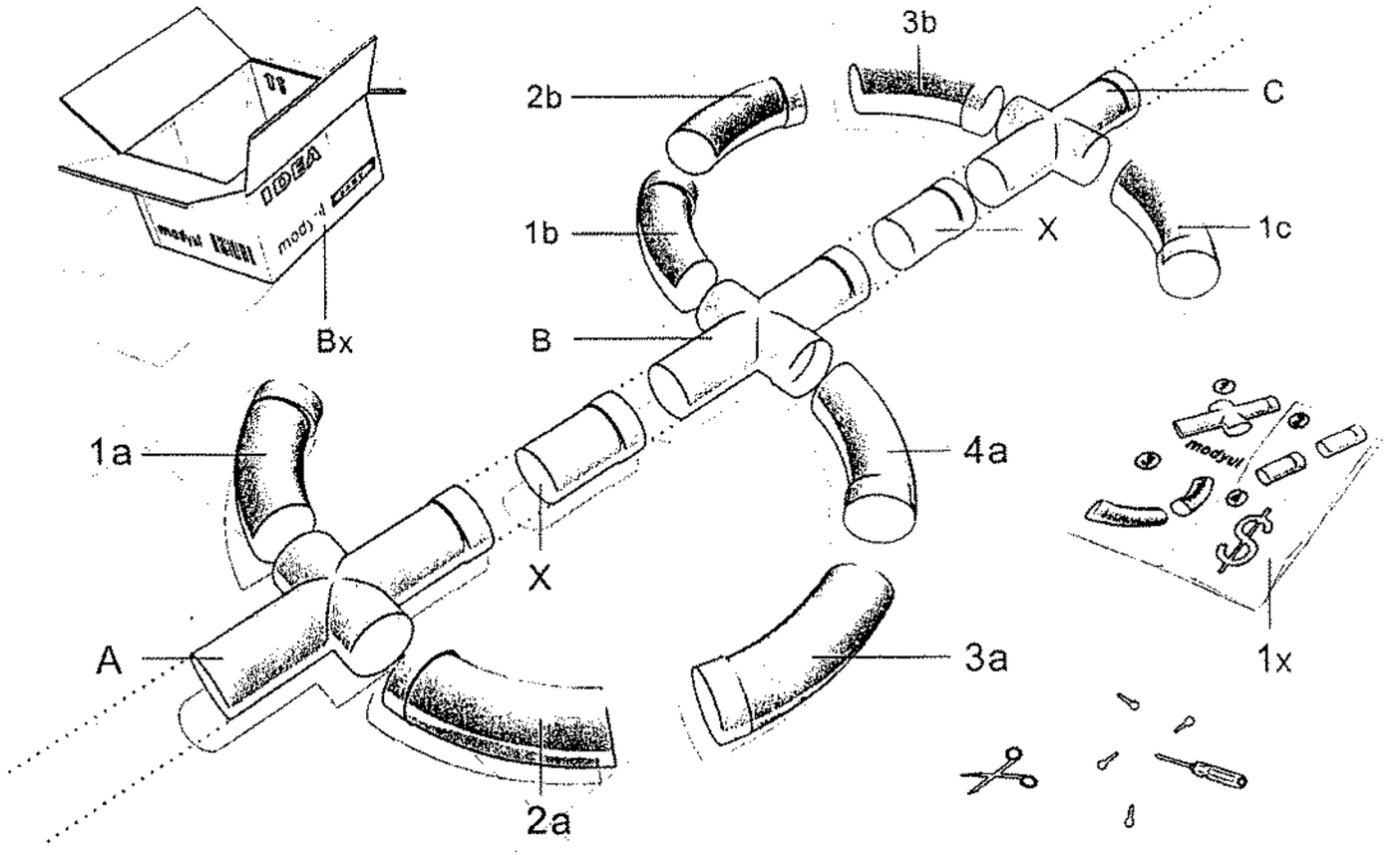
FT SUMMER SCHOOL DAY 9: PRODUCTION AND OPERATIONS

Fitting together a modular approach

Standardising the architecture of products and processes to allow the mixing and matching of different components can make companies more nimble and efficient, writes Ron Sanchez



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Modular strategies for creating products of all types and delivering services are rapidly becoming an integral part of contemporary management thinking.

The benefits of modular thinking extend well beyond product strategies, however, and include new approaches to creating more flexible organisations and improving the management of supply chains and outsourcing. Modularity can also offer a powerful framework for identifying, building and using an organisation's knowledge assets.

All products are composed of functional parts. The architecture of a product consists of, first, the way its design is broken down into functional components and, second, the way these components interact in the product

Companies in other industries are beginning to realise they too can exploit modularity to achieve fast, flexible configuration of their products – while significantly reducing their costs.

Markets as diverse as automobiles, personal care products, financial services, food, software, industrial and consumer electronics, bicycles, home appliances and professional services are now adopting modular product architectures.

Modular processes

The concept of modularity works not only with physical components but can also be used to create more flexible, configurable processes. The process of making a product or delivering a service can be separated into various

the company has its operations while maintaining a consistent way of working globally.

For example, Ikea, the Swedish furniture maker and retailer, has harnessed the modular idea for both its product and process architectures, giving it considerable strategic flexibility. Ikea creates modular designs for its Scandinavian furniture products. It carefully designs and specifies the components in its products (such as table tops, table legs and hardware) so that they can be

and willingness to offer attractive prices.

Flexibility

Most managers are looking for several kinds of strategic flexibility in their businesses. Manufacturing companies want to offer broader product lines or even mass customisation of products for individual customers while taking advantage of global sourcing of materials, components and services. Makers of food and per-

architecture enables them to provide a range of both standard and locally adapted products. Companies developing software, whether for internal use or as products, are interested in outsourcing development of software components to companies in India, eastern Europe or Asia while ensuring that these components will perform within a defined software architecture.

Financial and professional service providers want to offer their clients seamless global services

same time reducing the complexities of operating globally.

Modularity also offers another crucial advantage – speed in bringing new products to market.

Once a company begins to convert its product designs to modular product architectures, it becomes possible to adopt a new way of developing products that can radically reduce time to market. GE Fanuc Automation, a leading maker of industrial automation systems, Philips' audio products group, and companies

components interact are the first thing to be defined and standardised, eliminating chain reactions of component redesigns. Standardised component interfaces also allow products to be rapidly upgraded.

When Sony introduced its first HandyCam 8mm format video camera, for example, the company defined component interfaces that would accommodate a number of technological improvements in components under development at the time. As

and, second, the way these components interact in the product (that is, the component interfaces). An architecture is modular when the interfaces between components are designed to allow mixing and matching of different components, thus enabling many product and process variations to be rapidly configured.

Perhaps the most familiar example of a modular product architecture is the desktop computer, in which a range of microprocessors, memory cards, hard disks, monitors, keyboards and other components can be combined in a virtually unlimited number of ways to produce different variations of computer.

Another familiar example is Sony's use of modular architectures to configure more than 250 variations of its Walkman product over a 10-year period. Each product variation offered consumers a new combination of functions, features, performance levels and price points. Sony also used the stream of product variations to test consumer preferences and fine-tune its mix of Walkman models.

a product or delivering a service can be separated into various functional activities.

A modular process architecture is created when the interfaces between the activities are defined and standardised. Different versions of each activity can then be mixed and matched in a well co-ordinated process design.

Standardising the way each activity interacts with others makes it possible to outsource more activities or to have them performed by different groups of employees, while maintaining a single consistent way of working throughout the company.

Creating and running a global supply chain, for example, virtually requires the use of well-defined and standardised modular activities. Suppliers of components and services, whether global or local, may be asked to provide components or services at various locations round the world in a manner consistent with a single process design. A modular process architecture provides a foundation for working with the most capable suppliers in any location where

(such as table tops, table legs and hardware) so that they can be combined in different ways to create a range of new products. But the company has also developed a modular process architecture to co-ordinate the global sourcing and shipping of components for its furniture.

Ikea's process architecture defines the way that orders will be transmitted to suppliers, the quality standards to which various types of components must be made, the way purchased components must be packed for shipment, the way shipping information must be transmitted by suppliers to Ikea, and so on.

Because the way each supplier must perform its activity within the global supply chain is clearly defined and followed by its suppliers, Ikea can readily source components from any qualified member of its global network of more than 1,800 suppliers. This freedom enables Ikea to configure its supply chain to take maximum advantage of movements in currency exchange rates, fluctuations in shipping rates, suppliers' available production capacities

ing of materials, components and services. Makers of food and personal care products want standard production processes that can accommodate a range of local variations in ingredients.

In addition, the ability to configure a range of product variations within a standard process

vice providers want to offer their clients seamless global services based on compatible activities performed by co-operating partners or other companies round the world.

Modular product and process architectures are the key to achieving these aims while at the

Strategic partitioning

The way in which developers split or "partition" the components of a product design is often determined by a company's past practices, rather than by the current needs of the market.

Strategic partitioning instead relates elements of a product's component structure to specific benefits in the minds of consumers.

It also seeks to minimise the number of components responsible for variant products and technological change, ensuring that the majority of components are re-used and stable.

Done well, strategic partitioning makes it possible for companies to create plenty of variant products and upgrade them quickly, while reducing costs by re-using common components.

Managers should understand that component interfaces are not minor technical details to be left to the engineering staff. Rather, interfaces will determine the range of strategic flexibilities the company will have to configure its products and adapt its processes in the future. Managers must actively monitor and guide the flexibilities being designed into the interfaces of new product and process to get the best out of modularity.

mation systems, Philips' audio products group, and companies in other industries are reporting reductions of between 50 per cent and 80 per cent in development time and resource requirements after implementing the modular approach.

The modular approach reverses the priorities that companies have traditionally followed in product development. In designing new products, most companies focus first on developing individual components. Often, it is only after carrying out a great deal of development work on these components that developers begin to define fully the component interfaces required to make them work together.

Letting component development run ahead of interface specifications in this way typically forces companies to redesign components, often more than once, throughout the development process. Recent research has established that such redesigns of components can consume 50 per cent or more of total development time and resources.

In the modular approach, the specifications that control how

ments in components under development at the time. As these higher-performing components became available, they could be introduced directly into the HandyCam product architecture without requiring extensive redesign of other components. Sony's use of modular development methods enabled it to maintain its technological leadership and dominance of the market for 8mm format video cameras.

Standardising interfaces can also enable developers to produce new components or devise new processes compatible with a company's existing products and processes. They make it more attractive for suppliers to invest in developing components and activities that can be used in a company's product and process architectures again and again. Modularity is thus a central concept in co-ordinating global networks of developers and suppliers – and in using that network effectively to lower costs while extending market coverage.

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