品族规划过程。最后以平面铣床和五面体加工中心为例应用所提出的方法进行产品平台和产品族的构建。

最后基于 ASP、SQL 开发了产品协同开发链集成管理系统网络平台,实现客户需求管理、产品平台管理、供应商资源管理、任务分解分配、供应商选择

和绩效评估等的导航,本文主要进行了跨企业模式下的模块化产品平台规划子系统的开发,该子系统提供了完整的产品平台规划流程和相应的设计、分析功能,为协同开发链产品平台规划提供了有效分析和优化工具。

关键词: 产品协同开发链; 实施方法论; 协调机制; 产品平台; 加工中心

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ABSTRACT

Supplier involvement in product development has become an increasingly popular method for it has positive effect in improving product development cost, quality, time and innovation, etc. The relationship among assemblers and its suppliers can be called as product collaborative development chain (PCDC). To design the optimal and innovative product by optimizing and managing product, resource and process is the core idea of PCDC. Therefore, how to organize and manage development chain effectively by market requirement and enterprise research and development strategy is the main problem of PCDC.

The inherent complexity of PCDC, such as iterative design process and dynamic design environment, makes collaboration more difficult. To solve the collaborative modeling and analysis problem of PCDC, the collaborative framework of PCDC based on reference model is presented. On the top layer, the design chain meta-model is described; the entity, attribute, and relationship among the entities are defined definitely. In the middle layer, the design chain reference model and design chain model are described. On the bottom layer, the design chain example which is initialized and implemented repeatedly in the product development cycle process. According to design chain model, the implementation methodology and technologies of PCDC are presented.

The coordination and collaboration of different relation are the key issues to implementing product collaborative development. The coordination mechanism of PCDC is discussed from four aspects: information mechanism, incentive mechanism, support mechanism and safe mechanism, and then the system collaboration is analyzed and optimized. The coordination capacity of PCDC means the collaborative effectiveness of enterprise inside and outside; it affects not only the internal composing relations of PCDC, but also the PCDC efficiency and R&D performance of new product. The system coordination environment and management process which are helpful for research and development performance for new product are

presented, the relationship conception model between system coordination capacity and new product performance is established. Finally, a research questionnaire is designed to carry out investigations; the research data and information are sorted and analyzed statistically.

The traditional modular identification factors, including product function and structure, and the outsourcing effect factors such as customers, suppliers etc, are considered in the planning process of modular product family and product platform. Based on the product platform conception and characteristic of PCDC, according to the requirement analysis, product platform design and product family design, the product platform and family planning process for inter-enterprise PCDC are analyzed elaborately. Finally, two examples of product platform planning of modular machine tool are given to show the efficiency and effectivity of proposed method.

Finally, based on ASP, SQL, a network platform of integrated management system for PCDC is developed. In this dissertation, the modularization product platform planning system is designed, which includes the planning flow of product platform and related design and analysis function; it provides the effective analysis and optimization tool for product platform planning of PCDC.

Key Words: Product Collaborative Development Chain (PCDC); Implementation Methodology; Coordination Mechanism; Product Platform; Machine centre

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