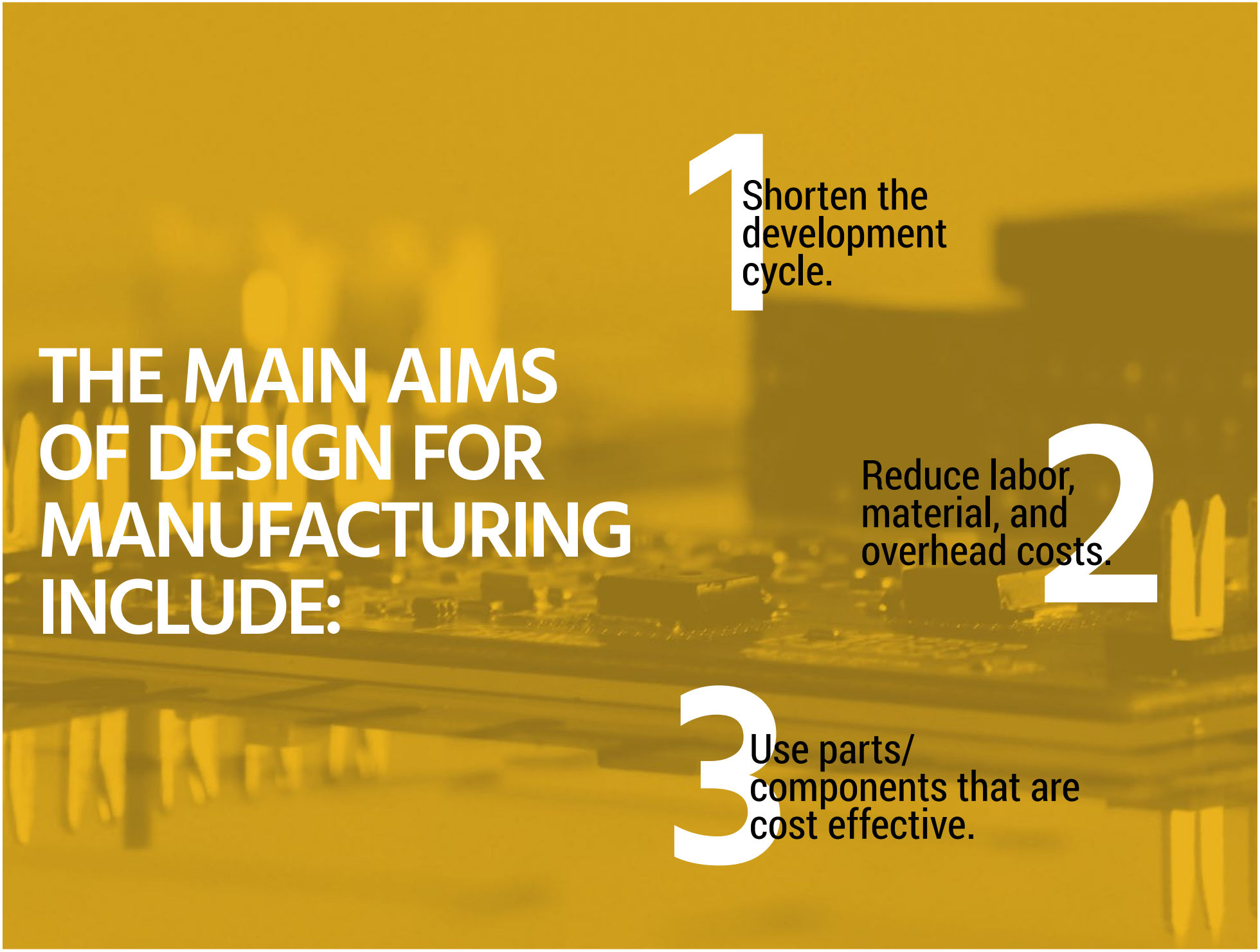
# Design for Manufacturing

## 10 Reasons to Use EMS Design Services


EBW Electronics

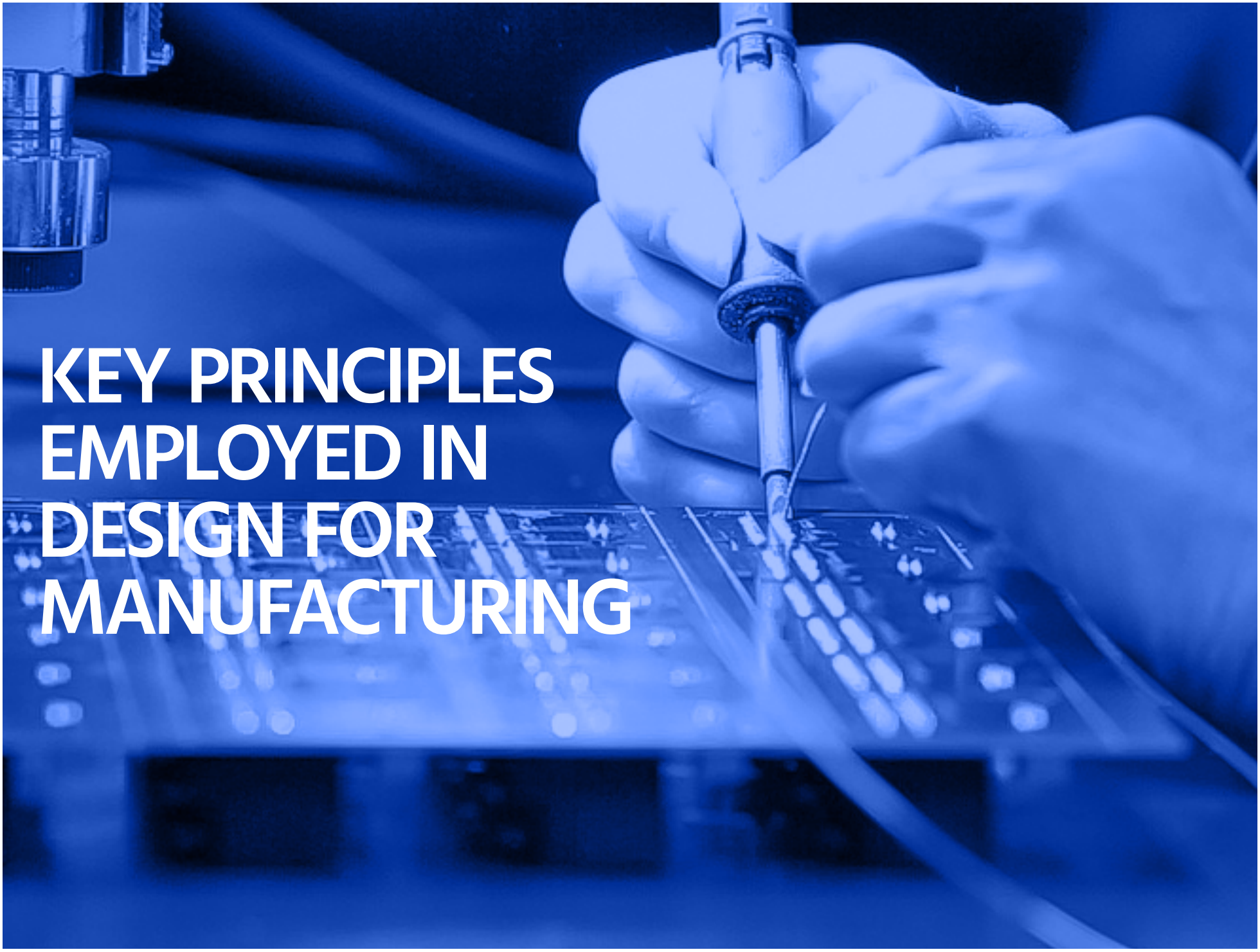
## The design phase is one of the most critical stages in the development of any product.

The design for manufacturing approach gives special consideration to the manufacturability of a product to ensure that it is produced in the most cost effective way. This approach also aims to reduce the product development time and ensure that the products are of high quality and reliability.



# THE MAIN AIMS OF DESIGN FOR MANUFACTURING INCLUDE:

1. Shorten the development cycle.
2. Reduce labor, material, and overhead costs.
3. Use parts/ components that are cost effective.


KEY PRINCIPLES
EMPLOYED IN
DESIGN FOR
MANUFACTURING

## 1 MINIMIZE THE TOTAL NUMBER OF PARTS.

Minimizing the total number of parts helps to reduce inventory, purchases, equipment, testing and so on. It also helps to reduce processing time and development time.

## 2 USE OF MULTIFUNCTIONAL PARTS.

Using multifunctional parts reduces the total number of parts required. This principle helps to cut the total cost of production.

## 3 USE OF STANDARD PARTS.

Standard parts are readily available and less expensive as compared to custom-made parts. Standard parts are also less likely to fail as compared to custom-made parts.

## 4 REDUCE THE NUMBER OF FASTENERS.

Fasteners can significantly increase the cost of manufacturing a product. They can also lower the efficiency of a product.

## 5 SELECT PROCESSES THAT SIMPLIFY FABRICATION.

The overall cost of manufacturing an electronic product such as a printed circuit board can be reduced by employing processes that allow easy fabrication.

## 6 SELECT A PROCESS THAT ALLOWS EASE OF ASSEMBLY.

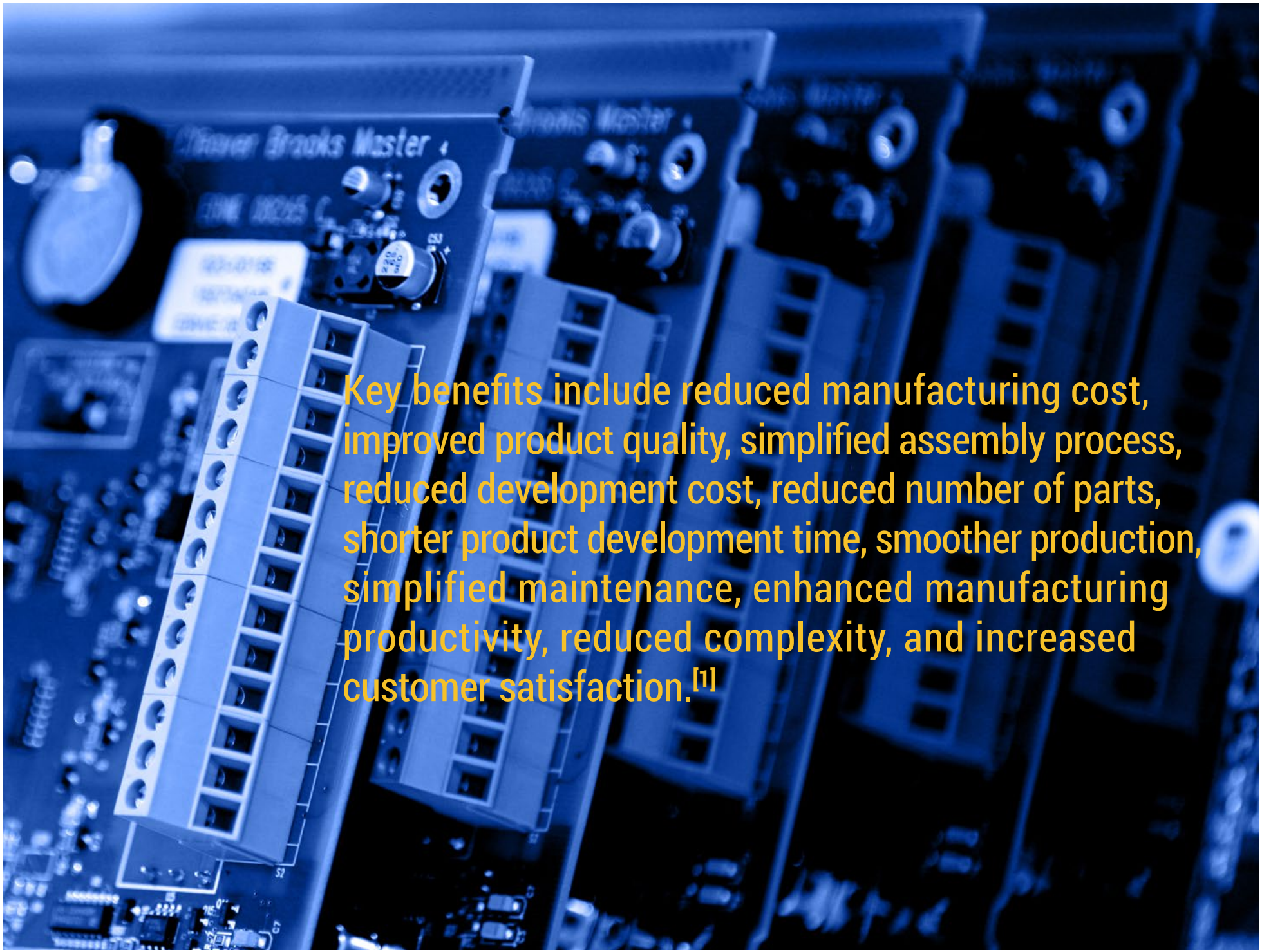
Reduce the assembly directions and select a process that enhances speed of assembly.

## 7 USE OF MODULAR PARTS.

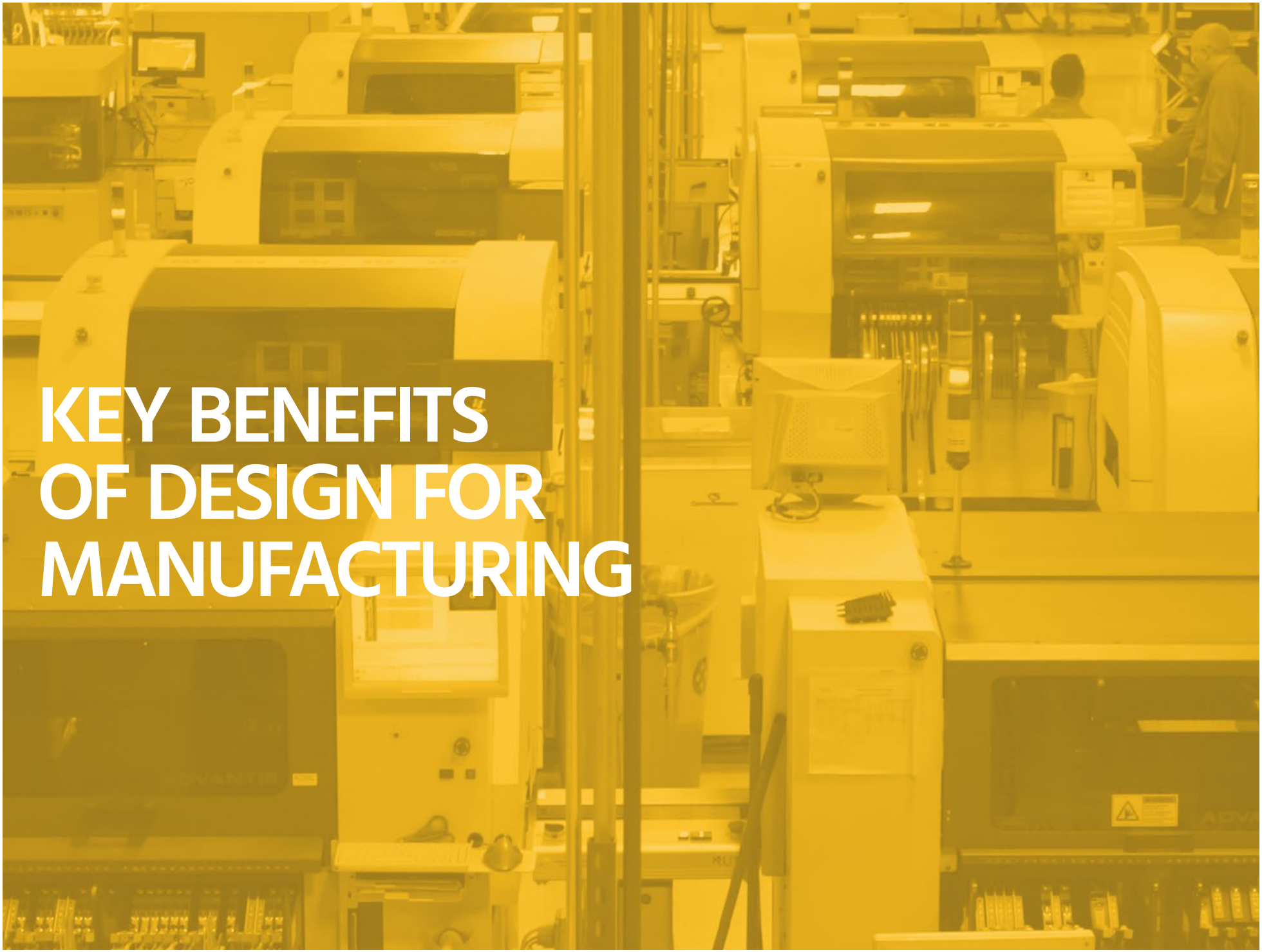
Use of modular subassemblies helps to simplify testing, inspection, assembly, and so on thereby reducing the total cost of manufacturing.

## 8 MINIMIZE THE NUMBER OF STEPS PER PROCESS.

Complex operations and processes tend to increase the overall cost of producing a product.


Key benefits include reduced manufacturing cost, improved product quality, simplified assembly process, reduced development cost, reduced number of parts, shorter product development time, smoother production, simplified maintenance, enhanced manufacturing productivity, reduced complexity, and increased customer satisfaction.[1]

**Research has shown that up to 70% of the cost of manufacturing a product is determined by design decisions.**[1] In comparison, it is estimated that production decisions determine about 20% of the cost of manufacturing. The principles used in the design for manufacturing approach also help to reduce the difficulties that are likely to be encountered during manufacturing.

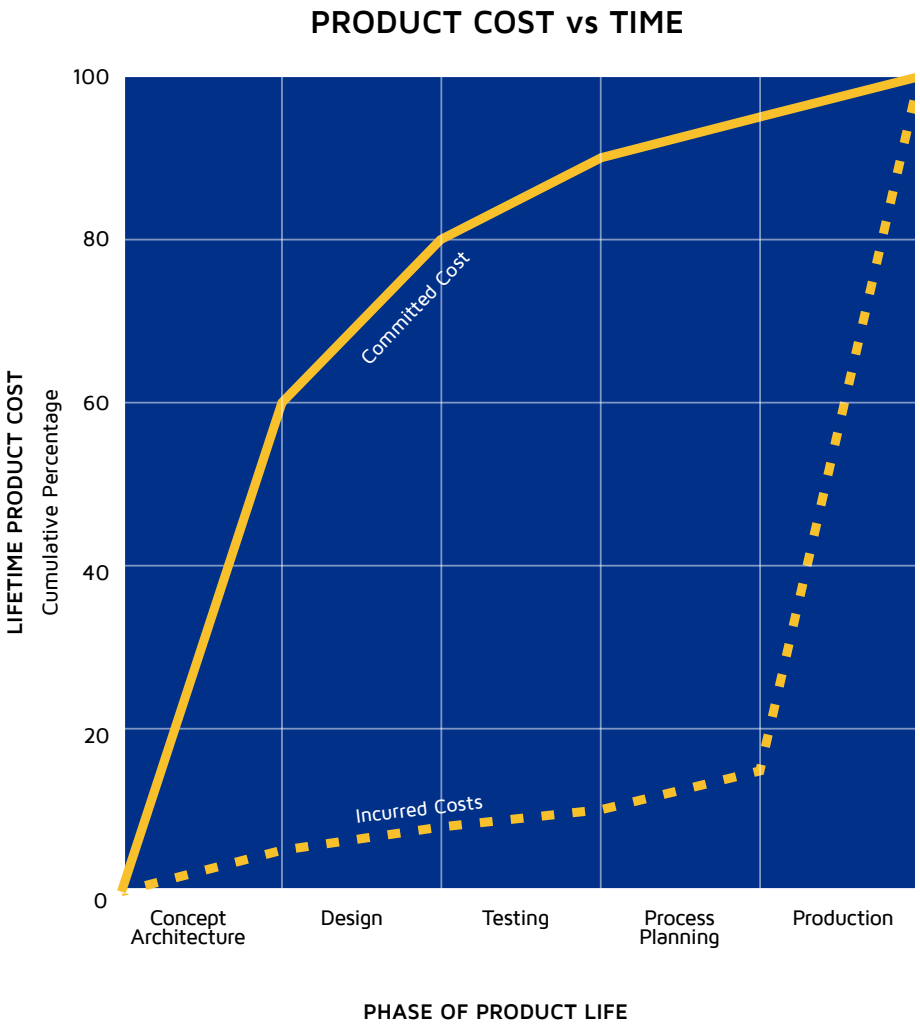


# KEY BENEFITS OF DESIGN FOR MANUFACTURING

# 1 REDUCED MANUFACTURING COST

## The cost of manufacturing a product is reduced by exploiting various cost saving opportunities.

This is achieved by factoring in various aspects of manufacturing a product during the design phase. The cost of manufacturing a product is reduced by exploiting various cost-saving opportunities such as reducing the number of parts, using multi-functional parts, using standard parts, reducing separate fasteners, minimizing assembly directions, and so on. It is therefore important to contract an electronic manufacturing services provider that has in-house design capabilities.




Approximately 80% of the total cost of producing a product is determined during the concept and design phase.

## By the time a product is ready for production, around 95% of the total cost of production is determined.[2]

This implies few opportunities for cost reduction in the advanced stages of product development. The in-house designers of your EMS contractor can re-engineer your design to allow production of high quality products in a cost effective manner.

# IMPROVED PRODUCT QUALITY

## Low quality products negatively impact brand perception.

As such, it is necessary to ensure zero defect products. The design for manufacturability approach employs principles that enable manufacturing of high quality products. The approach maximizes compliance to eliminate errors and inaccuracies that can occur during operations such as part insertion and positioning. In addition, the approach maximizes use of standard components because they are more reliable and available as compared to non-standard parts. Engaging an EMS provider that has in-house design capabilities helps to enhance the quality and reliability of your products.

# ASSEMBLY PROCESS SIMPLIFIED

## Design for manufacturability eliminates potential assembly difficulties to ensure that the process is a smooth as possible.

The approach also considers the direction of assembly to ensure that the most efficient and cost effective way method of assembly is used. In most cases the assembly system is designed to add parts from above. Adding parts from above reduces the effort required to place and position the parts since the system is working in the same direction as the force of gravity. This yields higher production efficiency.

# FEWER ENGINEERING CHANGES

## It is easier to address revisions and engineering changes in the early stages of product development.

As compared to the traditional method of product development, the design for manufacturability approach optimizes the design to reduce the chances of difficulties occurring in the production stage. Engineering revisions in the manufacturing stage can significantly affect the time-to-market and the overall cost of manufacturing. The traditional approach of product development delays the delivery to market of 60 to 80% of products.[3]

# REDUCED NUMBER OF PARTS

## The time required for processing, developing, and engineering a product such as an electronic circuit is dependent on the number of parts used.

The assembly and testing effort also increases with an increase in the number of parts. The cost of manufacturing an electronic product can, therefore, be significantly reduced by reducing the number of parts. The designer can also reduce the number of parts with the aim of reducing manufacturing complexity.

# SHORTER PRODUCT DEVELOPMENT

## Optimizing the design of a product minimizes the need for revisions.

As compared to the traditional method, the design for manufacturing approach shortens the time-to-market by up to 40%[3]. Shortening the product development time can help to significantly reduce the cost of producing an electronic product. This is usually achieved by employing design for manufacturing principles such as eliminating manufacturing complexities, using standard components, using electronic subassemblies, and so on. Reducing the product development time can also help you to get your products to the market faster. The in-house designers of your electronic manufacturing services provider can re-engineer your design to shorten the product development cycle. It is, therefore, critical to engage them as soon as your initial design is ready.

# REDUCED COMPLEXITY

## Assembly and fabrication complexities can increase product development time and significantly increase the cost of manufacturing a product.

As such, it is important to eliminate all potential manufacturing complexities in the design phase. The design for manufacturing approach considers all aspects of manufacturing to eliminate all potential production complexities. Some of the principles used to reduce complexities include reducing the number of parts, avoiding custom-made parts, using modular subassemblies, using multi-functional parts, selecting a suitable assembly direction, and so on.

# SMOOTHER PRODUCTION

## Integrating design and manufacturing processes ensures a smooth production process.

With both the design and manufacturing teams adding their input to the design, it is possible to produce high quality electronic products in an efficient and cost effective manner. The design for manufacturing approach also enables the electronic manufacturing services provider to fully exploit the available manufacturing capabilities. Without the input of in-house designers, it can be difficult to exploit all the opportunities that can help to reduce the cost of manufacturing a product. To tap all the benefits of the manufacturing capabilities offered by an EMS provider, it is necessary to involve the in-house design team in the design of your product.

# 9 SIMPLIFIED MAINTENANCE

## Integrating design and manufacturing processes ensures a smooth production process.

The total cost of operating an electronic product mainly depends on the cost of maintaining or servicing it. Unless maintenance is factored during the design phase, it can be expensive to maintain some products.

## By involving the in-house design team of an electronic manufacturing services provider, it is possible to minimize the cost of maintaining your products.

The design for manufacturability approach avoids difficult components and custom-made parts. It also encourages use of modular subassemblies. Application of these principles helps to simplify the maintenance of electronic products.

# 10 INCREASED CUSTOMER SATISFACTION

## If you are looking for ways to satisfy your customers, then you need to ensure that your products are of exceptional quality.

You also need to ensure that your products are available at reasonable prices. The design for manufacturability approach exploits various opportunities to ensure that high quality products are produced in a cost effective manner. Using the in-house designers of your EMS contractor will enable you to get products that will not only satisfy your customers but also get to the market earlier.

# WHERE GREAT PEOPLE MAKE GREAT PRODUCTS

EBWE is a world leader in LED circuit boards and LED applications, specializing in design and electronic manufacturing of printed circuit board assemblies. Originally a part of a larger company and now a widely respected expert in electronics design and manufacturing, EBW Electronics continues to evolve with the times while staying true to its family atmosphere.

Our team-oriented approach and desire for quality keep everyone working toward the same goal: making a quality product efficiently.


REFERENCES

**[1]** C. Poli. (2001, August). Design for Manufacturing: A Structured Approach (1st edition).

**[2]** D.M. Anderson. (2004). Design for Manufacturability and Concurrent Engineering: How to Design for Low Cost, Design in High Quality, Design for Lean Manufacture, and Design Quickly for Fast Production.

**[3]** A. Belay. (2009). "Design for Manufacturability and Concurrent Engineering for Product Development". International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering [Online]. Vol. 3, No. 1, pp. 1-7.

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