Purchase intention towards remanufactured products: A systematic literature review

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Abstract

Remanufacturing is one of the processes to extend products' life cycle in closed-loop supply chain. The process runs by OEMs, certified firms or third parties and flows as receiving used products, making them function at least the same as brand new one and selling them again with warranty. Despite highlighted economic and environmental benefits, the remanufacturing industry is still underdeveloped with great opportunities. Due to the nature of the process, understanding customers' perception and purchase intention are vital for further and faster development of the industry. This paper reviews 26 journal articles.

Keywords: Remanufactured product, purchase intention, systematic literature review

Introduction

Remanufacturing is a closed-loop supply chain (CLSC) strategy that aims to recover the residual value of returned products (Wang *et al.*, 2013; Bittar, 2018; S. Wang *et al.*, 2018). It is a process that brings used-products to like new condition with warranty and at least the same quality, functionality, and performance as brand new ones (Jiménez-Parra *et al.*, 2014; Bittar, 2018; Vafadarnikjoo *et al.*, 2018). The process involves stages of product acquisition, disassembling returned products, cleaning, repairing or replacing worn-out parts, quality testing, reassembling and remarketing (Wang *et al.*, 2013; Bittar, 2018; Vafadarnikjoo *et al.*, 2018) that is an industrial process (Wang and Kuah, 2018). Remanufacturing is fundamentally different from repair, recycle, and reuse due to the requirement of converting the product to like a new one (Xu *et al.*, 2017; Matsumoto *et al.*, 2018a; Vafadarnikjoo *et al.*, 2018). The difference between these is not well understood in the market (Wang and Kuah, 2018). Therefore, these terms cannot be used interchangeably. On the other hand, the term refurbished means the same as remanufactured (McKie *et al.*, 2018).

Due to global sustainability issues, many countries took legal actions to promote sustainable actions (Qu *et al.*, 2018) and reduce carbon footprint such as the Paris Agreement. Also, customers become more sustainability-conscious and sustainability measures influence their purchase decisions (Vafadarnikjoo *et al.*, 2018). These players put pressure on organisations to take action towards becoming more sustainable and even they can gain competitive advantage by becoming greener. The benefits of remanufacturing mentioned in the literature are minimising landfill and waste, reduction of energy usage, increase sustainability consciousness, reducing manufacturing costs (Qu *et al.*, 2018; Wang and Kuah, 2018).

The success of remanufactured products in the market is dependent on customer acceptance (Wang and Hazen, 2016; Y. Wang *et al.*, 2018) which is mentioned as one of the main obstacles for remanufacturing industry (Vafadarnikjoo et al., 2018). This is also a reason why organizations do not challenge themselves in terms of sustainability because the profitability of remanufacturing activities is dependent on sufficient demand for these products (Wang et al., 2013) which is not high enough yet. Hence, understanding the potential customer and their perception has critical importance to have a place in the market and improve CLSC performance (Xu *et al.*, 2017; Qu *et al.*, 2018; Y. Wang *et al.*, 2018). One of the ways to improve customer acceptance level suggested is that highlighting and promoting potential benefits of purchasing remanufactured products to convince customers to consider them as an option (van Weelden *et al.*, 2016). The research focusing on marketing, and customer acceptance of remanufactured products is limited (Bittar, 2018; Matsumoto *et al.*, 2018a, 2018b; McKie *et al.*, 2018; Wang and Kuah, 2018).

Accordingly, the overall purpose of this literature review is drawing an overall picture of customers' perception of remanufactured products and influencing factors by reviewing the journal articles. The outcome will be helpful to form future researches with the aim of establishing better remanufacturing strategy to reach more customers. This paper will try to answer the following review questions with the findings from the literature.

Review question:

- What are the factors influence potential customers' purchase intention towards remanufactured products?

Sub-questions to be able to construct the subject on a better ground are:

- RQ1-What characteristics of products were considered as influencing factors?
- RQ2-What makes people avoid purchasing remanufactured products?

- RQ3-What encourages people to purchase remanufactured products instead of brand new?

The paper is organized as follows: methodology, descriptive analysis, findings, conclusion and a reference list.

Methodology

In order to increase the validity of results and not to miss any related article while reviewing the literature, the systematic literature review is chosen as an appropriate method to apply. The methodology used in this paper was influenced by the works of Denyer and Tranfield (2009), Durac*h et al*, (2017), and (Larsen *et al.*, 2018). Five steps of the systematic literature review were formed which is called 5S, see figure 1.

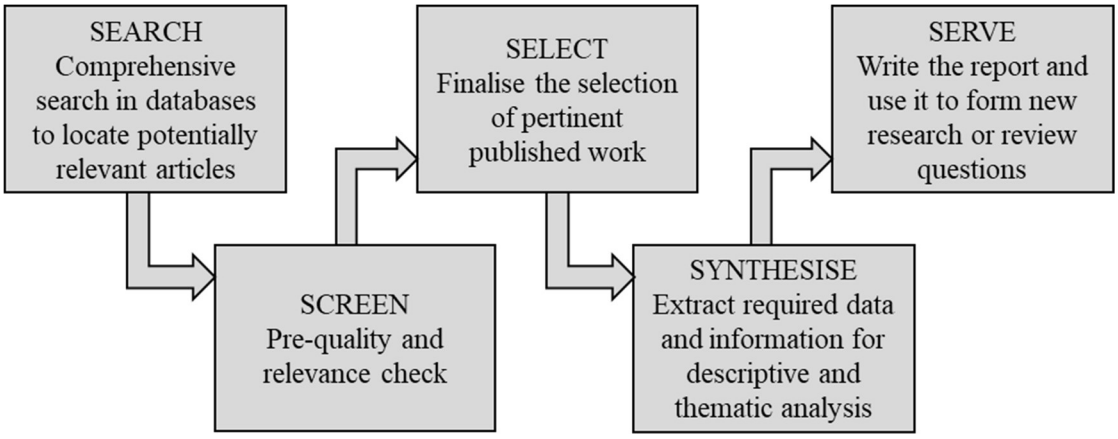

Figure 1: 5S's of systematic literature review process (adapted from Denyer and Tranfield, 2009; Durach et al., 2017; Larsen et al., 2018)

Set of keywords defined for each customer and remanufacturing focused. As mentioned before, terms remanufacturing and refurbishing are used interchangeably in the literature. Hence, these were selected as keywords for remanufacturing focus and customer and purchase intention for customer focus. Articles located in 3 different databases which are Scopus, ProQuest, and Web of Science. Initial research located 1720 articles and after duplicates removed there were 725 articles left for quality check by considering the journal ranking which left 292 articles for titles and abstracts screening, see figure 2.

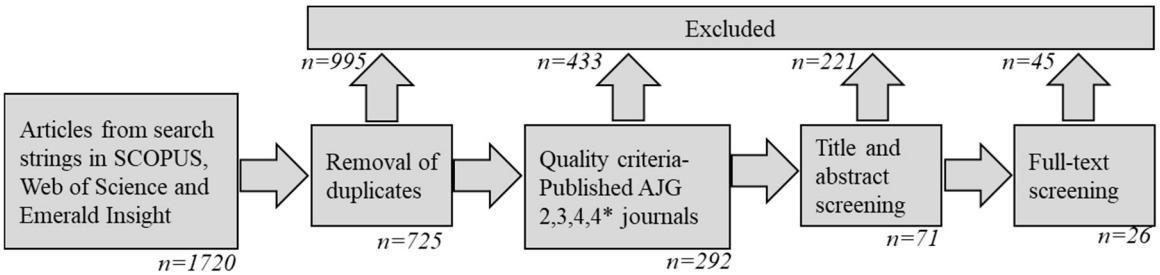

Figure 2: Selection of articles

Duplicates were eliminated by using a referencing software (Mendeley). This review includes the articles published in 2, 3, 4, and 4* ranked journals by Academic Journal Guide (AJG). A data extraction sheet was created to gather data for all included articles which include information of title, author(s), year published, journal, AJG ranking, data

sources, researched product or industry and location. This information was used for descriptive analysis. For coding, a qualitative data analysis software which is NVivo 12 Pro was used.

71 articles were included in the full-text review and 26 final articles selected for the final review. This review has three inclusion criteria, see table below: first, the article has to be written in English due to language barriers. Second, the article has to be published in a 2, 3, 4, or 4* journal according to AJG to make sure the publication quality. The last and most importantly, remanufacturing and customers have to be the main constructs of the articles. The articles do not meet these criteria were excluded. The paper

Table 1: Inclusion and exclusion criteria

INCLUSION CRITERIA	EXCLUSION CRITERIA
Remanufacturing and customers' perception are the main focuses of the article	The research focuses on other forms of end of life treatments such as recycling, reuse or second-hand market
The article is published in a 2, 3, 4 or 4* AJG ranked journal	The article focuses on the operational side of remanufacturing
The article is written in English	

Descriptive Analysis

This section will try to answer RQ4 which is focusing on research methodologies applied for the selected 26 articles. Information about the following point will be extracted: data source, data analysis method, researched product(s), and year of publication, journal ranking.

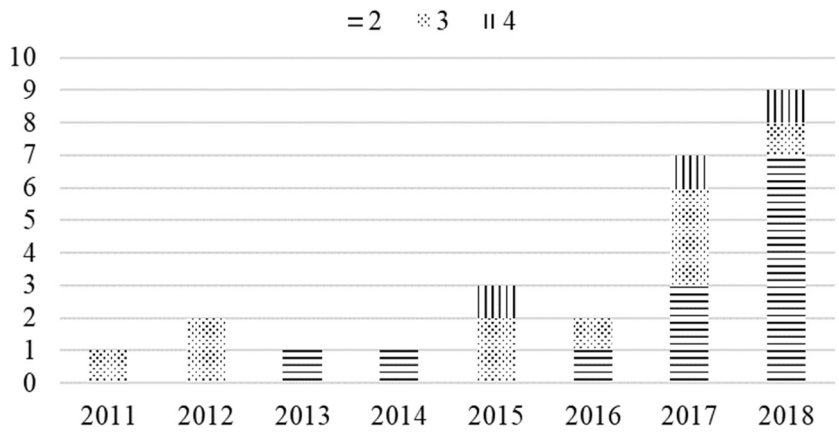

Figure 3: Descriptive analysis of 26 papers according to the year of publication and AJG journal ranking

The most common method of collecting data is questionnaire which is used by 18 out of 26 articles (69%), eBay transactions by 4, 2 experiments and lastly 1 review article and interview. Structural equation modelling and regression (ordinary/ partial least square, hierarchical) were the data analysis method used by 22 articles. Only one study considered three different product categories (technology, household and personal care) to compare the results. Three studies do not focus on any specific product or industry. Seven articles were about the automotive industry mostly about spare parts and more than half of the articles were about electronics such as phone, laptop, etc. Figure 3 demonstrates that researches published in 2, 3 or 4 AJG ranked journal were increased from maximum 3 to 7 and 9 in 2017 and 2018. Even there is a recent increase, still, there

is not a lot of examples of publications in top journals within the field. Furthermore, 35% of the papers were published in the Journal of Cleaner Production, and 12% in Business Strategy and the Environment, International Journal of Production Economics, and Production and Operations Management.

Findings

The following model was created to illustrate influencing factors of customers' perception or purchase intention towards remanufactured products by affecting perceived value or benefit and perceived risk of customer through different variables about product, personal and other attributes (van Weelden *et al.*, 2016; Wang and Hazen, 2016; Matsumoto *et al.*, 2018a; Y. Wang *et al.*, 2018), see figure below. This study will handle attributes separately to be able to purely focus on a single item. But, this does not mean that the study assumes the items do not have an impact on each other or together the impact is stronger or weaker.

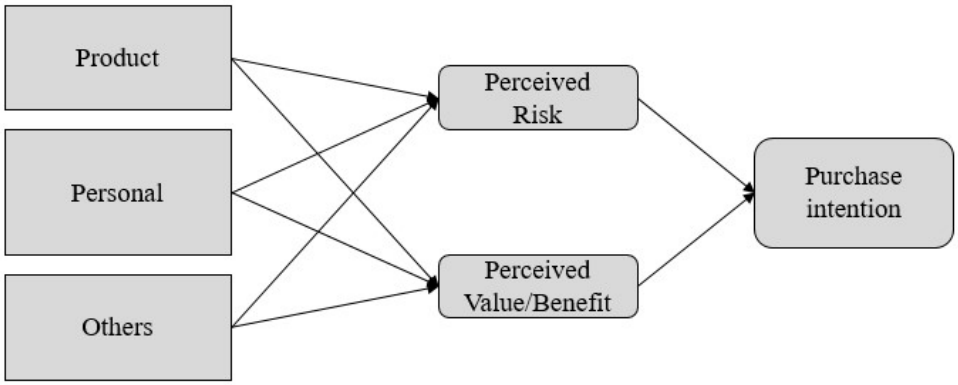

Figure 4: Conceptual model

Influencing factors extracted from the literature will be summarised by starting with availability.

Availability

Some authors claim that availability is one of the main obstacles to reach potential customers, especially, because of not being included in their purchase channels(Abbey, Meloy, Blackburn, *et al*., 2015; van Weelden*, et al*., 2016). Some studies show that some customers do not know where to access remanufactured products (Wang *et al.*, 2013; van Weelden *et al.*, 2016; Qu *et al.*, 2018). Wang *et al.* (2013) suggested to government and remanufacturers take initiative to form a sales network to increase accessibility. Additionally, country and region might affect this (Matsumoto *et al.*, 2017).

Brand Equity

High brand reputation means that customers trust the brand in terms of quality and performance. Original equipment manufacturers' brand reputation is a factor that can help to reduce the perceived risk of remanufactured products (Matsumoto *et al.*, 2018b; Vafadarnikjoo *et al.*, 2018). Furthermore, involved organisations' reputation also plays an important role to reduce perceived risk (Pang *et al.*, 2015; Vafadarnikjoo *et al.*, 2018).

Negative Associations

Even the definition of the term suggests that the condition is like new, some customers consider them as undesirable, second graded (Abbey, Meloy, Blackburn, *et al.*, 2015;

Khor and Hazen, 2017). These negative associations found stronger for personal care products than technology and household products (Abbey, Meloy, Guide, *et al.*, 2015). Furthermore, this disgust and repulsion directly affect the purchase intention towards and interest in remanufactured products (Abbey, Meloy, Blackburn, *et al.*, 2015).

Only New

Some consumers associate remanufactured products with negative terms such as dirty, garbage, trash, disgusting, etc. (Abbey, Meloy, Blackburn, *et al*., 2015) and consider as undesirable (Khor and Hazen, 2017). It is expected that this customer segment which is 20-40% would never consider purchasing remanufactured products. Therefore, there is a potential of 60-80% of the customers would consider purchasing remanufactured products. On the other hand, unwanted innovative features might be a motivating factor to look for remanufactured products (van Weelden *et al.*, 2016).

Price – Discount

Provided price advantage for remanufactured products reduces perceived risk and increases perceived value (Wang and Hazen, 2016). Therefore, one of the main drivers of demand for remanufactured products is lower price (Michaud and Llerena, 2011; Wang *et al.*, 2013; Jiménez-Parra *et al.*, 2014; Abbey, Meloy, Blackburn, *et al.*, 2015; van Weelden *et al.*, 2016; Xu *et al.*, 2017; McKie *et al.*, 2018; Vafadarnikjoo *et al.*, 2018). Lower price also provides an opportunity for OEMs to access new customers who couldn't afford the brand new product (X*u et al.*, 2017) even further, price is one of the most important factors that have a positive impact on convincing customer to switch from purchasing brand new products to remanufactured ones (Hazen, Mollenkopf, *et al.*, 2017). Impact of discounting might be different in different regions (Matsumoto *et al.*, 2017).

There is not a consensus about a standard ratio of discount (Bittar, 2018). This ratio is usually between 20 and 40% (Wang and Kuah, 2018). As a demand driver, discounting up to 60 is suggested due to quality concerns of products that over discounted (van Weelden *et al.*, 2016; Bittar, 2018), it could even lead to distrust of the overall brand and damage brand reputation (Abbey, Meloy, Blackburn, *et al.*, 2015). Additionally, customers are willing to pay more for products remanufactured by OEMs or authorised organisations than third-party firms (Subramanian and Subramanyam, 2012). Surprisingly, Mugge, Jockin and Bocken, (2017) found that financial benefit don't have a direct impact on purchase intention which is widely seen in the literature and practice. The reason behind this might be that participants could have seen the lower price as an already provided benefit.

Product – Technology, Warranty

Consumers interested in remanufactured products prioritise functionality over newness or appearance, and also performance is another important point to convince customers to purchase remanufactured (van Weelden *et al.*, 2016). Available return option and length of warranty increases the attractiveness level of remanufactured product (Pang *et al.*, 2015) by providing after sales services. Technology not mentioned much as an influencing factor. It might be because most of the researches focus on a specific product instead of a variety of choices where technology could be considered as a factor.

Product Usage and Treatment History

Knowledge about the product and treatment during remanufactured process is an important issue highlighted as information gap (Wang *et al.*, 2013; van Weelden *et al.*,

2016; Bittar, 2018) such as how remanufacturing been conducted, product usage history (S. Wang *et al.*, 2018; Wang and Kuah, 2018; Y. Wang *et al.*, 2018). These negatively impact remanufactured products' attractiveness (S. Wang *et al.*, 2018) by increasing ambiguity level (S. Wang *et al.*, 2018) and risk perception (Wang *et al.*, 2013). Therefore, reducing ambiguity level would be beneficial to attract more costumer (Xu *et al.*, 2017; Vafadarnikjoo *et al.*, 2018) by making the steps of remanufacturing more transparent (S. Wang *et al.*, 2018). On the other hand, reducing the information gap might have a negative impact on purchase behaviour (Wang *et al.*, 2013). Additionally, some customers have the intention to purchase remanufactured products they do not, due to lack of information which is called as intention-action gap (S. Wang *et al.*, 2018). To handle this issue, (Wang *et al.*, 2013) suggest governments and remanufacturers to take action to improve the image of remanufactured products by setting some standards.

Quality

Quality perception of remanufactured products is one of the factors that affect the purchase intention most (Abbey, Meloy, Blackburn, *et al.*, 2015; Abbey, Meloy, Guide, *et al.*, 2015; Wang and Hazen, 2016; Hazen, Boone, *et al.*, 2017; Vafadarnikjoo *et al.*, 2018). Customers do not a chance to test the product quality before making the purchase decision, therefore they require some signals to trust the like new condition as the definition of remanufacturing promises (Michaud and Llerena, 2011). Warranty, certification, and brand image could be used to increase perceived quality and reduce associated risk (Matsumoto *et al.*, 2018a). It is safe to say that if a remanufactured product is certified by a trustworthy organisation this will be seen as a symbol of quality (Matsumoto *et al.*, 2018a). Furthermore, as mention in the previous sub-section, sharing information about product usage history and remanufacturing processes could be used to increase perceived quality instead of leaving these uncertain and ambiguous. Additionally, country of origin is a factor that affects the perceived quality, such as Matsumot*o et al.*, (2018a) found that customers willing to purchase more the remanufactured products from developed countries than developing.

Risk

There are six types of risk associated with remanufacturing; performance (malfunctioning) , time (effort and time spend to repair in case of any problem), physical (safety risk), financial (repair or return cost and required new purchases), social (being laughed because of purchasing remanufactured products) and resource (dishonest parties) (Wang *et al.*, 2013; van Weelden *et al.*, 2016). All these have a negative relationship with customers' purchase intention (Matsumoto *et al.*, 2018a).

Providing information about products' usage and treatment history (Hazen *et al.*, 2012; Wang and Hazen, 2016; Abbey *et al.*, 2017), quality certification (Michaud and Llerena, 2011; Matsumoto *et al.*, 2018a), and warranty (Pang *et al.*, 2015; van Weelden *et al.*, 2016) would be beneficial to reduce associated risks.

Subjective Norm

Most scholars expect that remanufactured products would attract more environmentally friendly customers than others (Wang *et al.*, 2013). Surprisingly, there are studies claiming that environmental friendliness does not always reflect on the action of individuals (Khor and Hazen, 2017; Bittar, 2018; Qu *et al.*, 2018; Wang and Kuah, 2018). One of the main reasons why this gap exists is lack of information available about product, processes and environmental benefits (Wang and Kuah, 2018) but the challenge

to build the link between intention and action is greater than informing (Abbey, Meloy, Blackburn, *et al.*, 2015). Furthermore, approval or encouragement of purchasing remanufactured product by important people to customers (family, friend) would increase the chance of purchase happening (Jiménez-Parra *et al.*, 2014; Qu *et al.*, 2018; S. Wang *et al.*, 2018) also culture and country might make difference (Matsumoto *et al.*, 2017).

Being familiar with the concept of remanufacturing and previous purchase of remanufactured products are found to be an important factor to purchase them instead of new ones by reduced risk due to familiarity (Hazen *et al.*, 2012; van Weelden *et al.*, 2016; S. Wang *et al.*, 2018). Also, ambiguity tolerance limit of individuals positively relates with purchase intention of remanufactured products (Hazen *et al.*, 2012; S. Wang *et al.*, 2018). A study found that remanufactured products are more attractive to younger people (Abbey, Meloy, Guide, *et al.*, 2015).

Being sustainability conscious consumer started to become a status symbol (Wang and Kuah, 2018). Surprisingly, when people make green purchases they tend to display and when there is not a viable way of displaying the action or product they tend to prefer non-green option (Abbey, Meloy, Blackburn, *et al.*, 2015; Wang and Kuah, 2018).

Sustainability

Being environmentally friendly product is considered as a factor that influences customers willingness to purchase remanufactured products (Michaud and Llerena, 2011; Jiménez-Parra *et al.*, 2014; Hazen, Mollenkopf, *et al.*, 2017). On the other hand, there are researches claim that environmental benefits of remanufactured products do not play a major role to convince more customers (Abbey, Meloy, Guide, *et al.*, 2015; van Weelden *et al.*, 2016; Vafadarnikjoo *et al.*, 2018). The reason behind this behaviour would be that customers do not know enough about the environmental benefits of remanufactured products (Michaud and Llerena, 2011; Khor and Hazen, 2017; Mugge *et al.*, 2017). Furthermore, even customers receive information about the benefits, they are not willing to pay extra for remanufactured products just because of their green characteristics (Michaud and Llerena, 2011).

True Understanding of Remanufacturing Concept

Studies reveal that, surprisingly, consumers do not see remanufactured products as green (Abbey, Meloy, Blackburn, *et al.*, 2015; Khor and Hazen, 2017) even some see them as second hand, unusable (S. Wang *et al.*, 2018). Also, customers do not trust remanufactured products in terms of quality and performance (Abbey, Meloy, Blackburn, *et al.*, 2015; van Weelden *et al.*, 2016; Wang and Kuah, 2018) even the definition of the term says that their condition is like new. This misconception of remanufacturing is one of the main barriers to overcome (van Weelden *et al.*, 2016; Matsumoto *et al.*, 2018b). Because, awareness of remanufacturing have a positive impact on purchase intention (Mugge *et al.*, 2017) and if customers know more about the similarities between remanufactured and new products their chance of purchase increases (Jiménez-Parra *et al.*, 2014). Governments and enterprises should take action to overcome this issue and increase awareness (Qu *et al.*, 2018), also reducing ambiguity in remanufacturing activities is another recommended step to reduce perceived risk (Wang and Kuah, 2018).

Conclusion

Attributes that potentially influence customer's purchase intention are extracted from the academic articles and explained separately in the findings section which tries to answer the review questions.

RQ1: Selected 26 article mainly focus on a single product. Quality, price/discount, reputation, environmental benefits, warranty and being able to display were mentioned. If researches look for more than one product or product family the outcome would be different due to the availability of options. Also, this will make the studies closer to reality, especially in these days it is possible to find quite a few replacement products for the same purposes.

RQ2: Risks associated with remanufacturing products are the main reason why customers avoid purchasing or even do not consider as an option. The other potential reasons are the thrill of newness, misconception of remanufacturing, unavailability, social pressure and unawareness of ways to access remanufactured products.

RQ3: Being able to have access to a product with a lower price seems to be the main driver of demand for remanufactured products. In addition to price, approval of close individuals, culture, familiarity, and ambiguity tolerance are important. Surprisingly, being sustainability conscious was not found as a one of the main factors to look for remanufactured products. The reason might be the misconception or not seeing them as green products. One of the suggested solutions to this issue was taking actions to increase awareness. Also, previous experience of individuals is important.

The main contribution of the paper is providing a comprehensive overview to guide researchers for further studies in the field. A conceptual model is delivered with the aim of demonstrating the overall picture. This systematic literature review will be functioning as the ground for future empirical work. Future work will be testing the potential influence of different attributes by hypothesises to develop a better understanding of customers' perception to promote greener behaviour.

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