MEDWIN PUBLISHERS
Committed to create value for Researchers

Ergonomics International Journal
ISSN: 2577-2953

Positive Sum Design: Designing Affordances for Bias, Choice and Coordination

Gonsher I*

Assistant Professor of Practice, Brown University, USA

***Corresponding author:** Ian Gonsher, Assistant Professor of Practice, Brown University, School of Engineering and Department of Computer Science, 184 Hope St, Providence, RI 02912, USA, Tel: 401 954 8884; Email: ian_gonsher@brown.edu

Opinion

Volume 1 Issue 3

Received Date: December 07, 2017

Published Date: December 18, 2017

DOI: 10.23880/jenr-16000127

Opinion

In my previous introduction to Positive Sum Design, I explore the limits that zero sum bias places on our ability to solve problems creatively [1]. Drawing on Human (or Humanity) Centered Design paradigms, as well as other creative strategies, I suggest practices for overcoming these kinds of biases by reframing and redesigning "win/lose" or "lose/lose" scenarios into "win/wins". By "reframing the game", and recognizing the mutability of constraints, designers can better understand the motivating forces that scaffold the decisions of stakeholders, and design affordances for coordination, cooperation, and trust. In this essay, I will further explore the usefulness and limitations of these kinds of biases as they relate to the creative process, and elaborate on strategies for overcoming or better employing these biases in order to design positive sum games.

Our ethics are grounded in the mutability of constraints; in our ability to see beyond that which is immediately apparent or otherwise obscured by the inertia of the status quo. Limited resources-even merely the perception of limited resources-engender competition and conflict. But by creatively and compassionately cultivating awareness of unrecognized opportunities, recognizing that more is often available than our biases allow us to perceive, we shift our attention to what is possible, opening space to reframe a zero-sum game into a non-zero-sum game.

There is a growing body of research emerging from the fields of behavioral economics, game theory, and the psychology of choice that can provide designers with better tools for considering how to create affordances for cooperation and coordination over distrust and competition.

Affordances and Humanity Centered Design

An affordance is a relationship between a user and an object or environment that provides the possibility for a behavior [2]. The classic example of an affordance is a doorknob, which affords twisting and opening. The design of the knob has a direction of fit with the human hand, just as the size of the door fits a human scale, providing a space to walk through. But an affordance is more than just the physical fit of an object or environment to the body. An affordance is what a subject perceives to be possible. It is the opportunity space that design creates. A doorknob suggests its function without requiring the user to consciously consider it. It indicates its function through its form. In this way, affordances are both cognitive and physical; they constrain behaviors towards action, as they create the potential for that action to occur.

Gibson describes affordances thus [2]:

"The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarities of the animal and the environment."

He further elaborates that an affordance is…
"…neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of

the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer" [2].

Don Norman, a student of Gibson, further developed and popularized the concept of affordances within Human (User) Centered Design in his seminal book "The Design of Everyday Things" [3,4]. Norman's views have since been adopted by a new generation of designers who employ the term to design better cognitive and physical fits between users and the products and services they create. Norman encourages designers to think carefully about how users discover and use the things around them.

Positive Sum Design takes these ideas a step further, applying the concept of an affordance to the design of systems and objects that facilitate coordination, cooperation, and collaboration, transcending the limitations of biases in order to produce greater value for all stakeholders.

The Usefulness of Bias

Zero sum bias, which is where our critique began in the prior essay, is hardly the only bias that inhibits creative problem solving, leading designers down the narrow road of limited, suboptimal outcomes where competition is privileged over cooperation [5]. However, sometimes biases can be useful and necessary. There are many mental shortcuts, or heuristics, that can be applied to decision-making. Sometimes, often even, biases can be used quite effectively, and accurately, to help users and designers make choices, especially in circumstances where there is limited knowledge, which in the absence of omniscience, happens to be the world we all actually live in. In short, your intuition is often right.

In the absence of complete, rational knowledge of a situation, the choices we make are dependent on the conditions of the problem, and the limited cognitive capacity to discover what is possible. This idea of optimization under constraints was first suggested by Nobel Laureate, Herbert Simon, who coined the term "bounded rationality". Bounded rationality describes the way the mind, with all its capacity for both rationality and bias, and the environment with its inherent uncertainty, can be considered in relation to each other in order to better understand the way people make decisions in real world conditions [6].

Like the concept of an affordance, introduced by Gibson and elaborated on by Norman, which is dependent on both the behaviors of actors and the conditions in which they act, bounded rationality gives us a description of decision-making that can be useful to designers throughout their creative process, as well as for the outcomes of that process, providing users with affordances for choice and behavior. Simon uses the metaphor of a pair of scissors to explain bounded rationality in the following way, later elaborated upon by Gigerenzer:

"Human rational behavior is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor". Just as one cannot understand how scissors cut by looking only at one blade, one will not understand human behavior by studying either cognition or the environment alone" [6].

Simon elaborates on bounded rationality in his book, "The Science of the Artificial", by stating: "A thinking human being is an adaptive system; men's goals define the interface between their inner and outer environments, including the latter their memory stores. To the extent that they are effectively adaptive, their behavior will reflect characteristics largely of the outer environment (in light of their goals) and will reveal only a few limiting properties of the inner environment – of the physiological machinery that enables a person to think" [7].

Gigerenzer's research provides evidence that often less knowledge is more helpful in making accurate predictions than scenarios that provide more knowledge or allow for more choices. This "recognition heuristic" can be quite accurate when satisfying the conditions of limited knowledge, while sufficing for the task at hand [8]. If given two objects, and one is recognized and the other is not, then the recognized object will have higher value with respect to the criterion [9].

Gigerenzer and Goldstein asked two groups of students, American and German, "which city has a larger population: San Diego or San Antonio?" Nearly two thirds of Americans responded correctly that San Diego had the larger population. And yet, despite less familiarity with the geography of the United States, 100% of the German cohort chose correctly, outperforming the American group. All of the Germans had heard of San Diego, but most did not recognize San Antonio, inferring that the former was the larger of the two options [9]. Fast and frugal intuitions can be quite accurate in an uncertain world. Sometimes, less is more.

The Limitations of Bias

But bias can also limit our ability to design affordances for better cooperation and coordination, and distort our understanding of how to frame a problem or ask a question. Bias can reinforce and perpetuate inequalities of all kinds. One such bias, investigated by Amos Tversky and Daniel Kahneman in their groundbreaking work on biases, is the availability

heuristic. Availability is the ease with which relevant instances of a given category come to mind [10].

In one study, subjects were given lists of names to remember including both famous names and less famous names. The famous names were more easily recalled. The prior experience of the subjects had primed them to give prominence to the famous names, which could be more easily remembered at the expense of the less familiar names.

The problem this kind of bias poses for creative problem solving was succinctly articulated by Abraham Maslow, who famously wrote, "I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail" [11].

The availability bias impedes our ability to think divergently, and can lead to creative blocks as the mental archive of relevant examples is exhausted, limited by the capacity to retain memories. We have a tendency to recall what easily comes to mind. Availability bias inhibits our facility to come up with many, different approaches to a problem or a question, which is extremely important to the design process [12]. These kinds of biases can lock us into seeing the constraints of a given situation as fixed and immutable.

Divergent thinking is fundamental to robust ideation and bias towards what is familiar and memorable limits our ability to find novel and useful solutions. Cultivating divergent thinking can provide the designer with the sufficient escape velocity to break away from the gravity of the status quo, and discover new ways of coordinating behavior and generating value.

In order to overcome this bias, consider creative strategies that allow you to think beyond your thinking, so to speak. Consider bringing other people and perspectives into your process of ideation, discovering a greater reservoir of ideas than is available to you alone. Empathize with others who can offer diverse insights. Think laterally, relating ideas indirectly to other categories of ideas, as you build off of unusual or unexpected associations. Even tools like Google or a thesaurus can be helpful in augmenting your thinking and overcoming availability bias. Diverse perspectives enhance the creative process. The ability to zoom in or zoom out provides different perspectives that can open up new avenues of discovery, and ultimately provide more value for everyone.

A related cognitive bias to the availability bias, inhibiting our ability to see beyond the immediately apparent constraints, is functional fixedness. Functional fixedness developed out of the work of Gestalt psychologist, Carl Duncker, who was interested in how we create a holistic, meaningful cognitive picture of the world from the myriad disconnected pieces of information we are constantly exposed to. Duncker presented the following puzzle to demonstrate the idea:

You are given a box of thumbtacks, a candle, and a book of matches. Your task is to fix the lighted candle to the wall. How would you do it?

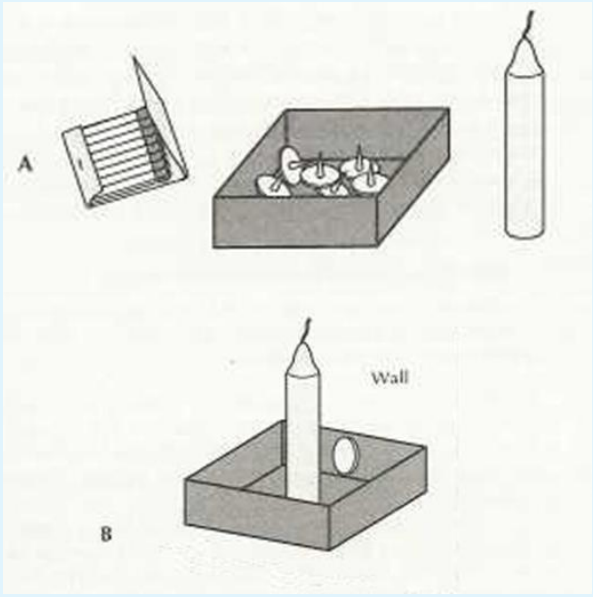

Figure 1: Puzzle to demonstrate the cognitive bias.

Many people will attempt to solve the problem by either trying to melt the wax so that it will adhere to the wall or to use the thumbtacks to pin the candle to the wall. None of these solutions succeed. The solution to the problem involves dumping out the thumbtacks from the box, and using the box as a kind of shelf, pinning it to the wall with the thumbtacks and placing the candle inside of it. Most people only see three items with which to solve the problem: the candle, the matches, and the box of thumbtacks. They fail to see the hidden fourth item; the box that holds the thumbtacks. Many people get stuck within the fixed and familiar expectations of the function or use of those objects. In this case, creative thinking is literally depended on thinking within the box, not outside of it [13].

Reframing the Game with Choice Architecture

Positive Sum Design is, in part, an attempt to coordinate choices in such a way as to produce the most aggregate value for the most stakeholders. In order to effectively do this, the biases that limit creativity and coordination, and the inability to perceive otherwise obscured value, must be overcome. In this way, the coordination problems posed by Positive Sum Design more closely align with what might be characterized as Humanity Centered Design, rather than Human (or User) Centered Design; the former emphasizing systems

and the relations between agents, considering all the stakeholders participating in that system, including anyone who is involved in the design, production, consumption, and disposal/reuse of designed objects or experiences; the latter emphasizing merely the individual user, which is typically taken to be equivalent with the consumer. Yet, with both, empathy is essential for gaining insights into the conditions which provide affordances for choice.

Choice architecture is a term coined by Sunstein and Thaler in their book, "Nudge". It refers to those affordances for choice that a given process provides. In "Nudge", Sunstein and Thaler explore strategies for presenting options to users, influencing behavior while preserving the freedom of choice – an idea they call "Libertarian Paternalism." Sometimes choice architecture provides affordances for an expanded menu of choices (and the necessary knowledge to make informed decisions), but sometimes choice architecture limits choice, providing a path of least resistance towards the best possible outcome. They provide six principles of good choice architecture: 1) incentives 2) mapping 3) defaults 4) feedback 5) error 6) structure [14].

Simple interventions to choice architectures can change behavior quite radically. Setting the default to "opt out" rather than "opt in" for a retirement plan can make the difference between having enough money in retirement or not. The organizing of complex choices in easily accessible and visually compelling ways, as when given the choice from thousands of swatches of subtly different gradients of house paint, can make complex choices seem less overwhelming. Good choice architecture can provide stakeholders with the tools to map and compare between different options, especially when the stakes are high, as they might be when deciding how to treat an illness. Better affordances for choice can help users make better decisions that lead to better outcomes for everyone [14].

Designing Affordances for Win/Wins

Thoughtful choice architecture can furnish solutions to coordination problems. A coordination problem is a situation where stakeholders benefit from adopting a complementary strategy in order to achieve a win/win, a positive sum. In the previous article on Positive Sum Design, I offer the well-known coordination problem given by Jean Jacques Rousseau: the Stag Hunt.

Two hunters, who cannot communicate directly, have a choice. They can coordinate their behavior in order to kill a stag, which is a big payoff for both. Or, the two hunters can work independently, in an uncoordinated manner, each taking home a rabbit, which is a pretty meager pay off, but better than nothing.

The problem the hunters face is that all stakeholders must either implicitly or explicitly understand the choices of the other(s) in order to coordinate their behavior or earn the bigger payoff. In situations where direct communication is not possible, as in the example given above, other methods for coordinating behavior become necessary. This is where thoughtful affordances for choice come into play.

Consider ways in which to design the environment, and the rules and norms that operate within that environment, produce abundant common knowledge. Common knowledge is knowledge that is known by everyone; I know that you know that I know that you know, etc. If it is known by all hunters that the local laws don't permit the hunting of rabbits, then there is less incentive to defect, and a greater probability of coordination and cooperation. Likewise, if white furred rabbits are difficult to see against the white falling snow of the surrounding environment, then conditions will be more favorable for hunting stags.

Consider the way drivers coordinate their behavior on the road, even with limited direct communication, aside perhaps from the occasional honk of a horn. Most drivers are aware of the norms for driving. They observe, by and large, the laws of the road. Most drivers understand that it is proscribed to run a red light, but sanctioned to advance on green. You can count on most drivers to observe these rules, resulting in coordinated behavior between all stakeholders.

This kind of common knowledge can be even further enhanced with symbolic representations that nudge and remind drivers to act in a safer, more courteous manner: a sign reminding drivers not to text while driving or to buckle their seatbelts, for example. But even beyond these examples, the development of, and participation in, rituals can be an effective strategy for developing affordances for coordinated behavior. The daily commute is a ritual that can reinforce positive sum behaviors and common knowledge by reminding drivers about what constitutes best practices on the road through the daily practice of driving to work [15].

In instances where direct communication is not possible, and where design interventions upon the environment are limited, appealing to the biases of stakeholders provides another strategy for coordinating behaviors and producing positive sum outcomes. Michael Suk-Young Chwe gives an example of this kind of coordination in his book, "Rational Rituals: Culture, Coordination, and Common Knowledge."He describes the pull of people toward one another by virtue of the inherent biases they hold in common.

"Two people who want to meet each other somewhere in New York City when the time has been prearranged

but the location have not. Both people only care about meeting each other, not the location, and there are as much possible coordination as there are locations in the city. Facing this hypothetical problem, however, people typically choose the Empire State Building, Grand Central Station, and so on. In other words, shared ideas about what is "obvious" can help coordination even without any explicit communication" [15].

Positive Sum Design

Design is ubiquitous. It determines our behaviors and our capacity for choice on a scale that is hard to fully grasp. Consider the task you are doing right now, and the design decisions that went into making that behavior possible. Consider the choices available to you as you engage with the material culture and built environment all around you. Design organizes our relationships to each other in subtle and conspicuous ways. It shapes the manner in which we choose to coordinate our behavior for mutual benefit, or choose not to [16-18].

The questions that I will conclude with, which are both ethical questions as well as design questions, are the following: Can thoughtful design change bias? Can design promote the kind of bias that advances cooperation and coordination? If so, by what means? What affordances might be designed to change a zero sum into a positive sum?

As Simon says, "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones" [7]. The manner in which choices are presented to stakeholders, as well as the decisions designers make throughout the creative process itself, represent two different, but related choice architectures. Both are creative processes that hold the potential for positive sum outcomes.

Figure 2: Positive Sum Design.

References

1. Gonsher Ian (2017) An Introduction to Positive Sum Design. Critical Design Critical Futures.
2. Gibson JJ (1950) The perception of the visual world. Houghton Mifflin, England.
3. Norman DA (1998) The design of everyday things. MIT, London.
4. Norman DA (1999) Affordance, conventions, and design. Interactions 6(3): 38-42.
5. Meegan DV (2010) Zero-Sum Bias: Perceived Competition Despite Unlimited Resources. Front Psychol 1: 191.
6. Gigerenzer G (2008) Rationality for Mortals. How people cope with uncertainty. Oxford University Press, New York.
7. Simon Herbert (1996) The Sciences of the Artificial 3rd (Edn.), MIT Press, Cambridge, MA, USA.
8. Gigerenzer G, Goldstein DG (1996) Reasoning the fast and frugal way: Models of bounded rationality. Psychological Review 103(4): 650-669.
9. Goldstein DG, Gigerenzer G (2002) Models of ecological rationality: The recognition heuristic. Psychological Review 109(1): 75-90.
10. Tversky A, Kahneman D (1973) Availability: A heuristic for judging frequency and probability. Cognitive Psychology 5(2): 207-232.
11. Maslow AH (1966) The psychology of science: A reconnaissance. Harper & Row, New York.
12. Guilford JP (1957) Creative abilities in the arts. Psychological Review 64(2): 110-118.
13. Duncker K, Lees LS (1945) On problem-solving. Washington DC, American Psychological Association.
14. Thaler RH, Sunstein CR (2009) Nudge: Improving decisions about health, wealth, and happiness. Yale University Press.
15. Chwe M (2001) Rational Ritual: Culture, Coordination, and Common Knowledge. Princeton University Press.
16. Gibson JJ (1977) The Theory of Affordances. In: Shaw R, Bransford J (Eds.), Perceiving, Acting, and Knowing: Toward an Ecological Psychology. Lawrence Erlbaum, Hillsdale, pp: 67-82.

17. Kahneman D (2011) Thinking, fast and slow. Farrar, Straus and Giroux, New York.

18. Kant I, Guyer P, Wood AW (1998) Critique of pure reason. Cambridge University Press, Cambridge.