

Modular high-tech innovations

Mahesh Deshpande of Dassault Systèmes and Jan Goepfert of ID-Consult discuss the value of holistic modularity at the whole product portfolio and value-chain levels

BY JACQUI GRIFFITHS

What is holistic modularity?
Mahesh Deshpande: Modularity has been used for years to manage complexity in products. Now there's a shift from a technical, product-by-product perspective towards product system modularity. This holistic modularity embraces the interdependencies between hardware, software and service across the product portfolio and the participation and trade-offs across key functions of the value chain – such as engineering, procurement, sales, manufacturing and logistics.

Jan Goepfert: To optimise modularisation it's essential to involve the full value chain, because each function has different targets. Holistic modularity means aligning all these views to create one solution. This strategy needs to be applied across the organisation, with support from top management down to the workers.

What key challenges can holistic modularity help manufacturers overcome?

Deshpande: Most manufacturers' operating margins remain low and traditional levers for improving the margin have been exhausted. End-to-end modularity is one of the few strategic levers left.

Portfolios are often complex and broad, and increasing system complexity brings integration challenges. Products that used to be

predominantly mechanical now combine mechanical, hardware and software. Products are also becoming disaggregated, with some pieces deployed on the cloud, hardware components virtualised into software components, and physical interfaces converted into communication interfaces using wireless standards.

Goepfert: Modularisation enables flexibility in creating product variants that would be too costly and time-consuming to develop individually. By enabling companies to break down complex product systems into manageable parts, holistic modularity provides a way to combine and recombine elements to create the variety the market demands at the rapid speed it expects – if they do it right.

How can holistic modularity empower companies to compete?

Goepfert: Modularity provides an approach to handle the complexity of product systems, including the different innovation speeds of mechanical parts, electronics and software. Breaking those disciplines down into items that can be managed at different speeds down the value chain is a big challenge to manufacturers. But if they cut their product and functions properly, they can react faster to market-driven or technical-driven changes.

Our recent modularity study empirically shows, that modularisation drives company success



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significantly: companies that apply modular strategies are between 20-30% more successful in reaching their market, revenue and profit targets.

Modularity also opens the value chain, making it easy for different suppliers to provide pre-tested and pre-assembled modules for the manufacturer to put together. By modularising the product and defining clear interfaces you enable organisational modularisation, both internally and externally across the value network, including the customer. The smartphone is a perfect example, providing a hardware base and a platform onto which the user uploads apps developed by third parties.

Deshpande: Modularity can support a do-it-yourself customer configuration solution, enabling the consumer to quickly configure an appliance with their choice of features, for example, or an operator to configure a total networking solution by themselves. That reduces lead times from days to hours and enables new business models that build customer satisfaction.

It also enables a strategic sourcing strategy wherein an OEM can consolidate numerous part suppliers into fewer module partners. That allows a shift, both on the sourcing/procurement and the supply/delivery side, from a cost reduction focus to a high value add, innovation focus with the suppliers as partners in a risk-sharing model. By assembling the product as late as possible, close to the customer's location, manufacturers can also reduce the lead time from order to delivery.

What is the key to a successful holistic modularity strategy?

Deshpande: Leadership and digitalisation are key. Many companies have modular platforms and architectures in place on a product-by-product basis. With strong leadership support though, they can drive the adoption across all product lines and business units.

It's important to establish a modularity initiative under a digital transformation umbrella because it creates the perfect blend of internal and external effects, operationally and in the market. After an initial pilot, modularity needs

to be adopted by all participants that touch the product. Today too much knowledge is hidden in documents and experts' heads, but digitalisation lends a holistic information model that makes information usable for everyone.

Digitalisation also enables the strong governance that modularity demands, including traceability of changes and precise configuration management, as well as monitoring key performance indicators (KPIs) to show the progress of the modular architecture including the analytics behind it.

Goepfert: Holistic modularity requires an end-to-end tool chain, starting with market needs, customer requirements, product functions and variants. These are transformed into technical solutions comprising hardware, software and mechanical components, which are then the basis for the production system.

It starts with the creation of the product architecture in a holistic, modular model. A key success factor is to align interdisciplinary teams in defining this modular architecture early in product development as mistakes, such as defining the modules wrongly, will be impossible to repair later.

Therefore we need a 'system of innovation' to achieve that alignment early on, bringing together the market perspective and the product perspective. It provides a flexible platform where the interdisciplinary team can visualise, evaluate and play out scenarios, analyse KPIs and create the best product that balances their different priorities. This model then needs to be shared and synchronized with actual product development. With the modules perfectly defined, the company can then consistently develop the software, electronics and mechanical parts of a product before integrating it. Ultimately, end-to-end modularisation can empower manufacturers through more efficient operation and rapid innovation of products and business models to meet the demands of dynamic markets. ■

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