

A Decision Support System for Computer Chair Selection: Leveraging the Simple Additive Weighting Method

ABSTRACT

Aims: The objective of this study is to develop and construct a decision support system utilizing the simple additive weighting method to aid in the selection of a computer chair. Subsequently, user satisfaction with the created decision support system for computer chair selection will be assessed.

Study design: This research is motivated by the challenges frequently encountered in the furniture industry, as uncovered through interviews with the proprietor of a furniture store.

Place and Duration of Study: Department of Informatics, Universitas Multimedia Nusantara, between January 2023 and July 2023.

Methodology: Problem identification with the furniture owner is the initial step in this research. A literature review is then conducted to gather information about the research's theory. Design and analysis are then conducted based on the findings of the literature review. Subsequently, an application is developed, followed by testing and comparison. Finally, evaluation and documentation are completed to draw conclusions from this research.

Results: The research study employed the EUCS technique to obtain conclusions, and a questionnaire was administered to assess user satisfaction with the system being investigated. The result obtained suggests a satisfaction rate of 80.47%. Based on the findings acquired, it can be deduced that the execution of the development of the decision support system for the selection of computer chairs was efficiently carried out.

Conclusion: Based on the outcomes of the user satisfaction test utilising the EUCS questionnaire, it can be inferred that the design of the decision assistance system for selecting computer chairs is deemed acceptable and effectively utilized by users.

Keywords: Computer Chairs, Decision Support Systems, EUCS, Simple Additive Weighting

1. INTRODUCTION

In an era characterized by rapid technological progress, there is a discernible trend towards digitization, whereby tasks traditionally performed manually or in non-digital formats are gradually being transformed into digital processes[1]. Undoubtedly, as a result of this transformation, a significant portion of the populace now relies on computers as mediators for their routine activities, encompassing education, commerce, and professional endeavors[2]. The activity involves not only the utilization of computers, but also the incorporation of supplementary elements such computer tables, computer chairs, and other supporting items [3].

For individuals who do not engage in prolonged computer usage, the aforementioned factors may not hold significant importance. However, for those who partake in extended computer-related activities, such auxiliary elements play a crucial role in enhancing concentration and comfort [4]. In a scientific study titled "The Relationship between the Ergonomics Level of Chairs and Students' Concentration Levels in Schools: A Nationwide Study," Suryani et al. assert that the degree of ergonomics in chairs plays a crucial role in preventing decreased

31 attention levels among students across the country. The Slah District in Kulon Progo,
32 Yogyakarta, asserts that various activities such as attending school, college, playing games,
33 and working necessitate concentration and comfort while sitting in front of a computer for
34 extended periods [5], [6]. The ability to maintain focus and comfort is closely tied to the
35 quality of the computer chair utilized during these activities [7].

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37 A preliminary survey was done on January 25, 2011, involving 105 students from Higher
38 State High School 1 Lower Country. Through the administration of questionnaires, it was
39 shown that a significant proportion, specifically 60% of the students, expressed discomfort
40 with studying in classrooms that had been previously utilized. According to the data provided
41 in the study, a significant proportion of participants reported experiencing various physical
42 and mental symptoms during their academic activities. Specifically, 72.38% of respondents
43 reported feeling sleepy during lessons, while 52.38% experienced dizziness. Furthermore, a
44 substantial 91.42% of participants reported being unable to concentrate effectively while
45 studying. Additionally, a considerable 82.85% reported feeling tired and fainting, while
46 38.09% experienced pain in their back and thighs. Moreover, 12.38% of respondents
47 reported experiencing pain in their arms, while 22.85% reported pain in their neck and
48 shoulders. Furthermore, 16.19% reported having stiff hands, and 28.57% reported feeling
49 anxious. Additionally, 21.90% reported experiencing numbness in their legs, while 7.62%
50 reported feeling a sense of heaviness. Lastly, 24.76% reported feeling unbalanced when
51 transitioning from a seated to a standing position after an extended period of sitting. The
52 selection of an ergonomic computer chair is of utmost importance when engaging in a range
53 of activities, given the inherent variances in these activities and their respective durations [6],
54 [8]. The selection of an inappropriate computer chair can have a substantial influence on an
55 individual's ability to concentrate, experience comfort, and maintain general health
56 throughout extended periods of computer-related activities. [9], [10].

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58 In a recent interview, Victorian Jaya, proprietor of a furniture company established in 2002
59 called Father Samuel, shared insights into the range of furniture items available for sale,
60 including chairs, tables, and other enduring pieces. Clients often face challenges and
61 experience a dearth of knowledge when confronted with the chore of choosing computer
62 chairs. The aforementioned issues stem from a deficiency in comprehending the diverse
63 criteria and accompanying factors that ought to be taken into account when engaging in the
64 decision-making procedure [11], [12]. The factors to be taken into account encompass cost,
65 seat width, seat height, and backrest height. The necessity of implementing a decision
66 support system (DSS) for seat selection arises from the complexities involved in supporting
67 customers in choosing computer seats that meet their individual needs and preferences. The
68 decision support system (DSS) will employ the basic additive weighting method in order to
69 enhance the decision-making process.

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71 The rationale behind employing the saw approach is in its widespread recognition and
72 extensive application within the context of decision making involving several attributes.
73 (MADM). The MADM (Multiple Attribute Decision Making) approach is employed to identify
74 the most optimal choices from a set of alternatives based on specific criteria [13], [14].
75 Additionally, it should be noted that this particular approach is highly appropriate for
76 conducting calculations on a smaller scale. The primary objective of this research endeavor
77 is to assess the degree of user satisfaction pertaining to the computer seat decision
78 assistance system [15], [16]. Once the aforementioned objective is attained, it is anticipated
79 that the developed system will be instrumental in benefiting society, particularly individuals
80 lacking proficiency in identifying computer chairs that align with their requirements and
81 preferences. The preference or referral to clients seeking to purchase a computer seat may
82 be based on specific criteria. It is anticipated that the provision of a comfortable seating

83 arrangement will prove beneficial, particularly for individuals engaged in prolonged
84 computer-based tasks.

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86 **2. MATERIAL AND METHODS**

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88 The first phase of this study involved problem identification. During this phase, the problem
89 was identified as the challenges faced by the community in selecting computer chairs that
90 meet their specific requirements. This was accomplished through interviews with Mr.
91 Samuel, a furniture shop owner, as well as a survey conducted via Google form to gather
92 insights on the difficulties encountered when choosing computer chairs.

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94 The subsequent phase entails doing a needs analysis, wherein an examination is conducted
95 to identify the specific requirements necessary for the design and production of a decision
96 support system aimed at facilitating the selection of computer seats. During this phase, the
97 determination of system specifications, including the selection of software and hardware
98 components, is undertaken. Subsequently, a comprehensive examination of literature is
99 conducted, encompassing the essential knowledge pertaining to decision support systems
100 as well as the many methodologies employed in such systems. The objective is to identify
101 the most suitable approach that aligns with the available data and prevailing challenges.
102 During this process, the criteria including the computer chair were also examined. Following
103 the establishment of these criteria, interviews were undertaken with individuals involved in
104 the furniture industry. The purpose of these interviews was to ascertain the key factors that
105 significantly impact the selection process of a high-quality computer chair, taking into
106 consideration the specific requirements of the interviewees.

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108 The subsequent phase involves the design of the system, during which the operational
109 mechanisms and functionalities of the system are determined and analyzed. The design
110 include the identification of the input to be received by the system, the process of
111 computation, and the generation of the output to be produced by the system. Subsequently,
112 the advancement of the system is initiated, wherein the decision support system is
113 programmed in accordance with the identified difficulties, requirements, and designs.

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115 The subsequent phase entails process evaluation and testing, which is conducted once the
116 system or its components have reached a usable state. During this phase, the system
117 undergoes repairs to address any issues that have arisen, and enhancements to certain
118 features are implemented if deemed required. The concluding phase of this research entails
119 documentation, specifically encompassing the recording of the generated apps and the
120 outcomes of user approval.

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122 This study encompassed a systematic approach to system design, which involved multiple
123 steps such as the development of Data Flow Diagrams (DFDs), flowcharts, establishment of
124 table relations, production of data tables, and generation of mockups [17].

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126 The Data Flow Diagram (DFD) is a graphical representation that illustrates the movement of
127 data within an organization. It utilizes specific symbols to indicate the transfer of data that
128 takes place within the operations of a business system [18]. The system consists of two Data
129 Flow Diagrams, specifically referred to as level 0 and level 1. The level 0 Data Flow Diagram
130 (DFD) illustrates the interactions between the system and the two roles that are currently
131 accessible. The diagram presented in Figure 1 illustrates the transmission and reception of
132 data by the two roles.

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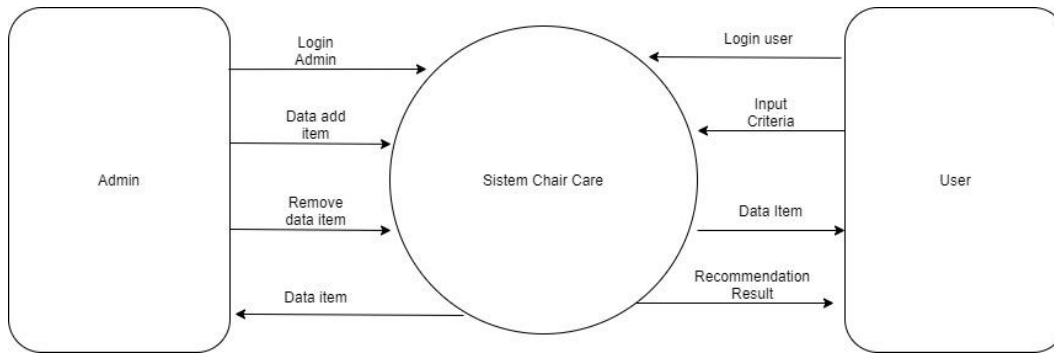


Figure 1. DFD level 0 web Chair Care

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At the first level of the Data Flow Diagram (DFD), there are four processes included. These processes are logging in, adding items, entering criteria, and displaying the results of suggestions or the results of the Simple Additive Weighting (SAW) calculation. During the item addition procedure, the administrator will upload item data to be included into the database. This data will include various attributes such as the brand, width, seat height, backrest height, price, URL, and a photo of the item. The data item flow facilitates the transmission of item data to both the administrator and the user, enabling them to access the available data items. Furthermore, the item data is directed towards the final score table, where it is utilized in the computation of the Simple Additive Weighting (SAW) method.

The subsequent step is inputting the criteria, wherein the user will proceed to enter the criteria in accordance with their preferences. The criteria data will be inputted into the criteria table and afterwards transferred to the final score table for utilization in the SAW (simple additive weighting) computation.

The final stage involves presenting the recommendation outcomes. During this stage, the system retrieves the data previously computed in the final score table and sequentially displays it to the user. The order of presentation is determined by the highest values obtained from the Simple Additive Weighting (SAW) calculations, in accordance with the user's specified preference criteria, as depicted in Figure 2.

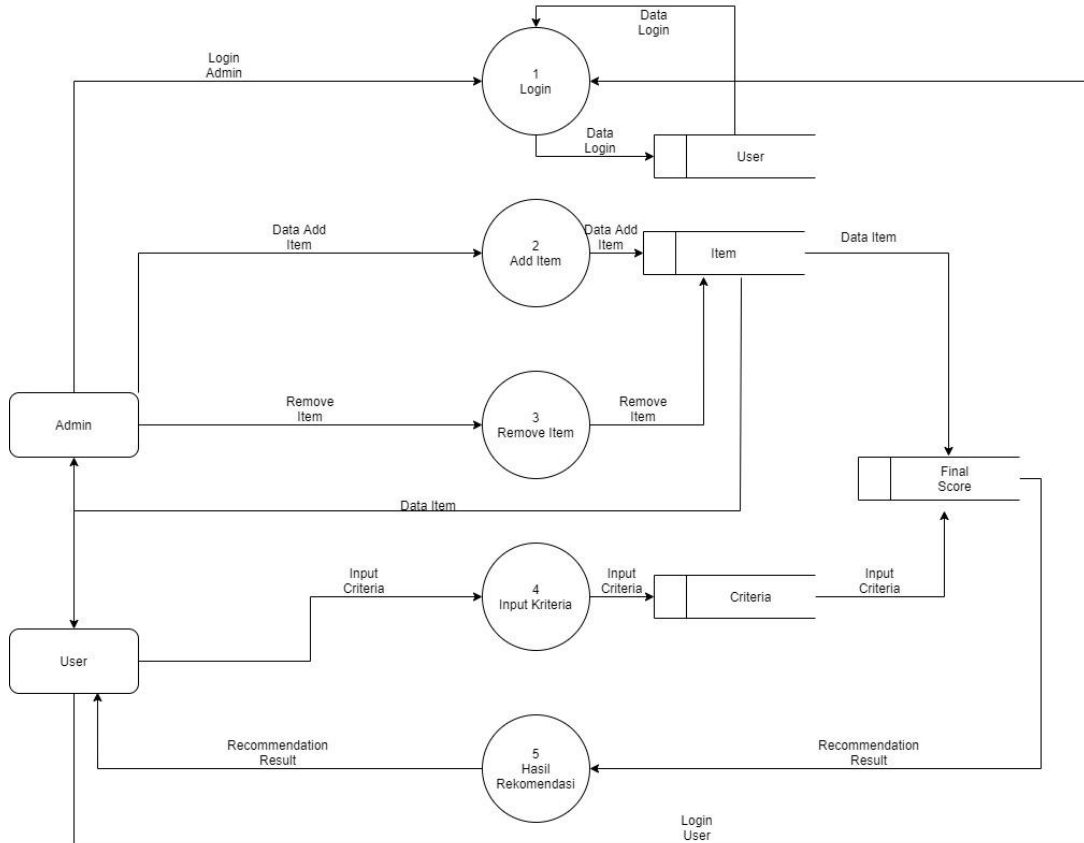


Figure 2. DFDlevel1webChairCare

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The initial step undertaken by the administrator when accessing the website involves the presentation of the home view. The administrator will have the ability to access the Chair Care website by providing their email and password on the designated page. In the event that the email or password submitted is inaccurate, a notification will be displayed indicating the incorrectness of the email or password.

During the authentication procedure, the system will also verify the role associated with the user's data. The Chair Care website encompasses two distinct roles, specifically the administrative role and the user role. If the role possessed by the user corresponds to the user role identified in the database, then the user is granted access to the dashboard page based on their role, namely the administrator position in this instance.

Upon accessing the "add item" page, users will be presented with a form that includes fields for entering the brand, width, seat height, backrest height, price, URL, and photo of the item. Once the administrator completes the form and selects the "add" button, the entered data will be recorded in the item table database. This data will then be displayed on the preceding dashboard page. In the event that the administrator decides against adding any data, they have the option to return to the dashboard page. The graphic presented in Figure 3 depicts the administrative flowchart.

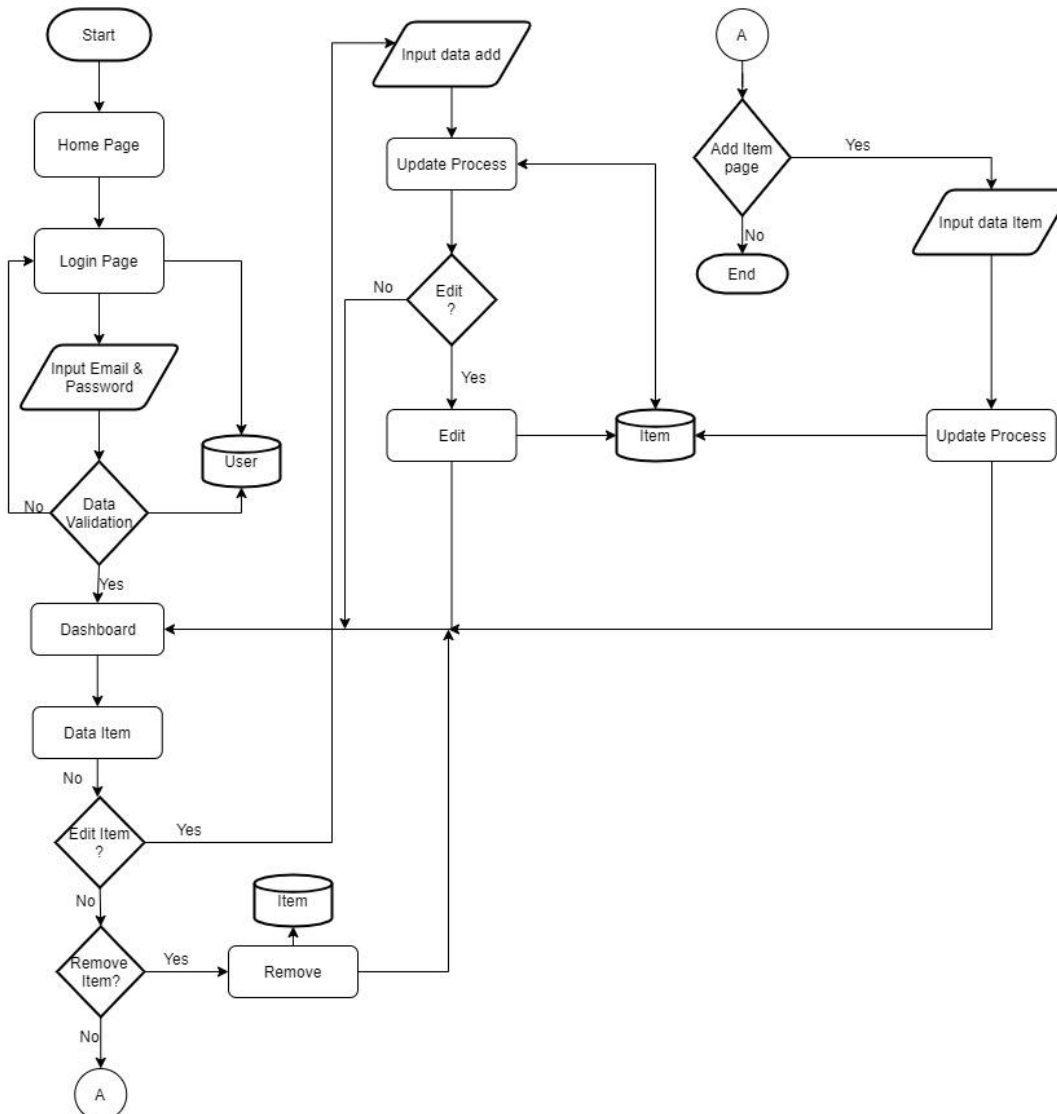


Figure 3. FlowchartAdmin for adding and editing dataset and criteria

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On the user's end, the initial step entails the identical process as that of the administrator's end, which involves signing in and afterwards validating the login credentials. Upon successful authentication, the user gains access to the user dashboard page. The recommendation page will provide a dropdown form that includes criteria for selecting an item based on the user's preferences. Once the user completes the form and initiates the result button, the data will be subjected to computation utilizing the Simple Additive Weighting (SAW) technique. This approach aims to ascertain the things that align with the criteria specified by the user. The webpage will present item information that aligns with the user's specified criteria, determined by the utilization of the Simple Additive Weighting (SAW) technique. Additionally, users will have the ability to access comprehensive data pertaining to the selected item. As depicted in Figure 4.

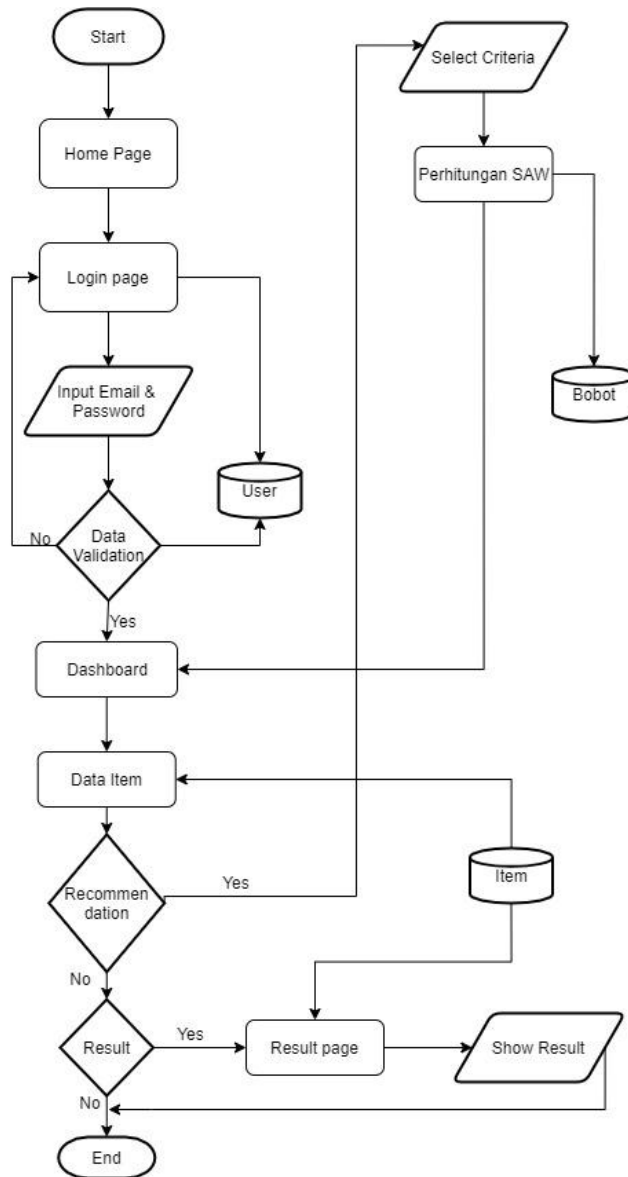


Figure 4. Flowchart User Decision Support for Computer Chair

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3. RESULTS AND DISCUSSION

After the completion of the design phase, the subsequent step involves the practical implementation of the designed flowcharts and data flow diagrams into a functional application. The following perspectives provide an analysis of the outcomes resulting from the execution of the concept. On the administrative page, upon successful authentication, the administrator is able to input and modify data pertaining to computer chairs using the integrated program, as depicted in Figure 5.

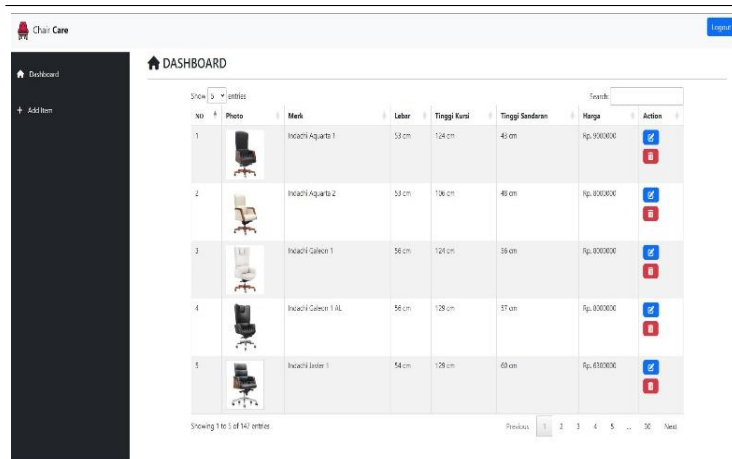


Figure 5. Admin Dashboard Page Image

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The user is able to input the desired criteria for the computer chair on their respective page, as illustrated in Figure 6. Subsequently, the recommendations generated through the utilization of the SAW algorithm will be presented to the user, as depicted in Figure 7.

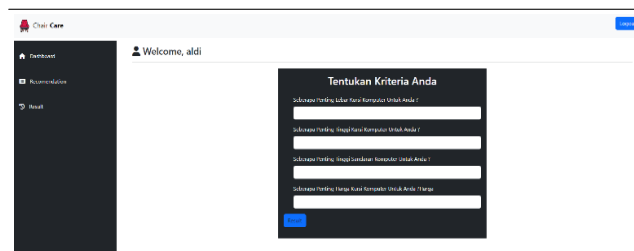
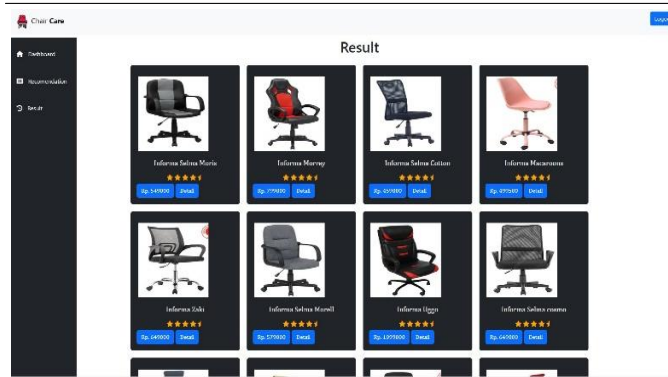


Figure 6. Input Form Criteria for choosing a computer chair

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Figure 7. Image of the recommendation results for choosing a computer chair using the SAW algorithm

The chair care decision support system for computer chair selection employs the simple additive weighting approach, also known as the chair care method. This system utilizes a MySQL database. The SAW method employed in this system involves multiple stages,

223 including the acquisition of user criteria values, the determination of user criteria weights, the
 224 identification of maximum and minimum values, the computation of the SAW score, and the
 225 storage of the resulting SAW calculations.

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 227 The purpose of the scenario test procedure is to validate or re-evaluate the computation
 228 process performed by the system. The testing procedure is comparing the SAW calculation
 229 outcomes produced by the system with the manually derived calculation results obtained
 230 through Excel, which have been conducted on 34 separate occasions involving diverse
 231 individuals. The simple additive weighting formula is employed in this calculation.

232 Table 1 represents a dataset containing product trial data that will be utilized in the ongoing
 233 trial procedure. The dataset included in this study consisted of 10 product data points, each
 234 containing information on four criteria for each product: seat width, seat height, backrest
 235 height, and seat price.

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 237 **Table 1. Table of Computer Chair Product Trial Data**

Brand	Seat Width	Seat Height	Backrest Height	Price
Vernon1AL	57	125	55	Rp.3.060.000
Capitol1	56	115	51	Rp.2.780.000
Lexton1	56	115	53	Rp.2.700.000
Mustang	65	129	75	Rp.2.508.000
PolkaGT1A	55	94	50	Rp.1.386.000
ViraHT0A	60	102	52	Rp.1.452.000
Lomo	55	84	58	Rp.799.000
Lucas	62	121,5	51,5	Rp.1.199.000
Zenia	59	92	49	Rp.699.000
CoralChair	50	94	44	Rp.899.000

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 239 This study conducted a user satisfaction test with the objective of assessing the ratings
 240 provided by those utilizing the system. At this juncture, the user will be extended an invitation
 241 to initiate their interaction with the system. Subsequently, they will be presented with a form
 242 encompassing ten inquiries pertaining to their subjective experiences and perspectives when
 243 engaging with this system. The subsequent query is an illustrative instance of an inquiry that
 244 will be posed to the user. The data pertaining to the question in this study is presented in
 245 Table 2.

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 247 **Table2. Table of User Satisfaction Questions**

No	Criteria	Question list
P1	Content	Is the use of the computer chair selection decision support system in accordance with the wishes of the user?
P2		Does this system provide clear information?
P3	Accuracy	Does this decision support system provide precise and accurate information?
P4		Can this system run according to the user's wishes on each page?

P5	Format	Does the display of the computer chair selection decision support system make it easy for users?
P6		Does this computer chair selection decision support system have an attractive appearance?
P7	Ease of use	Is this decision support system easy to use on any device?
P8		Is this decision support system easy for users to understand and use?
P9	Timeliness	Does this decision support system have good performance?
P10		Does this decision support system help users shorten the time in choosing a computer chair?

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Table 2 is a table of questions that will be asked to determine user acceptance of the system created using the EUCS method. After a list of questions was made, the questionnaire was distributed to 34 respondents, to see the results of user acceptance of the application that was built, and the results of the questionnaire can be seen in Table 3.

Table3.EUCS Questionnaire Table

Question list	Answer				
	VNA	NA	N	A	VA
Is the use of the computer chair selection decision support system in accordance with the wishes of the user?	13	17	4	0	0
Does this system provide clear information?	9	23	2	0	0
Does this decision support system provide precise and accurate information?	15	13	6	0	0
Can this system run according to the user's wishes on each page?	12	15	7	0	0
Does the display of the computer chair selection decision support system make it easy for users?	11	18	3	2	0
Does this computer chair selection decision support system have an attractive appearance?	3	21	7	3	0
Is this decision support system easy to use on any device?	5	23	3	2	0
Is this decision support system easy for users to understand and use?	8	17	8	1	0
Does this decision support system have good performance?	5	20	7	0	0
Does this decision support system help users shorten the time in choosing a computer chair?	11	17	5	0	0

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256 Based on the findings obtained from the conducted calculations on each of the established
257 criteria, an evaluation was performed to ascertain the efficacy of the developed system.
258 Specifically, in relation to the initial criterion of content, the assessment results indicate that
259 13 respondents strongly agreed, 17 respondents agreed, and 2 respondents remained
260 neutral in response to the first question. Regarding the second question pertaining to the
261 content criteria, denoted as Q2, the outcomes of the assessment indicated that 9
262 participants expressed a strong agreement, 23 participants expressed agreement, and 2
263 participants remained neutral. The final computation of the decision support system for
264 selecting computer chairs yielded a user acceptance rate of 80.47% for the recommendation
265 system. Based on the acquired results, it can be concluded that the system under
266 investigation is deemed acceptable and suitable for users as a decision support system in
267 the context of picking computer seats, utilizing the basic additive weighting method.

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269 **4. CONCLUSION**

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271 The findings of the conducted research, when compared with prior studies, indicate that the
272 variations primarily pertain to the determination of criterion weight. In earlier studies, the
273 criteria weights were derived directly from the user-selected criteria values. However, in this
274 research, the criteria weights were obtained by recalculating the user-selected criteria values
275 to determine the appropriate weights. The findings of this study indicate that the
276 development and implementation of a decision support system for selecting computer chairs,
277 utilising the basic additive weighting method, has been effectively created and constructed.
278 The efficacy of the SAW method and the accuracy of the system calculation outputs have
279 been substantiated by the conducted trial process. Furthermore, according to the outcomes
280 of user satisfaction assessments conducted using the EUCS questionnaire and its stated
281 criteria, the average score attained in this decision support system for selecting computer
282 chairs is 80.47%. Based on the obtained results, it can be inferred that the design of the
283 decision support system for the selection of computer chairs is deemed acceptable and
284 effectively utilised by users.

285

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287

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291

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