Part Number Count is a Useful Indicator for Complexity Cost

The number of unique parts in a product platform impacts both Direct and Indirect Costs

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Part Number Count is a common metric in Modularity Programs

Modularity is growing more popular as a method to improve business performance. One of the significant benefits many companies seek from Modularity is a reduction in costs driven by non-value added complexity. The complexity improvement from modularity is often reported publicly by a reduction in the unique part number count for their product platform rather than as a monetary figure. Reported part number count reductions vary from 20% to as much as 90% with an average result around 50%.

Part Number Count in modularity refers to the total number of unique part numbers required to manufacture all desired product configurations in the complete platform. Alternative part metrics used elsewhere include the number of piece parts in a single product configuration, or the number of unique part numbers used to make that single product configuration. The value of modularity is measured on the complete product platform, not on a single product.

Large manufacturers who offer a complete family/portfolio of products typically have a lot of unique parts in their systems that must be managed. Counts commonly range from tens of thousands to more than a hundred thousand. Part number count tends to increase over time in most companies as acquisitions are made, products are updated, new customers are served, etc.

Part number count is not inherently bad. Most markets need some product variance, and it takes some complexity in the form of more to produce the same unit volume part numbers to deliver product variance. However, adding and maintaining part numbers leads to activities that increase cost so the best companies try to balance value against total cost.

Counting part numbers is relatively easy, and these typical reductions through modularity are impressive. However companies are judged on finances, so how do part number count reductions relate to lowering complexity cost?
Indirect Costs increase with Part Number Count

Part number count is a strong driver of indirect activities. The cost to design and document a new product platform is directly proportional to the number of unique parts in that platform and independent of the volume of products produced.

Other indirect costs have some factor due to the production volume, but also some portion of cost related to the variety of parts. For example, procuring 100 identical valves requires purchasing, transportation, quality assurance, stocking, picking for production, etc. If ten each of ten different valves were required instead, there would be additional activities to order ten different items, inspect them, stock them into different bins, pick the correct ones, etc.

Part Number Count is also a factor in Direct Costs

Direct costs are directly attributable to the manufacture of a product; meaning they are proportional to the volume of product produced. Companies have established methods to measure their direct labor and material costs and allocate them to products. So for a given production volume, how does reducing the unique part number count yield a savings in direct labor and material cost?

Direct Labor

Let’s compare the direct labor activities to produce a given unit volume for a complex product platform with many unique part numbers to a simpler platform with fewer unique part numbers.

A fabrication or assembly operation may require setting up a tool or fixture. The complex product platform has more part variance and may require more setup changes. The simple platform can be designed to reduce or eliminate setup changes by using more common parts. The activity to change setups is part of direct labor cost so the complex product has a higher cost per unit.

The assembly area for the complex product has to handle more unique parts than the simple product so it will take up more space. Assemblers must determine which parts they need for the product variant they are building, then find and retrieve the correct part, and assemble it properly. In a simple product, there are fewer parts from which to select, they can be located closer, and the assembly operation is more consistent. The complex product will require more direct labor time to produce the same volume as the simple product.

Material Cost

Part number count complexity can also affect direct material cost. The complex product will require more part variants in certain purchased commodities. Just as in the manufacture of the final product, fabrication of commodity parts has a complexity cost from setups and tooling. The supplier of the commodity can achieve savings by producing higher volumes, and some of those savings can be passed on to the product manufacturer. The percentage in cost reduction may be small but the actual total savings can be quite large.

Part Number Count as a measure of Complexity Cost reduction

To fully understand complexity cost, a company must consider the effect of part complexity in both indirect and direct functional areas.

The unique part number count in a product platform drives additional activities that add cost beyond basic business expenses and volume driven costs. While it is theoretically possible to perform a
bottom-up calculation of the complexity costs for each individual part, such a task would be very time consuming and expensive.

Instead, the top-down measure of Part Number Count is a good leading indicator of the potential complexity cost savings of a modularity.

On average, the cost of indirect labor activities driven by part numbers is proportional to the total number of parts. If the implementation of a modular product architecture reduces the part number count by 50%, the part-driven activities can also be reduced by 50% along with their cost.

The portion of direct labor that is driven by part number count also has a potential cost reduction. The actual relationship of savings to part number count is more complex here than in indirect functions, but direct proportionality is a reasonable first approximation. The activities and cost driven by production volume and other causes remain the same regardless of complexity.

The potential reduction in direct material cost should be estimated by part number changes only in purchased commodities rather than total part number count.

The savings from modularity can be found in many areas of the business. An accurate accounting requires an in-depth analysis. Instead, part number count is a simple but important measure that a company is heading in the right direction.

The change in Part Number Count is a useful leading indicator of potential complexity cost reduction. It is widely reported by companies in their transformation to modularity and provides a good benchmark for companies just beginning the journey.

About the Author

John Niethammer is a Senior Consultant at Modular Management and a generalist in Program Management and Modular Product Architecture development. He previously worked as a university professor, design engineer, and consultant in technology transfer and product development process. John helps clients to create modular product architecture concepts by applying the methods and tools developed by Modular Management. John has a Ph.D. in Mechanical Engineering from the University of Minnesota in Minneapolis, MN.

About Modular Management

Since 1996, Modular Management has worked with companies across the globe to create and apply market driven, strategic Modular Product Architectures in industries as varied as home appliances, industrial products, telecommunications and construction equipment.

By partnering with Modular Management to implement this approach, companies have achieved dramatic improvements in business performance through increased speed and efficiency while simultaneously expanding the breadth of product offered to the market.

Using a proven methodology, experienced Modular Management consultants partner with companies to deploy a set of innovative tools and structured processes. Together, they uncover and exploit the economic potential of a Modular Product Architecture that lies within the markets, products, technologies and operations.