Research suggests modular design competence can benefit new product development

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(Phys.org) —A new research study suggests that supplier integration into the new product development process can be more beneficial if buyers increase their competency in modular design.

Penn State Smeal College of Business faculty member Veronica H. Villena and her colleague Fabrizio Salvador of the IE Business School in Madrid examined the ways modular design competence can mitigate costs and challenges associated with supplier integration while making best use of the benefits. They also reveal that such benefits are limited when the buyer is pursuing high levels of product innovation.

Supplier integration refers to a supplier providing information and participating in decision-making during the development of new products and processes. Modular design refers to conceiving of products in terms of modules that can be modified without changing an overall product design.

By integrating suppliers into the new product design process, manufacturers can tap into supplier expertise and knowledge, share risk, cut manufacturing costs and improve technical performance.

The researchers concluded that modular design competence "makes design iterations less frequent, thereby curtailing buyer-supplier negotiations regarding the cost, timing and quality requirements of

engineering changes associated with such iterations."

However, supplier integration has challenges and drawbacks as well. It requires technical and managerial resources, there is a high level of design and technical interdependence and communication channels become more complex.

"We argue that the interdependence of the design activities allocated to different suppliers creates diseconomies that detract from the technical performance and add to the manufacturing cost of the new product being designed," the researchers wrote in an article that recently appeared in the *Journal of Supply Chain Management*.

To mitigate these diseconomies, Villena and Salvador propose that buyers incorporate the design of modular products as much as possible without hampering innovation. Modular product competency, they said, will allow for more efficient integration of suppliers.

In their study, Villena and Salvador found benefits to modular design competence that include decreased manufacturing costs and improved technical performance through, for example, a decreased number of design iterations.

"(Modular design competence) makes design iterations less frequent, thereby curtailing buyer-supplier negotiations regarding the cost, timing and quality requirements of engineering changes associated with such iterations," they wrote.

Furthermore, when the supplier is in control of their design, there is a clear link between the module performance under their control and the overall product performance.

"In this situation, each supplier can unambiguously demonstrate how its

own technical expertise has added value to the overall product," the researchers noted, prompting suppliers to continue to perform at a high level to secure future business.

But are these benefits similar when developing a highly innovative product versus an incrementally innovative product? Villena and Salvador showed that the benefits of modular design competence are limited, especially for highly innovative products. They argued that high product innovation might create new interdependencies and constraints for design tasks between a buyer and its suppliers, which would reduce the effectiveness of modular design competence in managing the division of design labor between the buyer and suppliers.

Villena is an assistant professor of supply chain management at the Smeal College of Business, and Salvador is a professor of operations management at IE Business School. Their study, "Supplier Integration and NPD Outcomes: Conditional Moderation Effects of Modular Design Competence," appeared in the *Journal of Supply Chain Management* in January.

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