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Research & Development (R&D) in Strategic Production of a Safest Car

Aidanazima Abashah[#1], Shahriman A.B[*2], Haslina Hassan Basri[#3] Razinda Tasnim A.R[#4], A. Harun [#5], Z.M. Razlan [#6], M.S.M. Hashim[#7], W.K. Wan[#8]

 # School of Business Innovation & Technopreneurship, University Malaysia Perlis
*School of Mechatronic Engineering, University Malaysia Perlis

*Motorsports Technology Research Unit (MoTech), University Malaysia Perlis

[1]danazima@unimap.edu.my, [2]shahriman@unimap.edu.my, [3]haslinahassan@unimap.edu.my,
[4]trazinda@gmail.com, [5]aziziharun@unimap.edu.my, [6]zuradzman@unimap.edu.my,
[7]sanihashim@unimap.edu.my, [8]khairunizam@unimap.edu.my

Abstract— **This study was conducted to investigate the influence of Research and Development (R&D) in producing a safer car by investigating the manufacturing safety behaviors among employees of the manufacturing company. The quantitative method of data collection was utilized to collect the data among these employees and fifty-two respondents covering different age groups, educations levels and positions in the company had answered the survey. The main statistical analysis such as Pearson Correlation and Multiple Regression was used to analyze this data gathered by using SPSS software. Based on the statistical results, the research finding displays a significant relationship between R&D and manufacturing safety behavior among automotive manufacturing employees. To conclude, R & D is one of the crucial factors for every automotive manufacturer to make sure the car produced are at the highest safety level.**

Keywords— *Research & Development, Behaviour, Safety, Car, Manufacturer, Automotive Industry*

1. Introduction

The automotive industry is led and dominated by the US, Japan, China globally and the number of automobile models has increased each year. About 6.9 million passenger cars were sold in 2017 while only 4 million were produced in the same year in the US alone. The rapid growth in the automotive industry has opened a new opportunity for the Malaysian economy. In 1983 and 1993 Malaysia has established Proton and Perodua, the national brands with the aim to spur the Malaysian national industrialisation. Since then the automotive industry becomes the strategic part of the manufacturing sector and has employed about 710,000 people and contributed to RM 30 billion of Malaysian GDP [1].

In recent years, the automotive industry has adopted new technology and innovation in order to deliver the most advanced and safest vehicles. These technology and innovation moves have become the essentials for and car manufacturers and original equipment manufacturers (OEM) as they will create new advantages for the firms that want to stay competitive in a market. As such, design and R&D are crucial factors for the survival of these firms. In a global industrial landscape that is changing fast, firms must continually revise their design and range of vehicles where this product-life-cycle (PLC) is at the growth and maturity stages. Firms also need to invest in their R&D so that their vehicles will have the latest technology in the market.

In order to elevate the car safety standards and awareness among consumers, Vehicle Type Approval (VTA) has been imposed in the European market by the European Community. A similar approach has been taken by Southeast Asia country by introducing ASEAN NCAP on 8th December 2011. ASEAN NCAP provides a few guidelines and regulations with regard to car safety that need to be complied by car manufacturer before launching the new car model in the market. There are also assessments tests that the new car model needs to go through and the five- star badges will be awarded for the new car model that has passed the test with excellent result. In the report, the five-star badges result will indicate that the car has the highest safety level. The report is useful to the car purchaser as it can act as their guideline in purchasing the car that has the best features for safety. In order to undertake these numerous assessment tests and pass them with excellent results, the automotive manufacturers therefore need to invest in the recent and most advance technology. Therefore, the R&D in technology

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becomes a must, not only to gain a competitive advantage but also to fulfill the ASEAN NCAP guidelines and procedures. The implementation of these both guidelines and regulations not only will enhance the safety value of the car but they serve to provide extra safety measures for the drivers, passengers, road users as well as reducing the high accidents rate on the road.

2. Literature Review
2.1. Safety Behavior

Safety is a must in every action taken for human daily as safety embroil lives. While addressing safety behavior in automotive industries, safety is considered mostly on behalf of car purchasers rather than manufacturers' perspectives. Previous study has stated that safety was ranked as second factors (19%) after price which is (27%) as factors that need to be considered when purchasing cars [2]. This proves that car purchasers in Malaysia are very much aware of the safety factor of the cars they want to purchase. They are also more knowledgeable about the braking system and general safety of the car compared to the overall assessment of the car. Through programs like VTA and ASEAN NCAP the new assessment has been made with the aim to encourage the manufacturer to develop and equip the latest car with a safety system that can reduce road accidents and fatalities. Now the level of performance and 'roadworthiness' requirements are set to be the mandatory compliance list in vehicle assessment must be met by the related parties (applicants; original equipment manufacturers (OEM), domestic brand owners or traders) before the car can be marketed in the country [3].
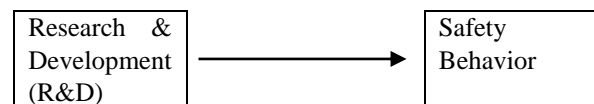
2.2. Research & Development (R&D)

As the technology shift is rapidly changing, there are opportunities for improvement in the automotive industry for manufacturing firms to stay competitive locally as well as globally in the market. The term of R&D is referred to as continuous improvement in processes, procedures or products itself through the innovations made to the technology used by a firm. In other words, it is a strategic and long-term activity towards the future success of the firm and automotive industry. It needs a high commitment from the firms to continuously invest in the R&D activities that lead to the development of the technology that can bring

growth to the firms as well as economies [4]. These series of activities in R&D are adapted not only in the automotive industry but also across all sectors of the different industries.

General Motors from the United States has implemented its R&D activities for its vehicles by enhancing the new computer system and sensor technologies such as light detection and ranging radar (LiDAR). The technologies applied was less costly for the consumers and such technologies have made the self-driving car improve in its safety performance abilities. Thus, the technology is capable to help car purchasers reduce crashes and saving their lives. It is also can reduce vehicle emissions and congestion while shortening the travelling time. The R&D activities were taken by General Motors was formed from its vision of zero crashes, zero emissions and zero congestion.

Through R&D activities the manufacturing firms will produce new cars with new safety value added features that follow the safety guidelines and undertake the assessment tests that have been laying down by ASEAN NCAP Overall Assessment Protocol (2017) [5]. The assessment protocol aims to promote Safety Assist Technologies (SATs) in Southeast Asian countries. It contributes 25% of the overall rating with a maximum of 18 points emphasizing on Effective Braking and Avoidance, Seatbelt Reminder, Blind Spot Technology (BST) and Advanced SATs.

Research & Development (R&D)	→	Safety Behavior

Figure 1. Research Framework

Therefore, based on the literature review and research framework above, the research hypothesis is as below:

H1: There is a significance relationship between research & development (R&D) and safety behaviour.

3. Methodology

The quantitative method of data collection was utilized to investigate the relationship between Research & Development (R&D) and safety behaviour from car manufacturer perspectives. The total fifty-two respondents were involved to answer the questionnaire form.

There are three parts in questionnaire form. Part A is for respondent's background whereas Part B and Part C are for safety behaviour and R&D examine by using a 5-likert scale. The questionnaires that were developed have been validating by an expert before conducting the pilot test.

4. Finding

Based on the data collected from questionnaires, the analysis of the findings is as below:

4.1. Demographic Analysis

Fifty-two respondents in car manufacturing companies had participated in answering the questionnaires and they were thirty-eight were male respondents (73.1%) and fourteen were female respondents (26.9%). Only one of them is less than 24 years old, whereas twenty-one respondents have the age between 25 to 33 years old, ten respondents have the age between 43 to 51, fifteen respondents have the age between 34 to 42 years old and five respondents have the age between 52 to 60 years old. The respondents also have a different level of education; 8 of the respondents have their master or doctorate, 40 of the respondents have their degree, 3 respondents have their diploma and only one respondent has an education certificate. The respondents also are working in various positions inside their company. 4 of the respondents are head of department and unit, 9 of the respondents are manager and supervisor, 7 are executives, 30 are engineers and 2 at other positions. Moreover, about the majority of them are working in the R&D department (48), 2 of them in administration and corporate level and 1 of them respectively in production and others department.

4.2. Reliability Analysis

Table 1. Reliability Analysis

Variable	Item	No.of Item	Cronbach Alpha	Remarks
Safety Behaviour	Safety is the highest priority when performing my job.	5	0.769	Acceptable
	If I have a concern about the safety issues of a car, I will know whom to contact.			
	I would rebuke someone who is committing an unsafe practice.			
	My company ensures that its safety best practices follow ASEAN NCAP protocols.			
	ASEAN NCAP influences the automotive industry by making a new paradigm shift in the new car sector in Malaysia.			
Research and Development (R&D)	My company is committed to bringing an autonomous car on the road when addressing the concern about car safety.	5	0.829	Good
	My company makes an effort for R&D to address customer's concern on car safety.			
	My company embarks R&D towards highest car safety level			
	My company does R&D for each production and launching of a new model to optimize the car performance.			
	My company plans to design a car with autonomous features for safety purpose.			

The table above presents the reliability analysis results of the study where it is obtained based on the Cronbach Alpha value on how good each variable is correlated to each other. DV-Safety Behaviour (α=0.769) is acceptable and IV-Research & Development (α=0.829) is good [6][7].

4.3. Descriptive Analysis

Table 2. Descriptive Analysis

Variables	N	Mean	Standard Deviation
Safety Behaviour	52	4.24	0.56
Research & Development (R&D)	52	3.83	0.63

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4.4. Pearson Correlation Analysis

Table 3. Pearson Correlation Analysis

	Safety Behaviour	R&D
Safety Behaviour	1	0.639**
R&D		1

The correlation coefficient, r is used to measure the two variables that are related. The variables indicate strong correlation and closely related when r value is closer to ±1.0. The table above shown correlation between R&D and safety behaviour with r=0.639, 63.9 percent at 99 percent confident interval [8]. Thus, the value indicates a strong relationship between R&D and safety behavior.

Table 4. Correlation of Research Hypothesis

Hypothesis	Correlation
H1: There is a significance relationship between research & development (R&D) and safety behaviour.	.639

The correlation was positive and significant when the r value is less than 0.8 and the correlation value is no crucial multicollinearity problem if the variable value is below than 0.8.

4.5. Regression Analysis

Table 5. Linear Regression

Model	Standardized Coefficients	T	Sig.
	Beta		
R&D	0.621	4.166	0.000
R square = 0.409			
Adjusted R square = 0.385			
F change = 16.978			
Note: Significant level: p<0.01			

The table above presented the p value is 0.000 shown the significant relationship between R&D and safety behaviour. Thus, the *H1: There is a significance relationship between research & development (R&D) and safety behaviour* is accepted.

5. Discussion & Conclusion

In conclusion, based on the data analyzed, there is a significant relationship between R&D and safety behavior among car manufacturer employees in designing and producing a new safer car. According to Product-Life-Cycle (PLC) model, R&D is usually introduced when the business entity especially automotive companies are at their growth and maturity stages. More importantly, R&D is a platform where the automatic companies may introduce their existing car with better features as well as to introduce the new car to stay competitive in the same market locally and globally.

Acknowledgement

References

[1] Ministry of International Trade and Industry, *Automotive Industry*. Kuala Lumpur: Ministry of International Trade and Industry Retrieved from: https://www.miti.gov.my/miti/resources/2._Auto motive_Industry, 2016.

[2] Kassim, Khairil Anwar Abu, et al. *"Consumer behavior towards safer car purchasing decisions."* Journal of Engineering and Technological Sciences, Vol 48, No. 3, pp. 359-366, 2016.

[3] Anwar, Abu Kassim Khairil, et al. *"Advancement in Vehicle Safety in Malaysia from Planning to Implementation."* Asian Transport Studies, Vol 4, No 4, pp. 704-714, 2017.

[4] Kale, Dinar. *"Innovative capability development in the Indian pharmaceutical industry."* International Journal of Innovation and Technology Management, Vol 9, No. 02 pp. 1250013, 2012.

[5] ASEAN NCAP. *"ASEAN NCAP Overall Assessment Protocol".* Kajang: ASEAN NCAP, 2017.

[6] Sekaran, Uma, and Roger Bougie. *Research methods for business: A skill building approach*. John Wiley & Sons, 2016.

[7] Hair, Joseph F., et al. *"Multivariate data analysis"*. Vol. 6, pp. 289, 2006.

[8] Davis, J. Matthew, et al. *"Relationship between fluvial bounding surfaces and the permeability correlation structure."* Water Resources Research, Vol 33, No.8, pp. 1843-1854, 1997.