The implications of product modularisation on the development process, supplier integration and supply chain design in collaborative product development

Kopenhagen, F.^a, Held, T.^{a,*}

^aHamburg University of Applied Sciences, Department of Mechanical Engineering and Production Management, Germany

ABSTRACT

Generating economies of scale is one of the most desirable goals when developing modular product systems. Since complex products are commonly developed in collaboration between an Original Equipment Manufacturer (OEM) and its suppliers, pursuing this goal inherently establishes interdependencies between the development process, supplier integration and supply chain design. To fully reap the benefits of modular product systems requires a comprehensive approach that encompasses these fields and addresses the interdependencies between them via a coherent collaboration between development and purchasing. This is the main focus of this work. In this paper, we first describe how the product development process has to be restructured for the concerted development of modules and overall products within the scope of a modular product system. Secondly, we propose a new collaboration model between the OEM and its suppliers, since OEMs need to collaborate directly with suppliers of lower levels of the value chain in order to facilitate the standardisation of components and modules across different products. Finally, we delineate an awarding process for both development services and production volumes for series supply that resolves the conflicting priorities of economies of scale and avoiding over-dependence on single suppliers. The process models described in this paper have been conceived based on systems engineering principles and have been successfully tested and further refined throughout several industrial projects carried out with two automotive manufacturers. The resulting approach will be demonstrated using a generic example taken from the automotive industry.

ARTICLE INFO

Keywords:

Supply chain design;
Robust value chains;
Modularity;
Product development;
Complexity management;
Awarding process;
Supplier integration;
Automotive industry

*Corresponding author:

tobias.held@haw-hamburg.de
(Held, T.)

Article history:

Received 14 August 2020

Revised 28 January 2021

Accepted 7 March 2021

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Implikacije modularizacije izdelka na razvojni proces, integracijo dobaviteljev in oblikovanje dobavne verige pri sodelovalnem razvoju izdelkov

Kopenhagen, F.^a, Held, T.^{a,*}

^aHamburg University of Applied Sciences, Department of Mechanical Engineering and Production Management, Germany

POVZETEK

Ustvarjanje ekonomije obsega je eden najbolj zaželenih ciljev pri razvoju modularnih proizvodnih sistemov. Ker se kompleksni izdelki običajno razvijajo v sodelovanju med proizvajalcem originalne opreme (OEM) in njegovimi dobavitelji, zasledovanje tega cilja samo po sebi vzpostavlja soodvisnosti med razvojnimi procesom, integracijo dobaviteljev in oblikovanjem dobavne verige. Da bi v celoti izkoristili prednosti modularnih proizvodnih sistemov, je potreben celovit pristop, ki zajema ta področja in obravnava medsebojne odvisnosti med njimi prek skladnega sodelovanja med razvojem in nabavo. To je glavni poudarek tega prispevka. V prispevku najprej opišemo, kako je treba prestrukturirati proces razvoja izdelka za usklajen razvoj modulov in celotnega izdelka v okviru modularnega sistema. Nato predlagamo nov model sodelovanja med proizvajalcem originalne opreme in njegovimi dobavitelji, saj morajo proizvajalci originalne opreme neposredno sodelovati z dobavitelji nižjih ravni vrednostne verige, da bi olajšali standardizacijo komponent in modulov v različnih izdelkih. Nazadnje opisujemo postopek nagrajevanja, tako za razvojne storitve, kot za obseg proizvodnje, za serijsko dobavo, ki rešuje nasprotujoče si prednostne naloge ekonomije obsega in preprečuje preveliko odvisnost od posameznih dobaviteljev. Modeli procesov, opisani v tem članku so bili zasnovani na principih systemskega inženiringa in so bili uspešno preizkušeni in dodatno izpopolnjeni v več industrijskih projektih, izvedenih z dvema proizvajalcema avtomobilov. Razviti pristop je prikazan na splošnem primeru iz avtomobilske industrije.

PODATKI O ČLANKU

Ključne besede:

Oblikovanje dobavne verige;
Robustne vrednostne verige;
Modularnost;
Razvoj izdelka;
Upravljanje kompleksnosti;
Postopek nagrajevanja;
Integracija dobaviteljev;
Avtomobilska industrija

**Kontaktna oseba:*

tobias.held@haw-hamburg.de
(Held, T.)

Zgodovina članka:

Prejet 14. avgusta 2020
Popravljen 28. januarja 2021
Sprejet 7. marca 2021

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