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Process of Digital
Transformation in
Medium-Sized
Enterprises – an Applied
Research Study

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List of Abbreviations

BU	Business Units
DTS	Digital Transformation Strategy
IoT	Internet of Things
KPI	Key Performance Indicator
LED	Light-emitting diode

Abstract

This working paper provides a summary of the present state of research concerning the course of digital transformations occurring in many firms globally. More specifically this paper presents performs a case study in the German firm OSRAM Opto-Semiconductors shedding lights on the specific effects that a digital transformation strategy (DTS, hereafter) has on a small-medium sized firms.

Companies are facing ever changing business environments, and it is their challenge to keep up with the dynamic technical status quo. In order to do this, many (including OSRAM OS) have embraced the strategic relevance of digitalization efforts and are currently working on measures to sustain their position or advance in their own markets.

It has been said that digital transformation efforts often lack the momentum and support needed to really move a company forward, and the aim is to assess the opportunities that a well-executed digital transformation brings along.

The methods of analysis employed in the study include a literature research for the general, more theoretical part and empirical research on potential business impacts of a digital strategy for the company specific second part.

Aforementioned research led to the conclusion that effective and efficient strategic management is key to driving a company's change efforts in the digital world.

1 Introduction

In the ever-changing industry landscape, rapid advancements in the software development are having a powerful impact on companies. Following the recent trends, companies are not only using Information Technology as a means for efficiency, but as a driver for competitive advantage and success (cf. Perkin/Abraham 2017: 26).

However, in recent years, the significant implications of digital technology for businesses have underpinned the strategic role of information technology in firms (cf. Bharadwaj et al. 2013b). Digital technology has become integrated into firms' products and services, physical products are augmented by digital features, sales and customer service channels have become digital, and the value of data itself is unleashed through advanced data analytics (cf. Bharadwaj et al. 2013b).

The objective of this paper is to assess the current situation of firms taking part in the gradual process of digitalizing their business, and analyzing the process at OSRAM Opto Semiconductors (OSRAM OS hereafter) in Regensburg, Germany.

.In the process of digital transformation, it has to be acknowledged that the literature has to be updated on a regular basis, since the technology changes happening are so rapid in nature, that many articles written even five years ago may be outdated.

The key sources are recently published academic journal articles and books. The literature was selected on the basis of performing applied research, which has the intention of producing a possible solution for a problem faced by a group of people or organizations. This method of research allows one take theoretical insights and apply these in real-world situations. For this, both qualitative and quantitative data is used (cf. Hart 1998: 46).

Recently the topic of digitalization and digital transformation has been one of the focal points of leaders in the economy as well as research (e.g. Abolhassan 2017; Perkin/Abraham 2017; Bounfour 2016). Even though the topic digitalization has been widely discussed, there is not yet so much literature on the potential negative impacts and the human aspect of doing digital business. This paper is going to address this research gap and takes into account the human dimension of an increasing digitalization.

The paper is structured as follows: after this first introduction, the drivers of digital transformation are introduced in chapter two. In chapter three, the opportunities and challenges for companies are laid out. In chapter four first the used methodology (case study research) is laid out, followed by an overview of medium sized enterprises and their importance for the German economy. After that the case results are presented followed by a discussion of the applied case and a comparison between literature and practice in the new 'Digital OS' team. Chapter five provides some closing remarks.

2 Literature Review on Digital Transformation

In the following chapter, the blanket-term 'digital transformation' will be interpreted, along with a description of factors that influence digital efforts called the 'drivers of digitalization'.

2.1 Basic Principles and Term Definitions

Composing one definition of the term 'digital transformation' is quite difficult, since every organization and author seem to have its own assumption as to what it means.

The simplest definition for 'digital' is given by Perkin and Abraham (2017:31): "A method of getting information from one place to another that is not analog".

'Digital transformation' is used here to describe the ongoing change from an analog sharing of information to real-time data processing and analyzing that is happening in society, businesses and industries (Gray/Rumpe 2017).

Acknowledging the difficulties in finding a clear definition is the first step in order to understand the vast possibilities and applications of digital transformation in enterprises. "Many companies are now introducing company-wide digital transformation strategies as a means to systematically address their internal changes" (Chantias/Hess

2016: 2). These strategies take not only the traditional strategic process into consideration, instead, the trans-functionality is shifted into focus. The traditional functional areas (such as operations, marketing, procurement) and various IT-enabled business processes (such as customer service) are linked and consolidated into the 'Digital Business Strategy' (cf. Bharadwaj et al. 2013a).

Bharadwaj et al. (2013a) distinguish between key external and internal factors that have brought a need for a DTS with them. The external trends (e.g. pervasive connectivity, amount of information, growth of cloud computing) pressure an enterprise into changing its strategy and processes in order to maintain their market position. On the internal side, the emerging issues and developments (such as limitations of traditional business models, increased familiarity with IT) drive the need for change within an organization. These key trends impact a DTS of a firm in terms of scope (go beyond customary boundaries), scale (use network possibilities of platforms), speed (for product launching), and value creation source such as data or networks (cf. Bharadwaj et al. 2013a; Bounfour 2016: 22).

Cap Gemini and MIT Sloan Management examined the issue of digital transformation in terms of maturity level within 400 large companies globally, and grouped these in a two-by-two matrix according to the criteria of 'digital intensity' and 'transformation management intensity' as depicted in Figure 1 (cf. Westerman et al. 2014: 2):

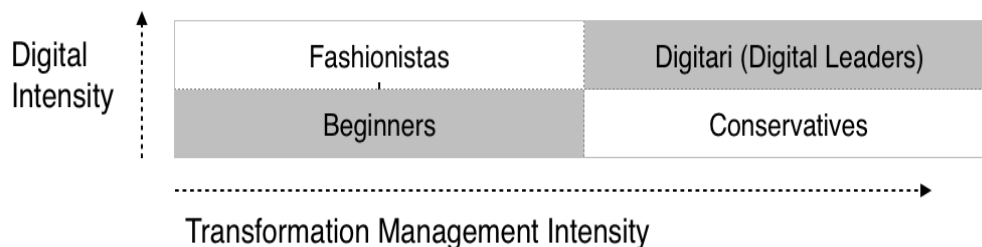


Figure 1: Four Types of Digital Maturity

Source: Westerman et al. 2014: 2

This graphic is helpful in depicting the influence that a strong DTS can have on a business model, and it also shows that a company can move from one level of maturity to the next if the efforts are intense enough.

2.2 Transformation in Enterprises

It has been brought to light that most German companies are aware of the potential of digitalization, but the fact that many only pursue single projects driving the digitalization forward without having a company-wide approach.

There is a strong need for a digital strategy, and most importantly: its implementation (cf. Abolhassan 2017: 19).

In order to examine the process of transformation, specifically the digital transformation, it is necessary to lay a theoretic foundation using Gartner's Hype Cycle model, which is basically an adaption to the widespread S-Curve and adoption curve model with the added dimension of technology. The Hype Cycle as shown in Figure 2 is also a measurement of risk, which decreases with augmented knowledge about technology at the end of the cycle (cf. Linden/Fenn 2003: 6ff.).



Figure 2: **The Hype Curve**
Source: Linden/Fenn 2003: 5

The takeaway from this model is that companies tend to join a trend that is presented to be the 'next big thing', without looking into the potential impact on their business in detail. A few trends that are 'hyped' are for example (cf. Panetta 2016):

- Cloud application development services
- 'Big Data' and information management
- 'Platform as a Service'

On the other hand there are trends that were hyped, but because of limitations and slow development/adaptation fell out of focus of the companies, e.g. the public cloud storage and real time infrastructure (cf. Smith 2011: 6).

The hype cycle lays a good basis for a simpler and more long-term digital transformation model laid out by Perkin and Abraham in reference to a company's technological mindset:

- 1) LEGACY (traditional thinking).
- 2) ENABLED (some shift in mindset, strategy etc. but not yet fully embedded).
- 3) NATIVE (the company naturally takes part in the constant, fluent change).

These steps describe a constant model of change that is not completed at once. Digital Maturity reaches through all business segments, which also means that the model is

applicable to the customer interaction, planning and processes, resources strategy, vision and culture (cf. Perkin/Abraham 2017: 52).

2.3 Defining a Strategy

Embedding the aspect of digital transformation into a company has to be part of the organizational strategy. This chapter will include a definition of strategy, its formation and its importance to the company.

In Robert M. Grant's book 'Strategy Synthesis' (2010), there is a shortlist of what all successful strategies have to include. On the basis of this, the first aspect is that goals have to be simple, consistent and long term. Secondly, a company has to possess a profound understanding of the competitive environment (this can be achieved using a PESTEL or 5-Forces analysis). Thirdly, an objective appraisal of resources has to be done (using a SWOT analysis - cf. section 5.1). Finally, the effective implementation has to be given in order to stay on top of the competition (cf. Grant 2010: 11).

The competitive advantage of one company can be highlighted when analyzing an industry based on own key performance indicators and the 5-Forces framework by Michael Porter (cf. Porter et al. 2011: 29). After having established the industry environment, it has to be considered that gaining and maintaining a competitive advantage is becoming more and more challenging in today's business world. Rita Gunther McGrath (Harvard Business Review 2013) claims that following her 'playbook' is the new basis for remaining in or claiming the top position within an industry:

- Continuous reconfiguration: 'continuous morphing' opposed to rapid change.
- Healthy disengagement: no more defending of strategies to the end – acknowledge the point in time where it is necessary to change strategy.
- Resource allocation that supports agility: central control of assets, ownership is not crucial anymore.
- Innovation proficiency: learning from failure is encouraged, budgets are dedicated to experiments.
- Leadership: perfection is not the key, rather seizing of opportunities that help the organization grow (cf. McGrath/Gourlay 2012: 14ff.).

She declares her framework to be the next 'big thing', and that because of the growing gap between reality and traditional approaches, something more adapted to the rapidly changing technology (external pressure) is to be used. In the context of digital transformation, this model is quite useful. The external drivers will be further defined in the following sections.

2.4 Drivers of Digitalization

Identifying the drivers that externally force an enterprise to transform itself is key to understanding the objectives that it follows. Therefore, there will be an enumeration of the most influential components of digital transformation given in the following paragraphs.

2.4.1 Big Data/Analytics

Nowadays, scholars and researchers see 'Big Data' as a more valuable resource for 'evidence based decision making' (cf. Hammond 2013).

Due to the immense influx of data (Big Data) and its potential, there has to be a methodological approach to analyze and monetize the information. This data is the basis not only for individualized optimization of the customer experience, but also for the optimization of processes, for making operational and strategic decisions and for business innovations (cf. Abolhassan 2017: 19; Mbassegue et al. 2017: 29f.). The main focus has to be laid on the real-time analysis by converting the data from sensors and devices into processable bits of information.

Currently, advanced analytics are implemented in the industry, supplying companies with historical, diagnostic, and predictive data sets. Competitors within industries (such as the LED industry) are racing one another to be the most efficient in using the gathered data to their advantage (cf. Kreutzer/Land 2015: 82).

Naturally, this impacts the entire business, changing its sales cycles, customer relationship management, supply chain and financial analytics. The use of 'Big Data' strongly influences OSRAM OS as well, optimizing work streams and further developing their CRM.

2.4.2 Industry 4.0

One of the most important drivers of the digital transformation is the concept of 'Industry 4.0'. It can be beneficial to large and small corporations equally, some of the forecasted benefits specifically for Small and Midsized Enterprises (SMEs) were highlighted by Alasdair Gilchrist in his Book 'Industry 4.0':

- Increased competitiveness of businesses: with market entry barriers shrinking through new technologies, the collaboration between SMEs becomes easier, thus challenging the large corporations.
- Increased productivity: companies are becoming more and more efficient, thus lowering operational costs which leads to increased profits.
- Increased revenue: companies can expect a high Return on Investment (ROI) if they adapt to the changes that Industry 4.0 is bringing forward.
- Optimization of manufacturing processes: merging legacy IT systems with new tools and services is challenging, but if it is done right, the operational efficiency

increases greatly as well (lead times, production times, and decision making times all decrease gradually; cf. Gilchrist 2016: 199f.).

2.4.3 Cloud Computing

Another catchphrase always associated with Industry 4.0, the IoT and the shift toward a digital future is the so-called cloud. This technology is useful where conventional technologies to save data reach their limits, and it no longer is a feasible option to have on-site data storage (cf. Abolhassan 2017: 1).

Generally speaking, if a company is collecting data from the Internet of Things, it will have a cloud in which data is being stored while making it accessible at any location.

Businesses use the cloud as a secure storage for the valued assets, which can include: customer data, production statistics, strategically relevant files, KPIs and financial statements. Since this information is critical and confidential, a lot of trust has to be laid into the business cloud. A normal consumer cloud can not be used for commercial purposes.

Using a cloud to store big data sets allows a business to collect, connect, interpret and automate (employing data-driven algorithms to manage transactions, decisions, and responses for a variety of situations), which makes causes it to be one of the drivers and tools of digital transformations that offer the best outlook for the future (cf. Soule et al. 2015: 3).

2.4.4 Digital Darwinism

Introducing the theory of Darwinism here is a step towards showing the difficulties that companies will face if they do not adapt well enough. Neil Perkin mentions the simple sentence of 'adapt or die' (cf. Perkin/Abraham 2017: 4f.) as his conception of Digital Darwinism, which is a very pragmatic view of the topic. This paragraph will dive a deeper into the topic, which is loosely based on Charles Darwin's publication 'The origin of species' from 1859.

Darwin's evolutionary theory can not only be applied in a biological sense, but also to businesses. In an industry environment, the external conditions are always changing and shifting. If a company is too rigid in its path and structure, it will not be able to exist in the future. 'Only the fittest will survive' is a harsh statement, leaving a lot of room for interpretation, but even this can be seen in the industry. For illustration purpose, the case of Nokia can be applied. Nokia was one of the most valuable global brands worldwide in 2008 earning more than 50% of the total profits in the telecom industry, and having an image of a highly adaptive consumer-focused conglomerate. The company developed the first smartphone in 1996, which preceded consumer needs at the time. Ultimately, the turning point into the downward spiral was reached when the company failed to see the importance of software in a mobile device, only putting its focus on hardware research and development. Users were presented with

an iPhone, which had a brand new software, user friendly interface and a large screen. Nokia at the time was so 'blinded' from their previous success that the business was resistant to adapt to the market. (cf. Surowiecki 2013)

While Nokia is still producing mobile phones, the newer generations (e.g. the Nokia model 3310 now with a color display, but very basic functions) are modernized versions of the former best-sellers. The resemblance is still there, but there is no guarantee for its success.

This example fits the basis for Digital Darwinism quite well, since the mistakes in leadership and strategy are very obvious in hindsight, and as already stated above, Digital Darwinism focuses on smartness and capabilities that are necessary to survive in the increasingly complex and dynamic business environment. The challenge is to master the process of the digital transformation by focusing on the right path forward (cf. Kreutzer/Land 2015: 94).

3 Opportunities and Challenges for Companies

While undergoing the process of digital transformation, firms may see the rising opportunities but also face challenges that come with digitalization. A challenge for many firms is not forgetting about the human aspect that machines will not replace humans in the next few years (cf. Gilchrist 2016: 239). Some of the positive results of digital transformation include performance and efficiency gains.

3.1 Improvement in Efficiency

Without a doubt, businesses strive to stay flexible and individual while achieving higher levels of efficiency (cf. Bharadwaj et al. 2013b: 652). Digitalization has been hyped up to be one of the biggest opportunities to advance and sustain a business in the future. Workflow efficiency, accelerated productivity, reduced unplanned downtime and increased profits can be achieved with a change in mindset towards the existing data and process structures (cf. Abolhassan 2017: 107; Gilchrist 2016: 3).

Gathering real-time data from business processes (all along the value chain) greatly reduces the costs of internal coordination among functions and units (cf. Soule et al. 2015: 7; Chantias/Hess 2016: 2). These changes allow workers to free up more time for their main tasks without having to focus on making smaller internal reports and spend time on gathering the relevant data. If all of the data is to be found in a commercial cloud, the employees do not even have to be on-site anymore, because they can access it from anywhere with a steady connection. This leads mainly to an overall increase in efficiency and possibly also employee satisfaction.

3.2 Data Transparency and Security

While the digital transformation of a firm is happening, one of the main focuses has to be the data transparency and security. As mentioned above, a business cloud is used to store and interpret data from different sources in the IoT. Companies have to focus on not generating so called 'IT islands', which can be seen as local databases that have been built in the past. Their opacity and complexity require extra energy to be comprehended. Nowadays, data is oftentimes recorded multiple times because users and systems do not effectively communicate with one another. This IT fragmentation makes the collection of data very non-transparent and complicated. A company's goal should be to consolidate and harmonize their global IT landscape for improved transparency while maintaining data safety (cf. Abolhassan 2017: 104). There have been many 'hacker attacks' recently, targeting the data of prominent corporations. 'Hacker attacks' are mainly motivated by financial interests (e.g. taking data 'hostage' and demanding ransom payment for the retrieval). Firms need to cooperate with a powerful provider of end-to-end encrypted security service that complies with the corporate government codex and also the contingency plans of each company (cf. Abolhassan 2017: 66f.).

During the process of digitalization, firms of any industry need to continually protect themselves from security breaches while still growing their connectivity with consumers and cooperation partners (cf. Peyraccia et al. 2015: 131). By understanding the strategic risks that are associated with moving forward in the digital world, that being the online traceability of digital moves, a company's digital security has to become part of the strategy as well (cf. Bharadwaj et al. 2013b).

3.3 The Human Factor

When talking about the data aspect of doing business in a digital environment, the human factor can not be omitted. While digital transformations are deeply embedded in business and production strategies, there has been more and more concern of where the human factor (the advantage a human has over a robot) comes into play. In this sense digitalization is both a job killer and a job machine (cf. Beste 2016). To benefit most from digitalization humans should learn to work with the robot or the machine, how to use robots to interpret or even refine the results of the smart software, and how to further increase the use of such a machine. That is how many new jobs are created. It is in the hands of each individual and company to see and reap the benefits of a digital economy in the long run. While this paper is not the ideal place to discuss the importance of having a responsible and sustainable policy for digitalization, this aspect can not be overlooked and could become one of the biggest challenges moving forward.

4 Case Study at OSRAM OS

In order to move from a very general strategic approach of digital transformations to the actual application within a case study, it is mandatory to investigate the industry and competitor environment in Germany. For this, OSRAM OS will be introduced and the industrial basis in Germany will be analyzed.

4.1 History and Background Information on OSRAM OS

As an introduction to the case, an overview of OSRAM and its Business Units (BUs) will be given.

OSRAM was founded in 1919 by a merger of Auergesellschaft, Siemens & Halske and Allgemeine Elektrizitäts-Gesellschaft (AEG); thirteen years after Carl Auer von Welsbach invented the original OSRAM light bulb. In 2016, the OSRAM group carved out their incandescent light bulb business under the name LEDVANCE in order to shift their primary business focus from 'old technology light bulb' to 'future LED and semiconductor based technologies'. OSRAM is now functioning as a lighting technology provider with the business units Specialty Lighting, Digital Systems, Lighting Solutions, and OS (cf. OSRAM 2016: 3ff.):

The subsequent case study was conducted in OSRAM OS. In 1999, OSRAM entered the semiconductor market by purchasing the LED segment of its former parent company, Siemens. This new business unit registered under the name OSRAM Opto Semiconductors GmbH laid the foundation for the current business model and its ongoing globalization. OSRAM OS is one of the market leaders both in research and development, and in the manufacturing of high-quality LED products for illumination, visualization and sensor technology.

OSRAM Opto Semiconductors produces standardized as well as individualized visible and invisible lighting solutions for high-performance applications such as the automotive sector; but also miniature LEDs for mobile devices, detectors and infrared sensors.

Looking at the annual report 'Re Inventing Light for 110 Years Annual Report of OSRAM' the revenue in FY16 (September 2015 to September 2016) went up by 8% to €1.425 billion, making OS the business unit with the most growth.

The EBITDA amounts to €310 million with a margin of 21.8%, and because of the high earnings, a lot of capital is invested into the research and development of new products and procedures (cf. OSRAM 2016: 17ff.). The company's vision is to 'light the future': meaning that light is now used to transfer information, shape rooms and spaces, provide energy, influence the mood and productivity and finally to increase overall security. This ties into the mission of 'shaping light by advancing solutions for illumination, visualization and sensing'.

OS employed a total of around 10,500 people as of September 30, 2016. Currently, there are LED assembly sites in Wuxi, China (in expansion) and Penang (Malaysia). One end-to-end LED chip production site is located in Regensburg, with another one under construction in Kulim (Malaysia), which started operating in Q1 FY18, its main focus being the rapidly growing general lighting market. With the opening of the new plant, OS will have a long-term factor cost benefit, possibly making the company the cost leader in the industry (cf. OSRAM 2016: 5).

4.2 Methodical Approach

The question as to how the data and content in this report was generated can be answered using Robert Yin's (2018) approach to designing and conducting case studies. The Digital Transformation seems to be a part of a "social phenomenon", which the shift from physical business to computer based activities in entire industries and in daily life. For the purpose of this paper, as embedded single-case study design offers the best theoretical basis, which will be applicable to OSRAM OS in later sections of this paper. Yin argues that an embedded case study may involve more than one unit of analysis. In an organizational study, the embedded units might also be 'process' units – such as meetings, roles, persons or locations. With this case study design, it is possible to examine only the strategic/digital transformation unit of OSRAM OS, without having to take all the other corporate units into consideration.

Our analysis follows the 'snapshot' approach, where the case is investigated in a specific time period. As the snapshot develops, the picture presents itself over a tight timeframe (cf. Thomas 2011: 511ff.).

These methodical aspects were taken into consideration in the process of gathering information for the case study itself. As typically for case study research the results presented in the paper cannot be representative of an industry or cluster of enterprises.

In the later, more OS specific sections of this paper; almost exclusively material from OSRAM will be used. This information is partially publicly available (Annual Reports, Quarterlies, Brochures), and partially access restricted.

4.3 Market Environment and Competition for the SME's in Germany

Germany is globally known to be the export champion for high quality and highly technical products. Large parts of this industrial success have their base in the so called 'Mittelstand'. The traditional understanding of this term is that these small to medium sized companies are held by entrepreneurial families that put a strong focus on traditional values and management methods that links leadership, strategy and governance very closely (cf. Venohr et al. 2015: 5–11). 'Mittelstand' companies are also distinguished by their focus on very specific niche and/ or premium market segments and

their technological core and close customer relationships which helps them bypass direct global competition from Multinational Companies (MNCs) (cf. Slomka 2013: 6).

Firms in the German 'Mittelstand' often produce for clients that have their own specifications. This creates a close bond between supplier and customer. 85% of companies in the sector operate as B2B businesses, striving to solve complex problems that each customer is facing. Making up a distinctive group of firms are the upper-sized 'Mittelständler', that are the driving force behind the German export powerhouse. In his report, Bernd Venohr identifies three segments (cf. Venohr et al. 2015: 5ff.):

- 1) Small- and medium-sized enterprises (SME) make up 99,98% of all companies (count) in Germany.
- 2) Small-sized enterprises are categorized with annual revenues below €50 million, accounting for 31,43% of exports.
- 3) Mid-sized enterprises are divided into three sub-categories (€50m-€100m; €100m-€250m; €250m-€1000m), this segment in total accounts for 36.88% of all German exports.
- 4) Large companies (upper-sized Mittelstand): with revenues of over €1billion they make up 0.02% of all companies (count), but still account for 31.69% of exports; OSRAM OS falls into the large mid-sized enterprises with an annual revenue of €1.425 billion (cf. OSRAM 2016: 17).

Based on the assumption that OSRAM OS is part of the 0.02% of upper-sized Mittelstand firms, it is still legitimate to classify OSRAM OS (being an independent subgroup ('Teilkonzern') of OSRAM Licht AG) as a medium sized enterprise under classic values of the 'Mittelstand', which will further be refined in the second part of the paper. Another applicable argument for classifying OSRAM OS as 'Mittelstand' is that the growth of OSRAM OS has only recently started with the higher penetration of LED components in the lighting market, therefore the company structures, processes, go-to-market approach, organization and heritage of OSRAM OS do still truly represent 'Mittelstand' characteristics today.

4.4 Hurdles and Challenges of SMEs in a Digital Environment

No matter how small an enterprise is, it has to adapt to the changes and advancements in technology like any other competitor in the market. Here, it is notable that SMEs may be quicker in adapting new IT systems because of their small size. In the process of digital transformation, the reliability of data and IT systems has to be given (cf. Abolhassan 2017: 27).

As the large corporations face complications in digitalization because of pre-existing relationships, problem solving methods and behaviors, smaller businesses are more agile, but because of their lesser resources also find themselves in tough waters at

times. Regardless of firm size, the following hurdles for digital transformation can be identified (cf. Perkin/Abraham 2017: 34):

- Technology and data: outdated, inflexible systems inhibit integration of new systems.
- Short-termism: short-term targets blur the long-term view of large projects.
- Talent: digital talent is difficult to attract and retain.
- Legacy approaches: learned and adapted behaviors are hard to ‘unlearn’, making progress slow.
- Organizational silos: non transparent decision making, internal politics that hinder growth.
- Prioritization: how to allocate the limited resources most effectively.
- Culture and structure: micro management and resistance to change affect the advancement of a firm.

Out of these seven factors, the following two are of major importance for the OSRAM OS case study and will therefore be described in more detail below: (1) “Technology and data” as described in ‘4.4.1 Legacy IT Systems’ and (7) “Culture and structure” as described in ‘4.2.2 Driving Change’.

4.4.1 Legacy IT Systems

The first factor that hinders progress is the continuous use of outdated, inflexible IT systems in a company.

Every company adapts a new system in hopes of replacing or aiding an existing system. Because of the deeply-rooted nature, criticality and size of the legacy systems, it is usually too expensive to just replace them completely. As a result, firms have been ‘wrapping’ new systems around legacy technology for some time, gradually increasing the complexity even more. The original system is thus not changed, but a ‘shell’ of new software is implemented around it, and the more fragmented a system architecture becomes, the riskier it becomes (cf. Perkin/Abraham 2017: 43f.).

With most IT departments lacking resources in day-to-day operations, there is hardly any reflection about possible innovations. The increased complexity is claiming a lot of time for adaptation, expansion and integration of systems, but no new implementation is taking place. Developing a good IT should be the goal of any organization in order to save costs and increase efficiency of their employees. Of course, any IT department requires effective KPIs that measure the improvements over time. Above mentioned KPIs will also have to measure how successful a new implementation was, whether it exceeded the cost plans, was implemented on time or caused any unforeseen contingencies (cf. Arvidsson et al. 2014: 57).

4.4.2 Driving Change

Associated with the culture and structure of an enterprise is the process of change management for any given project. Most companies will see their digital transformation as an ongoing activity that involves handling change within teams, Business Units or entire organizations. In his publication 'Leading Change: Why Transformation Efforts Fail', John P. Kotter lays out eight stages that have to be managed in order to drive transformation forward (cf. Kotter 2009):

- 1) Establish a sense of urgency (identifying possible risks and crises).
- 2) Form a powerful guiding coalition to lead the effort (assembling a powerful group to drive change).
- 3) Create a vision to direct the change initiative (developing a vision that directs the direction of change).
- 4) Communicate the vision, using every vehicle possible (vision and strategies have to be spread and made public).
- 5) Motivate employees to perform and take into account the vision (for example by inspiring ideas).
- 6) Invent incentives for evident routine advancements (to increase workplace passion).
- 7) Consolidate performance improvements and produce more change (successes drive credibility of change efforts, thus lowering the resistance towards new projects, making the drive towards the vision easier and quicker).
- 8) Institutionalize new approaches developed during the initiative (use successes as a projection towards corporate success).

Undoubtedly, the stages that Kotter has developed suggest a straightforward path to transform an organization. However, his model does not take into consideration the resistance to change that every employee can bring along. Because people focus on their own interests, and not those of the organization, change leaders have to be very careful in selecting their methods. Overcoming resistance starts with the diagnosis of different resistance types and adapting the corrective actions accordingly. It is equally important to adapt one's change strategies to the situation, even if this might create short-term uncertainty (cf. Kotter/Schlesinger 2008: 11).

Handling the resistance of employees towards a digital transformation in a firm is crucial. Successful implementation of digital systems mostly happens under the theme of rolling out specific (tested) tools after the pilots have proven their benefit. (cf. Peyracia et al. 2015: 35ff.). Giving employees freedom to try risky things without a pressure to succeed offers the opportunity for innovation that comes from within the company. Small, high autonomy teams have proven to be the most agile and productive. These

teams lead to continuous improvement because of their ingrained learning culture and reflection time (cf. Perkin/Abraham 2017: 85).

Since change management is a key aspect of a digital transformation, this has to be addressed in any corporation as well, not just in OSRAM OS. Managing the resistance towards digital initiatives is ongoing in the organization, and is an embedded component of the overall digital strategy.

4.5 Organizational Basis

As outlined in the first paragraphs of this paper, digitalization is happening in every aspect of the value chain, and it is in the hands of the companies to keep pace and reap its benefits (cf. Nanry et al. 2015: 1).

OSRAM Licht AG as a company has recognized the need for preparing itself for the IoT as well as Industry 4.0, and has thus encouraged each business unit (BU) to start digital initiatives. This connects to Gartner's Hypecycle (ref. 2.2), in which the technology trigger was the gradual rise in consciousness towards the topic of digitalization, which brought a wave of inflated expectations towards the speed of realization with it. In OSRAM OS, many digital initiatives were started, but never connected to the existing systems, thereby creating decentralized 'IT Islands' (ref. 3.2) without having any support from users or a measurable effect on the business. After this plunge in handling new IT systems, a pause in innovation set in until the importance of strategic planning before developing new IT structures became clear again in the summer of 2016.

In order to align the BU strategy with a digital transformation, it was decided to tackle the tools and portals on the customer-facing side first in a project managed by the new 'Digital OS' team. Because of the amount of normal day-to-day tasks that each employee is responsible for, a team of consultants was hired to kick-off the project.

Despite a very competitive LED industry OSRAM Opto Semiconductors has been growing by around 10% annually over the last ten years (cf. OSRAM OS 2017a: 3), This growth is mainly driven by sales to large customers (e.g automotive manufacturers). The company strives to continue growing as before, for which the sales for small and medium sized customers will play an important role. Since OS is a manufacturer in the B2B market, there are traditionally different sales processes than attracting and retaining a B2C customer. In OS, it typically involves either a trade show; or a tender from a potential customer, a seller being sent to said customer, him demonstrating the products and negotiate contract terms, and then potentially entering an agreement later on. The objective is to develop a standardized approach to reach smaller customers, while simultaneously improving the customer relationship management to large customers using new technologies such as Big Data and the Internet of Things.

4.6 Transformation and Strategy

Following the previously laid out organizational basis and definition of needs, a corporate 'digital strategy' was developed in order to reach the initial vision of 'building the optimal digital path and support for each of the three customer segments'. The main focus of the entire project is to use technology to lever the existing strengths, enabling OS to manage the next growth phases sustainably. While OS has been very successful with large and medium customer segments, individual engineers and smaller firms have mainly been out of scope for the sellers.

The strategy to change this discrepancy was developed top-down. In the beginning of FY 16/17, there was a C-level decision made to implement a team focusing on the digital transformation (ref. Section 2). Following the creation of the core 'Digital OS' team, a strategy to hire and move the best-suited professionals to the team has started. The goal is to have major improvements in the use and availability of digital technologies by mid-2018. During the initial consulting process, the spotlight was laid on the customer facing topics in which substantial gaps were identified from current status to the prospective/ideal status. The consultants have identified the optimal approach to reaching the digital vision as a mix of line organization and consultants that work together closely over the first project phases which include:

- Identification of existing tools, hardware & IT infrastructure
- Developing a cost plan and timeline
- Definition of optimal solution for sellers
- Customer Relationship Management 'CRM' and Marketing processes (mutual understanding of topics / processes)
- Master Data Management
- Raising awareness of digital transformation topics
- Driving change of mindset within the organization (cf. OSRAM OS 2017b: 17f.)

These elements are all fundamental in developing and implementing a sustainable transformation strategy; and as can be seen in the following sections, the differences between the literature and practical use and implementation are not too substantial.

Existing literature claims that digital transformation is "A method of getting information from one place to another that is not analog" (Perkin/Abraham 2017: 31). Because of the broad spectrum that this term attends to, OSRAM was forced to select a path that was most beneficial and economically sensible while undergoing a digital transformation.

According to Grant, a strategy has to be simple, consistent and long term, which is what OS is trying to implement as efficiently as possible (cf. Grant 2010: 11). The key here is to see change as a continuous morphing of an organization to adapt and stay

ahead of the competition. In order to maintain its market leader position, OS chose the path of deploying a new team called 'Digital OS'. As mentioned above, Digital OS is a newly deployed team and also strategic approach whose purpose is to drive the digital transformation in OSRAM Opto Semiconductors. This approach was ingrained into the entire organizational strategy (connected to the aforementioned literature), which is an important step in driving the digital transformation of OSRAM OS. The first large project will be the digitalization of the customer-facing topics in CRM/communication/marketing and sales, which will be led by the vision of designing an 'optimal digital path and support for each of the three customer segments (large and small businesses, individual engineers)' (cf. OSRAM OS 2017a: 7).

Currently, there are many different 'IT Islands' in the sales process, and the Digital Team under the lead of a new CDO (Chief Digital Officer) is responsible for standardizing customer interactions and simplifying customer relationship management. In most firms, however, the CDO is not a leader (cf. Curran et al. 2017: 12), and this strategic decision leading away from the standard CEO-CFO-COO organization that many companies have nowadays is a leap to acknowledging the importance of keeping up with technology changes. A CDO has the responsibility of driving the DTS on a cross-functional basis, and is required to have sufficient experience in project management and other transformational projects (cf. Matt et al. 2015).

In total, there will be a number of work streams that will be handled the team with the support of external consultants/vendors. Unifying the current tools can be done by developing an app that combines the product catalogue, lead generation, customer information, and analytics on the front-end while being connected to the existing back-end systems.

4.7 Aim and Scope of "Digital OSRAM OS"

4.7.1 Increased Revenue

OSRAM OS will benefit through an increased access to the small and medium sized customer segment and their engineers by generating a much higher number of sales leads than before. At the same time, OSRAM OS will obtain more and quicker insights into changing customer behavior and customer expectations. A higher lead conversion into actual sales and an increased impact of the marketing cost spent is foreseen. Additionally, a better international teamwork around sales opportunities is expected.

"Digital OS" is one pillar to enable the ambitious top line growth targets for OSRAM OS. OSRAM OS is targeting to keep comparable revenue growth at 10-20% annually over the next coming years. Therefore "Digital OS" is a key enabler of this growth. How much revenue growth can be attributed to the "Digital OS" campaign is difficult to grasp (cf. OSRAM OS 2017a: 78).

But even if it were to account for only 1% of annual growth, that figure would already be €20m in absolute terms. With a gross margin of around 35%, that would already yield €7m additional gross margin in year one, the pay back of the incremental investment of "Digital OS" would also be in less than 2 years.

4.7.2 Reduced Operating Cost

OSRAM OS needs to spend less time and reduced manual work to prepare sales meeting materials, marketing campaigns and internal reports. By an enhanced first time request resolution and an enhanced customer self-service, OSRAM OS resources in the customer service area can scale slower than the budgeted revenue growth. Since OSRAM OS is setting up the system in an integrated way, the cost will be lower than initially foreseen through a lower need of point-to-point tool integration and maintenance (cf. OSRAM OS 2017a: 77). It will offer a new level of usability and data consistency, therefore removing unproductive manual work.

When achieving the reduction in operating cost as planned, OSRAM OS sees the potential to lower their Sales & Marketing cost and freeing up time from the employees to take part in trainings and workshops to further gain knowledge.

4.8 Challenges and Expected Outcomes

Since the Digital OS is a part of the operational strategy of OSRAM OS, the value of the project has to be seen in the long term, and not just as a short term investment.

There are two main fields of benefits that will arise in the long term: the increase in revenue and lowering of operational costs. The development of an interdisciplinary app connects the separate worlds of product presentation and customer relationship management with each other. Following the team's vision of finding the 'optimal digital path and support for each of the three customer segments', the goal is to increase access to small and medium customer segments to reflect changing customer behavior and expectations. This will expectedly lead to:

- Higher conversion through concentrating on key deals (based on deeper and more up-to-date information on customers and opportunities).
- Increase number of leads through better campaign and trade fair follow-up and web-to-lead routing.
- Increased impact of Marketing spent due to better targeting of individual customers and professionals.
- Enhanced attractiveness of OSRAM OS to distributors and up-to-date product information available on Distributor's websites.
- Preferred go-to-site for lighting professionals to get inspired and engineer their lighting applications (personalized, high usability, deep technical content and functionality).

- increased customer satisfaction, share-of-mind and eventually higher NPS scores (cf. OSRAM OS 2017a: 78).

These expected results are measurable using relevant key performance indicators that are still to be developed, but the focus on agile transformation leaves a lot of room for team members to experiment in their respective projects.

When establishing a new team, a structural realignment is to be expected within the company. The digital team is reporting to the head of Strategy, Communication and Digitalization, highlighting the strategic importance of the digital agenda in OSRAM OS.

Since the digital team will cover the entire value chain (LED, SSL, IR, R&D, SCM) in the future, the gradual integration and expansion of scope has to be given while not losing the position of being a collaboration and communication point between the central IT and different departments (cf. OSRAM OS 2017a: 36f.).

5 Conclusions

The results of this investigation of DTS in OSRAM OS indicated that the change processes laid out by academic frameworks such as Kotter's (2009) stages of transformation often do not pass through as trouble free as they are laid out. There is mostly some form of resistance to change, or unforeseen issues emerge during the course of the project undertaken. In the case of OS, the starting point was the drive from top management to implement the high-level strategy to deploy a team of digital experts at the manufacturing plant in Regensburg (cf. OSRAM OS 2017a: 43).

Bharadwaj et al. (2013a) characterize a DTS as a project on the basis of a clear definition of scope, scale, speed and source of value creation.

The case study analyzed in this contribution demonstrated that the DTS goes along with various challenges. The establishment of controlling and reporting structures, along with laying the foundation for interdepartmental cooperation has taken quite some time, and the uncertainties of project scope and limited communication have pushed the timeline back continuously. Not only is this a cost factor for OS, but also the complexity of the project keeps on rising (pulling ideas from different BUs to be owned by the team), confirming the claim of Bharadwaj et al. (2013a) that a DTS is not a single definition of scope and scale, rather a continuous process of adaptation and change. OS has recognized the need for a continuous change in the project of DTS implementation. The multiple work streams appear to be collaborating well, using the digital team as a touchpoint between the sellers, IT, marketing and management. Digital OS as a team will continue to grow and broaden its effect on the business as a whole, functioning as a pioneer for digital transformations within OSRAM AG. Team collaboration and cohesion will remain in focus, the different work streams will continue to benefit from each other's knowledge and experience.

There are companies in the B2C business that are much more advanced in the digital world (such as Facebook, Uber); but for a B2B medium-sized enterprise, OSRAM has understood the value that digital transformation will have for its business, but is still lacking in the area of interdepartmental continuous transformation. Companies such as SAP and IBM are what would be considered 'Digitari' in the B2B world. OSRAM OS has acknowledged the importance of an ingrained digital strategy, and that digital channels are the new starting points for advanced customer relationship management. The fast moving nature of the LED market forces the companies to continually invest in innovation (the new production facilities are equipped for 'Industry 4.0'), which can be seen as a first step towards achieving the digital vision ('finding the optimal digital path for all customer segments'), and becoming a 'Digitari' in the B2B manufacturing environment in the further future.

Our study has the following implications for firm decision makers from the LED industry and beyond. It has to be assumed that every player in the LED market has grasped the importance of developing a digital strategy, but because of industry secrets and the fast pace of innovation, every company keeps their detailed digital strategies to themselves in the rapidly moving and digitalized world of B2P marketing (business to people, considered to be the new marketing standard for addressing the individual who is part of a company). The LED industry overall is one of the drivers of sustainable lighting and sensory solutions, and the market growth underlines the need for products (projection, activity tracking, surveillance, infotainment etc.) that will be interconnected via the internet of things in the future.

It seems to be an enormous miscalculation and misinterpretation of any company (not just in this industry) not to see the potential and need for going digital. It can be assumed that the industry's level of digital adaptation can be considered 'fashionable', but with the continuing development of new products, the entire industry should be looking to shift towards becoming 'Digitari'. Only by keeping up with the innovations can the LED company stay afloat during such a scramble for market capitalization.

Beyond the LED industry, our paper has the following repercussions for firm practice. Digitalization efforts should be driven in an efficient and effective manner, awareness of the efforts undertaken by the digital team should be raised within all departments (the importance and significance of projects should become more transparent). Before starting the next project for which external personnel is needed, the scope should be clearer defined to ensure best possible return on investment (ROI). Interdepartmental communication and expectation setting should happen before concrete ideas are developed in order to not have any doublings of effort. Change management initiatives for the sellers overcome their initial resistance by showing direct benefits, gradually adapting to their needs.

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