

# WHITEPAPER

Innovation in design and manufacturing



AXIOM MANUFACTURING SERVICES LTD

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## INNOVATION

There are many definitions of innovation, Wikipedia cites the following examples:-

1. *the act of introducing something new: something newly introduced* ([The American Heritage Dictionary](#)).
2. *the introduction of something new.* ([Merriam-Webster Online](#))
3. *a new idea, method or device.* (Merriam-Webster Online)
4. *the successful exploitation of new ideas* ([Department of Trade and Industry, UK](#)).
5. *change that creates a new dimension of performance* [Peter Drucker](#)

And indeed these all provide us with something to hang our hats on and they all contain the word new. But new in never been done before or a new way to solve and old problem or both?

To my mind an invention is a completely new idea or 'thing' and innovation is the way in which it is creatively delivered, manufactured, launched, re processed etc.

Innovation should be about adding value, be it to products or processes or something else and will be driven by a number of things.

1. How to improve quality
2. How to enter new markets
3. How to extend the life of products
4. How to reduce costs (labour and materials)
5. How to improve production processes
6. How to reduce environmental damage and energy consumption
7. How to ensure that regulations are complied with.

So in simple terms innovation is a tool, which in the right hands will enable you to drive forward changes which will derive benefit to the organisation in some way.

## INNOVATION IN DESIGN

Getting your design right first time and to market on time can be challenging as products increase in complexity, product lifecycles shorten, consumer expectations for greater functionality and the markets become more competitive.

Developing products that are competitive in the marketplace require designers to balance the design specifications with the cost that the market is expected to bear.

Innovation starts with research, listening to customers requirements and understanding constraints of time and budget.

Often products are designed without a thorough understanding of the processes they need to go through to get to the end user, such as what are the best, most cost effective materials to use, which components have reasonable lead times, how easy will they be to manufacture, which equipment will be used to manufacture and test them, how environmentally friendly are they, do they conform to regulations etc.

The need to address manufacturing requirements can sometimes mean ripping up and completely redoing physical designs. As a result, design teams find themselves facing greater difficulties meeting specifications as pressure mounts for faster time to market.

Not forgetting that many organisations approach is to leave cost reduction until after the product is designed and already in production. Cost cutting shouldn't be the main focus but to leave it to the end of the design phase means that the impact of an excessive focus on cost reduction at production stage absorbs effort and talent that could be applied to more productive activities, like developing better new products and improving operations.

That is not to say that your designers are not aware of these issues, it's often simply that they have been around your products (and your competitors products) for so long that the need or desire to bring in a fresh set of eyes is simply overlooked.

The driving force to involve others can be for a variety of reasons including increased market pressures to reduce the total cycle lead time (from concept to full production) , enhance product flexibility, improve product quality and post NPI which includes cost, the types and quantities of materials used and problems occurring during early market launches.

It is therefore extremely important to factor in all of these things early on. In fact, if attention to post product introduction stage is not considered originally, no amount of manufacturing expertise or effort will get quality and manufacturability into the final product.

Experience tells us that cost is very difficult to remove after the product is designed, and usually the focus is then on parts and labour, not the total acquisition cost. For example if companies design products for lean production then overall costs can be dramatically reduced up front.

So how can an OEM achieve attention to both design and manufacturing which enables them to deliver products with the desired quality and level of cost?

***The answer is easy.***

Involving the manufacturer early on is paramount where; if you share common values and culture you will be able to build the trust needed for each of you to share your ideas and R&D.

The fact is that most of the cost of a product is fixed by the design, and so in many cases the best place to find large cost reductions is through improving a design or getting it right with manufacturing, procurement and test in mind, not in actual manufacturing.

Additionally, by thoroughly understanding past quality issues can help to prevent future problems when designing new and innovative products for the future. Indeed if manufacturing, quality and post production service staff are involved in the early stages any potential problems can be designed out.

The benefits of involving your manufacturer at the beginning includes:-

- Reduce number of prototypes
- Reduce number of components
- Reduce risk of component obsolescence
- Reduce design time and associated costs
- Reduce manufacturing and quality costs
- Reduce approval costs
- Increase time to market

## CUSTOM DESIGN AND MANUFACTURE (CDM)

OEMs are faced with trying to meet the ever increasing market demands for low cost, high quality products with short lead-times, whilst at the same time trying to design and deliver products which are innovative and competitive. How your products are designed conveys an important message about your company and what it stands for.

Many larger companies will have access to a variety of people who are able to work in cross functional teams to bring about integrated design and manufacturing, but often lack the time needed to bring new products to market due to other constraints. Small to medium companies' constraints could simply be that they do not have access to the integrated teams in the first place.

Design and development of products is rarely straightforward so you need a team who will work in close collaboration with your team to manage the risks associated with the exploitation of new technology and the development of new products. The integration of design, functionality, reliability, accessibility and manufacturability is enabled through combined technical expertise, marketing knowledge, experience and the utilisation of effective tools and techniques. Products must be robust and reliable throughout their life cycle, in addition to being innovative. Decisions made early in the design stage effect the innovativeness, robustness and reliability, and ultimately the competitiveness of these products.

There are 3 areas in which an outsourced partner can add value and bring innovation to your ideas:-

1. Develop new products based on your ideas
2. Extend an existing product line to new target markets
3. Refresh an existing product by introducing new features

Custom design and manufacture (CDM) is intended to provide an integrated solution which helps to alleviate the problems caused by using disparate teams who do not work together or communicate well, by creating products that satisfies a wide variety of requirements (design, procurement, manufacturing, engineering, testing, marketing, service etc) where the objective is to achieve the highest customer satisfaction at the lowest possible cost whilst observing time to market constraints first time.

CDM objectives are:

- To develop new and improved methodologies for the concurrent design and manufacture of products.
- To integrate manufacturing processes at the design stage, such that the products will be more manufacturable.
- Design and manufacture products that will meet performance requirements with high maintainability and reliability.
- To design and manufacture products that will be highly competitive.
- To develop methodologies and systems for the integration of all major functions the product to meet end user needs.
- To develop innovative products which will offer a lead in the market place.

By utilising this unique approach to product development you can be assured that your designs will be fresh and appealing whilst being manufactured at the lowest overall acquisition cost, reducing risks, improving time to market and competitiveness.

## DESIGN FOR EXCELLENCE (DFX)

DFx basically involves the incorporation of several considerations (manufacturability, procurement, test and the environment) into the design (and redesign of products) and where it has the greatest impact is upon the early design requirements.

By implementing DFX the outcome is usually a better designed product with potentially fewer parts, that is functionally efficient, easier to assemble and test, offers significantly reduced component and assembly costs, along with improved quality, reliability with a shorter time to market.

By implementing design for manufacturing (DFM), design for test (DFT), design for procurement (DFP) and design for environment (DFE) principles early in the development process your EMS can help you to make your product 'more' manufacturable.

## DESIGN FOR MANUFACTURE

Design for manufacture means that you proactively optimise all of the manufacturing functions into the design. DFM can reduce costs, as products can be assembled quicker from potentially fewer parts, products are easier to build and assemble, in less time, with better quality. Parts can be standardised and purchasing prices optimised. Designers can save time and money by not having to "re-invent the wheel." The result is products that are more responsive to customer needs.

## DESIGN FOR TEST

Design for test as the name implies adds testability features into the hardware design. This will reduce products going into the field with insufficient test coverage. Field failures can have a negative impact on margins and ultimately the companies' brand. Often a no fault found (nff) could be due to the fact that the product cannot be tested properly because the test coverage is too low. Additionally functional testing is not always applied in the same standard way because of the final end user application, so being aware of these conditions at design stage is very important.

## DESIGN FOR PROCUREMENT

Design for procurement is about rationalisation, and is a methodology which can free valuable resources, reduce costs, simplify operations and supply chains. Standardisation of parts means that you can optimise bulk buying opportunities and be more confident of the source. Being able to order larger quantities of standard parts and materials provides purchasing leverage where customers can benefit from suppliers economies-of-scale and arrange more frequent deliveries, to support just-in-time operations. Eliminating products with unusual parts and materials will greatly simplify supply-chain management. Improved quality can be achieved by eliminating older, infrequently used materials and those which are going end of life and which inherently have more quality problems and associated risks.

## DESIGN FOR THE ENVIRONMENT

Design for the environment is usually determined at the design stage and through design you can begin to reduce the environmental impact of your products throughout their life. As companies have to pay more regard through both legislation and consumer demands, to the environment, so the eco design aspects of products come under more scrutiny.

DFe aims to avoid or minimise significant environmental impacts and increase resource efficiency at all stages of a product's life cycle, materials, manufacturing, packaging and distribution, product use, and end-of-life.

There are 3 areas which need to be considered:-

- Energy efficiency – reduce the energy needed to manufacture and use your products
- Materials innovation – reduce the amount of materials used, use ones that have less environmental impact and those which can be recycled
- Compliance - ensuring that your product comply with legislation

Design for the environment not only looks at the design stage but also the production processes, seeking to reduce their environmental impact. By reducing the environmental impacts of a product across its entire life cycle an organisation can strategically reduce environmental impacts and operational costs for both themselves and their customers, thereby creating significant marketing potential and customer loyalty.

## BENEFITS OF DFX

The benefits of DFX means that you will get an optimised product that:-

- Offers significantly reduced overall costs
- Is functionally efficient
- Is easy to assemble, inspect and service

And also delivers:-

- Reduction in product development cycle time
- Reduction in manufacturing cost
- Reduction in maintainability/serviceability efforts and warranty costs
- Improved quality and reliability
- Creation of strategies which include any new technology developments

This process involves multi-function teams, working to design marketplace winners, not simply products that are easier to assemble; the advantages are better-designed, higher quality products with a shorter time-to-market. Which means that you are able to consistently deliver new products on time, to cost and performance specifications, delighting your customers.

## PARTNERSHIP

Extending your product development to include an outsourced design and manufacturing team may seem daunting. But with shrinking product development cycles, rising costs, rapid technology changes and increasing customer sophistication, companies recognize that they cannot go it alone if they want to innovate.

Partnering has emerged as an increasingly critical competitive competency for any company that aims to drive sustainable growth through innovation and success hinges on the quality of their collaborative relationships. Relationship should be built on mutual trust, shared responsibility and common goals.

In seeking a partnership, you need a team who are truly customer driven, share a similar culture, seek continuous improvements, live and breath quality and who can envision a variety of ways to meet the needs of the market with a great depth and breadth of experience and knowledge.

A DFX or CDM strategy requires the formulation of a multidisciplinary team where effective collaborations allow them to reduce costs, increase innovation, deliver more value to you, and create sustainable competitive advantage and where you can have absolute confidence and trust.

That team will understand that the protection of your IP is critical. Protection for your ideas, products, processes, designs, copyright etc should be via confidentiality agreements and NDA's to ensure that your intellectual property is kept confidential at all times.

Agreements are one thing, and it is worth remembering that Intellectual property (IP) rights are territorial, which means they only give protection in the countries where they are granted or registered. The question you should ask when considering an offshore partnership is 'are you looking for low cost or a trusted partner where your innovation is safe?'

If your innovation is ripped off what will it cost your company and your brand?

With reports that reverse engineering, counterfeiting, piracy, theft and other forms of IP misappropriation are widespread you really need to be sure that agreements between countries are both legally binding and enforceable.

Far better then to take a step back and really consider the cost of design and manufacturing in low cost regions, will it really be low cost if you lose first mover advantage? By considering the total acquisition costs and the protection you get here on home soil you really can make it more difficult for competitors to follow.

*It is important in the end to find right partner, who has a good culture match, where the people you deal with inspire your confidence and trust and with whom you can be open and honest. With the right ingredients product development and innovation will be in safe hands and it will be a truly win win relationship.*



## ABOUT AXIOM MANUFACTURING SERVICES

Axiom Manufacturing Services focuses on providing **contract electronic manufacturing services** (EMS) to original equipment manufacturers (OEM's) who do not want to manufacture some or all of their products in house.

A complete range of **electronics manufacturing services** are available from design support, prototyping, new product introduction, PCB assembly, sub assembly, product assembly, test, warehousing and logistics through to aftermarket services which includes repair and rework.

Our focus is on working in partnership with our customers, **providing a total electronics manufacturing solution**. We work with you to help you to retain your competitive edge and profitability. Axiom delivers value throughout the supply chain, whilst helping to lower your total acquisition costs.

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