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Biocomposite Headrests Design Criteria Weightage: Voice of Stakeholders via Survey and Analytic Hierarchy Process

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Abstract

This paper presents a novel framework to incorporate the Voice of Stakeholders in evaluating the design criteria for biocomposite headrests through a survey and the Analytic Hierarchy Process (AHP). The framework is meant to complement the sustainable conceptual design framework of biocomposite headrests suggested in the previous study, which is based on the Concurrent Engineering (CE) approach. At first, Product Design Specifications (PDS) for the biocomposite automotive headrest were established, embracing sustainable design practices. Despite the effort towards sustainable design, the voice of pertinent stakeholders should not be disregarded. Therefore, a survey was conducted to identify customers' determined criteria, and mapped to the designer's determined criteria. Subsequently, subject-matter experts (SMEs) from industries and academia were invited for criteria assessment through the AHP pairwise comparison matrix. The results were analyzed through the AHP Microsoft Excel tool with multiple inputs. The criteria weights (CW) determined by SMEs in priority order are safety (45.7%), comfort (16.7%), cost (15.6%), styling (12.5%), and lastly weight (9.5%), with a consistency index (CI) of only 2.8%, indicating a consistent response by SMEs. The SMEs response seems to match customers' expectations except for the cost, which is focal from the SMEs' point of view. For the criteria global weight (CGW), Factor of Safety (FoS) and maximum Von Misses stress are the most important criteria with an equal value of 22.9%, followed by manufacturability rating with 15.6%, support area with 12.8%, style rating with 12.5%, volume with 9.5%, and finally adjuster rating with 3.8%. The criteria weight will be used by the designer in the concept generation and selection stages. This framework can also be used for other product designs with identical nature, especially automotive components that have direct interaction with occupants.

1. Introduction

The Automotive headrests play a crucial role for safety, comfort, and support while driving. They help to prevent or mitigate whiplash injuries in the event of rear-end collisions, enhance the car occupant's comfort during long trips, and facilitate a more pleasant and ergonomically sound seating experience. In addition to functional requirements, the advancement of automotive safety technologies also needs to cater to contemporary requirements for sustainable design, with a number of automobile manufacturers having shown their commitment by employing biocomposite car components [1-3]. The headrest stay shown in Fig. 1 is the main structure of a headrest, typically made from steel material. Azlan et al. [4] in their recent work have proposed the use of biocomposite material for headrest stay, to replace steel aiming for a more sustainable design as it utilizes renewable resources, has a smaller carbon footprint, biodegradable, energy efficient, and has less toxicity compared to metal or typical composite materials. Nevertheless, a proper design framework is needed for the design to be successful.

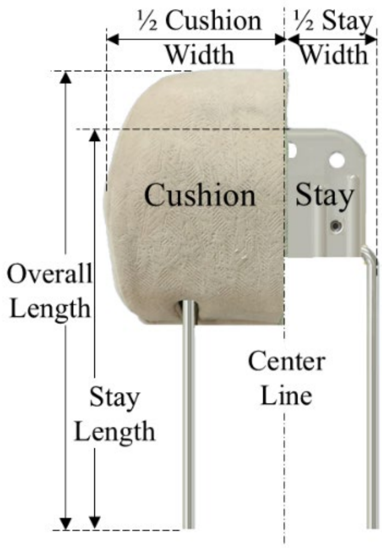


Fig. 1 *Headrest parts and dimensions*

Sustainable design practices are gaining increasing attention across diverse industries, ranging from major sectors like automotive, to smaller-scale products such as apparel [5]. Azlan et al. [6] recently introduced a new and sustainable conceptual design framework for biocomposite car headrests, embracing the Concurrent Engineering (CE) approach. The framework shows the relationship between headrest design, CE principles, and sustainable practices. Subsequently, Azlan et al. [4] also utilized the Theory of Inventive Problem Solving (TRIZ) as a problem modeling tool. Therefore, in this paper a market investigation was conducted, and the Product Design Specifications (PDS) was prepared prior to the concept generation stage as proposed in the biocomposite headrests conceptual design framework.

One notable feature of automotive headrests is that they serve as both a safety component and a component that directly interacts with vehicle occupants (or customers). Therefore, while the opinions of specialists are crucial, it is equally necessary to consider the voice of customers. Nevertheless, currently there is no established criteria-weight determination method that encompasses the voices of different stakeholders. Consequently, this paper presents a novel framework for integrating the Voice of Stakeholders (VoX) in evaluating the design criteria through a survey and Analytic Hierarchy Process (AHP), where the letter "X" represents various stakeholders as presented by Azlan et al. [6] and several other researchers in their study [7-9]. However, the focus of this study is on the two groups of pertinent stakeholders, namely the customers and the subject-matter experts (SMEs). SMEs incorporate industrial experts, academic experts, and the designer (main author of this paper). Furthermore, this method also eliminates the tendency to be biased in determining priority and weight for the design and selection criteria. The criteria weightage results from this study will be very beneficial for the designer during the conceptual design generation stage, as well as to be used with multi-criteria decision making (MCDM) in the design selection stage. MCDM is a methodology employed to prioritize alternative solutions based on several criteria and is extensively utilized across various domains [10]. The same framework can also be used for other products with the same design nature, without or with minor adjustments.

1.1 Market Investigation: Survey and AHP

This study used a survey and AHP as approaches for market investigation. The survey was employed to collect information from the customers, while the AHP was utilized to gain opinions from the SMEs. This section examines the most recent studies that explore the application of surveys and AHP in the context of sustainable automotive design.

Headrests are components that are close to and have direct contact with customers. Hence, their voices are important and must be considered by designers [11-12]. In addition, it fosters value co-creation where the automotive industry and customers jointly generate value that is advantageous to both entities [13]. One of the methods to directly engage customers and understand their needs, preferences, opinions, and behaviors is through surveys. This data-driven strategy keeps businesses competitive while enhancing client happiness by aligning their products or services to match customer expectations. Wellbrock et al. [14], in their study have conducted a survey among different respondents, aiming at premium automotive brand customers, to understand their expectations towards sustainable design of automotive components, mainly focusing on the car interior. In addition to that, Wellbrock et al. [15] also performed a study using social media platforms to specifically target customers of high-volume automobile brands. The findings revealed that a significant majority (63% of respondents) expressed a willingness to pay an extra cost for automotive materials that are natural and sustainable. In achieving sustainable development specifically in the automotive industry, Dominik et al. [16] in their study to understand the eco-economic decoupling between environmental protection and economic development, have used a survey questionnaire as a tool that has been responded by Croatian automotive companies. This gathers their perceptions towards the efforts, significances, and impacts of sustainable development in automotive industries.

On top of that, it is also important to get input from the SMEs to ensure headrests serve their functionality and are economically viable. By utilizing proper tools, experts can point out several significant design criteria, assess them, and set priorities for each of them. The Analytic Hierarchy Process (AHP) is one of the most popular techniques that is being used in MCDM, where decision makers express their preferences for criteria or alternatives by using pairwise comparison matrices (PCMs) [17]. The general flow of AHP starts with the creation of the hierarchical structure, a tree diagram that illustrates the hierarchical relationship between the goal, criteria, and alternatives. Then the pairwise comparison process was made by decision-makers, and a consistency check was performed to ensure the reliability of the judgment. There are also weighting methods involved that assign numerical values to criteria according to their relative importance. Finally, the priorities were set, and the alternatives were ranked [18]. In automotive biocomposite component conceptual design for instance, AHP is widely used for both part concepts and material selection. Fatchurrohman et al. [19] used AHP in the material selection process, where five alternatives of bio-reinforced polymer matrix composites have been evaluated and the best bio-reinforced polymer matrix has been selected for the use of car bumpers. Mastura et al. [20] also used the AHP method in their studies to select the most suitable conceptual design for automotive anti-roll bar. In their other study, Mastura et al. [21] have combined AHP with the Analytic Network Process (ANP) for material selection of natural fibers in automobile biocomposite components, where AHP computes the significance values of each criteria cluster through pairwise comparison and ANP derives the global priority values based on the internal dependency of the individual criteria. Shaharuzaman et al. [22] employed AHP to establish the relative importance of several design requirements for side door impact beams. Seven criteria were reviewed by ten decision-makers who are experts in automotive engineering and product design using a pairwise comparison matrix. The criteria weighting was then used together with the Viekriterijumsko KOmpromisno Rangiranje (VIKOR) method to determine the best natural fiber materials for the side door impact beams. Yusof et al. [23] in designing an oil palm fibre reinforced polymer hybrid composite automotive crash box, used four levels of AHP through the pairwise comparison matrix in selecting the best design concept for the cash box. Rosli et al. [24] demonstrate in their study the use of the AHP to select the best thermoset matrix for car armrests made of natural fiber composites, where the main objective of the study is weight reduction. Based on the research, it is apparent that most recent studies have utilized AHP as a selection tool rather than as a technique for determining criteria weights. This study, however, used the AHP to assess the weight of the design criteria.

1.2 Product Design Specifications

Table 1 presents a summary of the PDS for the Biocomposite Automotive Headrest. The significance of this study is to provide guidelines for the designer to ensure the successful design of the biocomposite automotive headrest. Therefore, PDS elements comprising performance, standards, size, weight, quality/reliability, ergonomic, material, installation, aesthetic, environmental issues, end of life, and product cost as suggested in Pugh's Total

Design are presented in this section [25]. The specifications were made based on literature, standards, and discussion between the designer and industrial experts.

The primary goal of the headrest is to prevent whiplash injuries and offer sufficient head support. In addition, it is also needed to comply with standards and regulations regarding automotive headrests, referring to Federal Motor Vehicle Safety Standards (FMVSS) Standard No. 202a [26] and the United Nations Economic Commission for Europe (UNECE) Regulation Nos. 17 and 25 [27-28]. Referring to Fig. 1, the size of the headrest with cushion is set according to the standards with a minimum width of 170 mm and above, and a minimum overall length of 370 mm. The headrest stay is set by the designer with a minimum width of 150 mm, and a minimum stay length of 330. The headrest's weight should be less than 1000 grams, and the stay's weight should be less than 800 grams.

To safeguard quality, the Factor of Safety is set at 1.5, which is considered adequately safe and cost-effective. Furthermore, it should be durable and endure wear and tear. The headrest also ought to provide optimal support and comfort. Additionally, the height needs to be adjustable within the range of 750 mm to 850 mm, which is measured from the H-Point of the manikin to the top of the headrest along the torso line axis. It also must be user-friendly and easy to install and remove. Moreover, the headrest styling must be appealing and complement the vehicle's interior. In terms of material, it must be free of hazardous chemicals and compounds, as well as comply with vehicle safety rules. To embrace sustainable design practice, the material used must be eco-friendly, have low energy consumption, and have a low environmental impact throughout its life cycle. It also needs to be recyclable or disposable conscientiously at the end of its life [29]. The headrest should also be cost-competitive compared to normal headrests.

Table 1 *Summary of PDS for biocomposite automotive headrest*

Requirement	Specification
Performance	Mitigate whiplash injuries in the event of a crash and provide head support.
Standard	FMVSS Standard No. 202a and UNECE Regulation No. 17 & 25.
Size	Headrest with cushion: Width ≥ 170 mm; Length ≥ 370 mm
	Headrest stay: Width ≥ 150 mm; Length ≥ 330 mm
Weight	Headrest with cushion ≤ 1000 grams; Headrest stay ≤ 800 grams
Quality/ Reliability	Factor of Safety (FoS) ≥ 1.5.
	Durable and withstand towards wear and tear.
Ergonomic	Optimum level of support and comfort.
	Adjustable height within standard range:
	Highest ≥ 800mm; Lowest ≥ 750mm.
Installation	Easy installation/removal and user-friendly
Aesthetic	Aesthetically pleasing and harmonizes with vehicle interior.
Material	Non-hazardous chemicals or compounds must comply with safety rules.
Environmental Issues	Eco-friendly and sustainable materials; Low energy consumption; Mitigate environmental impact throughout life cycle.
End of Life	Recyclable or disposable conscientiously upon end of life.
Product Cost	Competitive compared to normal headrests.

2. Materials and Methods

2.1 Overall Framework

As mentioned in the introduction section, this paper is a continuation of previous work initiated by Azlan et al. [4-6]. The results from this paper, which are the weighted criteria, will be used concurrently as guidance for concept generation as well as criteria weighing for conceptual design evaluation. The criteria weight determination method used in this paper is beneficial and unique because it involves multiple stakeholders in decision-making, including standards, customers, designers, industrial experts, and academic experts. The overall framework and stakeholders' involvement in biocomposite headrests stay design criteria weight determination are shown in Fig. 2.

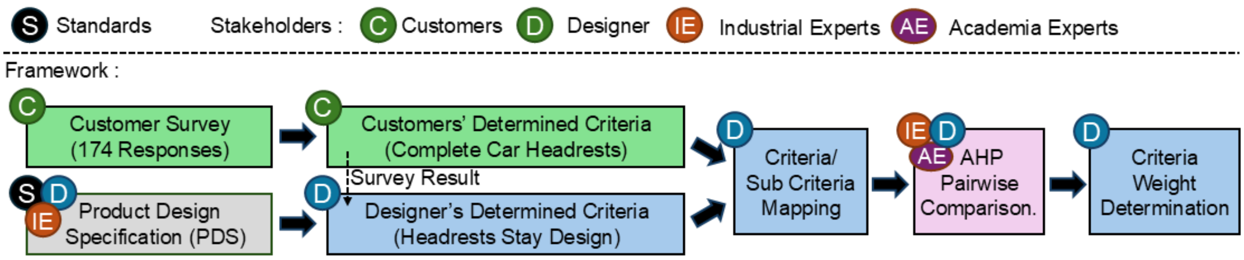


Fig. 2 *Overall framework and stakeholders' involvement for criteria weight determination*

First, an online questionnaire for prospective customers was prepared by the designer and distributed among respondents from different backgrounds via various messaging apps and social media platforms. In the survey, the customers were asked to rank a few criteria outlined by the designers that are based on literature and discussion with experts. However, if the criteria are not listed, the customer can also add their own criteria into the survey form. Concurrently, a PDS (Table 1) was prepared by the designer according to the design objectives, standards, and insights from industrial experts. Subsequently, four levels of the AHP hierarchy were constructed, and a collection of criteria established by the designer was outlined, mainly based on the PDS but also taking into account the results from the survey. Next, the customers' determined criteria and the designer's determined criteria were mapped in a table to demonstrate the connection between each of the criteria sets. Then, an AHP pairwise comparison matrix was built and distributed to five subject matter experts (SMEs) as shown in Table 2 for assessment. The assessment data were then inputted into an AHP Excel template with multiple inputs by Goepel [30-31] for criteria weight determination.

Table 2 *List of subject matter experts*

Category	Position & organization	Relevant experience
Industrial Expert 1	Senior Manager Product Design Department Automotive Seat Manufacturer	More than 25 years of experience in the automotive sector, specifically in the seat design department.
Industrial Expert 2	Senior Engineer Engineering Operation Automotive Company	More than 20 years of experience in the automotive sector, including in-charged of seat section.
Academic Expert 1	Senior Lecturer PhD Holder Malaysia Public University.	More than 15 years of experience in the automotive sector, and 3 years of teaching experience related to automotive safety and comfort.
Academic Expert 2	Teaching Engineer Malaysia Public University	More than 5 years of experience in the automotive sector with 4 years of experience working with an automotive seat manufacturer. Additionally, he has 3 years of teaching experience related to automotive safety and comfort.
Designer	Lecturer Malaysia Public University	More than 12 years of experience in the automotive sector and production engineering.

2.2 AHP Pairwise Comparison with Multiple Inputs

As mentioned in the previous section, the evaluation for each criterion was done through AHP pairwise comparison with multiple assessment inputs from five SMEs. The inputs were processed via the AHP Microsoft Excel template by Goepel Version 07.07.2022 [32]. In general, the Excel template comprises a summary sheet, and assessment sheets.

The summary sheet as shown in Fig. 3, is where the main data inputs (Table 3) were inserted. It also consolidates and summarizes all judgments using the geometric means of all decision matrices, with the main concerns of this study being the criteria weightage and consistency ratio. The data processing involved the eigenvalue problem, which was solved using the eigenvector method (EVM).

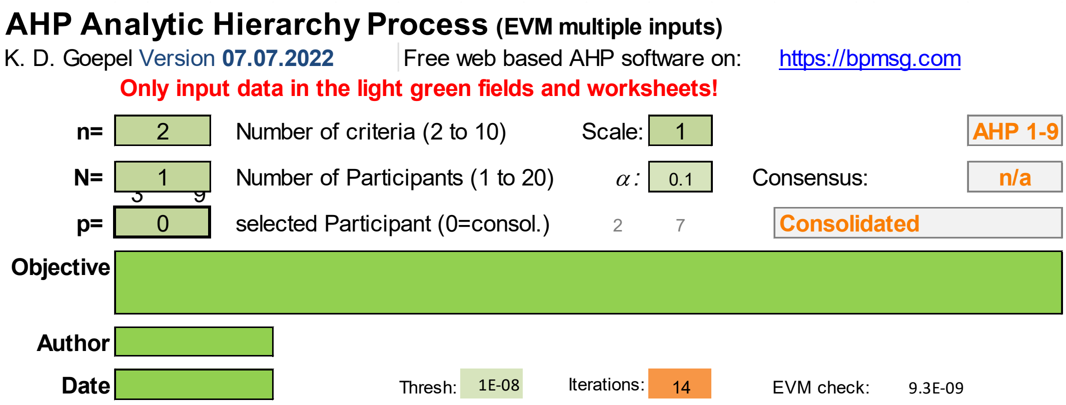


Fig. 3 *AHP Microsoft excel template: main data input [32]*

Table 3 *Main data for AHP excel template [32]*

Input data	Value	Remark
Number of criteria (n)	5	5 criteria to be assessed.
Number of participants (N)	5	5 SMEs as assessors.
Selected participant (p)	0	'0' to display consolidated results on the summary page.
Scale	1	Relation of Intensities x, and Pairwise element c: 1 indicates Linear, c = x
Alpha, α	0.1	Inconsistency threshold. The recommended value is 0.1 or 10%.

Additionally, the assessment sheets consists of individual worksheets for each SME to evaluate criteria through pairwise comparisons as shown in Fig. 4. Two criteria (or sub-criteria) denoted as criteria A and B were compared in terms of their importance over the other by the SMEs. The scales were according to the definition and explanation in Table 4.

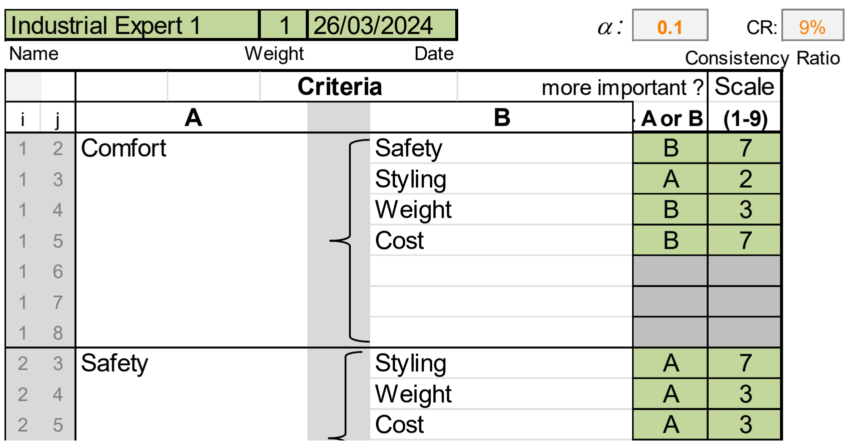


Fig. 4 *AHP Microsoft excel template: assessment data input [32]*

Table 4 *Assessment scale guide [32]*

Scale	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one element over another
5	Strong Importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another, and demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order.
2,4,6,8	To be used to express intermediate values	

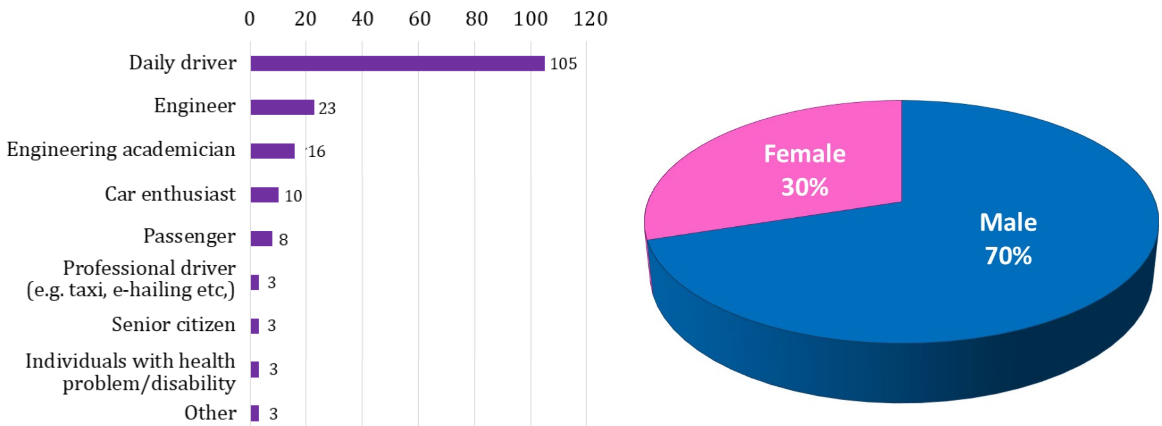
3. Results and Discussion

The results are divided into two sections: survey and criteria mapping, and criteria weightage as follows.

3.1 Survey and Criteria Mapping

There are 174 responses with the main demographic data as shown in Fig. 5. Most of the respondents are males with 70%, and the remaining 30% are females. Daily drivers are the highest category selected by the respondents, when they were asked to select one category that describes them the most. The remaining categories mentioned in sequential order are engineers, engineering academicians, car enthusiasts, passengers, professional drivers, senior citizens, individuals with health problems/disabilities, and other categories.

In the survey, the respondents were asked to rank the criteria for designing headrests according to them by using preferential voting. The results were then automatically analyzed in Microsoft Form by using the Borda count method, with comfort (18%) and safety (18%) being the highest ranked criteria based on the total score. The following criteria are height and adjustability (12%), as well as durability (12%). The remaining are shape and contour (11%), materials and padding (10%), style and aesthetics (8%), suit-to-seat design (7%), and others (2%). The survey results are shown in the customer-determined criteria column in Fig. 6. These results indicate that the majority of drivers prioritize safety, comfort, height, and adjustability (in relation to ergonomics) as their top concerns.



(a) (b)

Fig. 5 *Demographics of respondents: (a) Category; (b) Gender*

Customers' Determined Criteria (Complete Car Headrests) *Survey Question: Rank the most important criteria in designing headrests according to you.			Designer's Determined Criteria (Headrests Stay Design)								Biocomposite Material Selection
			Criteria	Safety		Comfort		Styling	Weight	Cost	
No.	Criteria	Results (174 Responses)	Sub Criteria	Factor of Safety	Maximum Stress	Support Area	Adjuster Rating	Style Rating	Volume	Manufac-turability Rating	To be Determined
1	Comfort	18%				●					
2	Safety	18%		●	●						
3	Height and adjustability	12%					●				
4	Durability	12%									●
5	Shape and contour	11%						●			
6	Materials and padding	10%				●					●
7	Style and aesthetics	8%						●			
8	Suit to seat design	7%						●			
9	Others	2%							●	●	

Fig. 6 *Survey and customer-designer criteria mapping results*

Four levels of the AHP hierarchy and a collection of criteria were established by the designer as shown in Fig. 7. The AHP hierarchy was made based on the PDS, while at the same time considering the results from the survey. The main goal is to get the best design of headrest stay, with the main criteria are safety, comfort, styling, weight, and cost.

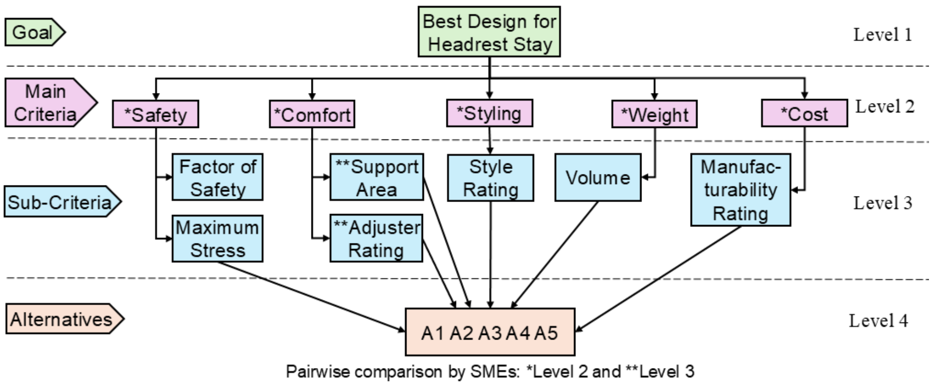


Fig. 7 *Four levels of AHP hierarchy framework*

Under the safety criteria, there are the Factor of Safety (FoS), and maximum stress as sub-criteria to evaluate the strength of the headrest stay. For the comfort criteria, the sub-criteria are the support area, and the adjuster rating to assess the level of support and adjustability of the headrest stay. The styling will be evaluated by SMEs based on the style rating. As the material is yet to be selected, the weight will be based on the part volume obtained from the Computed Aided Engineering (CAE) data. Finally, the cost will be evaluated based on the manufacturability rating by SMEs, as complex shapes are deemed to imply high manufacturing costs. All these criteria are to be used to evaluate all five shortlisted alternatives, namely A1 to A5. The mapping between the customers' determined criteria and the designer's determined criteria is also shown in Fig. 6 to show the relationship between each of the criteria sets.

3.2 AHP Pairwise Comparison

The AHP pairwise comparison results are classified into two groups: main criteria and sub-criteria. Table 5 presents the results for the main criteria, where two criteria A and B were compared by the SMEs. For instance, B7 shown in the top left corner of the result in Table 5 indicates that, the Industrial Expert 1 (IE 1) thinks that criterion B (safety) is very strong important (scale 7) compared to criterion A (comfort).

Table 5 *AHP pairwise comparison results for main criteria*

Criteria Comparison		Industrial Experts (IE)		Academic Experts (AE)		Designer (D)
A	B	IE 1	IE 2	AE 1	AE 2	D
Comfort	Safety	B7	A1	B2	B6	B5
	Styling	A2	A2	A3	A2	A2
	Weight	B3	A4	A1	A3	A3
	Cost	B7	B4	A1	A3	A3
Safety	Styling	A7	A4	A2	A5	A5
	Weight	A3	A4	A3	A6	A6
	Cost	A3	B2	A2	A6	A6
Styling	Weight	B2	A1	A2	A4	A2
	Cost	B3	B2	A2	A4	A2
Weight	Cost	B5	B4	A1	A2	A1

Same concepts applied to the pairwise comparison result for the sub-criteria shown in Table 6. Keep in mind that not all sub-criteria need to be evaluated by SMEs using pairwise comparison, except for the support area and adjuster rating under comfort criteria as shown in Fig. 7. Factor of Safety (FoS) for instance, is inversely proportional to maximum Von Misses stress, and therefore the importance is considered equal [33].

Table 6 *AHP pairwise comparison results for sub-criteria*

Criteria Comparison		Industrial Experts (IE)		Academic Experts (AE)		Designer (D)
A	B	IE 1	IE 2	AE 1	AE 2	D
Support area	Adjuster rating	A1	A4	A7	A7	A2

3.3 Criteria Weightage

The criteria weightages are the manifestation of the AHP pairwise comparison results. They are categorized into three groups: criteria weight (CW), sub-criteria local weight (SCLW), and criteria global weight (CGW). CW are results for level 2 (all main criteria), and SCLW are results for level 3 (sub-criteria for comfort and safety) of the AHP hierarchy framework. The SCLW for the Factor of Safety (FoS) and maximum Von Misses are divided equally into a 50:50 weightage ratio (SCLW =0.5 each). The remaining sub-criteria are single elements under the same main criteria; thus, comparisons are not applicable (SCLW =1).

The outcomes for CW and SCLW, are presented in Fig. 8. It can be seen that for CW, the highest weight goes to safety (45.7%), followed by comfort (16.7%), and cost (15.6%). The rest are styling (12.5%), and weight (9.5%). For SCLW under comfort criteria, support area was rated higher at 76.7%, compared to adjustability at only 23.3%.

The CGW is the product of CW and SCLW, shown in Fig. 9. FoS and maximum Von Misses stress are the most important criteria, with an equal value of 22.9%. Next are the manufacturability rating with 15.6%, support area with 12.8%, style rating with 12.5%, volume with 9.5%, and finally adjuster rating with 3.8%.

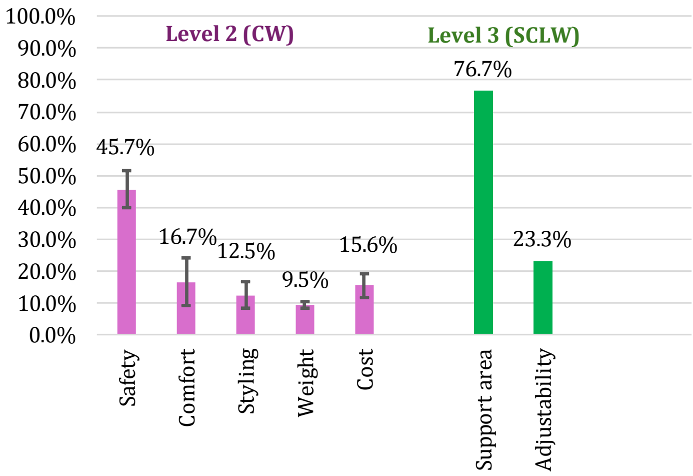


Fig. 8 *CW and SCLW for each criterion and sub-criterion*

Criteria	CW	Sub Criteria	SCLW	CGW
Safety	0.457	Factor of Safety	0.5	22.9%
		Maximum Stress	0.5	22.9%
Comfort	0.167	Support Area	0.767	12.8%
		Adjuster Rating	0.233	3.8%
Styling	0.125	Style Rating	1	12.5%
Weight	0.095	Volume	1	9.5%
Cost	0.156	Manufac-turability Rating	1	15.6%

Fig. 9 *CGW for each sub-criterion*

It can be seen that the SMEs give the highest priority to the safety criteria that comprise FoS and maximum stress. The second priority goes to comfort, with more priority given to the support area than the adjuster rating. Even though the exact criteria weightage value is unique for this study as it is based on the stakeholders assessment, the priority is aligned with the main purpose of the headrests, which is safety, especially during rear-end collision as highlighted in standards and also mentioned by the industrial experts during consultation. This is also proven by various studies on headrests that are mostly focused on safety and comfort [34-39]. Both safety and comfort criteria rank assigned by the SMEs are also seem to be aligned with customer expectations. Nevertheless, even though the cost is less prioritized by customers, it is highly rated by SMEs, especially industrial experts, as the criteria seen by them as a significant criterion, that in this case is rated by its manufacturability. The rest are style rating, and lastly the volume which affects the weight.

4. Conclusion

In conclusion, the assessment of biocomposite headrest design criteria was performed by pertinent stakeholders that involved customers and SMEs. The assessment by customers was conducted via a survey with 174 responses. The customers' determined criteria were then mapped with the designer's determined criteria that were meant for the AHP pairwise comparison matrix. The results show that the criteria that are highly prioritized by the SMEs are safety with 45.7%, comfort with 16.7%, and cost with 15.6%. The styling and weight are less prioritized, at 12.5% and 9.5%, respectively. The responses exhibited a CI of 2.8%, which is below the inconsistency criterion of 10%, thus suggesting that each expert provided a consistent response. In addition, the SMEs response seems to be in line with customers' expectations except for the cost, which is somewhat higher from the SMEs' point of view. The study demonstrates how the VoX can be systematically considered in decision making, in this case through the survey and AHP. The resulting weightage criteria thereafter can be utilized in any MCDM method to conduct the analysis required in further stages of product design and development. This framework can also be used for other product designs with an identical nature.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***framework design:*** *Khairul Azri Azlan, Muhd Ridzuan Mansor;* ***data collection, and analysis:*** *Khairul Azri Azlan, Muhd Ridzuan Mansor;* ***examination of results:*** *Khairul Azri Azlan, Muhd Ridzuan Mansor, Effendi Mohamad, Teruaki Ito;* ***draft manuscript preparation:*** *Khairul Azri Azlan. All authors reviewed the results and approved the final version of the manuscript.*

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