



SASTRA
ENGINEERING · MANAGEMENT · LAW · SCIENCES · HUMANITIES · EDUCATION
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INTRODUCTION TO ENGINEERING DESIGN

PROJECT WORK

INPUT DEVICES

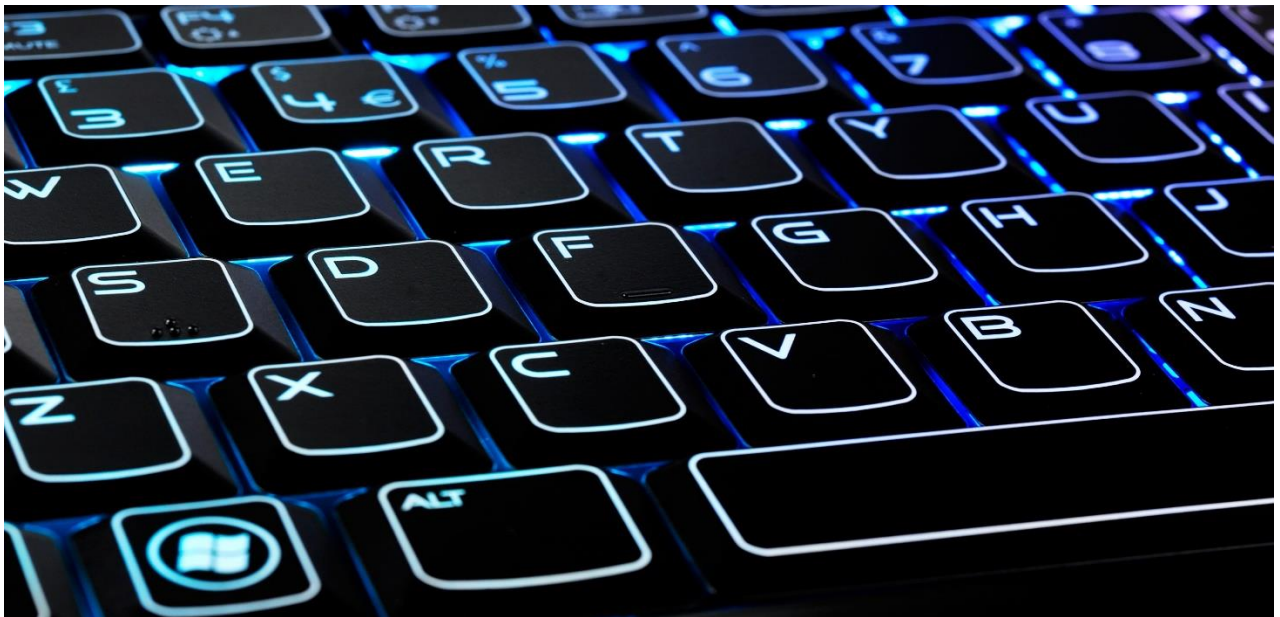
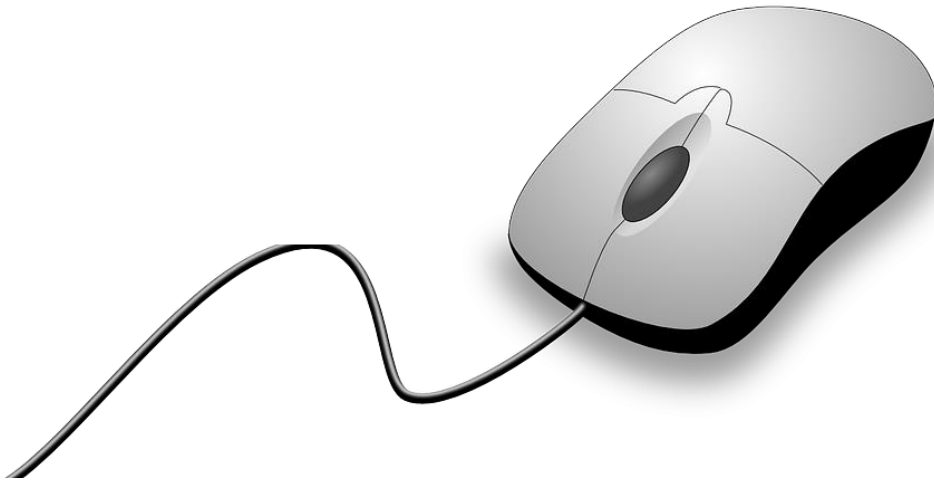
KEYBOARD & MOUSE

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Overview:

The two pieces of hardware that I used to write this project are a Keyboard and a mouse. The need to capture data quickly and accurately has led to a wide range of input devices. But these two stood out throughout the rapidly advancing computer era right from the invention of the Apple computer by Steve Jobs in 1976 until this very date.

Brief History:

The computer keyboard alphabetic layout follows the original QWERTY design of the first typewriter. Many new layouts have come for faster typing like DVORAK but the standard is still the QWERTY design is based on a layout created for the typewriter in 1873. Mouse played a very instrumental role in the transition of computers from strictly for professional purposes to general day to day users by removing the steep learning curve due to the use of command lines and terminals. The mouse was then adopted by the Alto project at PARC and became a foundational component of the GUI (Graphical User Interface)

Need:

1. **To input data:** The keyboard allows the user to type letters and numbers and the mouse allows the user to position the cursor, draw and execute program functions by clicking mouse buttons.

2. **To interact with the device:** Most interactions with a computer involve using a keyboard and a mouse. Interaction can be done in various ways but mouse and keyboard are the most commonly used

Problem statement:

This project is aimed to design a new and improved version of the existing keyboard and mouse with additional features in the form of developmental design. This project will be made according to core design principles.

Constraints:

Cost of the product would be the primary constraint because the consumer electronics market is very price sensitive.

While designing a mouse or keyboard weight and size (Dimensions) of the product is very important and should be within limits.

Considerations:

Functional considerations:

The keyboard and mouse should be able to support all kinds of various devices like PC (Personal computer), Laptop, Gaming console etc.

Quality considerations:

Durability and reliability of the device are very important without compromising the aesthetics of the device. The ergonomic design also has its value and niche audience.

Safety considerations:

Both mouse and keyboard are fairly simple products in terms of their physical electronic components but basic safety measurements are important.

Manufacturing considerations:

Supply chain should be managed well along with predictions of future market requirements.

Economic considerations

Since both keyboard and mouse are used across the globe generic design is more viable than niche design which may cause low sales and increase the cost of the product.

Environmental, Social & Legislative considerations

Electronic waste is one of the biggest problems because it is not easy to decompose so using eco-friendly and reusable plastic is better.

Objectives:

1. To increase typing speed

Improved typing speed helps to do things a lot faster. Many tasks like data entry, browsing and navigation of web pages can be done much more efficiently.

2. To reduce errors

A typographical error (often shortened to typo), also called misprint is one of the most common problems among users which reduces their productivity. A good comfortable keyboard can reduce these errors to a large extent.

3. To reduce hand/wrist Pain

Although mouse manufacturers have attempted to design and produce ergonomic mice, it seems that these mice put pressure on soft tissues of the hand/wrist region and also cause rotated posture of forearm bones (ulna and radius). An ergonomic mouse helps to reduce this pain.

Specifications:

Keyboard	Mouse
US QWERTY keyboard Spill-resistant design Tilt legs 10-Key Number pad Special Keys: 15 function keys Up to 5 million keystrokes	Sensor technology: Smooth Optical tracking Number of buttons: 3 (Left/Right-click, Middle-click) Scroll Wheel: Yes, 2D, optical
Height: 137.5 mm Width: 435.5 mm Depth: 20.5 mm Weight: 475 g	Height: 97.7 mm Width: 61.5 mm Depth: 35.2 mm Weight: 70.5 g
2 AAA batteries (30 days)	1 AA battery (12 days)
USB Type-C Cable	USB 3.0 Type-A Cable
2.4 GHz NANO receiver up to 10 meters	2.4 GHz NANO receiver up to 10 meters

Critique from personal experience Features

Keyboard

The best feature of my keyboard is the Mechanical keys which is a bit old school but the vibe and comfort of typing is a trade-off worth taking against its counterpart membrane keyboard which has a better typing speed. Can't forget RGB lighting as well which is essential for gamers.

Faded keyboard keys is a problem faced by almost all laptop and computer users along with me. Prolonged use of a keyboard for typing rubs off the visibility of alphabets, numbers and other characters which disgusts me.

Mouse

The best part of my mouse is it is completely wireless and along with that, it does not require any special receiver it works on Bluetooth technology which enables it to use for two different laptops at the same time.

My mouse has very low CPS (Clicks per second) which is useful for games like Minecraft. High CPS gaming mice are on the expensive side of the price spectrum which disgusts me.

Wish:

In this section, we shall discuss the non-exciting feature of a keyboard and a mouse that would delight me.

Keyboard

Because of the compact sizes of laptops in the keyboard, many keys are comprised. So I would Type-Abe delighted to have extra buttons on side of the keyboard along with the required software to switch between function keys and hotkeys. The ability to customize keys with the help of software would be the cherry on the top.

Mouse

I would love to see an extra thumbwheel along with two extra gesture buttons towards the right side of the mouse which can be used to emulate some of the functions of a trackpad in a mouse itself. We can get both horizontal and vertical scrolling. It makes it much easier to read the lines between codes and edit videos and photos in apps like Adobe Photoshop and after effects.

Kano model of Quality

1. **Must be** – user expect the qualities and will be dissatisfied if they are not fulfilled

- Compatibility and Compact Design
- Higher number of Keystrokes
- Durability and affordability

2. **Performance(One dimensional)** – user will be

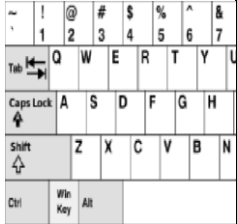
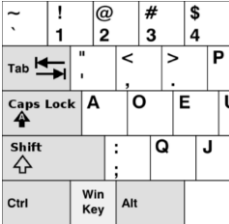
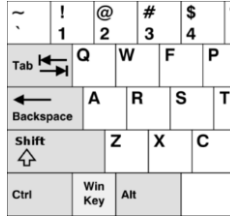
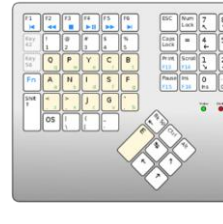
Satisfied, if the qualities are fulfilled and dissatisfied if they are not fulfilled





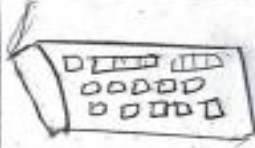

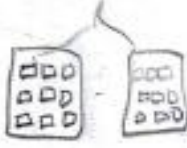





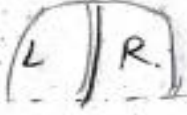





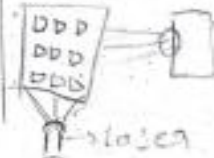

- Premium Mechanical Switches
- Better keys for low-force and tactile feedback
- Custom Layout keys for extra customization
- Adjustable LED Backlighting

3. **Attractive** – exceed user expectations, but if they are not met, the user will not be dissatisfied.

- Virtual keyboard with help of a projector and lasers
- Curved keyboard for positing arms naturally and comfortably
- Freestyle Edge Split Gaming Keyboard

Morphological chart:

Functions /Means	Means-1	Means -2	Means -3	Means-4
Keyboard Shape	Rectangle	Angled Split able keyboard	Split	Ergonomic
Mouse Buttons	Left - Right	+Middle button	+Side scroll wheel	Pressure detectors at the tip
Keyboard Keys Shape	Square	Circle	Optical Switches	Curved
Mouse shape	Optical mouse	Ball mouse	Vertical Mouse	Trackpad
Keyboard Layouts	<p>QWERTY</p> 	<p>Dvorak</p> 	<p>Colemak</p> 	<p>Virtual layout</p> 

Functions/ Means.	Means - 1	Means - 2	Means - 3	Means - 4
Mouse Shape.				
Keyboard Shape				
Keyboard Keys type				
Mouse buttons		 Button		
Portability			 It is a mouse	

COMBINATIONS:

COMBINATION-1:

FUNCTIONS	ALTERNATIVES
Keyboard shape	M1
Mouse Buttons	M2
Keyboard keys shape	M4
Mouse shape	M1
Keyboard layouts	M1
Portability	M4

COMBINATION-2:

FUNCTIONS	ALTERNATIVES
Keyboard shape	M4
Mouse Buttons	M2
Keyboard keys shape	M2
Mouse shape	M2
Keyboard layouts	M2
Portability	M4

Decision matrix:

	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	
CRITERIA DESCRIPTION	Cost	Learning curve	Ergonomics	Excitement/Coolness	Durability	
OPTIONS	Criteria 1 SCORES	Criteria 2 SCORES	Criteria 3 SCORES	Criteria 4 SCORES	Criteria 5 SCORES	TOTAL SCORE
Wired keyboard with Dvorak Layout and circle keys with trackpad	4	2	3	2	1	12
Wireless Ergonomic Keyboard with QWERTY layout and ball mouse	3	5	5	4	2	19
Laser Keyboard with Virtual Layout and ball mouse	4	1	4	4	4	17
Mechanical wireless keyboard with QWERTY Layout and Optical mouse	2	3	2	5	3	15
Virtual Keyboard with Qwerty Layout and vertical Mouse	1	4	2	5	3	15

According to the Decision matrix Wireless Ergonomic keyboard with QWERTY Layout and ball mouse is the best choice since it covers most of the functions & is easy to use and does not have any steep learning curve.

Keyboards with a split layout often assign significantly more keys to the thumb than what we are familiar with —usually enter, shift, alt, remove or backspace as well as the space bar. This reduces the load on the weaker little fingers that are otherwise responsible for these keys in the conventional QWERTY layout.

Conclusion:

Therefore the above mentioned designs are individually adjustable and divided into two parts that can be tented along with a mouse.

(Some Example prototypes from the Internet)



Qwertzy



Additional problem:

There is no doubt that conventional QWERTY keyboards dominate the market. But by analysing a ton of data, Science has proven that new and modern keyboard layouts increase typing speed by 20% and reduce errors by 15%. But still, these keyboards have not been able to break out into the market. Learning a new layout may not be a practical solution for many people. This problem is yet to be solved.....