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Challenges in Obsolescence Management and System Engineering Using the Example of the German Supplier Industry

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Keywords: Obsolescence; Product Lifetime; Electronic Components; Components Obsolescence Group; EcoReliability; EcoDesign.

Abstract: Obsolescence, in the sense of short lifetime of predominantly electronic products, is increasingly becoming a problem for industrial processes and ultimately for the community. The number of cases in which professional customers want to buy products, which are no longer available for purchase is steadily increasing. In the industrial setting this situation leads to strategies, which are necessary but actually undesired, in order to be able to maintain the business activities. Basically, more money and time has to be spent on countering obsolescence. In order to better meet these challenges, enabling people to exchange ideas with like-minded colleagues, who are in the same situation, and to jointly develop strategies for solution processes, an interest group driven primarily by the electronics industry has been founded under the name *Component Obsolescence Group Germany* (COG-D). The purpose of this paper is to describe the current state of affairs regarding Obsolescence Management (hereinafter referred as OM). OM in the sense of dealing with obsolete or discontinued components is not completely new, but the problem has increased significantly in recent years, which makes it interesting to take a closer look at the reasons in order to derive solutions. The findings are based on a survey taken among the members of the COG-D.

Purpose

The aim of the paper and its underlying survey was to find out about the challenges the German industry are confronted with regarding the discontinuation of especially electronic components and ensuring maintenance and repair.
These issues on a national market can be seen as a representative of the international industry.

Survey Design and Approach

The surveyed group consisted of members of the COG-D. An online questionnaire was sent to the members of the industry group, which was prepared by the BMBF Young Researcher Group “OHA” (Obsoleszenz als Herausforderung für Nachhaltigkeit = obsolescence as a challenge for sustainability) and partners, in which they were able to provide detailed information on the current situation, with regard to the discontinuation of components.
Additionally, they were able to describe their experiences from the past, outlining their method of resolution and providing outlooks and trends regarding the discontinuation of components. 63 people anonymously took part in the member survey, which was conducted between 27th of September 2018 and 30th of October 2018 and was exclusively addressed to the members of the COG-D. The participants took part as representatives of companies that are members of the COG.
The sectors represented in the survey group of the COG are shown in the following graph, with multiple responses being possible since many member companies operate across several industries.

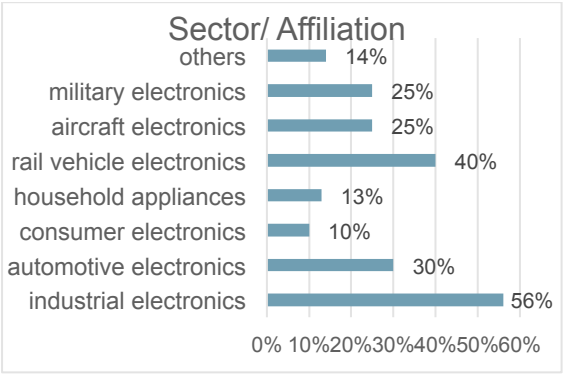

Figure 1. Industry sector affiliations of the COG.

Challenges of obsolescence management in companies

84% of the respondents stated that they were actively managing obsolescence in their company. Those 84% of respondents were asked a number of questions about OM that they were free to answer.

The first question dealt with how OM is practiced in the different companies. The three most frequent answers were that they carry out OM reactively (20), proactively (18) or strategically (11).

Proactive means, to be active in OM with foresight and planning in mind, as opposed to reactive, which is more tangible and follow-up. Reactive in this context means, that if e.g. a discontinuation occurs, the final covering of the discontinued components will be bought up as last-time-buy (LTB) and then usually stashed in long-term storage. Proactive OM is primarily concerned with the early detection of delivery bottlenecks and non-availabilities. That way, the assurance of ongoing production as well as service and maintenance can be guaranteed more safely to ultimately minimize or at least improve reactive measures.

To the question which problems in OM were encountered practically the answers varied strongly, although lack of understanding OM in the company (14) was the most common one. Lack of understanding OM means, for example, the meaningfulness and importance of the task field. In the context of business processes, OM is rather seen as a necessity, dealing mostly with solving problems. This inevitably means that the employees of OM constantly have to inform management about new issues which increases their risk of being perceived negatively.

The second most frequently cited aspect was the lack of communication or short-term communication of discontinuations (13) which also vary strongly with each company and are therefore very individual.

In addition, the problem of shortage of know-how or lack of successor series creates complications in the practice of OM, according to the respondents.

The third and last question on the topic of OM in companies was on the changing perception of obsolescence in the past 10 years.

On the one hand, it was often answered that the obsolescence of products has increased whereas at the same time long-term availability of components has decreased. On the other hand, there has been a rise in attention to the topic of obsolescence linked with a more professional approach. Some respondents describe they only established the topic of OM in their companies in recent years.

However, this also reflects the fact that some sectors were affected earlier and more severely by obsolescence and they therefore had to act earlier, while other sectors have only had to deal with the problem more intensively in recent years.

Of the 63 respondents, 58 said they were affected by component discontinuation (Figure 2).

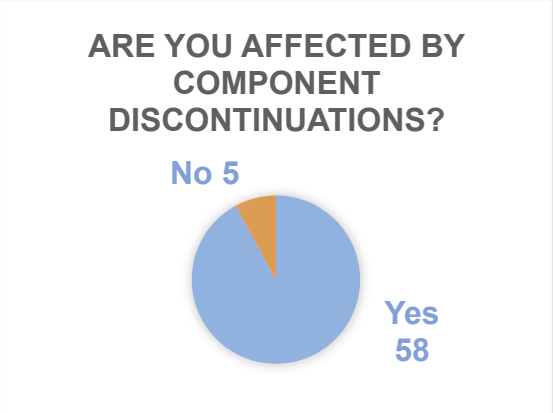

Figure 2. Affected by component discontinuations.

In the further course of the survey, these 58 respondents were asked in which areas they thought there would be an increase in discontinuations. Since it was possible to respond freely here, the spectrum of the respective answers is broad. They range from the smallest electronic components to mechanical items, plastics, adhesives and silicones. It should be emphasised that according to the answers of the respondents that semiconductor components (e.g. memories) and passive components (capacitors in particular), are affected more often. In this context, however, it was also described that many discontinuations occurred as a result of fusions or merger of suppliers. When asked what consequences this has for the company, it was often mentioned that one is forced to look for alternative components, which very often have to be re-qualified. The process of re-qualification is seen as negative, because it is associated with additional time and costs. If no result can be achieved in the process of component substitution, the assembly must be redesigned. In the answers, it was repeatedly expressed that re-designs are avoided as much as possible because they

involve large capacities of personnel and are time- and cost-intensive. A second possible solution is seen in the LTB and the subsequent long-term storage. LTB means that if a supplier no longer wants to produce a product, he gives his customers a Product Change Notification (PCN), which states until when the product will still be produced. A LTB is therefore the last possibility for a company to get newly produced components. Different answers were given regarding the measures taken to prevent discontinuations, which strongly depend on the affected components or assemblies. Often partnerships and so-called "Second Sources" are seen as a preventive measure to secure the component supply on a long-term basis. Partnerships in this context are agreements with suppliers, their involvement in product development, as well as their contractual commitment to supply over several years. Others try to work preventively with component databases, market observation, a sustainable component selection or professional OM.

In the survey, the participants also stated that they were seriously interested in the long-term storage of electronic components or assemblies. In the strategic mix of possibilities, many see long-term storage at least as a temporary solution, well knowing that the number of parts ultimately required can never be predicted exactly. Either the quantity stored is too large or too small. Additionally the high costs are a negative aspect according to the interviewees.

Furthermore, long-term storage is feared to cause damage which would make processing at the desired time in the future impossible. Mentioned here in particular were soldering problems caused by poor absorption of solder at the contact pins.

In addition to long-term storage and purchasing from distributors, brokers also play a major role. The difference between brokers and component distributors will be briefly explained in the following.

While independent distributors and brokers both pursue the same goal (or have the same essential function) - namely to support buyers and sellers in their search - the similarities end there.

The value a broker offers is to procure electronic parts on demand. However, they tend to lack other services such as a comprehensive quality review process, discrepancy checks and visibility of existing market conditions. However, the range of services offered by an independent distributor of electronic components goes far beyond a mere goods transaction.

When asked where they purchase components after discontinuation from, only twelve of the participants answered that they buy components from brokers while at the same time it is often emphasized that they mainly access brokers known in the COG. The dependence on urgency was also mentioned repeatedly as an important factor.

It is striking to note that there was no clear answer to the question which obsolete components were bought. Half would purchase everything that is available rather than paying attention to the urgency. The remaining answers cover active and passive components, as well as semiconductors and many more.

The advantages of buying obsolete components from brokers are rather described as a necessity. Answers often stating that availability could be guaranteed or that there would be no downtime in production. The topic of avoiding re-designs was stated as an upside, although one of the recipients replied that this problem is only being postponed, not solved completely.

Disadvantages arising from buying from brokers, etc., are mainly costs, e.g. in the form of purchase or paying for storage, as well as the commitment of time that comes with the examination of the construction units. A non-transparent supply chain was criticized and two of the participants noted that the consumption of the obsolete products by clients was uncertain. Plagiarism was mentioned repeatedly as an issue, next to the reliability and guarantee of the purchased components.

Levels of Obsolescence Management (OM)

In addition to the specific questions which problems of OM currently exist at the market, the participants were also asked what constitutes a good OM at all. The strategic approach can be roughly divided into reactive, proactive and strategic obsolescence management.

Reactive obsolescence management

The reactive OM is characterised by the fact that an action is executed after an End-of-Life (EoL) message has been received (Bartels et al. 2012: 157 ff.). The following process could also be described as "troubleshooting", in which an attempt is made to salvage everything that

can be saved, which makes that type of management very high risk. The reactive OM uses fewer measures as proactive OM. In the best case scenario this can include: Last time buy, long-term storage of components and assemblies, after-market supply and redesign of entire products or at least assemblies.

Proactive obsolescence management

The proactive OM is characterised by the fact that action is being taken before an EoL message arrives. The staff is thus warned early on and can adjust to unavailability. The proactive OM uses the following measures: People responsible for the OM have been appointed and are given time for the task, active risk assessment of the components, lifecycle analyses of item lists already in the development phase, positive partnership and contract design with suppliers, automatic/electronic monitoring of key components and regular coordination with customers. In addition, the measures from the reactive OM mentioned above are included.

Strategic obsolescence management

The strategic OM is characterised by the fact that all actions take place at an early stage. This means that regular forecast and cost analyses are made over the entire product life cycle, already starting in the development phase. Along with the methods from the reactive and proactive OM, strategic OM uses the following measures. A second or third source strategy, active inventory management (at least of the company's own inventories, or better yet of the suppliers' inventories), development of a sustainable and modular design and early development of an alternative design.

Conclusions

The results of the COG-D survey show very clearly that there is a steady increase in obsolescence in the form of discontinuation of components. The electronics industry is strongly affected across many sectors. Unavailability of components or subsystems impacts even ongoing production, but more severely the maintenance, repair and overhaul operations. The area of mechanical parts is of less concern but follows similar patterns.

In the area of electronic components, active components are particularly affected. However, the survey also shows that passive components such as ceramic multi-layer capacitors can also become obsolete. The example of ceramic multilayer capacitors shows, among other things, that company acquisitions and the streamlining of the product range quickly lead to bottlenecks in availability that can last for many months (Winzer 2017: 9).

In the case of active components in particular, it is evident that the market is increasingly dominated by a few large producers.

The concentration has to do with the fact that the investments for new generations of high-performance semiconductors are becoming ever larger and only big corporations can raise the immense financial resources. As a result, smaller manufacturers, which fabricate niche products, are disappearing from the market.

There will be no simple solution to the problems of obsolescence management.

In order to prepare oneself as well as possible, a strategy with several options is needed. It is crucial for companies to move from reactive obsolescence management to strategic obsolescence management. The experience of companies that have taken this path shows that production is more predictable, redesigns are fewer and the supply of spare parts can be guaranteed without interruption.

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