

# How can Concurrent Engineering reduce redesign in UK Electronics Companies?

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## **1. Introduction**

Modern new product development practices such as concurrent engineering and multifunctional teams have several advantages over traditional methods. These include a faster time to market, leading to competitive advantage and greater financial return, increased responsiveness to the market and better quality products.

However, some electronics companies in the UK are failing to achieve the best results in an area that they themselves see as one of their most critical activities. Reducing time to market has for a long time been seen as a way of gaining competitive advantage and UK firms will lose competitiveness if their NPD processes are not improved.

This research looks at high technology companies operating in the UK to see how they are developing new products, whether the process is working and where the processes could be improved. Specific areas of interest are the use of multifunctional teams, design reviews and their effect on the amount of redesign in a project.

Structured interviews were carried out in ten UK electronics companies to determine how they develop new products and how successful their processes are. The use of various elements of modern new product development in each company was examined and its effect on time to market and redesign was assessed. Since each company was from a different market sector, direct comparisons were not possible, so each company was assessed relative to their direct competitors.

Some companies were found to be very good at concurrent engineering and using teams, whilst others were found to be only good enough to remain competitive in the short term. Those companies that were successful had well integrated multifunctional teams, with collective responsibility and the power to make decisions, and design reviews with senior management at key points. Common failings in the unsuccessful companies included poor integration in multifunctional teams, insufficient review processes and lack of support from the top.

## **2. Methodology**

A field study was carried out with ten UK electronics companies to examine their new product development processes. The use of multifunctional teams, design reviews and other modern practices were investigated to see if they have any effect on the speed of development. The companies chosen varied in their market sector, ranging from component manufacturers to suppliers of radiotherapy machines. All used some aspect of concurrent engineering with varying degrees of success. Structured interviews were carried out with managers who have had experience of each company's new product development process.

In order to assess the effectiveness of each company's new product development process, an understanding of the process was required, as well as some measure of success. Since the companies varied in their market sector, direct comparisons of results were not possible. Information about each company's product and their main customers was required to properly analyse the results.

To understand the product development process in each company, it was necessary to find out which elements of concurrent engineering have been adopted and how. Specifically, information about the use of multifunctional teams, specifications, planning and simultaneous activities. The nature and frequency of design reviews was also of interest, and the effect that these had on the amount of redesign required.

Finally, to gauge the success of the process, information about the length of development process and the amount of sales generated by new products was required, as well as comparisons to their direct competitors.

### **3. Results**

The use and success of concurrent engineering in the UK electronics industry varies considerably. While most companies have adopted the basic features of concurrent engineering, such as multifunctional teams and parallel activities, these alone are not enough to gain competitive advantage. Some companies call all the people involved in the development a multifunctional team, although they still work and take decisions in their respective functions. For concurrent engineering to work, the team must work together without interference and with the authority to make decisions. There is little point in having a team if individual functions make the final decisions. The whole team needs to agree on a direction and work together to achieve it.

This way of working represents a fundamental change in the way people work, and as with all major change, it requires support from all levels. Senior management must be seen to support and encourage the process, and certainly should not undermine it. All staff involved in the development process must accept and support the process or it will not work. However, the experiences of some of the companies interviewed suggest that once people give the process a chance, they will see the benefits and may even enjoy the new way of working.

One strong example of how teamwork and collective decision making can improve product development is specifications. No one department has the knowledge necessary to write a specification. Marketing knows about the market and the customer requirements, but knows little about the technology. Engineering know about the latest technology but have no understanding of the customer. When marketing produces a specification, engineering must interpret it as best they can. If the specification is written jointly, with all relevant parties involved, then marketing can express the customer needs to engineering and engineering can explain what is technically feasible. The result is a specification that is acceptable to both marketing and engineering, containing all the necessary information so no interpretation is required. The question of whether to freeze the specification or specify only the most important factors depends on each company's way of working. Both methods have been used successfully in companies studied.

The collective decision making approach can continue into the early stages of design, such as architecture. When the basic functionality and physical properties of the product are being

defined, input from manufacturing and purchasing, as well as discussion between the various engineering functions (hardware, software, mechanical) ensures that everyone is happy with the product and decisions are not being forced on anybody. When this high level design is complete, everyone can go off and do their respective job knowing how the product will work and how it will fit together. This can help avoid costly mistakes and, if done properly, the actual product design can be done very quickly, with all development activities happening in parallel. Most of the problem solving should already have taken place so redesign should be kept to a minimum. However, it is inevitable that some problems may arise so there should be plenty of communication between team members. Co-location is one way of achieving this and has many advantages. As well as regular communication and the opportunity for joint problem solving, it can help with team integration and ensures that the team members are dedicated to the project and will not be distracted by other work.

While it is important for the team to feel empowered and able to make important decisions, it is also important to check on the process at a few key points. These reviews should be used as an opportunity to check that all necessary work has been completed before the next stage commences, and as an opportunity to check that the project is worth continuing. Projects that no longer fit with strategy or market needs should be cancelled, as should those that were based on false assumptions. Many companies use a three review process, and this allows sufficient control over the project without interfering with the process. Generally, a review should be held at the beginning, to ensure that the project is worth starting. Another should be held somewhere in the middle, preferably before a high spend phase such as detailed design or pre-production, to ensure that money is not going to be wasted. The final review should be held just before launch to ensure that the project is complete. Reviews are most successful when there is senior management involvement to ensure that the review is carried out properly. If the review is left to the team, then there it may not be carried out as thoroughly or impartially as it should be. However, too many reviews can be counterproductive.

There is no best way to do product development. Each company should develop a process that works for them and this will be dependent on factors such as the product and the company culture. The process needs to be adapted to fit the style of the company and the people working there. It should not be too prescriptive and the team must have the freedom to use initiative. Feedback is also important: if something in the process works against the team, it should be changed. The process should not be static, but should be reassessed after every project to ensure it encourages fast development and team work.

One of the major causes of redesign is change in the target market leading to changed customer requirements. There are two ways to minimise this. The first is carry out a thorough market analysis in the early stages of the project. By understanding everything about the target market now as well as the likely future trends and developments (both in the market and in the technology), the product specification will more closely match the market needs. The second way is of most use to those companies whose product already has a relatively short development time. It involves freezing the specification and high level design so that changes in the market or technology do not cause a rewrite or redesign. This will significantly reduce redesign, which makes up a large part of the design process. This should reduce the time to market by a considerable amount. Because the product has been released more quickly, there is less opportunity for the market to change. If combined with the first method, then the product should closely match the customer requirements. If there is an

unforeseen change in the market that causes a large change in the market, then there is opportunity to cancel or alter the project during a design review. Companies whose product requires a long development time may find that it is not possible to predict where the market will be and that change in customer requirements is inevitable.

Some companies do not see product development as an important area. They are paying lip service to the main features of concurrent engineering, but are not giving the process the support it needs from the top. Some of the companies interviewed are in sectors where no company has managed to get a competitive advantage through a fast time to market, so each company is happy just to remain at their current market level. However, as some of the other companies interviewed have shown, when one company does achieve a fast time to market they can achieve competitive advantage. Therefore, those companies who are currently as bad as their competitors have a choice of either implementing a successful process and claiming a competitive advantage, or waiting until a competitor does and lose their market share. However, it is not the managers involved in product development who are choosing not to use concurrent engineering, but senior management.

#### **4. Implications for Managers**

Product development is increasingly being seen as an important process. The companies that are giving it the necessary attention have the potential to gain significant competitive advantage over those companies which are either ignoring concurrent engineering or committing insufficient resources.

The most important thing management must do is support the process and commit fully to it. They must empower the team fully to develop the process and only intervene at the formal phase gates. The team as a whole should be responsible for decisions, and should reach those decisions collectively. Concurrent engineering requires the team to work as a team to reach the project goal, not as a group working separately to reach the goal of each department. Good team integration is the most important factor in the process. Ideally the team should be co-located and work on all aspects of development, except detailed design (where specialist knowledge is required), as a team. Progress should be reviewed by senior management at a few key points in the process.

Every company is different, with different staff, different customers and different products, and should adapt its product development process to suit these factors. The process should be flexible and adaptable, evolving into a better process. There are no specific 'correct' methods; the secret to good product development is to get the right people in the team at the right time and give them the support and authority they need.

In reducing redesign, and therefore time to market, the most important factors are:

- Thorough market research in order to completely understand and anticipate the customers needs;
- A product specification/definition that is written jointly by marketing and engineering, plus any other relevant parties, to ensure it contains the necessary commercial and technical information;
- An integrated, empowered team making decisions together and sharing all necessary information;
- Minimising or eliminating changes in the product description once detailed design has started;

- Senior management reviews at key points to ensure that all necessary work has been done and that the project is still commercially viable.

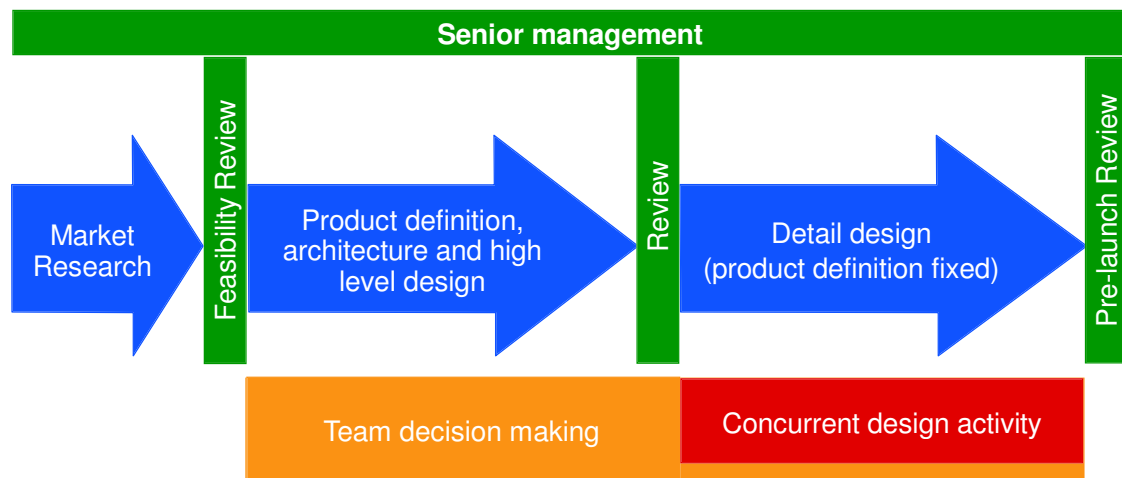


Figure 1 Key stages of NPD

## 5. Conclusion

Modern new product development practices have many advantages over more traditional processes, such as faster time to market, competitive advantage and greater financial return. However, success in this area has been limited for UK electronics companies. This research has looked at new product development practice in ten UK electronics companies. Processes varied significantly between the companies, as did the end result. Most companies used the basic features of concurrent engineering, such as multifunctional teams and parallel activities, although for the process to be successful the team must be integrated and empowered to make decisions. Concurrent engineering requires a fundamental change in ways of working, and requires support from all levels, especially senior management. Collective decision making should be used when writing specifications and product definitions, as knowledge from both marketing and engineering is required. Architecture design can speed up development by creating the opportunity for parallel activities and reducing redesign. Senior management reviews should be held at key points during the process to ensure that the project is progressing but without stifling the project. Strong market research at the beginning of the project can also help to reduce redesign by anticipating changes in the market. Many companies are not paying enough attention to their new product development process and are at risk of losing their current market share if a competitor improves their process and gains competitive advantage.