

Enabling Technologies, Platforms, Proliferations

A New Way of Working Structure for LED Product Development

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Abstract

This paper presents an overview of an approach MAX I.E.G. executed to reduce the product development cycle time for a major integrated LED manufacturer. The core of the project proposed an organization re-alignment and a new way of working to meet the market demand. Results included a 4X increase in product releases with the same resources.

INTRODUCTION

This paper details a project undertaken by MAX I.E.G. for a vertically integrated LED company to significantly increase the rate of new product introductions and reduce their time to market.

As the LED illumination market continues to grow, different product variants need to be available immediately after the lead product is released to the market. This is driven by the requirement for different temperature color preferences in various regions of the world. For example, North America prefers lighting applications with warmer (redder) white colors while Asia prefers cooler (bluer) white color lighting solutions.

Our approach was to understand the market dynamics and to align the organizational structure to meet this challenge. Our case study analyzed the current way of working (WoW) for our customer and identified limitations with its new product development resource and systems capacity. These constraints limited the amount of product releases below the anticipated market demands and hence a major change was needed.

PRODUCT DEVELOPMENT OLD WoW

Using “embedded” MAX I.E.G. consultants, the entire product development (PD) process was mapped out. This started at the ‘Idea Bank’ which listed new products proposed by marketing and concluded at the product market release point.

The initial assessment provided a high-level view of the product development process and the interaction between R&D enabling technologies and the product development group. Figure 1 shows a view of the old way of working. It illustrates activities between the key enabling technologies feeding into the critical path of new product development.

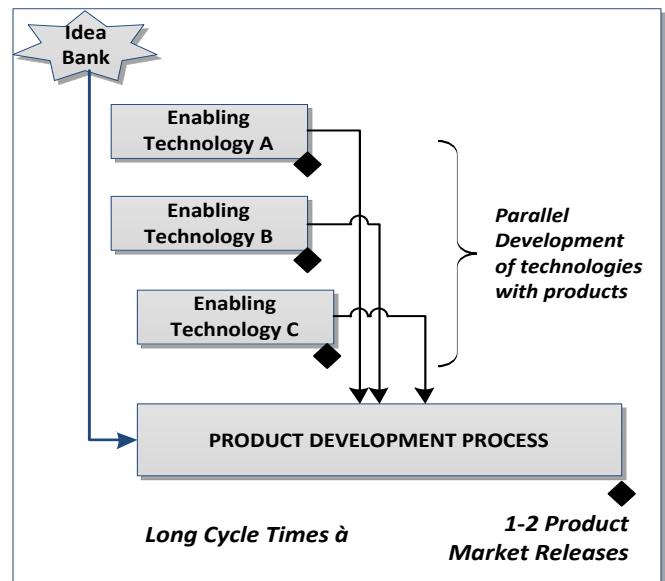


Figure 1: Old Way of Working

By reviewing the existing way of working (WoW) several issues were identified. First, each new product was designed and developed for a unique solution with a single product application. Second, enabling technologies were defined and developed in parallel with new product designs, which led to technical problems arising quicker than the engineering community could handle. Thirdly, once a new product was released, a separate project was then initiated to build and characterize the ‘follow on’ products. The problem with this approach is that minor modifications like color temperature or performance improvements (Lm/W) required the same long development process as the new product. Consequently, project timelines were long and unpredictable as engineers struggled to debug new processes and verify the reliability of new materials.

Borrowing a technique used to quantify risks as part of a FMEA (Failure Modes Effect Analysis) MAX developed RPN (Risk Priority Number) numbers to rank the issues affecting the rate of new product introduction. The table below shows a list of the identified issues with the existing WoW. For illustration purposes, only issues above RPN of 600 are shown.

Identified Issue	Total RPN
Parallel development of enabling technologies with product introduction	750
Unpredicted reliability performance (not able to qual from similarity)	730
Product construction not modular (single product application)	690
Minor changes on new products required as much time as new product introductions	680
Inefficient use of engineering resources (resource bottleneck)	640
Limited data on design & manufacturing window corners (not covering excursions)	630

Table 1: Issues with RPN Scoring

ORGANIZATION RE-ALIGNMENT

MAX studied the market demand and proposed a solution that allows for flexible development of modular re-usable blocks, platforms, and product variations or proliferations. The ‘Platform’ approach to new product development has been used in other industries successfully. For example, an automotive company will use the same car chassis in multiple models in their product line. This re-use allows for quicker time to market with lower overall development costs. (See Product Platform Development Tae G Yang G IMECE2005).

To ensure the proposed approach fit with the customer’s strategic direction, senior management assigned a Tiger team to validate and provide more inputs to this approach. MAX consultants worked directly with multiple cross-functional groups including Marketing, Product Development, and Manufacturing. The goal was to lay out more details in terms of re-organizing functional teams, roles and responsibilities, deliverables and the interaction between each of the proposed new teams.

PRODUCT DEVELOPMENT NEW WoW

After a few weeks of cross-functional interactions, a final proposal illustrating the infrastructure required to make this new way of working was completed. Other important results that came out of this work were the identification of gaps the organization faced in terms of functional and geographical resources. Senior management then reviewed the proposal and developed a plan to introduce the changes required. This plan took into account the current workload while allowing a smooth transition to the new WoW.

A main initiative for the new WoW was to de-couple technology development activities from product development critical paths. With the enabling technologies now being developed in advance of the product, the engineering teams now had the time to complete corner studies to fully understand the limits of the technology. Extensive

characterization and reliability testing could now be completed and any new failure mode(s) detected before the product timeline was committed to the customer. Additionally, the corner studies included the anticipated minor modifications required for the ‘follow on’ products.

Figure 2 below shows the proposed structure and three major teams under the new WoW approach. As illustrated, enabling technologies are the upfront activities before any product is released. Platform integration then takes all new technology blocks and verifies modular designs that serve multiple products variations in terms of color temperature and packaging options. The back-end process is simply a product proliferation team that is focused on releasing products to market in as quickly as a few weeks.

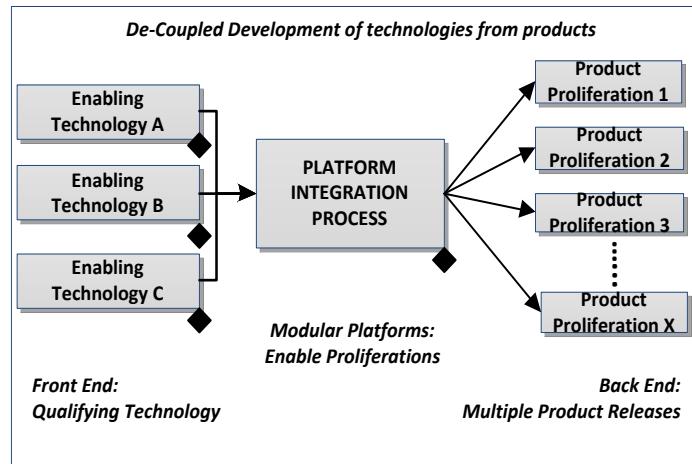


Figure 2: New Way of Working

As mentioned, one of the many benefits of the new WoW is the up-front understanding of the complex engineering trade-offs between performance, reliability, and full characterization of new materials and processes prior to building a product. One of the first results achieved within weeks of establishing teams was the development of the Enabling Technologies roadmaps along with Product Platform roadmaps. These roadmaps helped formally align the technical deliverables of the enabling teams to the product performance defined by marketing and required by the customers.

INFRASTRUCTURE REQUIREMENTS

To support the new WoW additional re-structuring of systems and tools was required to guarantee efficient execution. Marketing, along with product development must now maintain a portfolio management system that allows the enabling technology teams the necessary time to develop the core technologies. Once these technologies are available then they can be introduced into the product platforms.

The original single phase gated PD process had been designed for the old WoW and consequently did not target fast time to market project execution. With the New WoW in place, the number of tasks for product proliferations was reduced significantly. Additionally, a new phase gated process was established. The combination of these two improvements

allowed much faster time to market. Eventually the Enabling Technologies, Platform Integration and the Proliferation team used different Phase Gate Processes. Each process was optimized to their team's key technical deliverables.

In order to keep the team focused, clear KPI's (Key Process Indicators) were developed. Each of the newly created teams had different focus areas so a sense of accountability becomes important. The high level KPIs for each of the teams were:

- Enabling Technologies: Performance & cost goals
- Platforms: Implementation and corner case testing
- Proliferations: Fast time to market execution (75% faster than baseline)
- All teams: Quarterly updating of Roadmaps

TRANSITION PROCESS

Once the new WoW concept was detailed and bought in to by the teams and senior management, a transition plan was required to guide the teams to a fast and efficient change. Benchmark data suggests that over 70% of a major organization's change efforts fail. The key reasons for failure are identified as distractions and focusing on the wrong priorities. A more holistic approach is required to maximize the success rate when these changes occur. MAX referenced a proven technique developed by Dr. John Kotter called 8-Step Change Management Process to guide the organization through re-alignment.

During the initial stages of the transition, MAX recommended concentrating on four of Kotter's 8-step process: Guiding the Teams, Vision & Strategy, Communicating the Vision and Short Term Wins. These steps gave measurable results and were used as an aid to keep teams focused towards a common goal. The recommendation for this approach was partly driven by the need for a quick transition. Figure 3 below illustrates the change management process and how it was applied to this project.

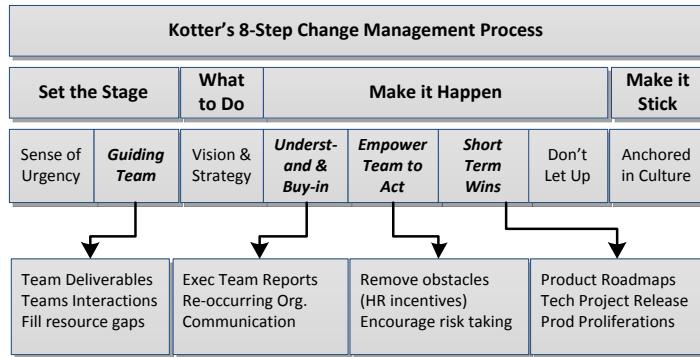


Figure 3: Change Management Process

RESULTS

By the end of the first quarter of the transition period, highly detailed roadmaps for each of the enabling technologies as well as the product platforms were available. The roadmaps

showed gaps between the market requirements and the existing enabling technologies performance. Consequently, this created an organization wide focus on closing the identified gaps.

A short-term win associated with this approach was the release of a phosphor technology. This new technology was introduced across multiple new products and enabled a 75% faster time to market compared to the old WoW.

Another example was the development of a standard package solution that multiple products could utilize. This reduced the time to market by 30% compared to the old WoW.

Within the first 6 months of the new WoW all new systems infrastructure were completed. These systems were:

- A new project portfolio management system
- A streamlined business creation process optimized for each of the teams
- A project prioritizing process to keep focus on the top projects for the company
- A resource allocation tool that allowed for current and future resource availability for project execution

From a strategic point of view, our LED customer released the first wave of proliferation products one quarter after the transition. This provided a good indication for a 4X increase in product releases by the end of the year.

CONCLUSION

MAX's approach to re-structure the appropriate organization based on the market demands lead to a rethinking of the development process. Other important factors contributing to the rapid change were strong management commitment, continuous cross-functional team interactions, following Kotter's 8-Step Process for change management and senior management empowerment of the team leads to drive the changes.

The organization re-alignment was necessary to execute faster product launches, with less risk, with the same organization head count. Once fully transitioned, the new WoW approach should yield greater market share and increase yearly financial revenues. These goals could never been achieved with the old WoW since the rate of product releases was limited below the market demand.

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