and describes how to use them in design problems.[2] Design Heuristics are a useful tool for designers in any domain who want to maximize the diversity of the concepts they generate in order to create their best designs.

6.8 Appendix

77 Design Heuristics Extracted from Designers' Concepts

#	Design Heuristic	Definition
1	Add Levels	Identify different levels of the product functions and add a series of gradual changes to facilitate gradual transitions of uses.
2	Add motion	Apply motion as part of the product's function. Consider how this can decrease the need for user activity or act as a playful attribute.
3	Add natural features	Explore relationships between the product and nature to improve function or aesthetics.
4	Add to existing product	Add an existing item to the product's functions. Consider physical attachment, creating a system, or defining relationships to products.
5	Adjust function through movement	Allow users to adjust function through moving the product or parts. Consider different motions (e.g., rotating, sliding, rolling) and controls.
6	Adjust functions for specific users	Design functions around a user population based on age, gender, education, and diverse abilities; allow each user to adjust functions.
7	Align components around center	Arrange extra components around a main function. Consider arrangement or configuration around a circular design element.
8	Allow user to assemble	Make the user part of the process by having them assemble if too large for packaging or if adds to user understanding of function.
9	Allow user to customize	Involve the user by giving them customization options. Consider how this provides the user with a sense of ownership and awareness.
10	Allow user to rearrange	Allow the user to change the configuration of components for adjustable functions by simple attachments or alignments of components.
11	Allow user to reoricut	Allow user to flip the whole product or parts vertically or horizontally to perform different functions.
12	Animate	Give lifelike qualities to the product by replicating human or animal features, gestural forms, and emotions.
13	Apply existing mechanism in new way	Consider how function is accomplished in other products and determine how they can be applied to your product when adapted to its new use.
14	Attach independent functional components	Identify different parts or systems with distinct functions and combine them by assigning form to each, and add a connection between parts.
15	Attach product to user	Make the user part of the function by attaching the product to a body part, such as user's head, finger, or feet, and redefine product use.
16	Bend	Form an angular or rounded curve by bending a continuous material in order to assign different functions on the bent surfaces.
17	Build user community	Consider how two or more users can work together to operate the product, or how one user's operation affects another.
18	Change direction of access	Use different ways of approaching the product, such as from the side instead of the front, to create more flexible solutions.
19	Change flexibility	Change material properties with different or modified material; Consider durability, collapsibility, function, and adjustability.

(*continued*)

[2] http://www.designheuristics.com

#	Design Heuristic	Definition
20	Change geometry	Use a simpler geometric form to achieve the same functions. Changing from familiar forms redefines user interaction with the product.
21	Change product lifetime	Consider the assumed lifetime of a product or its parts and alter the number of times it can be used.
22	Change surface properties	Highlight areas where the user interfaces with the product by using different colors, textures, materials and forms.
23	Compartmentalize	Divide the product into distinct compartments or add a compartment.
24	Contextualize	Envision the detail of how and where the product will be used and fit the product to this context.
25	Convert 2D to 3D object	Create a three-dimensional object by manipulating two-dimensional materials through bends, twists, creases, or joints.
26	Convert for second function	Design the product or its components with multiple stable states, where each state defines a separate function.
27	Cover or wrap	Overlay a cover, form a shell, or wrap the surface of the product and its parts with another material to customize, add function, and protect.
28	Create service	Develop a service by defining interactions between the user and a service provider.
29	Create system	Identify the core processes and define a multistage system that synthesizes those processes to achieve an overall goal.
30	Divide continuous surface	Divide single, continuous parts or surfaces into two or more elements or functions that can then be repeated and reconfigured.
31	Elevate or lower	Raise or lower the entire product or its parts to provide adjustability in use by allowing ergonomic solutions or suggesting additional functions.
32	Expand or collapse	Design the product to get larger or smaller to adjust or change function. Consider fluids, inflatables, flexible materials, and complex joints.
33	Expose interior	Show the inner components of the product by removing the outer surface or making it transparent for user perception and understanding.
34	Extend surface	Widen or expand the functioning surfaces of the product to enhance, adjust, or add new functions.
35	Flatten	Compress the product until flat with flexible materials or joints. Consider the effects on portability, structure, and storage.
36	Fold	Create relative motion between product parts or surfaces by hinging, bending, or creasing to improve packaging and storage.
37	Hollow out	Remove parts from the product for better fit to other products, functions, or the user's body.
38	Impose hierarchy on functions	Present functions in a set order to assist product use. Make the steps for reaching each function clear by controlling access to functions.
39	Incorporate environment	Use the living or artificial environment as part of the product by designing around it rather than distinguishing from it.
40	Incorporate user input	Identify product functions that are adjustable and allow users to make changes through an interface. Integrate in a cohesive, intuitive way.
41	Layer	Build the product through a series of layers of similar or different materials to provide various functions and interest.
42	Make components attachable or detachable	Make individual parts attachable or detachable for additional flexibility, ease of use, carrying, or repair/replacement.
43	Make multifunctional	Identify a secondary complimentary function for the product and create a new form to accomplish both functions.
44	Make product recyclable	Replace disposable components with reusable ones or vice versa. Modify the design according to the capabilities of the new material.

#	Design Heuristic	Definition
45	Merge surfaces	Join the surfaces of two or more components with complementary functions.
46	Mimic natural mechanisms	Imitate naturally occurring processes, mechanisms or systems.
47	Mirror or Array	Reflect or repeat elements about a central axis or point of symmetry to distribute force, reduce manufacturing cost, and improve aesthetics.
48	Nest	Fit one object within another. Design the inner form of the containing object to match the outer form of the contained object.
49	Offer optional components	Provide additional components that can change or adjust function, purchased separately or included, and where they are stored.
50	Provide sensory feedback	Return perceptual information (i.e., tactile, audio, visual) to the user, reducing errors, confirming actions, and informing of product function.
51	Reconfigure	Define relationships between functional components and change their configuration; attachments or alignments of components.
52	Redefine joints	Identify the ways product parts are connected and modify by removing, covering or changing the orientation of joints.
53	Reduce material	Remove material from the product by eliminating unnecessary components or shaving structural elements to make more efficient.
54	Reorient	Design the product to perform different functions based on orientation. Consider flipping the whole product or its parts vertically or horizontally.
55	Repeat	Copy components or an entire product to enhance function, allow for multiple simultaneous functions, distribute load, and decrease costs.
56	Repurpose packaging	Convert leftover packaging after the product is removed. Consider turning the packaging into a game, decoration, or other useful product.
57	Roll	Revolve a part or the entire product around a center point or a supporting surface by adding flexible materials.
58	Rotate	Move components of the product about a pivot point or axis, or allow the user to move components to adjust or change function.
59	Scale up or down	Change any of the physical dimensions of the product or its parts. Consider how changes in size and proportions can affect function.
60	Separate functions	Define functional components of the product and separate them into individual forms.
61	Simplify	Remove unnecessary complexity from the product to reduce costs and waste, or make the product more intuitive.
62	Slide components	Move one component smoothly along a surface in order to open and close surfaces, rearrange components, or adjust size of the product.
63	Stack	Stack individual components or make the entire product stackable to save space, protect the inner component, or create visual effects.
64	Substitute way of achieving functions	Replace an existing component to accomplish or enhance the same function. Consider different materials or forms to achieve the function.
65	Synthesize functions	Combine two or more functions by joining them to form a new device. Consider how the two functions can complement each other.
66	Telescope	Identify long components and split them into sections that can slide into each other. This can help to reduce product size when not in use.
67	Twist	Turn simple geometric forms in opposite directions, single or multiple times, to create a playful, iconic product; provides a larger surface area.
68	Unify	Cluster elements according to intuitive relationships such as similarity, dependence, proximity, to unify them for visual consistency.

(*continued*)

#	Design Heuristic	Definition
69	Use common base to hold components	Aligning modules on the same base or railing system to reduce the number of parts needed, allow users to rearrange, and make compact.
70	Use continuous material	Find ways to create connections between parts, and apply one continuous material to them to reduce parts, joints, and complexity.
71	Use different energy source	Replace expected energy source and redesign accordingly. Possibilities include chemical, geothermal, hydroelectric, solar and wind.
72	Use human-generated power	Make the user act as the power source for both primary and secondary functions, and the synthesis of multiple energy sources.
73	Use multiple components for one function	Identify the core function of the product and use multiple components to achieve the same function, with components specialized in tasks.
74	Use packaging as functional component	Embed packaging within the product, create a shell or cover for a component or entire product using the package, and uncover for use.
75	Use recycled or recyclable materials	Explore the use of recycled or recyclable materials within the product. Consider how structure and context will change.
76	Utilize inner space	Hollow out the inner volume of the product or its parts, and use the space for placement of another component.
77	Utilize opposite surface	Create a distinction between exterior and interior, front and back, or bottom and top for complimentary or different functions.
78	Visually distinguish functions	Create visual relationships among product functions by changing individual design elements.

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