

TARGET COSTING: REVIEW OF EMPIRICAL STUDIES IN THE AUTOMOTIVE SECTOR

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ABSTRACT

This aim of this study is to compare the existing theory on the subject of target costing with practices reported by empirical studies already performed in the automotive sector. We can identify the following specific purpose: to analyze whether the characteristics of target costing, identified by the theory, are in line with what was reported by the empirical studies already performed in the automotive sector. Data collection was executed using a review of empirical studies regarding this topic in automotive companies. The data collected allow us to conclude that none of the companies surveyed reports the use of the target costing model with the six characteristics the theory associates with it: price leads to cost, customer focus, product design focus, multidisciplinary teams; focus on the costs incurred during the product's lifecycle; involvement of the entire value chain.

KEYWORDS

Target Costing, Automotive Sector.

1. INTRODUCTION

The objective of the present article is to compare the existing theory on the subject of target costing with the practice reported by the empirical studies already performed in the automotive sector. As a specific target we can identify the following: to analyze whether the target costing characteristics, identified by the theory, are in line with what was reported by the empirical studies already performed in the automotive sector. The present world situation demands the adaptation of the corporate world to the current client demands for more quality and diversity. This causes the shortening of the products' lifecycle, and planning, control and waste elimination become mandatory factors for the survival of companies. In this context, target costing gains relevance as a cost management system, and is a useful tool to the constant search for continuous improvement. The present study was performed using a review of empirical studies on this subject in automotive companies. The period selected for this research spans from 1990 to the present, a time when this method began to be studied in the West.

The collected data allow us to conclude that none of the analyzed companies reports using the target costing model with the six characteristics the theory associates with it: price leads to cost; consumer focus; product design focus; multidisciplinary teams; focus on the costs incurred during the product lifecycle; involvement of the entire value chain.

2. LITERATURE REVIEW

The Target Costing (TC) concept originated in Japan, emerging around the 60s (Feil et al., 2004). We can, however, state that it started before this time, since it stems from another American definition – value engineering. The value engineering technique, initially developed at General Electric, is a concept that tends to maximise product attributes while minimising their costs (Feil et al., 2004). During the 60s, value engineering was combined with the idea of influencing and reducing product costs as early as possible in the product planning and development process (Feil et al., 2004), because in this phase the majority of costs are fixed (Tani, 1995). This new concept was called genka kikaku and its first documented use in Japan took place in the well-known automotive company Toyota, in 1963, despite the inexistence of any mention in the literature to that fact until 1978 (Feil et al., 2004). Later, genka kikaku was translated into TC, the term currently known worldwide. Translating the phrase genka kikaku literally, gen means origin and ka price. Placing both together we obtain the phrase “price origin”. This directs us to the tight existing link between price and cost, and we can therefore interpret this term in the sense that “the origin of price” is cost. Kikaku means plan. So, “cost plan” expresses the global approaching strategy to cost reduction which is a characteristic of the TC concept (Feil et al., 2004). Several authors define TC in different ways, but all of them share three common characteristics: market orientation, focus on product engineering, and focus on product functionality (Feil et al., 2004). Given the variety of existing definitions, the genka kikaku concept was determined and built from pieces of concepts and from its practical application in the competitive Japanese market. In its country of origin, TC is officially defined as a profit management process, by which factors such as quality, price, client trust, delivery terms and times and others are set at the product planning and development stage. They are also set at levels that respect the needs of the consumer (Huh et al., 2008). In the 80s, the method was recognized as a significant factor in the development of Japanese companies, because it allowed the strengthening of their competitive position in the global market (Huh et al., 2008), giving rise to a curiosity regarding its use in other companies. In order to survive in the current market, companies are forced to become experts, and to develop products that offer quality and functionality to the consumer, while at the same time guaranteeing a desirable profit to the company (Cooper and Slagmulder, 1999). Cooper and Slagmulder (1999) consider that TC is a technique that allows the strategic management of future company profits. According to Cooper and Slagmulder (1999), the three components of the method – quality, functionality and perceived value – are essential for the success of the company. It has then to balance this tripod with the requirements imposed by the market and with the adopted strategy. The TC concept is characterized by starting with identifying the price consumers are willing to pay for the products, considering their quality and functionality (Albright and Lam, 2006). After establishing the target sales price, the company defines the desired profit margin. This margin – or target margin – can be determined according to the company’s strategy, profit expectations, historical results, competitive analysis and result simulations (Cooper, 1994). The difference between the target price and the desired margin is called target cost – a value used as a reference during the whole process of product conception, since it is used to control both the product’s design and production costs. Cost becomes therefore an input for the product development process, and not an outcome (Cooper and Slagmulder, 1999). According to Cooper (1994), after defining its target cost the company will assess its total production costs, which can never surpass the established target cost because it guarantees the product generates the intended profit, while applying the sales price accepted by the market. When the product is in the conception stage and the previously defined target cost cannot be reached, the company use the value engineering (VE) tool. This is a multidisciplinary system that surveys the factors that may be influencing the cost of the product in order to allocate means to reduce and/or eliminate them without ever compromising the product’s quality and reliability

(Cooper, 1994). Like TC, this tool is used during the product's conception stage and has a crucial role in cost management by helping the company to manage the trade-off between functionality, quality and cost (Cooper, 1994). Another option to be assumed by the company is the cancellation of the project giving the production of the product (Helms et al., 2005). This can happen when the company considers the target cost cannot be reached and/or the profit margin does not ensure a satisfactorily return to the company. We estimate that 80% of product costs are tied up during the design stage, making it harder to obtain major cost reductions after this stage (Cooper and Chew, 1996; Davila and Wouters, 2004; Ansari et al., 2009).

As main TC characteristics we can indicate the following six: price leads to cost, consumer focus, product design focus, multidisciplinary teams, focus on the costs incurred during the product's lifecycle, and the involvement of the value chain as a whole (Huh et al., 2008). Regarding the first characteristic, the company starts to calculate the sales price in order to define the target cost. To establish the sales price the company has to consider several factors, such as the consumer traits, the product's lifecycle, the estimated sales quantities, and the competitor's strategy (Guilding et al., 2000). The price increases in the same proportion as the increment in the perceived value, i.e., the higher the perceived value seen by the consumer, the more the amount he is willing to spend (Modarress et al., 2005). The second characteristic – consumer focus – forces the company to adopt a market orientation without ever neglect quality, functionality, and product cost (Tani, 1995). The perceived value for the client regarding any incorporated characteristic and its functionality has to be greater than the cost the company incurred into to provide such characteristics (Swenson et al., 2003; Ansari et al., 2009). The third characteristic – product design focus – demands it be sufficiently advanced so that quality and functionality can be adequately adjusted to consumer needs. The design changes need to happen before production starts. Then the company is able to reduce and/or avoid costs and decrease the market launch lead time (Swenson et al., 2003). Regarding the fourth characteristic – multidisciplinary teams – cooperation between the different departments is mandatory for TC success (Monden and Hamada, 1991), because the teams involved in the process are responsible for the complete integrity of the product, from conception to final production (Swenson et al., 2003). This multidisciplinary cooperation is essential because in order for the cost reduction to be effective the company has to balance all the new product targets – cost, quality, functionality, volume of production and invested capital (Everaert et al., 2006; Cooper and Chew, 1996). As a rule, the engineering team has the most influential role in this type of teams, unlike accounting whose opinion is seen as unimportant (Dekker and Smidt, 2003). TC's fifth characteristic orders the control of the total costs of the product's lifecycle during its duration. These costs include the purchasing price for the components, and operational, maintenance, distribution and product placement costs (Ansari et al., 2009). The TC requires a continuous estimation of the production costs, while the product moves along the conception stage, in order to analyze the impact caused by design decisions in the costs, and also as a way to monitor the progress towards meeting the goals related with expense reduction (Everaert et al., 2006). To make that estimation we need a detailed cost information, that has to be reliable and accurate (Everaert et al., 2006). During the product development process we also need to continuously compare the new product expense levels with the target cost to be met (Everaert et al., 2006). Regarding the sixth characteristic, TC demands that all members of the value chain, such as suppliers, service providers, distributors and consumers are included in the process (Ansari et al., 2009), thus focusing the entire chain in the global objective of waste, excess and irregularity elimination (Helms et al., 2005). One of the requirements of this method is that the company must involve its suppliers as partners in the product conception stage, when the target costs are defined (Cooper and Chew, 1996). When selecting its suppliers, since all suppliers will be involved in the whole development process of a new product, the company prefers relevant factors such as trust, cooperation, ability to produce

quality parts, the amount of engineers and design experts employed, the reputation held within the industry by the services provided, and dependability (Helms et al., 2005). This relationship between the company and its suppliers generates the sharing of information on cost reduction (Helms et al., 2005), and on production methods and techniques essential to TC's success, besides ensuring that both the supplier and the buyer will meet their target cost (Ellram, 2000). Workers are the ones that present the best ideas for the company to reach a continuous improvement. This happens because they are the ones closer physically to the jobs and see, primarily, the type of faults that happen and their main causes (Cooper, 1996). The company must therefore motivate all its employees to meet the target cost during the product conception stage, using their creativity to create alternative plans that allow for a bigger cost reduction, and making TC an activity that generates profits for the whole company (Ibusuki and Kaminski, 2007). For this, employees need access relevant information in order to better reach the proposed goals (Modarress et al., 2005). When there is such information, co-workers internalize know-how faster and there is a greater understanding of costs and of the organization in itself (Helms et al., 2005). Co-worker training and instruction is of the highest importance in any TC initiative, because a lack of knowledge over the process can pose a barrier to its implementation (Ansari et al., 2009; Helms et al., 2005).

3. REVIEW OF EMPIRICAL STUDIES

The origin of TC has intrinsically to do with the Japanese automotive market characteristics and environment. When Toyota decided to include this method in its product conception process (Feil et al., 2004), the automotive market was going through profound changes in its surroundings. This industry was witnessing a shortening of the product's lifecycle, demand diversification, and the existence of a sharp competition (Monden and Hamada, 1991). Besides, Japan was suffering the consequences of an appreciation of its national currency - yen (Monden and Hamada, 1991). As a consequence the sector searched for new cost management methods that would be useful for manufacturing new products. They intended thus to satisfy demand and client imposed specifications at the lowest cost, as well as reducing costs in existing products by eliminating waste (Monden and Hamada, 1991). TC was therefore a very useful tool. According to Monden and Lee (1993), TC conquered the industrial market by being an effective cost management system in the product's design and development stage. The recognized success in its country of origin, Japan, where it has a usage rate of 100% in the automotive sector (Böer and Ettlé, 1999), restates its suitability to the industrial area. With the goal to analyze the most important target costing characteristics, according to the manufacturer, we analyzed the articles presented in Table 1, published during the period between 1995 and 2002, which report the use of this method in six automotive companies (Toyota, Nissan, Ford, Chrysler, Daihatsu, Fiat), from different geographic origins. The literature review allows the identification of six characteristics associated with TC: price leads to cost; consumer focus; product design focus; multidisciplinary teams; focus on the costs incurred; and involvement of the value chain as a whole.

Table 1: TC characteristics in automotive companies

Author	Company	Target Costing Characteristics					
		1	2	3	4	5	6
Bhimani and Okano (1995)	Toyota	X					X
Carr and Ng (1995)	Nissan	X			X	X	X
Mintz (1995)	Ford				X		X
Dyer (1996)	Chrysler				X		X
Lee and Monden (1996)	Daihatsu	X				X	X
Zirpoli and Caputo (2002)	Fiat				X		X

Legend:

- 1 – Price leads to cost
- 2 – Consumer focus
- 3 – Product design focus
- 4 – Multidisciplinary teams
- 5 – Focus on the costs incurred during the product lifecycle
- 6 – Involvement of the value chain as a whole

The Toyota Motor Corporation, the largest and most successful Japanese automotive company is known for its corporate innovation, its function integration ability and its internal philosophy (Hopper and Joseph, 1995). Its constant search for innovation led the company to adopt TC. This was done with the intention to improve its conception and production process, while facing the Japanese economic recession that was happening at the time (Monden and Hamada, 1991). In the Bhimani and Okano article (1995), the authors study Toyota in the United Kingdom – Toyota Manufacturing UK Ltd. – and have identified two TC characteristics present in the company: price leads to cost, and the involvement of the entire value chain. The same authors mention that the company calculates its target cost through the difference between sales price and the required profit margin. The first step starts with the definition of the sales price, for which the company takes into consideration the European sales estimates and the prices of cars previously marketed or currently on the market (Bhimani and Okano, 1995). Later the desired profit margin is removed and the target cost to be met is obtained. The importance of the role performed by the suppliers in the product conception stage is also mentioned. The supplier selection process must be approved by the mother-company, based in Japan, and by Toyota UK (Bhimani and Okano, 1995). Suppliers are selected according to the quality and functionality of the prototypes supplied, but they are also expected to get involved in the product conception and to give ideas that allow cost reduction and operational improvement (Bhimani and Okano, 1995). There is consequently a high know-how exchange between the suppliers and the company, because Toyota makes a point of promoting training sessions for the suppliers that explain the whole company production process, from the materials used to the implemented operational system (Sako, 2004). The role undertaken by the co-workers is also important for the organization, since it promotes employee involvement in the conception and production process through suggestions that allow product improvement (Hopper and Joseph, 1995).

The Carr and Ng (1995) article has as main theme the study of the company Nissan Motor United Kingdom, a subsidiary of the mother company Nissan Motor Company, Ltd., the second largest Japanese automotive company. In what regards TC, the authors managed identify four characteristics: price leads to cost, multidisciplinary teams, control of costs incurred, and involvement of the value chain. Regarding the definition of the product unit sales price, the company defines it according to information picked up in the market. The margin is defined considering the company's activity plans, and the target cost is calculated as being the difference between the sales price and the margin (Carr and Ng, 1995). The authors also mention the existence of multidisciplinary teams formed by co-workers originally from departments such as Quality, Design, Engineering, Buying and Finances (Carr and Ng, 1995).

Authors say that about 80% of the production costs concern materials and components used in the product, thus giving greater importance to cost controlling. Regarding the value chain, Nissan UK makes sure suppliers and co-workers are involved in the product conception and design process. Its co-workers are regarded by the company as a source of innovation, since they know the product specifications as well as their jobs, and consequently their cost reduction suggestions are more effective (Carr and Ng, 1995). Dealings with suppliers are tightly controlled since their supplies represent 80% of total costs. However, the trade relation existing between both parties is based on

trust, rather than in pressuring them to respect prices and margins (Carr and Ng, 1995). Nissan bets on the know-how exchange with its suppliers, and in the promotion of workshops as a way to increase its performance regarding themes such as quality, productivity and efficiency (Carr and Ng, 1995). The suppliers are selected according with the criterion called QCDDM – Quality, Cost, Delivery, Development and Management – and their performance on these five components is evaluated (Carr and Ng, 1995:357).

In the article presented by Mintz (1995), the company being analyzed is Ford Motor Company, the second largest American automotive company. Mintz (1995) identifies two method characteristics present in the company: multidisciplinary teams and the involvement of the value chain. The company develops its entire car and truck design process having always under consideration the price given by its suppliers (Mintz, 1995:29). This happens because the company considers that a lack of careful attention to the main costs leads to a complete method failure. Ford also uses the concept of multidisciplinary teams making them up with people from different internal areas of the company, and giving them the responsibility to create the product (Mintz, 1995). According to the author, Ford sees its co-workers as fundamental resources for the company. It takes a chance on them and finances their training (Mintz, 1995). The company encourages its co-workers to rotate between departments and also to benefit from an international professional experience (Mintz, 1995). We should also mention that the company has a huge reputation for financial training, an area where the company makes sure its co-workers receive years of intense training (Mintz, 1995).

The Chrysler Group LLC is known worldwide as an American automotive company, with headquarters in Detroit, Michigan (Dyer, 1996). The article of Dyer (1996) is centered in the relationship established between the company and its suppliers, and in the description of the SCORE program. This program was developed by the company and its goal is to improve the relations between the company and its suppliers. The same author is able to identify two TC characteristics in the company: multidisciplinary teams and the involvement of the value chain. The SCORE program – Supplier Cost Reduction Effort – has as main goal a cost reduction that benefits both business partners without injuring the suppliers' profits. It defines that the manufacturer is responsible for encouraging, revising and applying the suppliers' ideas in the quickest way possible, while sharing the benefits generated by those ideas (Dyer, 1996). The same program predicts that the suppliers will offer suggestions that will translate in a cost reduction equal to 5% of that supplier's sales to the company, without penalties in the case the goal is not reached. To make all this suggestion process easier, the company has decided to give their suppliers the possibility to submit their ideas and consulting their performance on an online platform (Dyer, 1996). As an example, during the first two years of application the SCORE program generated 875 ideas worth \$170.8 million in annual savings for Chrysler (Dyer, 1996). Through this program, the company is able to deeply involve its suppliers in the conception process, and they both try as a partnership to find ways to decrease the production costs while sharing the resulting savings (Dyer, 1996). The responsibility for supplier selection is given to a multidisciplinary team that evaluates the suppliers' ability to design and produced a specific component or system (Dyer, 1996). Considering their performance, Chrysler offers term contracts to the selected suppliers for a period usually corresponding to the lifecycle of a model of car, or more – an average of 4.4 years (Dyer, 1996). The company also makes a point in maintaining a high level of communication with the supplier, having for that purpose created a common e-mail account that makes information sharing easier (Dyer, 1996). Chrysler considers therefore that TC has completely changed the relation of the company with its suppliers, by focusing it on cost instead of on price. This change in focus allows the company to work together with its suppliers in order to respect common costs and functional goals, making it also possible to share a relation of trust (Dyer, 1996). The article also refers that the

company has introduced the concept of multidisciplinary teams, which allows all work stations to work together in order to develop the best product possible at the best price. Chrysler sustains that these teams fuel continuity, coordination and trust, both at an internal level and with the suppliers (Dyer, 1996), as well as innovation and problem solving, creating a faster and cheaper product development process. Consequently, all these improvements lead the company to produce components of the highest quality at a lower cost, while reducing the market launch lead time. From the development of a relationship with the supplier we can highlight four advantages (Dyer, 1996): reduction of the product's production cycle; reduction of the product's total costs; reduction of supplier's costs; increase in market share and profit.

Daihatsu Motor Co. Ltd. was established in 1907 and is currently defined as a mini-cars manufacturer, partly owned by Toyota (Lee and Monden, 1996). This organization has headquarters in Osaka, Japan, and is already present in more than 120 countries in its market segment (Lee and Monden, 1996). TC is seen by the company as a specific manifestation of an improvement and operational control system (Lee and Monden, 1996). The characteristics – price leads to cost, focus on the costs incurred and involvement of the value chain – are identified as the most essential by the company (Lee and Monden, 1996). At Daihatsu, the method is strongly related to the long term planning process of products and returns. This connection allows the company to adopt a strategy that joins the two mentioned components (Lee and Monden, 1996). As such, the target cost value results from the difference between the sales price and the desired margin, and represents the top management desired goal. The target profit margin is defined for each period and each car model. Because it's easy to calculate and given the already mentioned focus on profit, the return on sales ratio for similar products is used to define the margin (Lee and Monden, 1996). Considering the control of costs during the product's lifecycle the estimated cost is controlled and reduced using the value engineering technique (Lee and Monden, 1996). Daihatsu also has a co-worker encouragement policy that promotes their participation in the design process and in the development of new products, through suggestions that may add value to the product and lead to waste elimination (Lee and Monden, 1996).

The article of Zirpoli and Caputo (2002) is centered in the study of the relation between the automotive company Fiat and its suppliers. Fiat, an acronym for Fabbrica Italiana Automobili Torino, is the largest Italian car manufacturer, with headquarters in the city of Turin. Regarding TC, the authors have managed to identify two characteristics of the method: the existence of multidisciplinary teams, and the involvement of the value chain. The involvement of its main suppliers in the product design process has proven to be an essential strategy for the brand and has triggered a radical change in the entire value chain (Zirpoli and Caputo, 2002). In its relation with the suppliers, Fiat adopted a philosophy based in companionship, where it involves the supplier in a process of co-design and in the sharing of information (Zirpoli and Caputo, 2002). The supplier selection process is seen as crucial, because a less than good choice causes the company to enter into high costs. The company policy states that the choice of suppliers cannot be solely based on quality or on the price of the supplied component (Zirpoli and Caputo, 2002). Therefore the choice decision is based on two criteria: technical and political. First, the company assesses the presented components against about fourteen parameters that check the technical characteristics of the part in question and its consistence in terms of technology, cost and performance (Zirpoli and Caputo, 2002). The second step may be considered a political move, since the company analyses and assesses the supplier's portfolio, hopping to balance the quantities bought from the suppliers while creating a controlled competition among them (Zirpoli and Caputo, 2002). The authors describe also that, as a rule, Fiat shares the suggestions and benefits resulting from the suppliers' suggestions equally among them. In the case the suggestion emerges from Fiat, the benefit is given solely to the

manufacturer (Zirpoli and Caputo, 2002). The suggestions proposed by the internal divisions or by the suppliers are immediately applied to the existing products. In the case there is a decrease in costs, the suppliers are awarded with an amount equal to 50% of the cost reduction during the first year the suggestion is applied (Zirpoli and Caputo, 2002). Therefore, the suppliers chosen by the company have an interest in showing efficiency and in constantly improving their performance in exchange for long term contracts that usually coincide with the vehicle's lifecycle (Zirpoli and Caputo, 2002). The company also values geographical proximity with its supplier and uses money as an incentive to have them move to a closer location (Zirpoli and Caputo, 2002). In March of 2000, Fiat established an agreement with General Motors (GM) in which both would acquire a set of raw materials and other goods and services from the same suppliers together. As a consequence the supplying market became more competitive, with suppliers from both companies noting a doubling in their competition and business possibilities (Zirpoli and Caputo, 2002). The authors also report the existence of multidisciplinary teams with people from different divisions and external suppliers being involved in the same team (Zirpoli and Caputo, 2002).

Considering now the theme in hand – the most important TC characteristics – we note that in the automotive sector the type of existing relationship with the suppliers is crucial for developing the business. With a constant reduction in the product's lifecycles, and with the commitment of about 80% of the costs in the conception stage, the focus on design, research and development and in production planning is crucial for the survival of the companies (Carr and Ng, 1995; Lee and Monden, 1996). According to the opinion of Toyota, Nissan, Chrysler and Fiat, supplier participation in the product conception process explains the reinvention of their own design and development process as well as the business (Bhimani and Okano, 1995; Carr and Ng, 1995; Dyer, 1996; Zirpoli and Caputo, 2002). Instead of a competitive and exhausting relationship, with pressure being exchanged between the parties, the nature of the cooperating relationship between the supplier and the company is characterized by concepts such as trust or dependency (Zirpoli and Caputo, 2002). Suggestions that add value to the product are requested from the key business suppliers. This allows the reduction of waste and the improvement of the production line. The benefits stemming from these improvements are usually shared between both parties (Zirpoli and Caputo, 2002; Dyer, 1996). Besides, the company ensures the establishment of long term contracts with its suppliers, with a more extended duration normally coinciding with the product's lifecycle, as shown by Chrysler and Fiat (Dyer, 1996; Zirpoli and Caputo, 2002). The suppliers are thus encouraged to learn and absorb the organizational abilities specific to that company, and are then considered an integrating part of it (Sako, 2004). The existence of multidisciplinary teams can also be seen in Nissan, Ford, Chrysler and Fiat. The mixing of people from various areas in the same team gives birth to more structured ideas, more suited to the main goal: the creation of value for the product.

4. CONCLUSION

The goal of the present work is to compare the existing theory on the subject of TC with the practice reported by the empirical studies already performed in the automotive sector. As specific goals we can identify the following: to analyze whether the TC characteristics identified by the theory agree with what was reported by the empirical studies already performed in the automotive sector. The collected data allow us to conclude that none of the analyzed companies reports using TC with the six characteristics attributed to it by the theory: price leads to cost; consumer focus; product design focus; multidisciplinary teams; focus on the costs incurred during the product's lifecycle; involvement of the entire value chain. Most companies report only the use of two of the six characteristics of this model. The last characteristic is the only one where there is an agreement among all of the analyzed companies. All of them report special attention to the involvement of the

entire value chain, reporting that involving the suppliers or co-workers in the design process and in the product development adds value to it. The main contribution of the work performed is the identification of target costing characteristics foreseen in the literature review but not used by the companies. This allows us to conclude that the companies adapt the method to their specific needs. The main limitation of this paper was the quantity of reviewed articles. The initial goal was to focus attention on a pre-defined group of automotive companies, during a specific time period, thus offering a wide perspective of the application of the method in the sector. However, given the reduced number of available articles on companies from this sector, only six composed the studied group. The results found suggest the need for further research that will identify the causes for the differences found among what the theory presents as a target costing characteristic and what is reported by the empirical studies already performed in the automotive sector.

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