



Redefining design in an evolving industry

Summary

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Take a break for a moment and clear your thoughts of the project you're working on. Now, focus on the dynamic industry you work in and ask yourself where the market-competitive value of your designs actually lies, and where should it be in the future. The answer – invariably, lies in the 'soft' elements of those designs – is a direct reflection of the state of the electronics design industry itself, which by its very nature, is in a condition of rapid and ongoing evolutionary change. Maintaining the competitive, differentiating edge in your designs means it's essential to recognize and embrace those changes by evolving the way you design – the alternative is to watch the industry pass you by.

Now contemplate what the design industry will be like twelve months or even two years from now. Like everyone in the industry you'll have an opinion on this, because it's a key factor of business success and in some cases sheer survival. That future view will be markedly different from today – which is a given – but perhaps the real question is how will you and your company adapt to that change? And have you actually begun to cope with trends in the industry as it stands today?

The current state of the industry and the changing design landscape provide key indicators that help us all come to grips with those questions and highlights a series of developments that are profoundly influencing the future path of electronic design.

The framework of change

Perhaps the foremost reality for the electronics industry is the world-scale revolution in the way many products, or key elements of those products, are now designed, manufactured and distributed. The effect of this change is all around you, in the form of low-cost electronic products that have now become 'commodity' items. Irrespective of their development origins, they have been transformed from a unique product to a universal, low-cost product that applies to a worldwide market.

Whether it's a DVD player, industrial controller or a display sub-assembly, globalization – the move to a single, highly-competitive world marketplace – creates an environment where commodity products pour onto the world market from the most cost-effective manufacturing regions. For both big and small companies worldwide this also opens the opportunity to outsource cost-sensitive processes, typically manufacturing and distribution, on a world scale. This move to 'off-shoring' and the general trend to global product commoditization has generated entire categories of products that can only be differentiated from each other on price.

Along with the breakdown of localized market strategies and the continuing chase for lower production costs, the electronics industry is undergoing an era of unprecedented technological change. This has been driven by factors such as the increasing 'connectivity' of electronics products and in particular, the advent of low-cost, large scale programmable devices.

In short, reprogrammable devices such as FPGAs have created a revolution in the way products are designed by offering an open-ended platform for creating complex 'soft' hardware in the programmable design space. Along with the possibilities this creates it has also heralded an area of multi-disciplinary design where each of the traditional design processes must intimately and coherently interact.

The result is an expansion – and marked increase in complexity – of traditional electronic design tools and added pressure on design engineers to extend their skill-base and knowledge to deal with the revolving door of new technology. These factors conspire to place electronics designers in a position of using an expanded set of traditional design paradigms that struggle to cope with this new complexity.

In the final analysis the drive to reduce costs for a price-competitive market edge can only compromise the quality of design content, hardware and most importantly, the level of unique innovation that can be instilled in a product. This coupled with the pressure to reduce design cycle times – driven by the need to get to market ahead of competitors – means today’s designers are forced to develop products in ways that do not harness the most valuable skills in their armory: innovation and vision.

To break down the barriers that stand in the way of fully harnessing the latest technology we need to take a critical look at electronics design, how the process is currently tackled and how it must change.

Exploring design myths

Conventional thinking in today’s market suggests that valid product differentiators are the ability to produce a product at the lowest possible cost and in the least time. On the surface this seems a reasonable strategy, but these factors should not be confused with real product differentiators that are sustainable. The reality is they are company ‘survival drivers’ rather than factors that deliver a long-term competitive advantage in today’s market, or that of the future.

Let’s take the familiar ‘time-to market’ factor for example, which must be short as a basic business requirement, but is commonly thought of a path to competitive success – beat the opposition into the market and you’ve achieved a critical, dominating edge. On the contrary, all getting to market first will deliver is a product differentiation ‘window’, which is simply a time period when you have a product or feature that your competitor does not.

Unfortunately, this is a temporary achievement by its very nature, since other market players will follow and that perceived advantage is negated. A more worrying aspect of this approach though, is that a single-minded drive to be first to market will inevitably quash innovation and compromise product development quality, which is a high price to pay for a short-term competitive advantage.

In a similar way, focusing on low-cost manufacturing as a path to competitive success leads to a direct confrontation with the realities of today’s global market. Again, only one player can offer the perceived advantage of offering a product at the lowest price, and it’s only a matter of time before an even cheaper alternative arrives on the market to hijack that product differentiator. Low cost manufacture, like short product development times, is a basic requirement of doing business rather than a sustainable competitive edge in today’s industry.

Real and sustainable product differentiation lies in the way a product looks, feels and functions. A product’s look and feel – the form of the design – make it stand out from its competitors through a unique identity. While this is important, its value as a sustainable differentiator is diluted by the fact that it’s relatively easy to copy. Where the true long-term value lies is in the functional aspects of the design, which determine the way it operates and interacts with the customer, and the way it connects the customer to you and the rest of the world – this in turn is determined by the more secure ‘soft’ elements of the design, which host the product’s functional ‘intelligence’.

Design conventions

Beyond the business marketing strategies that affect how products are designed it’s also worth critically looking at the traditional understanding of the processes involved. The increasing use of programmable devices and a soft-centric approach to design has challenged many of the fundamental tenets of the electronic design process.

Take for example the historically-linked concept that electronic product design is a linear, sequential process that starts with the physical hardware and progresses to the software that resides on it. This design paradigm has its roots in the concept that the board layout defines the value of a design – which indeed it did, many years ago – and software adds functionality to that platform. Today, this traditional design methodology and the tools that support it force designers to lock in the choice of hardware, including programmable devices, at the beginning of the design cycle. The soft elements of the design – both programmable hardware and embedded software – can then be implemented on that hardware platform, but within the restrictions of the selected hardware devices.

To be blunt, this is now all backwards. Since the true value of today’s products is increasingly defined by the soft elements of the design, this is the focal point of product development and the place to start. The physical hardware platform needed to support that design intelligence should be created later or along the way, as its requirements become clearer and more fully understood. In this way the software base and performance requirements of the final design are no longer restricted by the choice of devices and hardware, freeing designers to focus and innovate in the area that delivers meaningful product differentiation within the market – the functional intelligence of that design.

The overall perception of today’s design practices is in many ways based on the outdated concept that the essence of a design – its core software and programmable hardware elements – is inescapably linked with the physical hardware platform that supports it. A fundamental, fixed bond between that design IP and the hardware it resides on is a concept that fails under scrutiny as design moves into the soft domain of programmable hardware and embedded

software, where the IP is being progressively disconnected from the physical platform it resides on. The platform now primarily acts as a vessel for the defining soft elements of a design and provides hardware peripherals to interface that intelligence to the outside world.

With the very essence of a design – the device intelligence and its encompassed functional elements – existing in the soft domain, the necessity of a custom-designed PCB is also squarely under the spotlight. As the hardware peripheral sections a board commonly holds become design commodities, the logical progression is a move to off-the-shelf (OTS) hardware solutions that can be used to support a design's core intelligence. In this way, precious product design time can be redirected towards creating unique and innovative solutions that provide true market differentiation.

A new approach

Ultimately, real and sustainable market differentiation is delivered by the design intelligence that delivers the unique behavior, functions and connectivity to today's products. When exclusively held in the soft content of a product it is more secure or difficult to copy, can easily be updated at any time – both the hardware and software content – and potentially disconnects a design from the shackles of a pre-determined hardware platform.

The change in thinking needed here is to turn traditional design inside out by focusing first and foremost on the soft design intelligence that defines a product. Then as the design progresses or even when it is complete, determining the physical hardware that supports it. The physical aspects of the design – the way it is deployed to the market – might be in any number of forms, including a complete OTS hardware device, an assembled set of OTS hardware modules or a traditional custom-built PCB.

What's even more compelling is the prospect of OTS hardware that is directly supported by both the design software and the hardware development platform you use to develop and test the product. Design carried out in that environment can then directly and seamlessly translate into the final product. If the system is also independent of device vendors the door opens to a flexible, soft-centric design approach that allows designers to innovate without the barriers imposed by hardware constraints or the complexity and inefficiency of traditional design tools.

In a highly competitive, global industry where change is inevitable and innovation rules, the time has come for a hard, fresh look at the way we design electronic products. Technological change, if you embrace it, is your ally in producing products that deliver long-term competitive differentiation when a soft-focused design paradigm is applied and hardware takes a back, supporting seat.

This is indeed the future, as all the global business trends, advances in technology and consumer demands clearly indicate – no crystal ball required. It's ultimately up to you to respond to a fundamental truth of the electronics industry; rapid and ongoing technological change is inevitable, and those that don't embrace it cannot remain competitive.