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A BEHAVIORAL SCIENCE APPROACH TO MASS CUSTOMIZATION CO-DESIGN TOOLKITS: DISTINCTION BIAS AND COMPARATIVE ELEMENTS

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Abstract: *Mass customization (MC) scholars identified key elements of transactional and relational phenomena underlying the value of the MC experience and co-design toolkit. Their work, outcomes and insights demonstrate applications of behavioral science, a field growing due to its practical application to motivate debiased decision making that changes individual and social behavior to achieve wellbeing. In the MC context, we explore distinction bias which predicts a single choice is the experientially optimal and happier option versus simutaneously deciding between two alternatives. Previous findings support comparisons of customized outcomes to standard offerings to judge value. We revisit previous MC studies on default versions to offer updated recommendations about the design of co-design toolkits that enhance MC experiential value.*

Key Words: ***Mass Customization, Co-Design Toolkit, Distinction Bias, Experiential Value, Behavioral Science, Consumer Loyalty***

1. INTRODUCTION

The pioneering studies of mass customization (MC) scholars identified key elements of the transactional and relational phenomena underlying the value of the MC experience and co-design toolkit. These concepts and their outcomes demonstrate applications of behavioral science. Interest in behavioral science is growing due to its practical application to motivate decision-making that changes individual and social behavior to achieve wellbeing. Knowledge of the biases inherent in human decision-making offer opportunities to apply a behavioral science lens to the way in which MC offers value to the consumer, guiding them to achieve their unique transactional and experiential goals. We explore distinction bias, a construct that deals with how a person chooses the experientially optimal option when deciding on a single choice versus between two alternatives. The concept predicts that single choices made in the situational context relevant to the decision tend to generate greater happiness with that choice. Previous work in MC recommends offering standard or default versions of MC offerings so that consumers can compare their customized outcomes to judge the value of these creations. Applying the distinction bias concept, we revisit this previous work on default versions to offer updated recommendations about the design of co-design toolkits that enhance MC experiential value.

The goal of this paper is to apply the behavioral science literature surrounding the distinction bias to the mass customization and personalization arena. We employ Hsee and Zhang's [1] conceptualization of distinction bias to explore this concept in MC. We begin with a discussion of behavioral science and its relationship the MC. Next, we describe distinction bias and its relevance as subject of research in behavioral science. Afterwards, we discuss extant MC literature regarding the significance and value-inducing elements of the MC co-design toolkit, imparting MC scholars' recommendations from empirical studies on the toolkit's ideal characteristics. Finally, we apply the distinction bias to MC and provide recommendations for MC toolkit designers and scholars. In short, this paper offers updated recommendations about structuring co-design toolkits that enhance MC experiential value with a particular focus on the distinction bias.

2. BEHAVIORAL SCIENCE AND DECISION-MAKING

The behavioral sciences are concerned with discovering how humans behave and make decisions so practitioners can predict and potentially change future behavior. In the 30+ years after the original characterization and seminal conceptualization of MC [2, 3], numerous theoretical and empirical studies by scholars in the field developed insights and recommendations aimed at improving the MC process. These led to a canon of work revealing the transactional and relational value of MC from the consumer perspective, much of it exploring individual decision-making that falls into the purview of behavioral science, albeit described via different terminology. Both behavioral scientists and MC scholars overlap in their study of observable and measurable behaviors concerned with how individuals choose, decide, and purchase providers' offerings. As such, comparing and applying some central findings in behavioral science relevant to and in the context of MC will serve as a fruitful foray into the unification of these fields of study.

Behavioral science flows out of behavioral psychology, a field with a storied history leading back to pioneering psychologists, like Skinner and Pavlov, who introduced and formalized the now ever-present concept of behavior. The field advanced for decades extending its tendrils into pre-existing domains to study. This process of behavioral examination of other fields notably led to the Nobel-prize winning work of Tversky and Kahneman [4] on the psychology of judgment and decision-making, for which the two scholars are revered as the founders of behavioral economics. Behavioral economics posits that people's behavior deviates from the rational economic model of decision-making in a predictable way. This finding set off a firestorm of future research which has built out the field more broadly. Expanding upon the idea that people are predictably irrational, behavioral science discovers and catalogs biases and heuristics which explain human behavior.

As alluded to earlier, the goal of behavioral science is to objectively capture how people really make decisions and act in different circumstances, after which scholars compare these behaviors to normative standards of homo economicus (i.e., the economic model that human decisions are always rational) to determine if this objective behavior fits standards of how we think people should act. Understanding how people behave is the first step in the process of helping individuals make better decisions. For example, findings from behavioral science have informed public policy interventions promoting health-related initiatives, political messaging, and business strategy. Behavioral insights drive the tech sector. Notably many cutting-edge, consumer facing technologies that deliver content to which people react strongly significantly influence the algorithms that populate everything each of us sees on our devices in our social media feeds, curated music playlists, shopping recommendations, advertisements, and more. Behavioral science allows researchers to "open up the hood" of a societal problem and start to understand why people decide and do what they do. Given this approach has been highly efficacious across multiple contexts and fields, application of the behavioral science perspective, approach, and methodologies stand to reinforce and deliver valuable results for MC scholarship and design.

Another benefit of using a behavioral science lens at MC and behavioral science is the availability of insights that can be derived from the fact that behavioral scientists are not unified in their interpretation of the source and process of human decision-making. Behavioral economists who follow Tversky and Kahneman's lead view choices made which do not consistently maximize economic outcomes as deviations. This framing is often fruitful because behavioral phenomena compared to a robust standard become meaningful, and such deviations from the homo economicus model of choice are deleterious, systemic errors that necessitate correction (i.e., buying four turtleneck sweaters because they are on sale at a discount when you only needed one).

On the other hand, scholars like Gigerenzer [5] view these deviations from normative economic standards in a less paternalistic, more positive light, characterizing these human decision-making errors not as faults, but as natural choices. This latter approach is well suited for MC scholarship. Decisions made by MC consumers are not subject to being right or wrong. The options they consider differ but are not objectively better or worse. People who engage in MC are attempting to satisfy their preferences as well as the MC toolkit allows. Gigerenzer's view of deviations as natural is fitting as people do not make errors by choosing any feature from categories for an offering that match their unique designs more appropriately.

The essence of MC is its ability to enable the consumer to express and realize uniqueness in offerings, outcomes, and experiences, in which the MC field excels at delivering value specific to situational or contextual factors. Many of the decisions consumers make during the MC process are qualitative and geared towards consumer happiness, creativity, or other more personal outcomes, which make MC important in not only helping individuals obtain product utility and transactional objectives, but also uncover and realize unique, subjective preferences and goals. As such, behavioral scientists should not only be concerned with identifying and correcting what may be considered suboptimal decision biases. Also, they should address human beings' natural decision process and address how to evoke and beneficially guide such choice making in a given decision framework. For instance, in presentation of three MC offerings, a person's natural choice will be the offering positioned in the center regardless of other features. This tendency of people to choose that middle option is known in behavioral science as central position bias. Knowledge of the array of human biases and natural choices from the spectrum encompassed by both the Tversky and Kahneman, and Gigerenzer views underscore the mutually beneficial approach of combining the lenses of both MC and behavioral science.

2.1. Distinction bias

With the MC co-design process filled with choice opportunities, MC toolkits should fortify decision-making by imbuing features and processes to use human biased and natural decision-making in positive ways. This means minimizing suboptimal choice patterns to enhance the MC experience.

Distinction bias is one such factor to consider in the construction of MC toolkits. The bias says that when people simultaneously compare multiple similar options, they are more likely to overpredict benefits, choosing the alternative with the quantitatively greatest features. However, when presented with a single offering suited to better meet the person's needs relevant for their particular situation, the individual's selection makes them happier versus the offering selected from the comparatively quantitative choice array. Following, we proceed with a brief review of factors MC scholars deem key to optimal MC toolkit design, and follow with a categorical model to which we consider implications of distinction bias.

3. THE MC CO-DESIGN TOOLKIT

In their seminal work, Salvador, de Holan and Piller [6] identified MC as the strategic "process for aligning an organization with its customer needs" prescribing

three vital "organizational capabilities" (p.71). The first of these is "solution space development" (p. 72) via a tool affording individuals options to communicate and innovate choices and unmet needs into the designed MC offering, allowing them to express their uniqueness, generate a variety of "virtual prototype(s)" (p. 73) for consumer review, and amass information on an ongoing basis about consumer experience and behavior. The second element of the process is "robust process design" (p. 73) where the firm incorporates current resources that are adaptable, autonomous, and modular to satisfy distinct requirements of different customers. The third element, "choice navigation" (p. 73), option matching and recommendation mechanisms for each MC user, interactive and responsive trial-and-error means, and systems that rearrange and to show the changes consumers select during the MC co-design.

Over the past 25 years, MC scholars have enumerated key aspects of the MC process that enhance the transactional and relational value of product outcomes and individual experiences for consumers. These characteristics are essential to structuring a well-designed MC configurator. The value rendering ability of the MC co-design toolkit to engender loyalty is what lies at the essence of MC success for both provider and customer [7]. In addition to the seminal finding that revealed MC as a significant generator of the consumer's willingness-to-pay two times that for the same standard, mass produced offering [7], numerous empirical studies revealed features required to structure effective MC toolkits to heighten the consumer's perceived value of the MC experience, factors that mitigate complexity while promoting psychological ownership, enjoyment, and control including uniqueness, the I-designed-it-myself effect, creativity [7, 8, 9, 10, 11, 12, 13, 14, 15].

Based upon these studies, Turner, Merle & Dichon [16] gleaned three categories key to developing co-design toolkits that enhance the value of the MC experience. Subsequent work of MC scholars reinforces these designations. The first category requires a large enough canvas, or solution space, structured to provide choice guidance while mitigating cognitive load, or complexity, what behavioral scientists call choice architecture [17]. This characteristic - scope of customization [16] - suggests three elements to enhance the choice process, number/breadth of modules, range of options, and degree of design freedom. All enable ease of use, selection of unique combinations of designs, flexibility, which reduce the burden of choice and enhance individual decision-making and allow the person to express uniqueness and creativity [9, 10, 13, 14].

Feedback mechanisms that are embedded and interpersonal are the second category [16]. Among the key features for MC co-design toolkits is incorporation of embedded trial-and-error learning and visualization features which help to lower complexity and increase psychological ownership by enabling the I-designed-it-myself effect, control, and enjoyment [9, 12, 13, 15, 18]. Among the capabilities required of well-built sales configurators to reduce product variety paradox [19] and enhance the MC experience are focused navigation, flexible navigation, easy comparison, user-friendly product-space description, and benefit-cost communication [20, 21, 22]. Further, learning from and sharing with others renders rich sources for peer input and involvement of user communities [12], as well as interaction with the MC provider's sales personnel [13]. which together serve to reinforce the individual's MC design choices and decisions. MC toolkits should be designed to adjust to the expertise and knowledge of users [23].

More recently, MC scholars have delved further into the social aspects of the co-design process, underscoring the import of social features in toolkit designs, and shedding light on the social dimensions of online configurators [24, 25, 26]. Even given the ubiquity of social media platforms, a 2021 pilot study comparing MC co-design toolkits of tangible and intangible offerings [27] found several MC providers have yet to incorporate social media sharing and feedback features into their configurators.

Comparative elements of a MC co-design toolkit are those that allow users to compare the combination of options they choose so they can judge and select which is ideal for them. Such mechanisms help to decrease a person's perceived complexity by minimizing cognitive effort of decision making between choices. Turner et al., [16] describe three comparative components, availability of a standard or default version of a mass customized offering to which MC consumers can compare their co-designed versions; packages of popular modules for comparison to various module options; and package pricing versus a la carte pricing of individual features [8]. Permitting such assessment, selection and comparison of MC options continues to be an important feature throughout the MC experience [19, 20, 28].

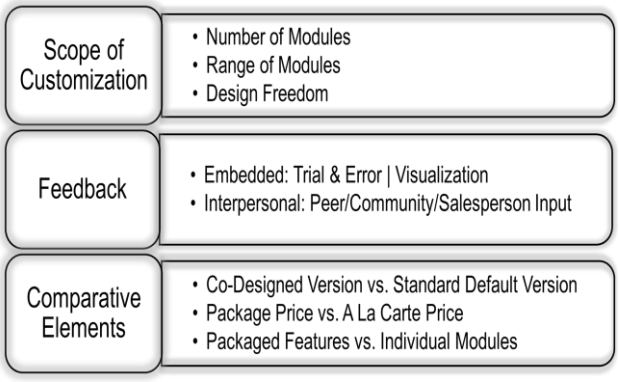

Fig. 1. *Turner et al. (2011) Elements of the Co-Design Toolkit*

4. DISTINCTION BIAS AND COMPARATIVE ELEMENTS OF THE MC TOOLKIT

Employing Turner et al.'s [16] model categorizing the three key components of the MC co-design toolkit, we proceed to explore the third one, comparative elements (Fig. 2). Previous work in MC recommends offering standard or default versions of MC offerings so that consumers can compare their customized outcomes to judge the value of their own creations. This is different from the default option described in behavioral science: Here, the default option is automatically activated when an individual neither acts nor decides not to choose from

options presented to them [4]. Given the participatory, collaborative essence of the MC experience enabled by the co-design toolkit, the default offering is a non-customized version meant to be used to aid the individual not only in the decision-making process, but also to reinforce the user's confidence in their own creative process and afford flexibility to change decisions made during previous iterations.

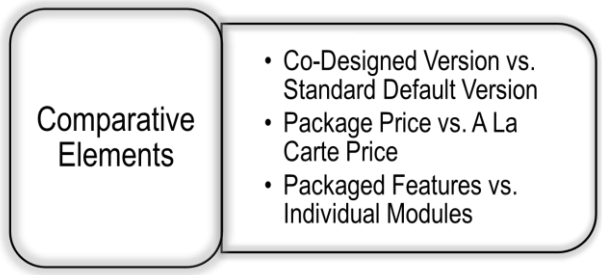

Fig. 2. *Turner et al. (2011) Comparative Elements of the Co-Design Toolkit*

Understanding the importance of experiential utility and situational context of decision-making, use of the distinction bias concept – and other behavioral science applications - can guide the design of more effective comparative elements in MC toolkits. How, then, should MC scholars provide guidance to practitioners on the optimal design of MC configurators to enable and incorporate knowledge gleaned from distinction bias?

One factor to consider is that the *type* of options offered to people can skew their perceptions of value, leading to a mismatch of outcomes with actual preferences. MC studies on complexity remind us that to ease the cognitive load of processing multiple choices, MC co-design toolkits must mitigate the effort with elements that increase control and enjoyment of the MC process [29]. The modularity of MC manages choices. Yet, while some quantitative differences are easy to interpret and compare in situations where comparisons are presented for evaluation, in a vacuum people are inclined to choose the highest value item but not necessarily the best value item. Knowing this about the distinction bias, these sorts of differences should be minimized or reframed when possible, paying attention to the composition and presentation of the alternatives displayed to the MC consumer.

Also, defaults can be used to further enable high quality decision-making when quantitative differences are in play due to distinction bias. A default option that highlights the suitability of an alternative in the mid-range of a quantitative field is another way to debias an array of choices. Further, a default structured to emphasize qualitative features may motivate non-quantitative comparative decision-making.

Another aspect of distinction bias, that a single choice made to fulfill a specific use situation generates more happiness for the consumer from subjective, more qualitative utility suggests that the MC toolkit should be structured to maximize how it gleans and pinpoints individual preferences, the more effective will be the MC co-design experience for the person. Therefore, elements that aid in enhancing single choices are key to optimal configurator design. Further, MC providers have some leverage to blunt the impact of distinction bias by framing options as qualitatively different whenever possible. MC firms can also attempt to limit the bias's impact by offering fewer comparative alternatives, but caution is warranted given MC empirical studies and providers' offerings are rich with modules, features, and options that appeal to MC consumers' desire for choices affording unique, individualized combinations.

5. CONCLUSION

Both MC and behavioral science fields focus on how choice architecture and framing to help individuals make decisions that produce better outcomes. Scholarship and findings in both fields directly overlap and complement one another, such that combining their insights expands their mutual benefit. The catalog of heuristics, biases, and research methodologies identified by behavioral science expands and offers the MC field additional opportunities and approaches to optimize consumers' co-design experiences. While we explore only one of many factors regarding choice architecture and decision framing, to our knowledge this paper is the first attempt to apply the behavioral science's distinction bias in the realm of the MC co-design toolkit.

Future research will clarify whether one or both approaches best serve the MC user. Given the point where consumer preferences become individually distinct is the domain and ultimate value of MC, unexplored behavioral science approaches will reveal and yield better toolkit designs. This will enable even more optimal decisions and outcomes for the MC consumer and provider, further enhancing the value of the MC co-design experience.

6. REFERENCES

[1] C. K. Hsee, and J. Zhang, "Distinction bias: misprediction and mischoice due to joint evaluation," *Journal of Personality and Social Psychology*, vol. 86, no. 5, pp. 680-695, 2004.

[2] S. M. Davis, *Future Perfect*, Reading, MA: AddisonWesley Publishing Company. 1987.

[3] B. J. Pine, Mass Customization: The New Frontier in Business Competition, Harvard Business School Press, Boston, MA, USA, 1993.

[4] A. Tversky, and D. Kahneman, "Judgment under uncertainty: Heuristics and biases," *Science.* Vol. 185, no. 4157, pp. 1124–31, 1974

[5] G. Gigerenzer, G., "On narrow norms and vague heuristics: A reply to Kahneman and Tversky," *Psychological Review*, vol. 103, no. 3, pp. 592–596, 1996.

[6] F. Salvador, P. M. De Holan, and F. T. Piller, "Cracking the code of mass customization," *MIT Sloan Management Review*, vol. 50, pp. 71-78, 2009.

[7] N. Franke, and F. Piller. "Value creation by toolkits for user innovation and design: The case of the watch market," *Journal of Product Innovation Management*, vol. 21, no. 6, pp. 401-415, 2004.

[8] B. G. C. Dellaert, and S. Stremersch, "marketing mass customized products: Striking a balance

between utility and complexity," *Journal of Marketing Research,* vol. 42, no. 6, pp. 219-227, 2005.
[9] M. Schreier, "The value increment of mass-customized products: An empirical assessment," *Journal of Consumer Behavior*, vol. 5, no. 4, pp. 317-327, 2006.
[10] N. Franke, and M. Schreier, "Product uniqueness as a driver of customer utility in mass customization," *Marketing Letters*, vol. 19, no. 2, pp. 93-107, 2008.
[11] N. Franke, and M. Schreier, "Why customers value mass-customized products: The importance of process effort and enjoyment," *Journal of Product Innovation Management,* vol. 27, no. 12, pp. 1020–1031, 2010.
[12] N. Franke, P. Keinz, and M. Schreier, M., "Complementing mass customization toolkits with user communities: How peer input improves customer self-design," *Journal of Product Innovation Management,* vol. 25, no. 6, pp. 546-559, 2008.
[13] B. G. C. Dellaert, and P. A. Dabholkar,, "Increasing the attractiveness of mass customization: The role of complementary online services and range of options," *International Journal of Electronic Commerce,* vol. 13, no. 3, pp. 43-70, 2009.
[14] A. Merle, J. L. Chandon, E. Roux, and F. Alizon, "Perceived value of the mass customized product and mass customization experience for individual consumers," *Production and Operations Management,* vol. 19, no. 5, pp. 503-514, 2010.
[15] N. Franke, M. Schreier, and U. Kaiser, "The "I designed it myself" effect in mass customization," *Management Science,* vol. 56, no. 1, pp. 125-140, 2010.
[16] F. Turner, A. Merle, and P. F. Diochon, "How to assess and increase the value of a co-design experience: A synthesis of the extant literature," in *Mass Customization, Personalization, and Co-Creation: Bridging Mass Customization and Open Innovation, MCPC 2011.*
[17] R. H. Thaler, C. R. Sunstein, and J. P. Balz. *Choice Architecture,* Princeton, NJ: Princeton University Press, 2013.
[18] Arora, N., Dreze, X., Ghose, A., Hess, J. D., Iyengar, R., Jing, B., Joshi, Y.V., Kumar, V., Lurie, N.H., Neslin, S., Sajeesh, S., Su, M., Syam, N.B., Thomas, J. and Zhang, Z. J. (2008), "Putting one-to-one marketing to work: personalization, customization and choice," *Marketing Letters*, vol. 19, no 3, pp. 305-321.
[19] A. Trentin, E. Perin, and C. Forza, "Sales configurator capabilities to avoid the product variety paradox: construct development and validation", *Computers in Industry*, vol. 64, no. 4, pp. 436-447, 2013.
[20] A. Trentin, E. Perin, and C. Forza, "Increasing the consumer-perceived benefits of a mass-customization experience through sales-configurator capabilities," *Computers in Industry,* Vol. 65, No. 4, pp. 693-705, 2014.
[21] E. Sandrin, "Synergic effects of sales-configurator capabilities on consumer-perceived benefits of mass customized products," *International Journal of Industrial Engineering and Management,* vol. 8, no. 3, pp. 177-188, 2017.
[22] E. Sandrin, A. Trentin, C. Grosso, C. and C. Forza, "Enhancing the consumer-perceived benefits of a masscustomized product through its online sales configurator: An empirical examination," *Industrial Management and Data Systems*, vol. 117, no. 6, pp. 1295-1315, 2017.
[23] I. Fürstner, Z. Anišić, and M. Takács, "Product configurator self-adapting to different levels of customer knowledge," *Acta Polytechnica Hungarica,* vol. 9, no. 4, pp. 129-150, 2012.
[24] P. Blažek, M. Kolb, M. Partl, and C. Streichsbier, "The usage of social media applications in product configurators", *International Journal of Industrial Engineering and Management,* vol. 3, no. 4, pp. 179-183, 2012.
[25] P. Blažek, M. Kolb, C. Streichsbier, and S. Honetz, S., "The evolutionary process of product configurators", in *Managing Complexity,* Bellemare, J., Carrier, S., Nielsen, K., and Piller, F. T. (eds.), 2017, (pp. 161-172) Springer, Cham.
[26] C. Grosso, C. Forza, and A. Trentin, "Supporting the social dimension of shopping for personalized products through online sales configurators", *Journal of Intelligent Information Systems,* vol. 49, no. 1, pp. 9-35, 2017.
[27] F. Turner, and M. Watts. "Looking for patterns: A comparative analysis of mass customization co-design toolkits for tangible versus intangible offerings," in *Towards Sustainable Customization: Bridging Smart Products and Manufacturing Systems*, Nov. 2021 (pp. 851-859). Springer, Cham.
[28] N. Suzić, E. Sandrin, S. Suzić, C. Forza, A. Trentin, and Z. Anišić, "Implementation guidelines for mass customization: A researcher-oriented view," *International Journal of Industrial Engineering and Management,* vol. 9, no. 4, pp. 229-243, 2018.
[29] F. Turner, A. Merle, and D. Gotteland, D., "Enhancing consumer value of the co-design experience in mass customization," *Journal of Business Research*, vol. 117, pp. 473-483, 2020.

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