



**GUIDELINES FOR SELECTING THE APPROPRIATE
HEALTH-RELATED PRODUCT CASE STUDY: LUMBAR
SUPPORT PILLOW**

**BY
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was approved as partial fulfillment of the requirements for the degree of Master of
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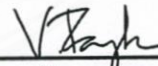
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ABSTRACT

Computers with desks and chairs are a hugely important part of human work. The worker may have to analyze the many data in a limited time. It calls for long, intensive hours of concentrated and repetitive work with the desk and chairs. Health back is also a popular option to support back when they sit in the wrong position. However, health back also easily accumulates the wrong position of ergonomic. They have almost some defects of existing product reference from ergonomic when they sit in the chair. Through the research, present to recommend a method of study that identifies an aspect of the analysis of the product on the market with ergonomic and engineering design, by comparison, existing product and found the best model to recommendation. Then the recommended design of the product, which can both satisfy customer demand and balance between production and cost. A recommend design may relieve low back pain by the existing production the market. Adapt and compare the good things from the existing product with the correct ergonomic and can fit any chairs. Then applied the technique of modified size and supportive ergonomic to long-term health when you work in the same position for a long time.

Since the product is well designed to support the correct ergonomic, we hope that this recommended product from the existing model will be using the memory foam material and can adjust to fit in any chairs and may relieve low back pain.

Keywords: 3F concept, Industrial engineer, Health related product, Low back pain, lumbar support pillow.



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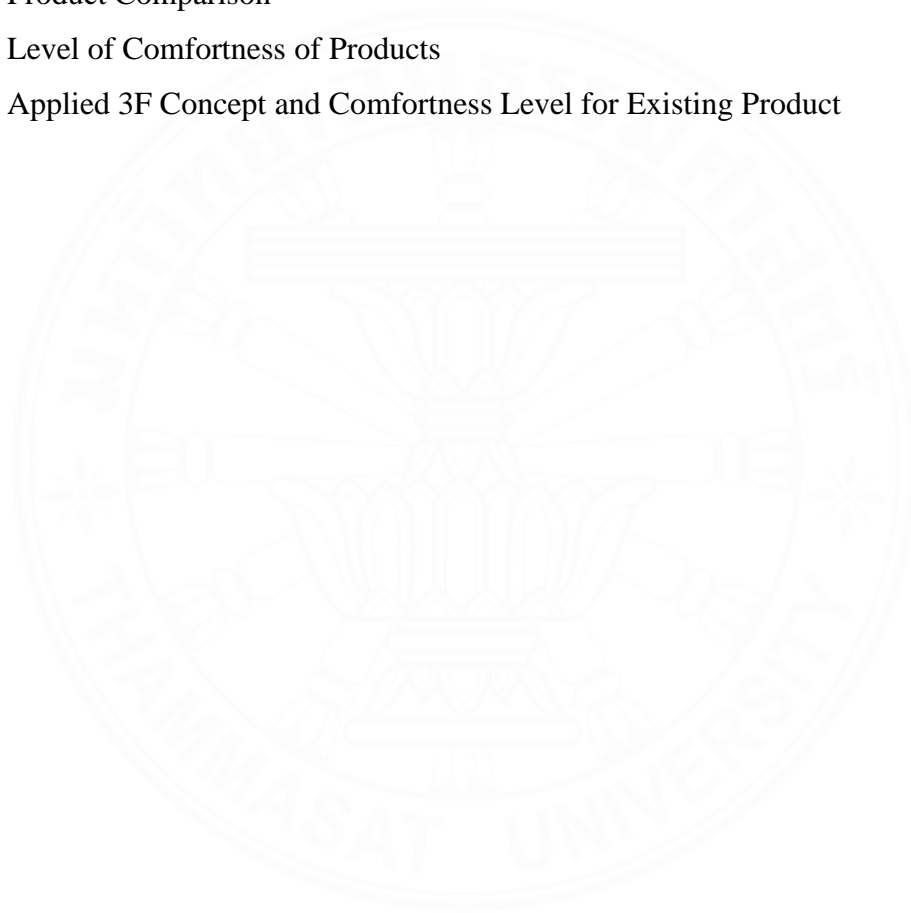
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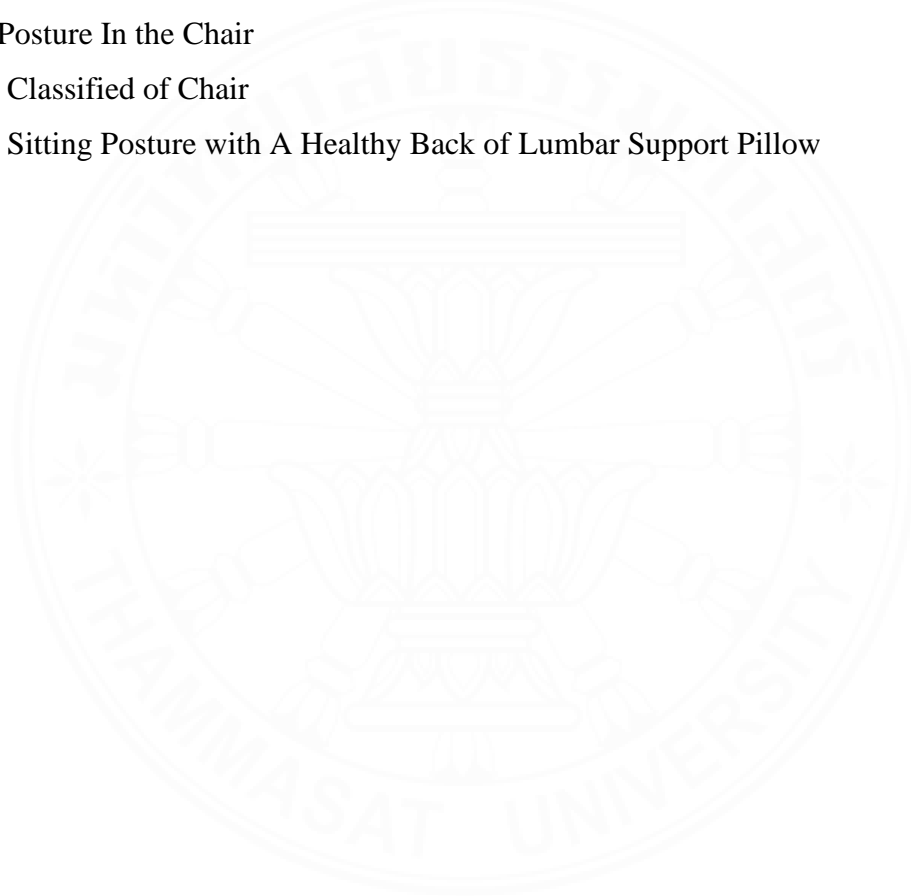
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CHAPTER 1

INTRODUCTION

Presented in this chapter is the introduction of automated machine for supporting rapid production, which can be categorized in six portions which are 1) Introduction, 2) Problem statement, 3) Objective, 4) Address issue, 5) Research scope, and 6) Limitation

1.1 Introduction

The new generations are more concerned about their health with a backache that is from sitting in the wrong ergonomic. Computers with desks and chairs are a hugely important part of human work. The worker may have to analyze the many data in a limited time. It calls for long, intensive hours of concentrated and repetitive work with the desk and chairs.

Health back is also a popular option to support back when they sit in the wrong position. However, health back also easily accumulates the wrong position of ergonomic. They have almost some defect of existing product reference from ergonomic when they sit in the chair.

The population of Thais in the urban area is 49.9% (Urban Population of Thailand, 2018) of Thai population, according to the CIA World Fact Book in 2018. Most people in the urban area are popular to use health back together with chairs. In addition, with the wrong sitting position, therefore you need to sit with the correct ergonomic for long-term health.

1.2 Problem statement

There are many products of health back in the market that needs to use in daily life to sit in the correct ergonomic in the long-term. The problems of the sit position that affects the health. Which the office lifestyle in Thailand may make it difficult to sit with the correct ergonomic (Ariyapong, 2018). Therefore, these have to let to our research that

is the key components by using ergonomic design and engineering design to recommend the best of products in the market.

1.3 Objective

To recommend a method of study that identifies an aspect of the analysis of the product on the market with ergonomic and engineering design theory.

To integrating the product design into the supply chain management.

1.4 Address issue

In this research, there are many factors to achieve the objective of project that leads to the final recommend design of the product, which can both satisfy customer demand and balance between production and cost.

1.4.1 Establishing target group

The area of interest for distributing the questionnaire is Bangkok Metropolitan

1.4.2 Identify the customer's needs

To recommend a product, customer demand effect to function, price, and design of the product. Designs that are based on what customers want and recommend the best of the existing product that may have less defect is a factor leading the customer to buy the product for better long-term health.

1.4.3 Data acquisition and interpretation

The analysis method that collected the data is the proposed way to get the exact data that will help to decide the development design and to know what the customers want. Thus, the design and execution of identifying nonconformities identified an objective analysis of optimization of the product to redesign in ergonomic. To achieve the final design, interpreting the results by using the product design and development

(PDD) (Robert Q Riley, 2020) and sitting ergonomic are the process of developing and creating the new product to meet the condition of consumers.

1.5 Research scope

In this part, several scopes and limitations have been concerned to achieve to recommend the health back to sit in the correct ergonomic with any chairs that includes having both feet on the floor, sitting up straight also means keep head straight. (Cmd, 2019)

Research scopes and limitations have been concerned in this research for developing the product can be categorized in 2 groups which are 1) Material of the product 2) Dimension of the product

1.5.1 Material of the product

Many materials can be used to make a health back for chairs but the suitable material for making the health bag is memory foam that can well withstand the force released by the waist and back. Memory foam will support and hold our lower back in the right posture and can stay put, cradling both sides of your spin without feeling rock hard. (The Mattress Firm Sleep Experts, 2018)



Figure 1.1 Memory foam (Robert Frontier, 2019)

1.5.2 Dimension of the product

The dimension of the product must be the proper size and fit with the chairs in a natural position and had all the features of a typical ergonomic office chair but it was

unique in that the backrest did not provide any specific support lumber. (Diane E Grondin, 2013)

1.5.3 Pillowcase

The case of pillow or cover material of the back support must be easy to launder and dries fast (Noggin and wink, 2018) so Nylon is easy to laundry and dries fast but is not often found in mattresses covers or let alone in a pillowcase. Therefore, Cotton can replace the Nylon material that can absorbent to sit on and easy to wash too and then Cotton becomes less expensive than linen or other material. (Dr. Rick Swartzburg, 2020)



CHAPTER 2

REVIEW OF LITERATURE

This chapter presents the short definition of Product Design and Development. The reviews of related research about the existing product of the heath bag.

2.1 Product design and development (PDD)

The product design and development (PDD) has been involved idea or concept generation, concept development and evaluation, manufacturing and testing or implementation of an artifact or service. The copes of design beyond industrial engineer design. Industrial design is concerned with the art of a product. The process of development varies between products with consumer needs. A good new product is the result of the method development efforts with the good define project goals. (Robert Q. Riley Enterprises, 2020).

2.2 Customer Requirement

Most people focus on a healthy lifestyle by getting sit in ergonomic when working time and exercise. Ergonomic sitting needs to have some support for the back and lumber to sitting in the correct ergonomic. The design of product should be compact in size, and support the correct ergonomic to reduce the backache that cause office syndrome.

2.3 Customer Perception

Referring to the normal method, the easiest health back that support back and lumber to be the correct ergonomic with comfort. But do not know if the consumer will sit in the correct ergonomic. It may cause the health back may support the correct sitting as well. Because the chairs cannot support the correct sitting ergonomic as the long-term working, you must discard and then by new of them to support the correct ergonomic.

2.4 Existing Products

As being said, there are many existing products in the market already, but mostly all of them are the same with different designs. Therefore, comparing the existing products in the market has been done to see flaws and strengths, so it could be used as a reference.

There are many online market sources to find the existing product, the sample has been analyzed wholly and narrowed down to four main sites, which are Amazon, Alibaba, and E-bay.

2.4.1 Product from Amazon

Table 2.1 Product from amazon (Xtreme Comforts, 2021)

No.	Product	Function				
		Memory foam	Fit with any chairs	Adjustable long strap	Support ergonomic	Removeable and washable cover
1	 <p>Powsure Back support for office chair</p>	✓	✗	✓	✓	✓
2	 <p>KINTTO lumbar support pillow</p>	✓	✗	✓	✓	✓
3	 <p>Lumber gray support pillow</p>	✓	✗	✗	✓	✗

2.4.2 Product form Alibaba

Table 2.2 Product from Alibaba (Sinowarm,2021)

No.	Product	Function				
		Memory foam	Fit with any chairs	Adjustable long strap	Support ergonomic	Removeable and washable cover
1	 Kuaou	X	X	X	✓	✓
2	 Office Driving Memory foam cushion for lumbar support	✓	X	X	✓	X
3	 Lumbar Cushion	✓	✓	X	✓	✓





2.4.3 Product from E-bay

Table 2.3 Product from E-bay (Wenbin Xie, 2021)

No.	Product	Function				
		Memory foam	Fit with any chairs	Adjustable long strap	Support ergonomic	Removeable and washable cover
1	 <p>Memory Foam Lumbar Back Support</p>	✓	X	✓	✓	X
2	 <p>Memory Foam Pillow Lumbar Support Cushion Home Office Car Seat Chair DS</p>	✓	X	X	✓	X
3	 <p>Memory Foam Lumbar Back Support Cushion Coccyx Pillow Backrest Car Office Tool</p>	✓	X	X	✓	X

2.5 Product Comparison

Table 2.4 Product comparison

Product	Function	Product	Function
 <p>Memory Foam Lumbar Back Support</p>	Memory foam Yes Fit with any chairs No Adjustable long strap Yes Support ergonomic Yes Removeable and washable cover Yes	 <p>KINTTO lumbar support pillow</p>	Memory foam Yes Fit with any chairs No Adjustable long strap Yes Support ergonomic Yes Removeable and washable cover Yes
 <p>Lumbar Cushion</p>	Memory foam Yes Fit with any chairs Yes Adjustable long strap No Support ergonomic Yes Removeable and washable cover Yes	 <p>Lumber gray support pillow</p>	Memory foam Yes Fit with any chairs No Adjustable long strap No Support ergonomic Yes Removeable and washable cover NO

After we explored the market, as a show before, we compared all of the best models in the market together and find the most suitable reference model, as shown in Table 2.4. The second model of the comparison table, KINTTO lumbar support pillow is the best model to be the primary model to recommend.

2.6 Expected product

After comparison the best model from the reference model, KINTTO lumbar support pillow. The expected design to recommend of the health back can be inferred in shapes that support ergonomic of sitting in the chair and the material of these can be memory foam that can be flexible and support ergonomic well.

From the reference model, a new design that is more innovative than the existing product could be developed. Adapt and compare the good things from the existing product with the correct ergonomic and can fit any chairs. Then applied the technique of modified size and supportive ergonomic to long-term health when you work in the same position for a long time.

2.7 The sitting posture

The sitting posture in the chair and the height of the workstation must be adjustable with a straight-back and horizontal thigh in spinal shape. To achieve the conventional sitting posture that the thighs rotate through 90 degrees but only some 70 percent of their turning to the horizontal. A working seat must give the least possible restrictive access to the workspace and activities. A seat shape that gets the better of some of these problems and has been used in several designs to support the back in the horizontal thigh. (E. N. Corlett, 2006)

2.8 Combine Product Design into The Supply Chain Management

The combined product design that is related into supply chain function provides opportunities for the reduction of the product cost, a higher experienced of serving consumer, as well as it reduces supply chain risks.

From the product design and supply chain capacities and capabilities reduces supply chain risk such as designing the product so the supply chain does not produce so fast enough or cannot deliver to the consumer.

Then the combined product design and functions across a supply chain may increase the supply chain performance through the design engineer perception the supply chain collaborating to a higher quality or more efficiency. (Omera Khan, 2016)

CHAPTER 3

METHODOLOGY

3.1 Key component

To guide the research, we use the literature review to recommend the best existing product. The literature review has revealed the existing product that from several online markets with popular searched and sale, the sitting posture in workstation and the combining product design into the supply chain management.

All of the healthy back design, there is the same key component that is comfortable, healthy and less expensive.

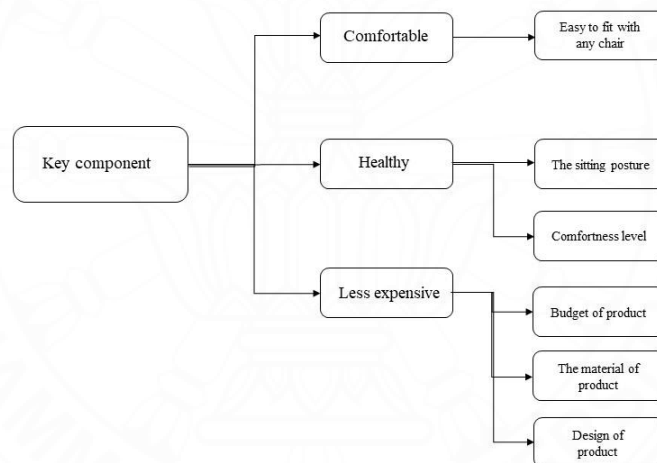


Figure 3.1 Key component

The first component is comfortable. The support back must be easy to adjust with any office chair in a natural position and had all the features of a typical ergonomic office chair and to achieve the conventional sitting posture that the thighs rotate through 90 degrees. The support back pillow could adjustable long strap to support this component.

The second component is healthy. Healthy means when consumers use the product that can support them to sit in the correct posture with an erect back and horizontal thigh in spinal shape to reduce the backache that may lead to office syndrome

or any else that comes from the incorrect sitting posture. So, the healthy back of the lumbar support pillow allows space for the back to decrease lumbar flattening during sitting or backache while sitting in the same posture for a long time.

The third component is less expensive. The product is a less expensive must including the material of the product that integrating into the supply chain management and design of the product. The correct design which match with area of back must reduce the unnecessary cost in the production process. Then the integrating product design and functions across a supply chain may increase the supply chain performance through the design engineer perception the supply chain collaborating to a higher quality or more efficiency.

3.2 Research concept

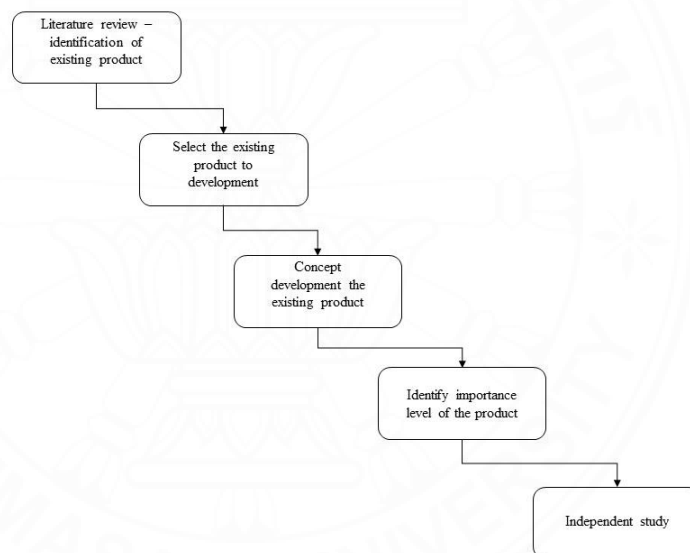


Figure 3.2 Research concept

The objective of this study is present a recommend method of study that identifies an aspect of the analysis of the product on the market with ergonomic and engineering design theory.

In order to complete the proposed, develop of the healthy back of the lumbar support pillow will be constructed, five main phases are required. Start with identify problem. Next, the second phase is literature review. For the third phase is concept

development the fourth phase is identification of importance level of product cost and translate needs to be conceptual design and the last phase is independent study (Figure 3).

3.3 Usefulness of products

The usefulness of products is defined as the consumer's perception that can provide some guidelines about existing product should be considered a benefit selected for a new design and development that consumer's needs. (Guoxin Li, 2014)

3.4 Comfort level

After research, the problems of the healthy back of the lumbar support pillow depend on shape and compression force that affects low back pain (LBP) that consumers need to decrease. The healthy back of the lumbar support pillow is provided to people that have low back pain by performing most work tasks in the same posture for a long time with the purpose of primary prevention of LBP.

In all the concepts of research, there are four levels of comfort of products for the classification of healthy back of the lumbar support pillow.

Table 3.1 Level of comfortness of products.

Code	Points in a scale of 4	Level of comfortness	Type of comfortness	Product examples
A	4(>3.0 - 4.0)	Very high	<ul style="list-style-type: none"> • Consists of all potential features and benefits • Softness and firmness which incorporate high side supports 	Ergonomic chairs, Gaming chairs with ergonomic design
B	3(>2.0 - 3.0)	High	<ul style="list-style-type: none"> • The augmented benefits become expected benefit • Attach securely to different chairs as needed. 	Lumbar foam cushion with belt
C	2(>1.0 - 2.0)	Medium	<ul style="list-style-type: none"> • Consists of the basic needs • Fundamental benefit for consumer • Great for specific chair or activity 	Heathy back lumbar cushion half shape of low back
D	1(0.0 - 1.0)	Low	<ul style="list-style-type: none"> • Customers have a minimum set of expectations about a product • The minimal purchase conditions • Flexible and not fit into sitting posture 	Heathy back support without foam cushion

According to Table 3.1, the level of comfortness of a product remains from an existing product. The biggest consideration when buying a healthy back of lumbar support pillow is whether it will relieve your low back pain and discomfort from the frequency of postural changes over time during work (P. Vink, 2012). Customers need to test several pillows to get exactly the right fit because many are listed as one size can fit all, but their actual size does make a noticeable difference feels when sitting with it

3.5 3F Concept

According to customers' perception and comfortness level of product, "size" or "fit" is key of recommending design which is customer first consideration when they test several pillows to get the right fit since its structure is quite simple to consider. Thus, for supporting the "Form, Fit and Function" concept, the size of healthy back support lumbar position, material, and comfortable of customer target are taken into consideration. The phase Form-Fit-Function (FFF) approach can describe the characteristics of the product in the market to find the best.

3.5.1 Form

The consideration of Form, these following topics are applied shape, size, mass, weight, dimensions, color, and other visual parameters that uniquely distinguish a part.

A healthy back of lumbar support pillow should be fit the sitting posture in the chair and the height of the workstation must be adjustable with a straight-back and horizontal thigh in spinal shape. To achieve the conventional sitting posture that the thighs rotate through 90 degrees but only some 70 percent of their turning to the horizontal as shown in Figure 4. (E. N. Corlett, 2006)

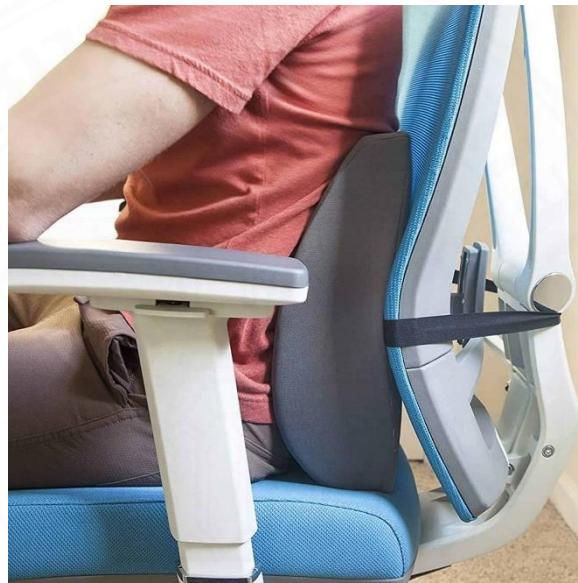


Figure 3.3 A healthy back of lumbar support pillow should be fit the sitting posture in the chair

Therefore, the guidelines for selecting suitable size of a healthy back of lumbar support pillow for different chair which are classified as three main groups: designer chair, semi adjustable, and fully adjustable (Thebeecheshotel.com, 2021) with mention as Figure 5.



Figure 3.4 Classified of chair

3.5.2 Fit

The definition of Fit can be mentioned as the ability of an item to physically interface which include the material that expected in the product to make a comfort to the customer when they use.

In this study, memory foam is applied as the key tool for fit the product with customer into comfort sitting posture, since memory foam will support and hold our lower back in the right posture and can stay put, cradling both sides of your spin without feeling rock hard. (The Mattress Firm Sleep Experts, 2018)

The other keys consideration is Overheating since memory foam can absorb and hold onto heat during offers a combination of softness and firmness with the product while using.

3.5.3 Function

The consideration of Function can be mentioned as the action that a part is intended to perform. For a healthy back of lumbar support pillow, the activities performed by the comfortable into sitting posture of target users is the key consideration. The curved cushion of the healthy back of the lumbar support pillow mentioned in much

research with respect to the angle of sitting posture of the user is implied about the comforts that should be provided during a period of prolonged sitting. (Vincenzo Casciolic, 2016) The healthy back of the lumbar support pillow should be fitted with the sitting posture with any chair classification. Figure 6



Figure 3.5 Sitting posture with a healthy back of lumbar support pillow

CHAPTER 4

RESULT

This chapter presents a case study of assessing the comfortness of a healthy back of lumbar support pillow with an existing product, which is considered in chapters 2 and chapter 3.

4.1 Results

This part will summarize the result from applied 3F concepts and comfortness level. From the existing product, the 3F concepts and comfortness level have the ability to meet the objective of this project.

4.1.1 Applied 3F concept for existing product





According to customers' perception and comfortness level of product, existing product are applied 3F concepts and comfortness level which are "Form, Fit and Function" concept is key of recommending design which is customer first consideration when they test several pillows to get the right fit since its structure is quite simple to consider.

A healthy back of lumbar support pillow should be fit the sitting posture in the chair and the height of the workstation must be adjustable with a straight-back and horizontal thigh. Ergonomically designed will help low back or full back to relieve the pain.

Memory foam is applied as the key tool for fit the product with customer into comfort sitting posture. The other keys consideration is overheating since memory foam can absorb and hold onto heat during offers a combination of softness and firmness with the product while using.

For a healthy back of lumbar support pillow, the activities performed by the comfortable into sitting posture of target users is the key consideration. Then it will be adjustable and hold to proper fit with any chair classification by the long strap for supporting the Form and Fit concepts and the hygiene function may be the other consideration by removable and washable the cover.

Table 4.1 Applied 3F concept and comfortness level for existing product

				
	Memory Foam Lumbar Back Support	KINTTO lumbar support pillow	Lumbar Cushion	Lumber gray support pillow
FORM	Ergonomically designed to help lower back and tightness	A KINTTO lumbar support pillow that simultaneously reduce the low back pain	Cushion tends to flatten over time even though designed cover full back and proper to sitting posture	A lumbar gray support pillow simultaneously by full back ergonomic sitting posture
FIT	Memory foam used that conforms to the back to deliver maximum pain relief	Memory foam is long, wide and deep to provide full back support	Memory foam is relief force while sitting even though plastic mesh structure does not conform the back pain relief	Memory foam high-quality to ensure the pillow is constructed and conforms the force released by the waist and back.
FUNCTION	Cushion is very bulky. Then can adjustable with every chair classification even though can't support to proper sitting posture	The pillow cover is durable to washable and maintains its appearance for an extended period of time. Then comes with long straps to hold with the chair	The cotton cover with plastic mesh structure is simple to remove and washable but flexible and does not proper to sitting posture	The pillow is long, wide and cover full back almost reached to neck. But the pillow may slide if the chair does not have armrest
COMFORTNESS LEVEL	B	B	C	B
PRICE (₹)	1000 - 1500	1300-2000	600-1000	1800-2400

For the result, the product that related with comfortness level in B code are almost level in the market even though the range of price is different by the ergonomically designed that cover area of the back, such as the memory foam lumbar back support product is designed to cover only lower back.

4.2 Discussion

According to table 4.1, the existing products are almost in the same level of comfortness level, in the table result, the comfortness level of product is high comfortness or 3 (>2.0-3.0) scale. All of existing products are following the form and fit concept by ergonomically design to support sitting posture even though different pattern of product and use memory foam material to absorb and hold the heat during offers a combination of softness and firmness with the product while using. For the form

concept, there are tiny different in strap and removable and washable of the cover for hygiene. The other consideration that referenced by amazon is price, there are in different range of price by the design that related with form concept.

The 3F concepts and comfortness level are useful selection to appropriate in this case study: lumbar support pillow. Therefore, the memory foam lumbar back support product is the best selected by existing product that related with the 3F concepts and comfortness level in lowest rang of price in the market.



CHAPTER 5

CONCLUSION

5.1 Conclusion and contribution

In conclusion, 3F concepts appear to be an able key considering the healthy back of the lumbar support pillow with a proper fit into the limited budget for customers. In addition, the comfortness level with sitting posture and shape of the design appears to be a significant point to consider before buying the healthy back of the lumbar support pillow even though the material does not have memory foam that will withstand the force released by the waist and back. Although the fully adjustable chair will be the best choice for relieving low back pain, then the healthy back of the lumbar support pillow is the best option that customers can easily carry and adjust with any chair classification and buying with several ranges of budget.

This project is one of the suggestions for guidelines for selecting the appropriate health-related product case study: lumbar support pillow. Because during this period, people are increasingly turning to work from home. Workstation while using computer working even with correct ergonomic posture but it might be a period of prolonged sitting. Therefore, lumbar support pillow can help relieve the low back pain which matches selecting with proper size and material.

In addition, if it is applied to other types of health-related product, such as mouse and gaming chair, which the design of the product are related by ergonomic and 3F concept. It is necessary to have basic knowledge and may need additional parameters or factors in the comfortness level and 3F concepts such as the size of the product, material, and comfortness level of the product while testing several similar products. Therefore, the performance of the 3F concept and comfortness level can be improved.

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