22. Modularity

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Definition and Background

As a concept in design thinking, modularity is a useful way to segment out the design process into more manageable tasks. Carliss Y. Baldwin and Kim B. Clark (2000) define modularity as an approach where "different parts of the computer could be designed by separate, specialized groups working independently of one another. The 'modules' could then be connected and (in theory at least) would function seamlessly, as long as they conformed to a predetermined set of design rules" (p. 6). Beyond this approach to computer design, Ellen Lupton and Jennifer Cole Phillips (2015) use the concept of modularity in design by defining modules as any "fixed element within a larger system" that can be readily applied to many design thinking problems. So, modules may be interchangeable parts of a computer system, or required design parameters such as those defined by a company's style guide. Just as the engineer can slot different modular pieces of a computer together to quickly build a system, the designer can take elements such as the client's logo or color scheme and prototype a design around those fixed elements. Modules can also be any items or tasks separated out to different individuals working on a singular project—for example, separating out written content, layout, images, and media from a website design. The key is the separate-yet-connected nature of the modules and the ability for designers to work on modules individually and plug them together. By following modular practices, designers have room for experimentation, ***iteration***, and ***innovation*** by clearly defining what parts of the design are fixed modules and then focusing their attention on the more fluid elements of the design process.

Joel Sadler et al. (2016) use modularity as a way to enhance ***rapid prototyping*** in the design thinking process. They write, "A component with a high degree of modularity has fewer dependencies on outside variables. In prototyping, this implies that modules enable designers to freely try combinations of parts, much like adding bricks in a toy construction kit" (Sadler et al., 2016, pp. 142-143). Designers are therefore able to use modular components to quickly build prototypes or proof-of-concept models and experiment with the design by taking apart and combining elements. Although the modules provide some constraints in the design process, they conversely aid in experimentation by allowing the designer to try out various ideas more quickly by prototyping around these fixed elements. As an example, modern web design has increasingly moved toward a modular, component-based design model. Popular web design frameworks such as Bootstrap,

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React, Angular, and Google's Material Design rely on modular components that can be quickly combined to create a functioning website or application instead of coding everything from scratch. The design can then be quickly populated with content in order to secure funding, provide a working model for user testing, or experiment with additional features.

Design Application

Modularity is an emerging trend due to its potential benefits in cost reduction brought about by the functional partitioning of a designed system or solution. Modular design has also influenced technical communication by promoting modular documentation. As single-source writing and dynamic content delivery become increasingly commonplace in industry, technical communicators are creating and reusing modular content to ensure sustainability and efficiency for content as it moves across contexts or formats. For example, communicators may use modular documentation in the ideation and prototyping phases of the design thinking process to quickly build out sections of text or design elements that will be standardized across a number of documents/designs. These modular pieces of content can further help ensure consistency as the content is used in multiple formats such as print/digital as well as shared across teams or working groups in the company.

In essence, modular documentation begins with understanding content requirements and defining content construction and maintenance strategy. Once these steps are done, technical communicators develop content modules (units of content) in chunks, such as a description, an overview, a task, a step, etc. These modules, like LEGO blocks, can be pieced together in different ways for different purposes, hence increasing efficiency and reducing cost of production since the modules can be reused and updated individually. Modern information mapping and development models like the DITA (Darwin Information Typing Architecture) standards and design systems such as those used for web frameworks like Bootstrap, Angular, or React are examples of modular writing in technical communication that students may use in the workplace.

Pedagogical Integration

For students learning the design thinking process, modularity can prove to be a useful part of early prototyping and as an aspect of using constraints to inspire design. Ellen Lupton and Jennifer Cole Phillips (2015) helpfully define modules in a broad sense as any fixed element within a larger system that can be readily applied to many design thinking problems. Stemming from work on LEGO Serious Play (LEGO, 2019), where LEGO bricks are used as a team-building, hands-on learning device, LEGO can also be used as an activity for demonstrating modularity in the design thinking process. Thinking of the LEGO bricks

themselves as individual modules that cannot be broken apart, students are encouraged to try different configurations, experiment, and *play* at design in a hands-on activity using materials that most of them are familiar with.

Starting with a quick introduction to building with LEGO and the combinations possible using the most basic of elements, six 2x4 red bricks (915,103,765 to be exact; Huw, 2017), students are split into teams and given a small bag of random LEGO bricks. The bag should contain elements such as wheels, wings, and plenty of small LEGO bricks that can be useful in a variety of builds. Students are then tasked with creating a vehicle or model using exactly half of the bricks. After finishing the first task, students trade their models with another group that must then "complete" the model by adding elements without removing any existing parts. Students are able to trade leftover elements with other groups as well as talk with the group they received the model from to help interpret what the model is supposed to be. Here, modularity and creativity are tested by working first from individual modules (the bricks themselves) up to larger constraints (the first model). The activity can also be further connected to other in-class activities, such as document design practice working from a style guide or design system where students have set parameters they cannot modify while still creating a unique product. In both the LEGO and document design activities, the key is to highlight the useful nature of modular design to speed up the design process while allowing for experimentation in working with other groups or playing with non-fixed elements.

References and Recommended Readings

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