Implementing Product Platforms in the Global Enterprise:
Lessons from an LED Industry Leader

Marc H. Meyer (corresponding author)
Matthews Distinguished University Professor, D'Amore-McKim School of Business
Northeastern University, 474 Dodge Hall, 360 Huntington Avenue, Boston, Massachusetts 02115
Tel: +1 (617) 373-5948
E-mail: ma.meyer@northeastern.edu

Jeffrey Cassis
Senior Vice President of Global Lighting (retired), Signify (formerly Philips Lighting)
Attn: Marc Meyer (above)
Tel: +1 (617)319-4905
E-mail: jeffreycassis@gmail.com

Oleksiy Osiyevskyy, Assistant Professor
Haskayne School of Business, University of Calgary, 2500 University Drive, NW,
Calgary, Alberta, T2N 1N4, Canada
Tel: +1 (587) 432-5020
E-mail: oosiyevs@ucalgary.ca

Dirk Libaers, Associate Professor and Kennedy Family Professor of Entrepreneurship,
Muma College of Business, University of South Florida, Tampa, Florida 33620
Telephone: 813-974-7820
E-mail: dlibaers@usf.edu

Implementing Product Platforms in the Global Enterprise: Lessons from an LED Industry Leader

Abstract:

Product "platforming", i.e., using technology subsystems or components that are shared within and across product lines, is a proven way to increase the effectiveness and efficiency of innovation processes in established companies and startups alike. Yet, in practice embracing the product platforming strategy turns out to be difficult, particularly within the context of global, diversified companies. This article examines the strategies and challenges of implementing product platforms across multiple business segments and multiple geographies. Using the experience of Signify in the LED industry, we explore the challenges of global platforming and the technological, organizational, management process transformations needed for success. We also examine how platforming strategies change as manufacturers enter the world of connected things.

Keywords: platforms, product development, modularity, innovation.

Introduction

Both management research and practice has long proven that product "platforming" (i.e., using technology subsystems or components that are shared within and across product lines), is a reliable way to increase the effectiveness and efficiency of innovation processes in established companies. The purpose of this article is to explore the challenges of implementing product platforms in the context of a multi-business unit, global corporation. "Platforming" is ever more important given opportunities that well-designed technology platforms can leverage a company's capabilities and assets to drive revenue in new adjacent market opportunities. In addition, the commonality of components and production processes associated with product platforming can drive down costs. And yet, with all this potential, the concept and practice of product platforming across different business units and product lines within the corporation remains challenging. The reasons are both conceptual misunderstandings of what a platform is and is not, as well as the intense organizational challenges inherent in cross-organizational collaboration. Moreover, platform champions must make the business case under conditions uncertainty for what can be large engineering investment needed to engineer product and process platforms. Done right, platforming can have a profound effect on improving time to market, providing greater flexibility for product variation, and lower cost of goods. Not done well, platforming can be a costly exercise with elusive outcomes.

In the pages to follow, we hope to provide pragmatic, field-tested advice on how to develop a strategy, organization structure and processes needed for successful platforming in a global corporation. This article is based on the experiences of one corporation's definition of its hardware and software platforms for global market penetration over the past decade. Using this example, we generalize towards frameworks for designing platform architecture, defining a global product-platform portfolio, organizing engineering teams, and platform-centric metrics for measuring results – all in the context of the global enterprise.

Definitions: What are product platforms and why implement them?

Academics, practitioners, and consultants have used the platform word so liberally that the "P" word could stand for just about anything within a corporation. To make sense of this area, let's suggest a simple, basic definition that has worked for decades amongst effective industry practitioners.

A product platform is a technology subsystem or component that is shared within and across product lines (Meyer and Lehnerd, 1997; Jiao, Simpson, and Siddique, 2007; Gawer, 2014; Choudhary, Van Alstyne, and Parker, 2016). One typically finds platforms as major subsystems that are deployed across multiple products – such as an engine or chassis shared across different passenger cars or SUVs. All cars need a motor or powertrain of some sort. However, any given powertrain may not necessarily be a product platform unless it is used across different vehicles. A product platform can also be a shared technology interface between different subsystems, such as the electrical connections and wireless communications connections within a vehicle. In software, the platform definition also applies, powerfully. For example, in any major set of software applications (such as an ERP system from Oracle, SAP, or Epic) there tends to be a common database (e.g. the engine) serving all the different specific applications – the product platform serving different applications. Similarly, the same basic operating system software and user interface developed by Apple works seamlessly across its various servers, laptops, iPads, and iPhones, providing the user with ease of use as well as allowing the separate devices to connect and interact. Platforming applies to both physical and nonphysical products.

The overriding goal of "platforming" is to achieve high levels of modularity so that a firm can quickly responding to new or changing customer needs rapidly – without having to reinvent the new product from the ground up each and every time. Reusable parts or components can also have a dramatic impact on sourcing and Cost of Goods Sold (COGS), given the volume procurement implications of common components and materials. Our work with capital intensive, high volume manufacturers has benefits as much as a 50% reduction in COGS when product lines are joined into common manufacturing and supply operation.

Product platforms rarely work well by chance; they require careful, meticulous engineering design & operational governance to support the broader range of functional and application requirements in specific products. Target product or system applications must themselves be designed to accommodate shared product platforms. This is typically referred to as a modular product or product line architecture, which minimizes interdependencies between modules performing different functions (Robertson and Ulrich, 1998; Thomke and Reinertsen, 1998). This modularity allows a company to swap in new generations of subsystem technology, and upgrade overall functionality, without having to redo all the other parts of a product or system.

Process platforms often go hand-in-hand with product platforms. A process platform is a common manufacturing process used to produce different types of products. Mars, Inc., for example, can produce different types of chocolate bars on the same physical asset; Honda, different passenger car and SUV models on the same flexible assembly line; or, P&G, different size diapers on the same diaper converters (Meyer, 2008). Like product platforms, process platforms do not happen by chance: to achieve commonality in high volume production environments requires careful design, equipment configurations, and commensurate capital investment. Once achieved, however, economies of scale drive increased utilization of plant and equipment. The efficiencies of process platforming can then ripple throughout the entire global supply chain, harmonizing and rationalizing a firm's supply network into a select few in order to drive up volumes and reduce per unit costs.

Defining a Platform Strategy: The Example of Signify LED

How might a company best define the strategy for a large-scale platform program in terms of base level architecture and product derivatives based on that architecture?

The guiding principle is to achieve commonality in underlying subsystems and components across a range of related products and systems. To see this principle at work, let us consider Signify (formerly Philips Lighting) – and specifically, the LED business. LEDs are an easy example by which to understand the principles of product platforming. All of us use lighting,

and increasingly, this lighting largely is LED-based. And LED functionality is increasingly becoming connected and therefore, software-based. At the time of this writing, Signify is running at about $7.9 billion in annual revenue with EBITDA of about 10%. It operates globally, with major R&D centers and manufacturing activity in Europe, North America, China, and India.

We immersed ourselves (and one co-author directly managed) in the platform development and deployment activity of Signify. Its platforming efforts span the past decade when the company was an operating division of Royal Philips, and then, as Philips Lighting. When Philips reorganized into separate medical, consumer electronics, and LED companies, Signify spun off as a standalone and publicly listed company.

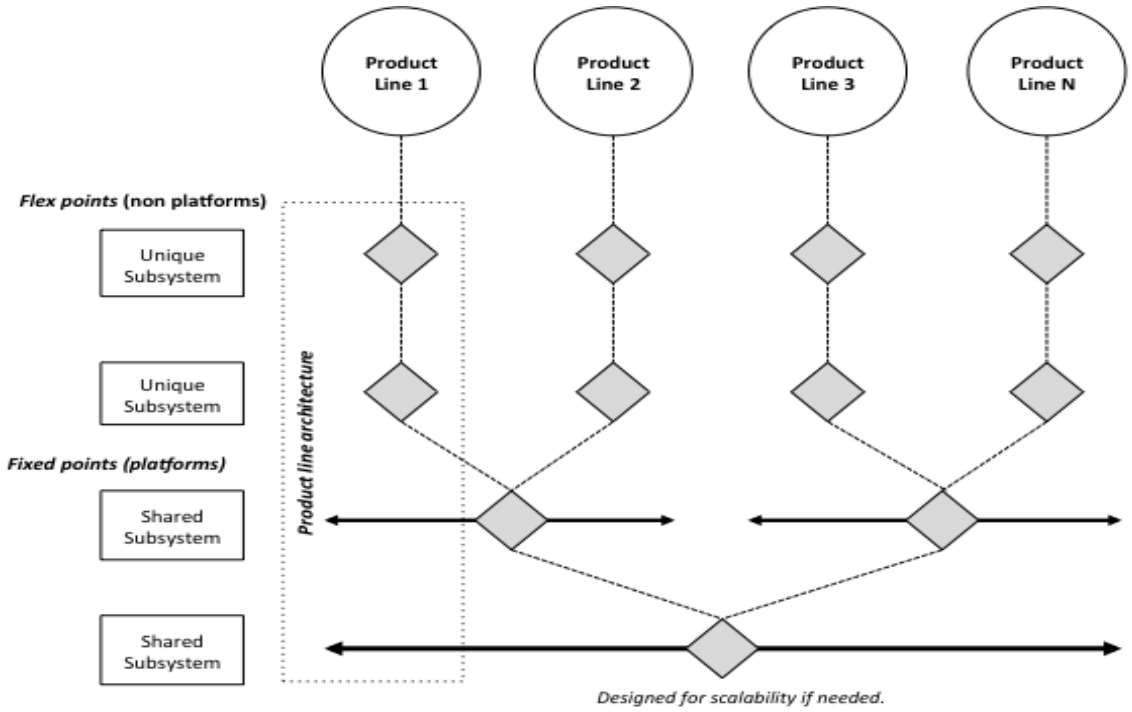
Signify specializes in premium, professional grade systems, including sales in major business segments: outdoor lighting (street lamps), office and industrial lighting (typically the long rectangular LED fixtures), and single point-source lighting found in retail stores and hotels. An LED is simply a diode placed on an electronic printed circuit board, which contains power management, dimming controls, communications chips, and of late, open slots for other types of sensors. In addition to providing light, each LED unit can accommodate location specific sensors for a wide variety of applications: noise monitoring in a city, occupancy sensing in an office, or a motion sensor in a store or museum. LED lighting is a natural platform for a variety of emerging IoT applications, and the LED industry is expanding its value creation well *beyond just illumination*.

Management used an underlying framework to define its platform strategy across these business units, shown in Figure 1. The framework has three dimensions of activity at work. First, running up the left are the major subsystems within the product line architecture. Second, across the top are the product lines within a business, often assigned to specific business units for product-market fit. Third, in the middle are the subsystems within the architecture. Some of these – such as those at the bottom of the figure – are common to different product lines. Others are specific or unique to the specific product line. In the version of the framework shown in Figure 1, there is one subsystem shared across all product lines at the bottom of the figure; and two platform variations needed to serve the different product

lines one step higher. The other two subsystem layers are shown as unique to the specific product lines. Obviously, for different companies in different industries, this figure will have many different instantiations (Meyer, 2007).

For those subsystems that become common subsystems – or product platforms --, engineering must be performed to make these subsystems work or *scale* across the different applications. Invariably, companies will select one or two major subsystems based on a combination of a high percentage of overall COGS and the technical feasibility for making them useful across the required range. The other subsystems are customized to specific market applications of the technology. And for platforming to work, there must exist a shared architecture across the different product lines so that common subsystems can plug and play across the portfolio. That's how auto manufacturers do it for car engines and chassis and software companies with their common databases and GUIs.

Figure 1: The Platform Framework



Most companies start off with one major subsystem for platforming, and then once comfortable with the technical and organizational aspects of the effort, starting their way up

the architecture stack over time. How far commonality goes up the stack within the product line architecture depends on the industry as well as execution.

Platforming Luminaires

All these ideas apply to Signify's platforming journey. Let's see how.

Historically, Signify had a culture to develop unique, customized solutions for its municipal, office, and retail lighting customers, who were often building architects who desired special solutions for their clients. Unique lighting designs have historically been called "peak" designs in the company. By 2009 or so, the company had literally thousands of unique "peak" LED systems for office, retail, and outdoor applications. If there was commonality, it was by accident rather than design, typically the result of the same engineer being shifted around from one project to another.

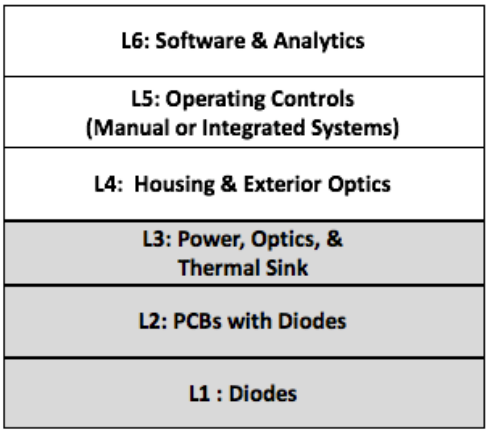
Senior management had been reading and thinking about product platforming for a number of years but had not yet taken the plunge. This changed with the acquisition of a smaller player in high-end "architectural lighting". The CEO of that acquired firm was a platform enthusiast. Soon, he was named the new head of a global platform & systems development and operations, with a charter to platform at least 1/3rd of the entire technology stack within LED systems.

At the time, the operational definition of a "platform" for this company became very specific – it was the composite of three specific subsystems, one layered on top of the other. The layers were (and remain):

- L1: the LED diode(s) itself;
- L2: the LEDs then placed onto a printed circuit board;
- L3: the LED-printed circuit board loaded with power controls and physical hardware for the optics/reflection and the thermal heat sink necessary for every finished product.

Figure 2 shows how these three subsystems fit within the rest of the elements within the product line architecture – one that works just fine for design and engineering purposes for indoor, retail, and outdoor lighting systems. The three platformed layered subsystems accounted for approximately 30% of the overall engineering effort for a completed product made by a local product engineering team. To design a finished lighting system, engineers would then design unique exterior optics (the lens covering the lights), uniquely styled housing, different types of operating controls or switches, and back in the 2009-2010-time frame, special application-specific software for controlling and getting energy usage and other types of information from multi-light installations – particularly large-scale street light installations in cities.

Figure 2: The Initial Platform Architecture for Indoor, Retail, and Outdoor Systems



These common systems were labeled "common building blocks" so as to not confuse anyone with the different meanings of the word "platform." Signify's global platforming team then designed each of these three building blocks (L1, L2, and L3) to be scalable across a defined range of power and lighting requirements. And then, the team created three versions of these combined building blocks for each market segment – outdoor, indoor, and retail. Figure 3 shows the "platform design" for each market segment – understand that each design contains diodes on a printed circuit board, with power controls and a thermal heat sink built into the platform design.

Figure 3: Signify's LED Platform Designs for Three Market Segments

Business Segment	The Platform Design	Platform-Enabled Products (Sample)
Indoor Office		
Indoor – **Retail / Hotel**		
Outdoor		

For the indoor office segment, the basic building block configuration was rectangular in shape (think overhead fixtures in offices or hospitals) and could be stacked lengthwise and horizontally to achieve different architectural specifications in terms of covered areas, energy requirements, and so forth. The outdoor platform subassembly was also rectangular in shape to support street lights, park or building open space lighting, and stadiums. In contrast, the retail instantiation was circular in design, called "point source" in the trade, and was intended for stores and hotel lobbies. But all three versions used common LEDs, PCBs, controls, optics, and heat sinks.

The impetus for the platform program was to deliver the highest quality LED luminaire at a competitive price, and to substantially reduce development cycle times – a real concern

given that building and lighting architectures often design luminaires, which on the surface, can appear rather unique. Signify realized that by using underlying product platforms, it could achieve economies of scale, better utilization of its supply chain, as well as in R&D, compete faster and at healthier operating margins. The margin improvement was increasingly important as the rest of the industry was shifting to commodity offerings.

Management also believed that platforming had to provide clear, quantifiable benefits to building owners, occupants, and lighting architects. The older "peak" designs were often hard to upgrade and service across large cities, offices, or stores. City or building managers had to manage substantial complexity over extended life cycles for mission-critical assets -- working lighting is essential in the office, the retail store, or on the city street. The differences in safety and productivity between well-maintained, upgraded lights and those that are left to degrade are tangible. As Signify began to introduce its lighting platforms, it made sure to bring its large customers along the journey to test, measure, and validate the electricity reductions, the worker productivity, and maintenance savings offered by the new designs.

A Platform Engineering Organization

Signify took a very deliberate platform-centric approach to organizing its R&D, company-wide. The guiding principle for structuring a large platforming initiative is that products come out looking like the organizations that build them. If senior management desired platform-based products, then there had to be a common platforming R&D group. Otherwise, each product development team would continue to simply "do its own thing" as they had done in the past, seeking to optimize their own particular products – from top to bottom – for their own customers. Decentralized platform design as a general community of interest might sound appealing for some seeking maximum degrees of freedom in design, but our experience is that it produces only partial results.

The need for Signify to create a centralized platform group was all the more important because of a culture of geographic and business unit autonomy, where the result was typically small-lot manufacturing located in each respective geography. However, once senior

management committed to a global platform strategy, it was clear that the old organizational approach would not produce the common product line architecture and building blocks needed to economize and leverage a common effort around the world. Accordingly, a central platform development team was formed in Eindhoven. In turn, that team worked hard to establish structured communications with each local development group in four major geographies to make sure that its common designs truly served local needs. "Product management" for platform products was essential: the global platform R&D team had to carefully understand the performance needs and operational constraints for installation and use needed by the customers across different geographical and business segments. For example, in order to be successful globally, a common building block had to accommodate local electrical codes and more general building codes across all regions. Achieving this level of scalability takes work and product management resources.

Trust in the centralized team needed to be established early on. The Global Platform's Team's director took an active role in setting priorities and sequencing opportunities, deciding on how fast and how far to go in the initial platform implementation. The team also brought on product management resources with prior experience working on global product programs. Collaboration and coordination between the Central Platform and local R&D teams was an absolute requirement for success.

Getting the local teams to truly integrate the Central Platform team's efforts into their own operations was pushed further by a change in the reporting structure. At first incubated in the company's special, premium Professional Systems business unit (sitting above the Indoor, Retail, and Outdoor business units), the Central Platform team was then extracted from Professional Systems division and elevated to the same level as Regional R&D and Market teams to serve all business units. This elevated reporting structure allowed for greater transparency as well as accountability across all business units and geographies.

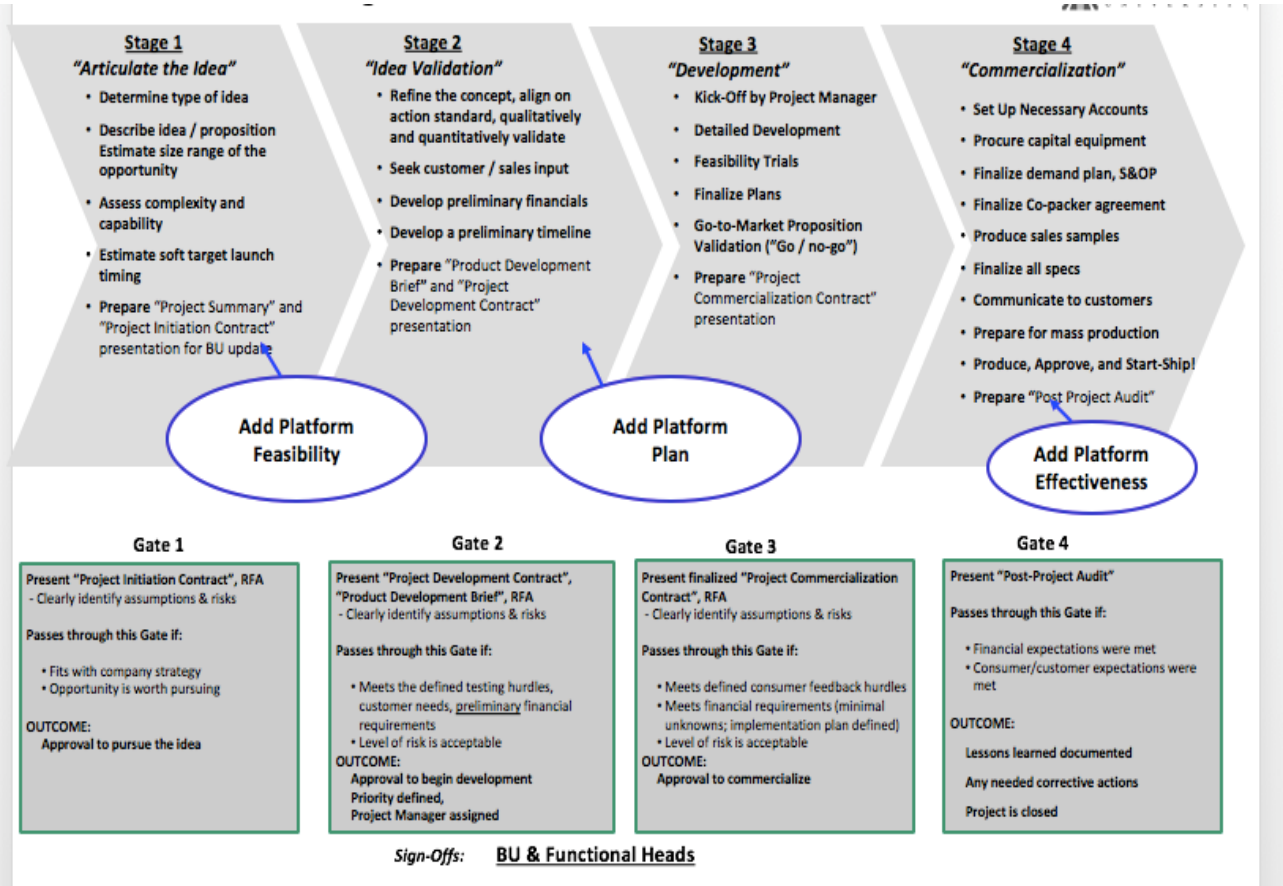
R&D Business Processes and Governance

R&D processes and governance mechanisms were also critically important for platform success. Prior to 2015, local development teams could essentially pursue the use of platform building blocks at their own discretion. Post 2015, this all changed. In order to not use a common building block, a local team had to provide a clear explanation, and not just in terms of required functionality, but also, the additional cost in terms of added R&D and time cycle to market.

The conduit for this was to modify the company's traditional stage-gate system in R&D. Most manufacturers have an entrenched stage-gate system in place to review and approve new product developments across the spectrum of initial concept creation to product and process development for that concept, to market launch. The unfortunate reality is that these stage gates, originally designed based on research into single product successes and failures (Cooper, 1990) tend to put individual product teams in heated competition for resources against short-term hurdle rates. In other words, a traditional stage gate will not encourage shared technology between teams. Signify's management found that it had to harmonize the single product lens on resource allocation with a longer-term, multi-product platforming approach.

The company modified its stage gate to incorporate platform utilization by individual new products or systems. Figure 4 shows the conceptual framework for doing this. It shows four major gates. Signify inserted a platform-utilization assessment activity or checkpoint into each of its stage gates. If an available building block was feasible for the proposed initiative, a local development team had to use it, or specifically justify its "peak" design. Over time, it also became common that a particularly advanced feature for a "peak design" would then become part of the platform design for all applications in subsequent iterations. Also, shown in the last gate in Figure 4 was a deliberate platform effectiveness review assessment by local development teams. This became standard operating procedure for the company.

Figure 4: Build Platforming into the Stage-Gate System



From a business investment perspective, management believed that platform development would on average be more expensive and time-consuming than a one-off design, but well worth the investment if the common design could be used across many products and customers.

The central platform team also adopted agile methodologies for rapid prototyping with tight feedback loops. It had to work fast and be responsive to local needs; as a centralized R&D Group, it could not become an impediment to any local team's ability to win highly competitive, time-constrained bids. Weekly communications were established between the central platform

team and the local geographic teams to ensure that customer requirements were captured and that the platform design for each of the three business segments was meeting expectations on cost, features and regulations. Also, the central platform team found itself responsible for organizing the supply chain strategy for its own platform components. This required the platform team to bring additional capabilities into its own team, including highly-experienced Signify supply chain and logistics experts.

Given the rapid pace of industry change, the platform group had to see itself as more than just another central R&D team, but rather, as a quick-moving venture within the company where local sales and product development teams were its clients, and their customers, its own customers. It was truly a different mindset within a large, established corporation.

Platform Metrics

As the old saying goes, if you don't measure it, you cannot improve it. Platform-based metrics are rare in management literature and practice. R&D metrics remain single product focused, the result of the single-product stage-gate systems that have become the mainstay of most large manufacturing systems (Cooper, 1980, 2008).

Management knew it had to measure differently. It worked diligently to deploy three sets of metrics worldwide to show the progress of platform adoption across business segments and geographies. Figures 5, 6, and 7 show these metrics, by quarter, for the critical period of 2010-2015 (Meyer, Osiyevskyy, Libaers, and van Hugten, 2018). These metrics were produced quarterly and became a review point at senior staff meetings, where both business unit and regional heads gathered in the Netherlands to review business matters.

The highlights were as follows:

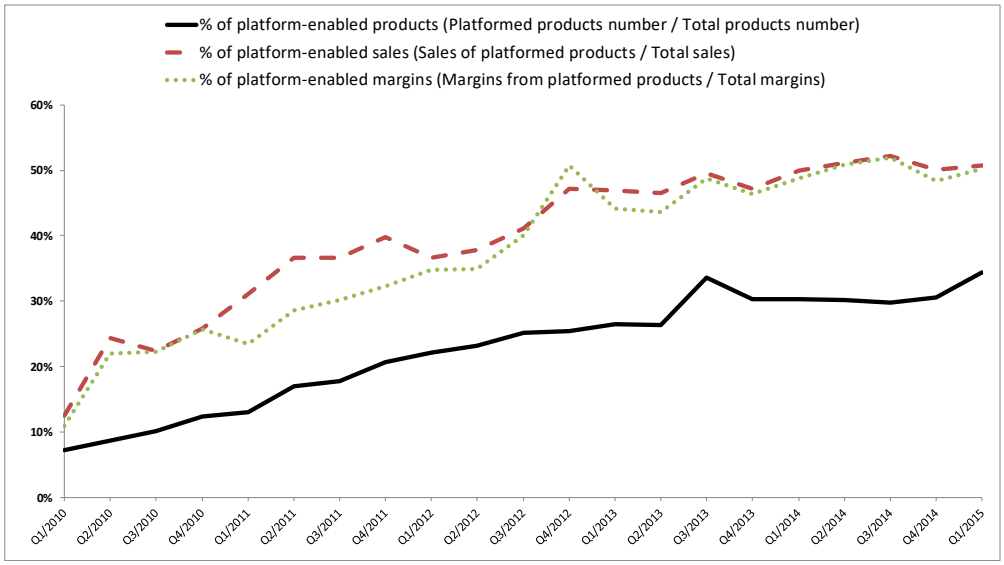
- **Company-wide platform adoption**: At the beginning of this, there was significant interest around the world on the part both the local R&D groups and large customers. Each local development team was under time pressure to deliver customer orders -- those unique designs imposed by building architects -- while at the same time

confronting price competition from low-cost players. In principle, platforming might really help. Signify's executive team was also excited by product platforms and expected success from all business segments and geographies. Some early adopters achieved immediate success using the LED building blocks. The indoor lighting segment was the most effective adopter early on. Product development cycle times dropped dramatically for derivative product designs, as well as new products. It made sense: working with common building blocks, an engineer simply had to add the optics and housing required in the specifications, as well as typically off-the-shelf controls to dim or otherwise operate the luminaries.

Not all segments within Signify were equally willing or effective, however. With customer orders on the line, some local R&D teams were not as willing to take on the risk of a new engineering approach. Yet, senior management viewed platforming as a company-wide mandate with clear competitive implications – a matter of importance and sustained margins in a world where lower-cost, lesser quality manufacturers were flooding into the market.

Metrics were needed to track platform adoption. Looking at Figure 5 it can be seen that over the initial five-year time period, the penetration of platforming across the company's products increased gradually, from 7% of platform-enabled products in the first quarter of 2010 to 34% in the first quarter of 2015, and not homogeneously across geographical regions and business segments. Today, that percentage stands at about 75% globally, due in large part to the business process and governance mechanisms described in these pages. At present, the goal for platform adoption is 80%, rather remarkable for such a large, multi-segment business.

Figure 5: Platforming Penetration at the Corporate Level (quarterly results)

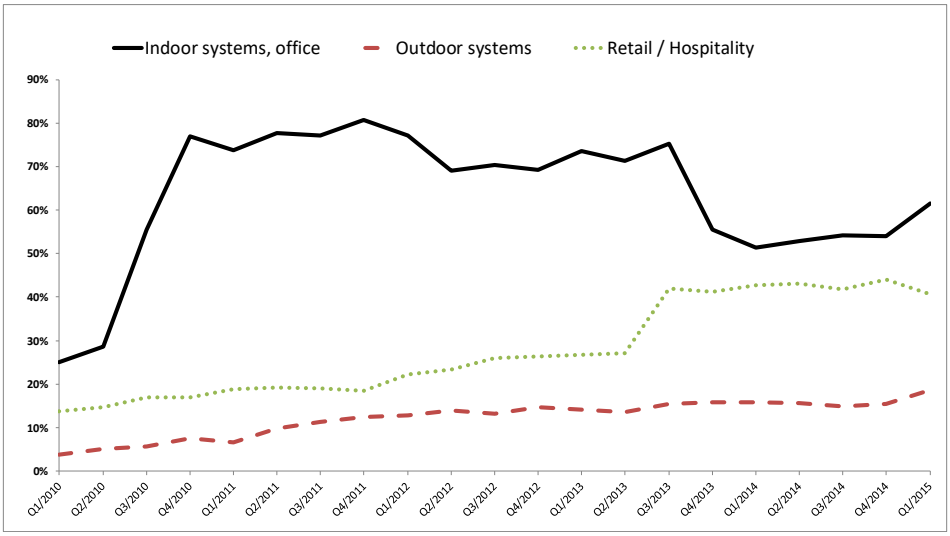


Source: Internal company data, used with permission from Signify Corporation.

- **Business Segment Platform Adoption**: Please examine Figure 6 for business adoption measures. During this critical initial five-year platform launch, the use of the common building blocks quickly accelerated in the indoor market segment. However, platforming took over three years to gain traction in the retail segment and was even slower in the outdoor segment. There are market-based reasons to explain some of this difference. New office construction tends to work on tight timelines, with anxious commercial landlords impatiently waiting to turn the lights on. Any delay in completing electrical, HVAC, and lighting systems comes right to the forefront. Retail construction, such as malls, is also time-pressured, but it is far less frequent than new office space construction, and often, renovations dominate over new building. Last, large-scale outdoor lighting projects might involve RFPs of greater than 10,000 lights in a single procurement. These tend to be slower single orders with a localized design, lessening the need to achieve economies across different orders – and more tempting to serve with unique, peak designs. It is recognized that some very large public sector and commercial customers will be able to insist on one-off, peak lighting designs by the sheer volume of their orders.

Figure 6: Platforming Penetration at the Business Segment level

(Platformed products number / Total products number, quarterly results)



Source: Internal company data, used with permission from Signify Corporation.

- **Geographic platform adoption**. This set of data show the organizational dynamics of different operating units within a global enterprise. For a number of years, the US operations had a "not invented here" attitude to the European derived platform building blocks, regardless of business unit focus. This was certainly not unique to the then Signify organization alone. American adoption was substantially below that of all other R&D groups for the first three years of diffusion, not because the platform building blocks themselves were unsuitable for the application, but because there was nothing forcing any of the different geographical business units to comply. Local engineers might not wish to learn and adopt new, standardized components due to time constraints – even though if well used, those same common building blocks could reduce time to market and improve profitability. Today, the U.S. adoption rate is on par with that of Europe, due to new governance mechanisms to be described below.

  On the other hand, adoption in "growth markets," which includes India, EMEA, and Central/South America customers, accelerated strongly and has remained at near

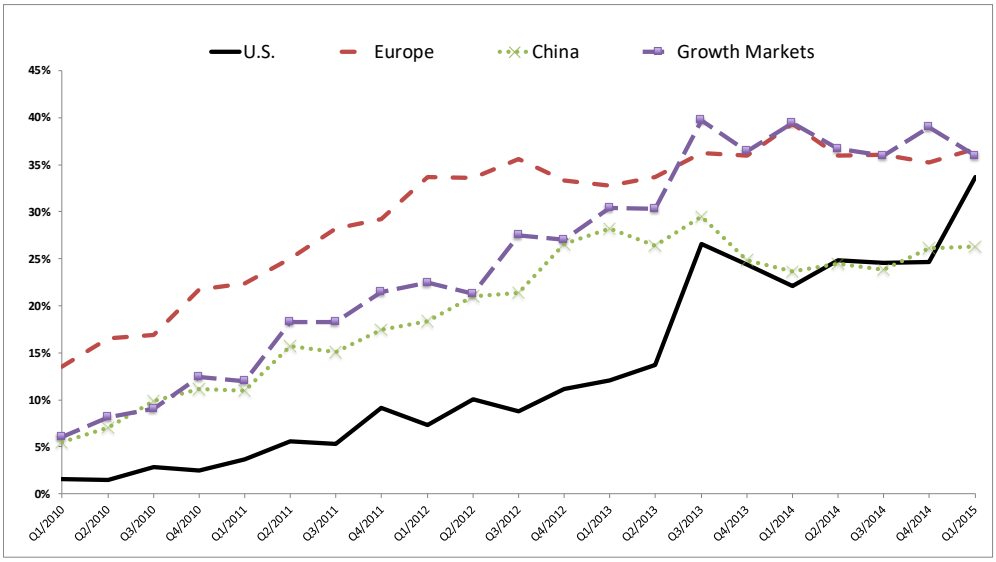
European levels of adoption– a testament to the versatility of the building blocks initially designed in Eindhoven.

The data also showed, however, that China had a lower adoption rate than either Europe or Growth Markets, even the though the local R&D team in Shanghai was an eager participant in all global discussions and activities. Further investigation driven by these data showed a classic price/performance issue. The European-based global platform development team had done its best to provide several tiers of price performance scalability in its building block designs – but in the case of China, with its explosive growth in commercial and public sector construction, new price-performance tiers below those of the European-designed platforms were required.

Think of it this way: the European central platform development team had created "better, and best" solutions, but to win in BRIC countries, Signify needed to also create "good, and value" building blocks. And like many other industrial manufacturers, Signify decided that rather than try to get its Europe-based engineers to think and design as if they lived in China, the best way to succeed was to create a dedicated China-based platform development team. This tactic worked. Platform adoption now stands at approximately 60%. And in fact, the Chinese R&D center is now increasingly taking the lead on newer generation platform designs.

Figure 7: Platforming Penetration at the Geographical Level

(Platformed products number / Total products number, quarterly results)



Source: Internal company data, used with permission from Signify Corporation.

In sum, these three sets of metrics – overall corporate adoption, business segment adoption, and geographic market adoption – played a fundamentally important role in guiding senior management inquiries and interventions over recent years. The data proved critical to drive organizational and attitudinal change.

To actually create these data, one of the global R&D staff members had to gather sales data by SKU/model (across over 3000 individual units) and spend several days allocating these data against platform-based products versus peak designs. Today, this process is automated. Any company seriously considering large-scale platforming programs must develop such platform metrics for a pulse check on how things are progressing, to help manage risk, and understand where to focus resources (Jacobs, Droge, Vickery, and Calantone, 2011; Lau, Yam, and Tang, 2011; Vickery, Bolumole, Castel, and Calantone, 2015).

The Portfolio and Product Line Management Needed for Platforming

Geographic price-performance variations were also an important consideration in both platform engineering and organization design. Signify had traditionally assumed a "hand-me-

down" strategy of taking older products for Europe and North America and deploying them to China and India. However, the sheer volume of demand from BRIC countries, as well as local preferences and building codes, increasingly made this hand-me-down strategy untenable. Customers in these markets have become as sophisticated as their counterparts in the West – demanding high levels of functionality *at low cost*. In 2012, Signify complemented its global platform team in Eindhoven with an emerging markets R&D Center in Shanghai to pursue cost-value leadership. In recent years, the platform building blocks developed in the Shanghai R&D center have been incorporated into product development across all geographies and business segments – for value-tier offerings.

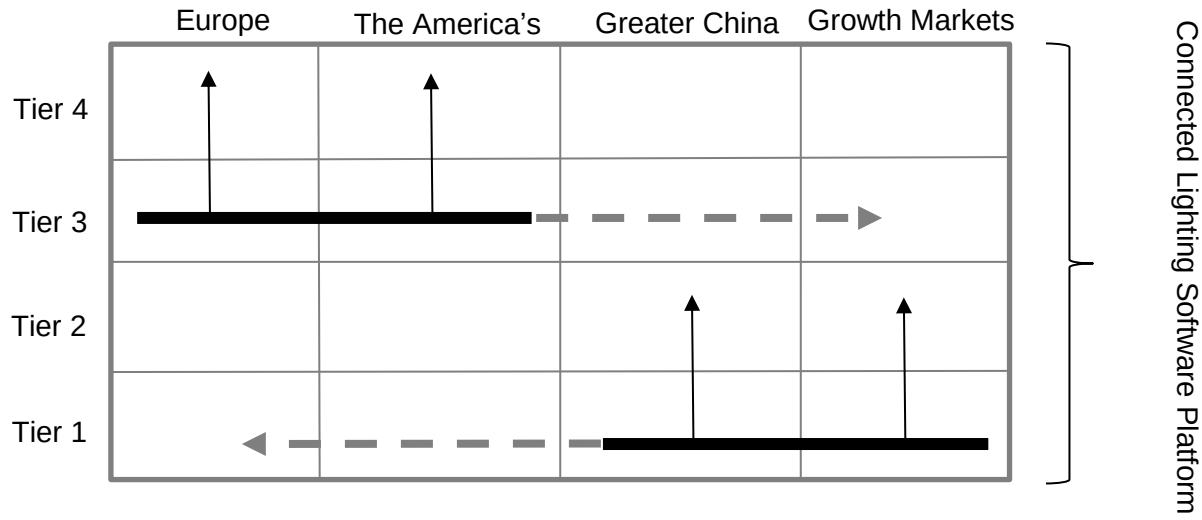
Platforming also helped Signify cull its proliferating product line. Historically driven by the whims of building and lighting architects, Signify had found itself making just about every design desired with premium pricing. However, maintaining the multitude of parts of pieces needed for all these special designs to support long term service agreements, or to upgrade systems for new performance or code requirements, was proving increasingly cumbersome and costly. Product managers found themselves trying to manage literally thousands of specific designs, many of which were assembled in small lots. And these product managers were not sure when to cull the portfolio since any customer could order upgrades for an older system at any given point in time.

Platforming enabled more disciplined global portfolio and product line management. Tiers of good, better, best segments could be more readily aligned and prioritized against geographic targets. Look at Figure 8. Whereas Tier 3 and 4 generally play well against North American and European targets, Tiers 1 and 2 play better in the Greater China, Indian markets, and other developing markets. And to achieve effective Tier 1 solutions, Signify had to develop lower cost LED platforms. From these lower cost platforms, upscaled products could then be readily developed, considered as Tier 2 offerings.

Over time, it is expected that the Tier 1 and 2 platform-based products will migrate to the West, and as economies continue to develop, Tier 3 and 4 products to the East. In fact, they already have. Cities such as Singapore, Jakarta, and Shanghai are legitimate Tier 3-4 users;

while Mexico City and Buenos Aries are already Tier 1 and 2 customers. This doesn't preclude Tier1-2 to be used in Europe and Tier 3-4 in Asia based on market demands. Signify's platform strategy has given new degrees of freedom to compete in more price sensitive markets around the world, and at the same time, giving these customers a clear migration to premium services that are emerging in connected lighting.

Figure 8: Global Portfolio Management Framework for Platforms and Products



Platforms Evolve: Managing LED-Enabled Services in the Age of IoT

Like Signify, if your company is transitioning from a focus on hardware (machines, vehicles, building infrastructure, computers, etc.) to developing and selling software-enabled services connecting these things, you will need to determine how to incorporate software into platform thinking.

We find it best to think of software like hardware for this purpose. Just as there are common physical building blocks, so there can be common software building blocks, such as common database designs, graphic user interfaces, logic or rules engines, and security routines. This can be a challenge in corporations because software engineers are typically and notoriously less disciplined and more individualistic in their designs than hardware engineers. However, software engineers are now well-trained in the principle and benefits of modular

code and layers of technology -- so creating software platforms is certainly within reach for any company. It requires management focus and discipline, however.

Signify applied the same approaches described above to its new Connected Lighting business, which now comprises about a tenth of its total revenue, and growing. These platform approaches for software include: a) a common layered, modular architecture, b) a gated phase review processes to ensure software platform utilization across different segment applications, c) reuse metrics to track that utilization, and d) a Central software platform team with strong communications processes to the various business unit and geographic development teams. Having prior experience in the hardware side of platforming truly helped Signify's management approach its new software business. Significant value creation opportunities existed in connected lighting. At the most basic level, luminaires were simply LEDs mounted on printed circuit boards with dimming or on-off controllers, heat sinks, and lens and housings. Adding open slots onto those same PCBs for additional sensors suddenly opened the possibility of a wide range of LED-enabled services, piggybacking on the luminaire's communications back to a host server. A simple light post or office fixture thus becomes an entirely new, unobtrusive platform for IoT applications, outdoors or in.

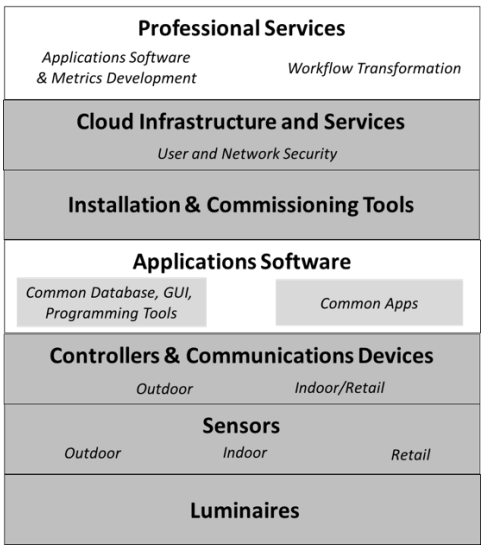
As with many hardware-focused companies, Signify's early attempts at software and IoT were messy – which in the software business can lead to escalating R&D and systems integration costs. As hardware and control firmware were increasingly platformed across business segments and geographies, the application software required for connected lighting was still out of the corporate platforming charter, somewhere "up in the Cloud". This was not a viable long-term strategy. Senior management knew it had to "platform" connected lighting software.

The Connected Lighting – a central software platform team – decided that its first step was to create a common framework for systems architecture. At its core, the connected lighting systems architecture had all luminaires connected to the Cloud (which has become a reality today), where applications software provided an ever-growing variety of services to end-users and building or municipal customers. Over time, luminaires would have an increasing

variety of sensors, each with its own streaming data and applications software to monitor, alert, and respond to the environment or people. For example, a city manager might desire his/her light posts to help monitor traffic, pollution, or crime. Or, a facilities manager might wish to track employee or visitor RFID badges throughout a building or to customize shared office space environments for individual preferences.

Figure 9 shows a high-level version of Signify's new platform architecture and its combined hardware and software technology stack. Most layers are clearly platformed – e.g. comprised of common software application building blocks or tools. Within some layers, such as the sensor layer, there are specific solutions or basic types of sensors for different business segments – an outdoor sensor versus an indoor sensor. Or, for the network communications layer, if the installation is within new building construction, Ethernet and other cabled solutions can be used; whereas retrofits to existing buildings are best done with indoor wireless connectivity to save cost. Outdoor installations require a cellular solution. The strength of the architecture as it is designed and implemented is that the overall system can accommodate and integrate these variations without violating the overall function of the connected lighting system for any given application.

Figure 9: The Connected Lighting Systems Architecture



Much of the "new" engineering by the team was to design Cloud-based installation and commissioning services for connected luminaires. The system has to sense what type of luminaire is being connected, as well as its various onboard sensors; and then, it has to ping each light and its sensors for uptime on a regular basis. Then, the next layer is the secure Cloud infrastructure, and its various security, device, and user management services. Obviously, things can get complicated rather quickly if there is not a disciplined architecture for all the hardware and software components involved, and it is this fact that motivated Signify and its connected lighting team to make the development of a connected lighting architecture an absolute top priority. Customization of software for specific customers comes at the very top of the architecture as professional services.

The connected lighting architecture also provides a pathway of good, better, best functionality – not just for Signify's own developers, but for customers as well. *Good* was optimizing energy utilization; *better* was dynamically adjusting indoor and outdoor environments based on pre-defined operational rules; and *best*, the integration of a variety of indoor and outdoor sensors for purposes beyond illumination, with a rule-based, location-specific design. As a system gathers more data and reacts to human and environmental conditions, it can learn from these events, becoming predictive in its operation. In short, AI meets LED.

Conclusions

Signify offers important lessons for platform-aspiring companies:

- **Revenue drivers.** First, there must be a revenue driver behind platforming. It cannot just be a way to reduce the cost of goods sold. Done correctly, platforming should see time cycles for individual product developments drop significantly, reducing time to revenue, and allowing engineers to try new product designs at less expense. Platforming should allow a company to quickly pursue new revenue opportunities, such as new connecting lighting applications for Signify. These product applications should produce greater revenue from the same technology base. For Signify, its total revenue

grew to over $7 billion in 2018, of which more than 70% was LED-based, and of this LED portion, the platform-based company in its "Professional" segments of office, retail, and outdoor reached nearly $3 billion. For the connected lighting area described in the last part of this article, this is known as the Systems and Services segment, and it reached approximately $700 million in 2018 or about 10% of total revenue. Perhaps most important, with over 44 million light points around the world, the number of LEDs and LED-sensors that need to be connected ***grew by 47% year over year from 2017!*** Platforming is a key enabler of Signify's revenue model for connected lighting.

- **Central platform teams.** Some companies have tried forming communities of practice around product and process platforms, allowing each product line team to develop its own "platforms." We've rarely seen this decentralized approach work to good effect. To have impact – which means to share engineered subsystems and manufacturing processes across products lines and even business units – there needs to be a well-staffed central team that serves all parties, applying product management skills across the range of customer requirements and consistently and carefully communicating platform designs with the different business units. Platforms do not define or manage themselves. Moreover, centralized platform teams must always be prepared to state the objectives and time for the next version or generation of the common building blocks under their care; otherwise, the various product lines cannot create and implement their own respective product line road-maps.

- **Platform Designers:** Platforming relies on mindset and capabilities. Platform teams must have systems architects, not just engineers. Systems architects are people who define all the various subsystems needed in a commercial offering, how they connect, and which ones can truly be common across product lines, others not common and how the two can be assembled or connect in a seamless, inexpensive manner. Moreover, these teams require strong product managers who understand local needs, the technical requirements for achieving flexibility and scale, and how any given building block design must change to meet certain regional cost and performance demands. And, these

product managers must be excellent internal communicators. And if a company is selling into emerging markets, it needs systems architects, engineers, and product managers who live in those markets and have an intuitive feel for the performance/price tradeoffs prevalent in these rapidly changing environments.

- **Platform metrics:** Management needs to develop a clear set of platform metrics, such as those presented above that show rates of adoption by business segment and market or geographical segment. At first, this may require some manual spreadsheet work to attribute platform utilization to products sales. Later, the process can be automated. But without such metrics, a management team is running down the platform path rather blind without the data needed to support corrective interventions.

Software platforming is next. For most manufacturers today, platforming cannot stop at the hardware! In a few years, this will probably be *most manufacturers.* Signify has had to look beyond its traditional hardware suppliers (for diodes and other components) towards a much broader array of potential business partners, particularly for software and services. This is an ecosystem journey in which Signify's goal is to be a central player by virtue of its market position and global customer reach (Boudreau, 2010; Choudary, Van Alstyne, and Parker, 2016). The business strategy for connected lighting continues to evolve; and in many ways, for Signify, connected lighting is indeed a *new business.*

Perhaps most important, platforming must be a company-wide strategy, carefully planned and diligently executed. It cannot just be an R&D or Engineering initiative.

References:

Boudreau, K. 2010. Open platform strategies and innovation: Granting access vs. devolving control. *Management Science*, *56*(10), 1849-1872;

Choudhary, S. P., Van Alstyne, M. W., & Parker, G. G., 2016. *Platform revolution: How networked markets are transforming the economy--and how to make them work for you*. WW Norton & Company

Cooper, R.G., 1980. Project NewProd: factors in new product success. *European Journal of Marketing*, *14*(5/6), pp.277-292.

Cooper, R.G., 2008. Perspective: The stage-gate® idea-to-launch process—update, what's new, and nexgen systems. *Journal of Product Innovation Management*, *25*(3), pp.213-232.

Gawer, A. 2014. Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, 43(7) 1239-124.

Jacobs, M., Droge, C., Vickery, S. K., R. Calantone 2011. Product and process modularity's effects on manufacturing agility and firm growth performance. *Journal of Product Innovation Management*, 28(1) 123-137.

Jiao J., Simpson T.W., Z. Siddique 2007. Product family design and platform-based product development: a state-of-the-art review. *Journal of Intelligent Manufacturing*, 18(1):5-29.

Lau, A., Yam, R., Tang, E. (2011). The impact of product modularity on new product performance: Mediation by product innovativeness. *Journal of Product Innovation Management*, 28(2): 270-284.

Meyer, M., A. Lehnerd, 1997. *The Power of Product Platforms*. Simon & Shuster: New York, NY.

Meyer, M.H., 2007. *The Fast Path to Corporate Growth: Leveraging Knowledge and Technologies to New Market Applications,* (Oxford University Press: New York).

Meyer, M.H., 2008. "Perspectives: How Honda Innovates," *The Journal of Product Innovation Management*, (25:3), May 2008, pp. 261-271.

Meyer, M. H., Osiyevskyy, O., Libaers, D., & van Hugten, M. 2018. Does Product Platforming Pay Off?. *Journal of Product Innovation Management*, 35(1), 66-87

Robertson, D., & Ulrich, K. 1998. Planning for product platforms. *Sloan Management Review*, 39(4), 19.

Thomke, S., & Reinertsen, D. 1998. Agile product development: Managing development flexibility in uncertain environments. *California Management Review*, 41(1), 8-30.

Vickery, S., Y. Bolumole, M.J. Castel, R. Calantone 2015. The effects of product modularity on launch speed. *International Journal of Production Research*, 53 (17): 5369-5381.