

FLUX: A MODULAR 3D PRINTED FURNITURE JOINERY SYSTEM

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Highlights: FLUX is a Modular 3D printed furniture joinery system that simplifies the hassle of fabricating complex wood joinery, joinery on a 90-degree angle and flat-packed arrangement for storage & delivery purposes. It satisfies the exigencies of the current pandemic online platform demand while reducing the cost of fabricating and handling the furniture parts.

Keywords: Modular furniture, 3D printer, Furniture joinery system.

Introduction

The current pandemic situation has drastically changed how the consumerism cycle works. As a result, full setup furniture may become a burden in either the storage space needed by the fabricator or the fuss handling oversized items by the courier provider. Thus, FLUX is a new concept on how furniture should be designed and handled to ensure all unnecessary costs can be kept at bay.

Content

The Ergo-aesthetic framework (figure 1) work as a guideline to set a priority level on each aspect of the design. It helps all designers to eliminate unnecessary elements while designing and focusing on the priority aspect. The Ergo-aesthetic Framework has been explicitly organised towards the design assessment elements, i.e. design quality, behaviour and culture, and virtual assessment. This framework has shown the relationship between the ergonomic domain and the aesthetic domain, which share the same characteristic on each evaluation criteria (Muhamad Ezran & Khairul Aidil Azlin, 2018). For instance, value and theme in the aesthetic domain share the same assessment criterion of behaviour and culture with the user movement and human postures inside the ergonomic domain. Besides, the most prioritised element has been placed in a darker chromatic colour scheme.

A product for people with specific disabilities requires extra attention to their behavioural preferences. The design should be flexible enough to simulate the current situation and demand as the design is usually extraction of the users' life experiences (Bei & Yan, 2011). In other words, the designed item should be highly pliant towards the anthropometric and biomechanical character of the user to optimise the productivity (Afzan et al., 2012), as an uncomfortable design may lead to health implications (Agha & Alnahhal, 2012). Beyond functionality, with improvements in product development technologies, consumers are prepared to have exciting products that can give them greater satisfaction through product relationships (Yang et al., 2019). By applying the Ergo-Aesthetic framework in the design process, FLUX has tremendously improved the dynamic setup of the intended furniture configuration regarding assembling capabilities, compact packaging, design and shapes configuration, and flexibility on colour selection. FLUX joinery system improving the time needed to assemble a piece of furniture by 80% yet maintaining the sturdiness of the overall structure.

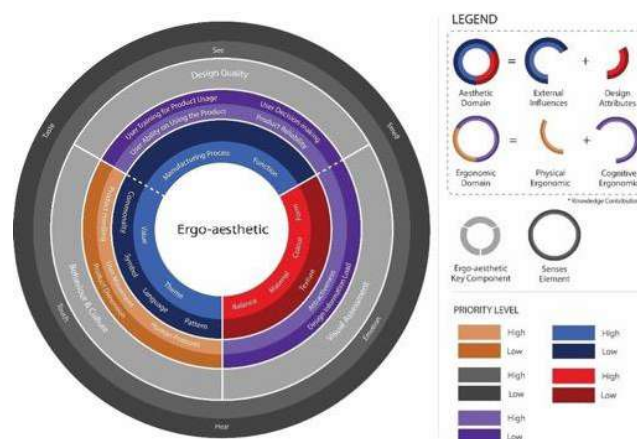


Figure 1: Ergo-aesthetic framework

The Ergo-aesthetic framework has become the philosophical basis for innovation, consisting of behaviour and culture, visual assessment, and design quality. Consumer and designer co-relationship has distinguished FLUX main specification, which are:

1. Easy to pack, deliver and assemble;
2. Reduce the complexity of the wood joinery fabrication and assembly process;
3. Universal joinery system which can suit with common joinery wood end.
4. Simplify the complexity in fabricating organic shapes in design.



Figure 2: Physical prototype of the FLUX assembly process

Figure 2 shows the FLUX 3D printed part, enabling the single sitter chair to be assembled using a cordless driller and screws. The joinery part also emphasises the colour contrast between the wood part and the printed part, which inherent in the Bauhaus philosophical direction. Figure 3 shows the overall setup for the single-seater chair.



Figure 3: Rendering illustration on FLUX application towards a single sitter sofa

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References

- Afzan, Z. Z., Hadi, S. A., Shamsul, B. T., Zailina, H., Nada, I., & Rahmah, A. R. S. (2012). Mismatch between school furniture and anthropometric measures among primary school children in Mersing, Johor, Malaysia. *2012 Southeast Asian Network of Ergonomics Societies Conference: Ergonomics Innovations Leveraging User Experience and Sustainability, SEANES 2012*, 3–7. <https://doi.org/10.1109/SEANES.2012.6299557>
- Agha, S. R., & Alnahhal, M. J. (2012). Neural network and multiple linear regression to predict school children dimensions for ergonomic school furniture design. *Applied Ergonomics*, 43(6), 979–984. <https://doi.org/10.1016/j.apergo.2012.01.007>
- Bei, F., & Yan, Y. (2011). A perspective of novel design and creativity in the development of furniture. *IEEE*, 6–9.
- Muhamad Ezran, Z. A., & Khairul Aidil Azlin, A. R. (2018). Ergo-aesthetic approach through senses and behavioral assessment. *International Journal of Engineering & Technology*, 7(3.28), 1. <https://doi.org/10.14419/ijet.v7i3.28.20953>
- Yang, B., Liu, Y., Liang, Y., & Tang, M. (2019). Exploiting user experience from online customer reviews for product design. *International Journal of Information Management*, 46(May 2018), 173–186. <https://doi.org/10.1016/j.ijinfomgt.2018.12.006>