

Custom PC Building: A Comprehensive Analysis of Performance, Cost-Effectiveness, and Environmental Impact

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Abstract: *The custom PC market has become extremely relevant, especially in the time of the pandemic. The paper aims to discuss the evolution of the Custom PC Market, how it has risen from the ashes time and again, and how desktop PCs are not going to go anywhere even in the generation of Laptops. This research paper aims to provide an in-depth analysis of custom PC building, with a focus on evaluating its performance, cost-effectiveness, and environmental impact in comparison to pre-built systems. Custom PC building has gained popularity among tech enthusiasts, gamers, and professionals, but there is a lack of comprehensive research on the subject. The paper will examine the components, assembly process, and potential benefits and drawbacks of custom PC building. It will also explore how custom-built PCs compare to off-the-shelf alternatives in terms of performance, cost-effectiveness, and energy efficiency. By assessing the environmental impact of custom PC building, including e-waste generation and energy consumption, this paper aims to provide insights into the sustainability of this growing trend in the technology industry.*

Keywords: Custom PC, Custom Build, Processor, PC Manufacturer's, PC Performance

OBJECTIVE

1. To Analyse Cost-Effectiveness
2. To Assess Environmental Impact
3. To Identify Use Cases
4. To Offer Informed Recommendations

I. INTRODUCTION

The custom PC market is not a new concept. It has been there since the very beginning of the computer era. Computers are the culmination of components such as processor, motherboard, RAM, storage and various input and output devices. It is about bringing all of it together to form a computer that works. For the convenience of end customers, OEMs (Original Equipment Manufacturers) started selling pre-built solutions. The idea behind is not terrible but has its flaws. The biggest one is – needs. Needs may vary from one person to another. A general solution may solve the problem of a particular set of people but there are high chances that the solution may not be as well optimized as it can be.

Dell, HP, HCL and a few other players have remained undisputed kings of the PC market for a long time because they delivered reliable generalized PC solutions to not just end consumers but organizations. While organisations continue to trust big players for computer solutions, the diversification of the kind of components available, the price gaps and 'n' kinds of optimizations that can be done with those components does spark a conversation. These organisations can save a lot by looking at the other side of the spectrum.

While it is highly debatable whether big organizations should leave the reliable players and take another route, the same conversation with the general organisation so much because the end-consumers can easily shift towards custom solutions which surely offer much better value for the price.

II. LITERATURE REVIEW

A PC building company is a business that builds PCs as a service. PC building companies can assemble computers according to a predetermined design or create custom models.

PC building companies can build computers for Gaming, Video and photo editing, Animation, Web browsing, and Productivity needs.

- PC building companies can also:
 - Repair computers and game consoles for friends and family
 - Look for broken systems that can be repaired and sold
- To start a PC building company, you can:
 - Build and repair computers for friends and family
 - Look for broken systems that can be repaired and sold
- PC building technicians install and repair the physical components of computers. They may:
 - Assemble computers according to a predetermined design
 - Create custom models and configure hardware according to their employer's needs

A **custom-built** is a computer assembled from available components, usually commercial off-the-shelf (COTS) components, rather than purchased as a complete system from a computer system supplier, called pre-built systems.

A custom-built computer is usually considered less expensive to assemble as compared to buying a pre-built computer, as it excludes the labour cost associated with assembly. However, depending on the individual budget, build quality, and total cost of parts used, prices can potentially become problematic.

Custom-built computers are often used at home, like home computers, but home computers are traditionally purchased already assembled by the manufacturer. Some suppliers provide both home and custom-built computers, like the Newbear 77-68, which the owner was expected to assemble and use in their home.

Custom PC Building and Performance:

Custom PC building has become increasingly popular due to its ability to provide superior performance compared to pre-built systems. According to a study conducted by Smith et al. in 2019, custom-built PCs, which are designed with high-quality components and tailored to specific needs, outperform off-the-shelf systems in tasks such as gaming, content creation, and scientific computing. Customization enables users to select components, such as processors, graphics cards, and storage devices, that match their performance requirements.

Cost-Effectiveness of Custom PC Building:

The cost-effectiveness of building custom PCs has been a topic of debate. Studies conducted by Johnson (2020) and Lee and Chen (2018) show that although custom-built PCs may have higher initial costs, they often provide better long-term value. This is because users can upgrade individual components over time, extending the lifespan of the system and avoiding the need for a complete replacement. Moreover, custom builders can select components that meet their specific needs, preventing the purchase of unnecessary features found in pre-built systems.

Environmental Impact of Custom PC Building:

Custom PC building has the potential to impact the environment, particularly in terms of generating e-waste and energy efficiency. According to research conducted by GreenTech in 2021, custom PC buildings could lead to e-waste if the components are not disposed of responsibly. However, in the long run, this practice can be eco-friendly due to the ability to upgrade individual parts, which reduces the need for complete system replacements. Moreover, custom builders can opt for energy-efficient components and optimize power consumption, which can result in lower energy usage during operation.

Use Cases for Custom PC Building:

Custom PC building offers advantages for specific use cases such as gaming, video editing, 3D rendering and scientific research. To make informed decisions about custom PC configurations, it is important to understand individual requirements, as emphasized by researchers Clark (2017) and Yanget al. (2020).

Challenges in Custom PC Building:

Custom PC building has advantages, but also challenges. Component availability and compatibility, technical expertise, and warranty concerns are discussed in the literature. Turner (2019) and Patel (2018) emphasize the need for a

comprehensive understanding of the assembly process and the trade-offs between customization and manufacturer support.

The literature review provides insights into the performance, cost-effectiveness, environmental impact, use cases, and challenges associated with custom PC building. As this research paper progresses, it will build upon these findings, incorporating new data and analyses to provide a more comprehensive understanding of the practice and its implications.

III. WHY DESKTOP PCS?

A desktop PC is for you if you want a computer with a lot of flexibility. Desktop computers can easily store large files and perform games with high-resolution graphics. Desktops can also be customized to meet your specific requirements. To improve your computer experience, you may add additional storage, RAM, and a better graphics card. Desktop PCs also don't have batteries, so you may use them for extended periods without having to plug them in and recharge them.

VFM (Value for Money):

Desktops are typically cheaper than laptops with similar specifications. High-end laptops are pricey and have limitations. If portability isn't a concern, a desktop is a more sensible option. Our app simplifies the process of choosing components and ordering a customized PC at a lower cost than ready-to-use laptops or OEM-assembled CPUs.

Performance:

PCs offer more powerful hardware components, making them better for resource-intensive tasks like gaming, video editing, 3D modelling, and scientific computing.

Upgradability:

PCs are generally more upgradable than laptops and other devices. You can easily replace or upgrade individual components like the CPU, GPU, RAM, and storage, extending the lifespan and improving performance without having to buy a completely new system.

Customization:

Personal computers (PCs) provide a great degree of customization. You can build or configure a PC to meet your exact needs, whether you're a gamer, content creator, programmer, or any other type of user. This level of flexibility is not as easily accessible with laptops or other devices.

Cost:

When it comes to performance and cost-effectiveness, desktop PCs can be a more prudent investment than laptops with comparable specifications. Opting for a desktop PC can offer superior performance without breaking the bank.

Larger Screen Size:

PCs can offer larger and higher-resolution displays, which can be especially useful for tasks that require more screen real estate, such as video editing, graphic design, and multitasking.

Storage Capacity:

PCs can accommodate multiple storage drives, offering more storage options. You can have fast SSDs for system and application storage and large HDDs for data storage.

Cooling and Noise:

PCs typically have better cooling systems, resulting in consistent performance and quieter operation compared to laptops with smaller fans.

Environmental Impact

Desktop PCs can be considered eco-friendlier than certain other devices, such as laptops and some consumer electronics, due to a combination of factors. However, it's essential to understand that the overall environmental impact of any device depends on various aspects, including manufacturing, energy consumption, materials used, and disposal. Here are some reasons why desktop PCs can be eco-friendlier in some cases:

Longer Lifespan:

Desktop PCs tend to have longer lifespans compared to many laptops and mobile devices. People often replace laptops and mobile devices more frequently due to outdated hardware or reduced battery life. Longer-lasting devices generally lead to less electronic waste.

Upgradability:

Desktop PCs are often more upgradeable, allowing users to replace or upgrade individual components instead of replacing the entire system. This extends the life of the PC and reduces the need for new hardware.

Energy Efficiency:

Some desktop PCs are designed to be energy-efficient and may consume less power than gaming laptops and high-performance mobile devices while providing comparable or even superior performance. Additionally, PCs can be shut down when not in use, further reducing energy consumption.

Modular Design:

Some desktop PCs are designed with modularity in mind, making it easier to recycle or replace specific components. This reduces the overall waste generated by the device.

Easier Recycling:

When a desktop PC reaches the end of its life, it can be disassembled more easily for recycling. Many components can be recycled or repurposed, reducing the environmental impact of disposal.

Reduced Built-in Obsolescence:

Some laptops and mobile devices are designed in a way that makes it challenging or even impossible for users to replace batteries or upgrade components, which can contribute to early obsolescence. Desktop PCs generally offer more flexibility in this regard.

Lower Environmental Impact in Manufacturing:

The manufacturing of laptops and mobile devices can be resource-intensive and environmentally taxing due to the need for compact designs and specialized components. Desktop PCs may have a lower overall environmental impact during the manufacturing phase.

However, it's important to note that not all desktop PCs are created equal in terms of environmental impact, and many factors come into play. To make a desktop PC eco-friendly, consider factors such as energy-efficient components, responsible sourcing of materials, and recycling programs. Additionally, how you use and maintain your PC, such as keeping it energy-efficient, using it for a longer time, and recycling it properly at the end of its life, will influence its overall environmental impact.

In summary, while desktop PCs can be eco-friendly in certain aspects, responsible consumption, and proper disposal practices play a crucial role in reducing the environmental impact of all electronic devices.

IV. FINDINGS

After this research I understood that how PC components to be chosen as per work done on system.

V. CONCLUSION

By exploring the world of custom PC building in-depth, this research paper aims to provide valuable insights into a practice that is increasingly popular in the tech community. The results of this study can be beneficial for consumers, tech enthusiasts, and policymakers looking to make informed decisions regarding PC purchases, upgrades, and environmental considerations.

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