

Schwaninger M. (2018) Systemic design for sustainability. *Sustainability Science* 13: 1225–1234.

Schwaninger M. & Ott S. (2023) What is variety engineering and why do we need it? *Systems Research and Behavioral Science* 41(2): 235–246. <https://doi.org/10.1002/sres.2964>

Ulrich H. (2001) *Gesammelte Schriften* [Collected writings]. 5 Volumes. Haupt, Bern.

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Author's Response Toward Implementing Second-Order Brand Management

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> Abstract • I emphasize the significance of addressing second-order brand management by clarifying the scope of the target article and the research context, in which the conditions and methods through which ethical and profitable business practices can be achieved are explored. Furthermore, I clarify the position of second-order brand management by distinguishing phenomena related to variety and complexity that can be attributed to selling and first-order brand management, and by using e-commerce case studies to support the theoretical framework.

« 1 » I would like to thank all the commentators for their stimulating and inspiring contributions. The commentaries received include elements I did not emphasize, aspects I failed to explain, and insights that will catalyze future development. In the target article, I aim to connect brand management and cybernetics by answering the two research questions (§§37, 80). Suppose I can convincingly demonstrate that brand management is a practice of cybernetics. In that case, the target article has achieved most of its goals. I propose two future research programs in the target article. The first is research on brands as systems (§82). This line of inquiry engages with the ecosystem of stakeholders incorporated within second-order brand management. The second is research into how to grasp the brand image held by stakeholders (§83). This line of inquiry is related to the question of how people perceive brands. I planned to conduct these research programs after the cybernetics community had recognized brand management as a relevant subject for cybernetic study. The commentaries I received are related to how to develop these research programs, so I can say that I achieved the purpose of the target article.

Scope of the target article

« 2 » **Peter Hayward Jones** provides a valuable clarification of concepts for readers unfamiliar with marketing and brand management to understand the target article while clarifying what the article addresses and leaves unaddressed. First, the definition of brand management cited by **Jones** (§3), which concerns “gaining power, by making the brand more known, bought, and engaging” (Kapferer 2012:10), does not align with the concept of a brand as an autopoietic system, as discussed in German-speaking countries and Japan. However, in the discussions developed in the target article, there are no deviations from Jean-Noël Kapferer's definition. **Jones's** (§2) point that the label exploratory should be further delineated is also plausible. In the target article, I use the term exploratory as an alternative to new. Conventional and exploratory labels correspond to traditional approaches and newer approaches to brand management, distinguishing between those with established methodologies and those without. Apart from those old and new, second-order brand management is exploratory in the sense that it is open-ended. **Jones** emphasized this exploratory nature in developing his commentary on second-order brand management. The brand portfolio strategy (Aaker 2004), including the master brand strategy described by **Jones** (§4), addresses the relationship among multiple brands. It has become common practice to define and systematically manage the relationship between the corporate brand as the master brand and product brands as subbrands. Although in the target article I do not address the management of multiple brands, brand portfolio strategy remains within the domain of conventional brand management – that is, first-order brand management. However, this point raises issues that warrant further exploration. Considering the complementarity between first- and second-order cybernetics, as discussed by **Juliana Mariano Alves** (§13), one could envision a strategic framework in which the corporate brand is approached through second-order brand management, while product brands are addressed through first-order brand management. This framework may offer a valuable analytical perspective.

« 3 » The commentary by **Maia Gould** clarifies that the target article has not progressed to the ecosystem study. **Gould** (§6) points out that Figure 3 of the target article gives an impression of a closed system. Although the systems under discussion are not closed and are embedded within an ecosystem, the target article remains limited in that it focuses primarily on dyadic relationships. In saying that “[g]oing further and expanding the constructs might help in understanding relationships and complexity in modern brand management” (**Gould** §6) points toward advancing research into brands as systems, an agenda that precisely aligns with the future research program. **Gould** (§§16f) is also astute in pointing out that a more in-depth analysis of purpose is desirable. In purpose-driven strategy, the term purpose has been used to refer to the company’s existing reason for being, which, as **Gould** (§16) states, is “assumed to mean a social responsibility.” The discussion of purpose in cybernetics and systems science is not referenced in the target article, and more advanced research is needed.

« 4 » In addition, the target article does not explain how brand identity changes due to interaction with stakeholders. **Alves’s** perspective (§9), which sees brand identity change as an activity to amplify internal variety to respond to the variety of stakeholders external to the company, may give specificity to the analysis.

« 5 » **Alfonso Reyes** organized the discussion on autopoietic systems and Stafford Beer’s Viable System Model (VSM) (Beer 1981), respectively. The idea of brands as autopoietic systems is not an idea of the target article but was initially proposed by Oliver Errichiello and Marius Wernke (2022) and Junzo Ishii (2022) (target article §§30ff). In the target article, I do not discuss this view, and whether it is more than a metaphor remains unclear. Also, connecting brand management with the VSM was originally an idea of Errichiello and Wernke (2022) (target article §33). However, to my knowledge, how it can be applied to brand management has not been presented. It seems to be still in the development stage. **Reyes** (§§4ff) provides an organized discussion of autopoietic systems to address these issues. In addition, **Reyes** (§§8ff) presents an argument (Espejo & Harnden 1989; Espejo & Reyes 2011) that

re-interprets the VSM from the point of view of second-order cybernetics. The second-order cybernetics approach to the VSM connects the VSM with second-order brand management rather than first-order brand management. It is a direct contribution to the future research program I propose in the target article. Furthermore, **Allenna Leonard** (§11) brings a new perspective to the relationship between ethics and brand, as discussed in connection with the design process in the target article (§§62f, 70), by indicating which systems within the VSM brand identity and ethics belong to.

Research context of the target article

« 6 » **Alves** develops an argument that brings mutual insights by considering water governance and brand management in parallel. Thus, it would be helpful to consider brand management in parallel with management and governance in another field. On the other hand, **Leonard** expresses concern about the prevalence of brand identity and brand activity in society. **Leonard** points out that marketing can be unethical or inevitably entail exclusion (**Leonard** §§2f) and that applying ideas about brand identity to fields other than commerce, such as universities and growing students, can diminish adaptability and innovation and limit agency (**Leonard** §10).

« 7 » I agree with **Leonard’s** points and concerns. I want to state that that was precisely the premise of conducting the study for the target article. My intent was not to extend current business practices outside of business but to bring ethics into business and then seek ways for that business to gain benefits comparable to or exceeding those of unethical businesses. In other words, the intent is not to expand the idea of commerce to a broader area that includes our lives as citizens, but the opposite. In another publication (Honjo 2023) supported by the same research grant as the target article, I examined the case of a business structured based on the ethic of care (Gilligan 1982: 30), which is the opposite of servicing and businessizing care in the marketplace. I presented an example of such businesses achieving significant success.

« 8 » Two questions by **Gould** shed light on these research contexts. **Gould’s** Q1 asks

how brand activism is to be evaluated not in terms of its stated purpose but from the perspective of the outcomes. This question, however, is not limited to brand activism – it should be addressed more generally. Assuming that the mere declaration of purpose is insufficient for evaluation, the question to be posited is how and under what conditions the pursuit of profit can be reconciled with the pursuit of stated goals. Furthermore, in Q2, **Gould** raises the issue of how the broader systemic effects of brand management and marketing are to be integrated into second-order brand management, noting that “whether it is possible in all cases for a company to hold a profit motive as well as a commitment to solving the wicked problems” (**Gould** §18) remains a matter for further research. These are precisely the questions I wish to address, and the target article is a step toward that end. Accordingly, I am not yet able to answer **Gould’s** questions directly. However, if a framework could be developed in which the pursuit of profit and engagement with wicked problems are compatible, it would offer a hopeful foundation for a wide range of initiatives.

Variety and complexity

« 9 » I have already discussed the concerns behind **Leonard’s** question, but the question can be viewed as being about variety recognized by the customer. **Leonard** (§5) uses the example of moderately large pharmacy shelves with over 50 brands, many of which have several variations, to ask whether the ordinary consumer can recognize more than a handful of them and whether it would matter Q1. It is common for retail stores to offer many products, and such a sales approach depends on issues of mental and physical availability (Sharp 2010). A two-stage strategy is at work here. First, companies try to increase mental availability, i.e., the likelihood that consumers will recall the product they want to sell. Efforts to increase recall may use the fear arousal approach, an example of selling, or seek to have consumers form a brand image similar to the company’s desired brand identity. Then, efforts are made to increase physical availability, that is, to make the product readily available when recalled. Many products are placed in retail

stores to increase physical availability, not so that consumers have to choose from a large number of products. In other words, the effort to reduce variety for the consumer takes place before the consumer goes to the retail store. It is the role of brands as identifiers (target article §4) to make this happen.

« 10 » **Alves's** question can be seen as addressing the variety or complexity perceived by a company. **Alves** addresses the concept of variety engineering (Schwaninger & Ott 2024), the process of increasing or decreasing variety within or outside the system, based on Ross Ashby's Law of Requisite Variety (Ashby 1956: 206ff), and asks how systems can "avoid excessive de-trivialization and overload of its capacity to absorb complexity, while still retaining its ability for self-organization and adaptability" (Q1). First, I consider first-order brand management, where only customers are de-trivialized. The reason for creating a brand identity is to build strong brands by ensuring brand consistency through complexity reduction (target article §8; Aaker 1996). Brand identity is a constraint that prevents complexity from increasing unnecessarily. In second-order brand management, the company is also de-trivialized, increasing the company's internal complexity. At the same time, second-order brand management has dynamics in which elements of the brand identity are eliminated through interaction with stakeholders, including customers, which contributes to the reduction of internal complexity. In this case, the level of complexity is automatically controlled by the evolution of the brand identity. Therefore, the answer to **Alves's** Q1 would be that engaging in brand management, whether from a first- or second-order perspective, may serve as a means of appropriately configuring the level of complexity. Brand management is a practice concerned with stakeholder perceptions. It is not necessarily exclusive of other practices but can be combined with them. For example, bringing the idea of brand management into water governance would make it easier to determine the range of complexity to be handled. When a brand management perspective is added to other practices of second-order cybernetics, the inclusion of the stakeholder-perception dimension not only advances those practices but also contributes to clarifying what

second-order brand management entails. It should be noted, however, that I am not advocating for applying business practices to the commons. Brand management applied to other fields would need to be ethical in its own right.

Implementation through digital marketing

« 11 » **Gould** (§§8ff) addresses hyper-personalization, noting that "the learning loop between algorithm (leveraged through advertising placement by brands) and consumer is ripe for exploitation through deceptive persuasion" (**Gould** §11). I agree with **Gould's** assertion that hyper-personalization is not necessarily positive. However, I doubt the claim that hyper-personalization can be compatible with second-order brand management (**Gould** §11). Hyper-personalization appears to be inconsistent not only with second-order brand management but also with first-order brand management. Hyper-personalization implies an algorithmic response to high complexity rather than a reduction of high complexity for the company, which is also related to **Alves's** Q1 on complexity. Promoting hyper-personalization means removing the customer's right to choose by reducing the variety for each customer and making the choice the only one. This approach would be the opposite of helping customers choose by presenting a brand identity.

« 12 » **Gould** (§§14f) discusses customer de-trivialization and customer dignity. The first thing to mention here is that the difference between first-order brand management and selling is on the agenda since the customer is the subject of discussion in this case. In the target article (§§72ff), I described de-trivialization as treating customers as non-trivial machines rather than trivial machines (Foerster 1984: 13). By contrast, **Gould** states that "[b]uilding detailed profiles aims for the de-trivialization of potential customers" (**Gould** §15), and there is a discrepancy here. First, it is not possible to obtain sufficient data to hyper-personalize a subject that is a non-trivial machine. Also, recognizing the customer's dignity means allowing the customer to exercise agency, e.g., to make choices. In the target article, "the assumption that de-trivializing customers leads always to acknowl-

edging their dignity" (**Gould** §15) is what is meant above.

« 13 » **Gould** also seems to assume that acquiring "the agility of the brand identity" (**Gould** §8) in second-order brand management positively impacts hyper-personalization. However, if agility is high enough to be effective for hyper-personalization, it is unlikely to be perceived as a brand identity. The change in brand identity described in the target article (§§14f) refers to incorporating stakeholder interactions to ensure consistency is not compromised. The premise is that brand identity is inherently resistant to change due to the necessity of maintaining consistency.

« 14 » Algorithmic hyper-personalization reduces customers' choices and forms filter bubbles – environments in which individuals are surrounded by selectively biased content aligned with their interests and values (Pariser 2011). It can hinder personal development (**Leonard** §10) and exacerbate social fragmentation. Such issues may be understood as relevant to critical cybernetics, which seeks to develop ways of recognizing distinctions imposed by others that lead to oppression and to create conditions in which individuals can exercise their agency (Scholte & Sweeting 2022: 986; Krippendorff 2023).

« 15 » The media ecology mentioned by **Jones** places brand management in the research context of cybernetics from an aspect not addressed in the target article. The idea of mass-media ecology proposed by Klaus Krippendorff (1988: 30ff), to which **Jones** (§9) refers, is that mass-media is not a unidirectional communication but a network composed of institutionalization, self-organization in the social domain (Krippendorff 1988: 43). Unidirectional communication and communication through a self-organized network correspond to selling and second-order brand management, respectively. Krippendorff says:

“Traditional preferences for linear causal explanations initiated by outside events and the belief in a correspondence conception of truth are thus necessarily partial, and if the flow of information in society is circular, goes back to where it started, describing the one-way flow of outside events to a public and stopping there is seriously misleading.” (Krippendorff 1988: 33)

The perspective of mass-media ecology rejects not only the concept of selling but also –

“the positivistic correspondence notion of truth and the associated ontological assumption of an observer- and actor-independent reality that simply ‘waits’ to be discovered.” (Krippendorff 1988: 54)

«16» I need to engage in further research to answer Jones’s Q1, “[h]ow might second-order brand strategies be managed, or coordinated over time, to flourish in a changing marketing ecosystem?” In management studies, the study of ecosystems has become a research trend. Within this context, an ecosystem is described thus:

“To provide a product/service system, an historically self-organized or managerially designed multilayer social network consists of actors that have different attributes, decision principles, and beliefs.” (Tsujimoto et al. 2018: 55)

Furthermore, ecosystem orchestration is defined as –

“the set of deliberate and purposeful actions undertaken by the ecosystem orchestrator to encourage voluntary, value co-creating inputs and effect coordination among hierarchically independent ecosystem of the ecosystem.” (Autio 2022: 107)

The title of Jones’s commentary, “Second-order Branding as Orchestration of Media Ecology,” suggests positioning second-order brand management within the research on ecosystem orchestration. I interpret this as an extension of what I identify as my first future research program: research on brands as systems. Moreover, because the perspective of media ecology engages both ecosystems and cognition, I see a need to integrate this with my second future research program, which focuses on how to grasp the brand image held by stakeholders. Jones’s Q1 is a question that can only be addressed through the completion of several further stages of research – it functions as a research question in its own right. Furthermore, it is now possible to incorporate social media into media ecology (Gould §12).

«17» For the above reasons, I cannot develop a comprehensive discussion

of media ecology here. However, the idea proposed by Marshall McLuhan, cited by Jones (§10), of viewing brand identity as “a medium in which other content, the messages, are carried” (McLuhan & McLuhan 1988) points toward a different trajectory of digital marketing practice – distinct from hyper-personalization – even though it requires more precise consideration of what it means to treat brand identity as a medium. As Jones (§3) states, “[n]o cases or attributions of companies with a second-order process are made” in the target article. Since the target article is a theoretical study, I have intentionally dropped cases to avoid limiting or biasing the reader’s reading. However, I have cases in mind, and they are precisely those that pertain to implementing digital marketing in a direction distinct from hyper-personalization practices.

«18» Kurashicom Inc.,¹ discussed as a case study in Honjo (2023), is an e-commerce company that earned annual sales of 7.01 billion yen and an operating profit of 1.08 billion yen as of the end of July 2024. Kurashicom began operations in September 2007 as an e-commerce site specializing in vintage Scandinavian tableware. It has since expanded its business to include the sale of apparel and household goods from around the globe and its own apparel and cosmetic products. The website Hokuoh, Kurashi no douguten,² operated by Kurashicom, is an e-commerce platform that continuously produces and distributes content – such as editorial features, podcasts, original dramas, and even films screened in theaters – aimed at attracting individuals who may not necessarily be looking to shop. The site has even evolved into a platform where other companies place advertisements. Kurashicom’s slogan is “create a life that fits your lifestyle”³ and the company aims to be recognized as a provider of content and products to help each customer feel like they fit in.

1| Retrieved 17 March 2025 from <https://kurashi.com/en>

2| 北欧、暮らしの道具店. Retrieved 17 March 2025 from <https://hokuohkurashi.com>

3| Coincidentally, the fit that Kurashicom describes is similar to the fit that is the term for radical constructivism.

«19» This can be seen as an implementation of inbound marketing (Halligan & Shah 2014), in which potential customers access the company’s content, become interested, and then make purchases on the spot when they feel like purchasing. Inbound marketing has been practiced since before the digital era, as exemplified by the rock band The Grateful Dead (Scott & Halligan 2010). However, digital technology has made it much more feasible. Inbound marketing aims to create conditions where people are entertained or empowered and choose to purchase when they feel ready. This goal contrasts with hyper-personalization, which focuses on “allowing marketers to micro-target them to get them to purchase products, potentially at moments of weakness” (Gould §15). How Kurashicom’s slogan is shared and the appropriate content and products are distributed may serve as a reference when considering brand identity as a medium.

«20» Thinking about brands in a stakeholder ecosystem is the opposite of promoting isolation and fragmentation through a filter bubble. Instead, it leads us to ask what kind of brand management promotes collaboration. E-commerce, as typified by Amazon.com, is usually oriented toward implementing the scenario of “everything at/from home,” which is thought to promote isolation (Manzini 2022: 16). By contrast, when conducting research for the target article, I had in mind the example of increasing sales by promoting collaboration even in e-commerce.

«21» The e-commerce platform Rakuten Ichiba⁴ (meaning Rakuten market), operated by Rakuten Group Inc.,⁵ is a massive online shopping platform with over 50,000 participating merchants and over 100 million registered members. Its revenue in 2024 reached approximately 1.3 trillion yen. Founded in 1997, Rakuten Group opened Rakuten Ichiba to make it easy for anyone to open a store. It has since expanded its business to include financial services such as issuing credit cards and establishing banks, an e-book business, and a mobile network

4| 楽天市場. Retrieved 17 March 2025, from <https://www.rakuten.co.jp>

5| Retrieved 17 March 2025 from <https://global.rakuten.com/corp>

operator. Rakuten Ichiba, launched in 1997 when it was still uncertain whether products could be sold over the Internet, was built on the concept that “Shopping is Entertainment!” This idea is grounded in the premise that “Shopping is Communication. Communication is Entertainment” (Mikitani & Rakuten Daigaku 2007: 3). The core idea behind this approach is to increase communication volume between stores and potential customers. It is assumed that when a retailer engages in frequent, non-business communication with customers – developing a relationship akin to friendship – customers will gain a fuller understanding of the products, including their background, and choose to purchase at a moment that feels right for them. In this context, shopping is viewed as a collaborative activity between friends. Of course, not all stores on Rakuten Ichiba necessarily adopt this perspective. However, the knowledge required to foster collaboration between stores and customers is shared with merchants through the platform’s training program, Rakuten Daigaku⁶ (meaning Rakuten University). It is also widely disseminated in book form (Mikitani & Rakuten Daigaku 2007).

« 22 » Digital marketing encompasses both approaches that render brand management unnecessary and those that further develop it. Hyper-personalization opens the door to the former. In contrast, Kurashicom’s inbound marketing, which helps customers find a lifestyle that fits them, and Rakuten Ichiba’s collaborative approach demonstrate the potential for the latter to generate substantial value. While detailed case studies of these and other companies are a topic for future research, further study of brand management as a second-order cybernetics practice would provide a theoretical framework for such practices that conventional marketing and brand studies have failed to provide.

References

- Aaker D. A. (1996) Building strong brands. Free Press, New York.
- Aaker D. A. (2004) Brand portfolio strategy: Creating relevance, differentiation, energy, leverage, and clarity. Free Press, New York.
- Autio E. (2022) Orchestrating ecosystems: A multi-layered framework. *Innovation: Organization & Management* 24(1): 96–109.
- Ashby W. R. (1956) An introduction to cybernetics. Chapman & Hall, London. Retrieved 14 June 2013 from <http://pcp.vub.ac.be/books/IntroCyb.pdf>
- Beer S. (1981) Brain of the firm. Second edition. John Wiley & Sons, New York.
- Errichiello O. & Wernke M. (2022) Order in chaos: Cybernetics of brand management. Springer-Verlag, Berlin.
- Espejo R. & Harnden R. (eds.) (1989) The Viable System Model: Interpretations and applications of Stafford Beer’s VSM. Wiley, Chichester.
- Espejo R. & Reyes A. (2011) Organizational systems: Management complexity with the viable system model. Springer Verlag, New York.
- Foerster H. von (1984) Principles of self-organization in a socio-managerial context. In: Ulrich H. & Probst G. J. (eds.) Self-organization and management of social systems. Springer, Berlin: 2–24.
► <https://cepa.info/1678>
- Gilligan C. (1982) In a different voice: Psychological theory and women’s development. Harvard University Press, Cambridge.
- Halligan B. & Shah D. (2014) Inbound marketing, revised and updated: Attract, engage, and delight customers online. John Wiley & Sons, Hoboken NJ.
- Honjo S. (2023) サービス・ウィズ・ケア:「北欧、暮らしの道具店」のケース・スタディ・リサーチ [Services with care: The case of the Life Culture Platform “Hokuoh, Kurashi no douguten”]. *Quarterly Journal of Marketing* 43(2): 42–53. <https://doi.org/10.7222/marketing.2023.049>
- Ishii J. (2022) 進化するブランド: オートポイエーシスと中動態の世界. 碩学舎, 東京 [Evolving brand: In the world of autopoiesis and middle voice]. Sekigakusha, Tokyo.
- Kapferer J.-N. (2012) The new strategic brand management: Advanced insights and strategic thinking. Kogan Page Publishers, London.
- Krippendorff K. (1988) Towards a cybernetics of (mass-media) institutions. In: Thomas S. & Signorielli N. (eds.) Essays in honor of George Gerbner. University of Pennsylvania, Philadelphia PA (Unpublished). http://repository.upenn.edu/asc_papers/251
- Krippendorff K. (2023) A critical cybernetics. *Constructivist Foundations* 19(1): 82–93.
► <https://constructivist.info/19/1/082>
- Manzini E. (2022) Livable proximity: Ideas for the city that cares. EGEA spa, Milano.
- McLuhan M. & McLuhan E. (1988) The laws of media: The new science. University of Toronto Press, Toronto.
- Mikitani H. & Rakuten Daigaku (ed.) (2007) 楽天市場公式ネットショップの教科書: 改訂版楽天市場直伝EC商売繁盛60の秘訣. インプレスR&D, 東京 [Rakuten Ichiba official online shop textbook: 60 essential principles for e-commerce success directly from Rakuten Ichiba. Revised edition]. Impress R&D, Tokyo.
- Pariser E. (2011) The filter bubble: What the Internet is hiding from you. Penguin Press, New York.
- Schulte T. & Sweeting B. (2022) Possibilities for a critical cybernetics. *Systems Research and Behavioral Science* 39(5): 986–989.
- Schwaninger M. & Ott S. (2024) What is variety engineering and why do we need it? *Systems Research and Behavioral Science* 41(2): 235–246. <https://doi.org/10.1002/sres.2964>
- Scott D. M. & Halligan B. (2010) Marketing lessons from The Grateful Dead: What every business can learn from the most iconic band in history. John Wiley & Sons, Hoboken NJ.
- Sharp B. (2010) How brands grow: What marketers don’t know. Oxford University Press, South Melbourne.
- Tsujimoto M., Kajikawa Y., Tomita J., & Matsumoto Y. (2018) A review of the ecosystem concept: Towards coherent ecosystem design. *Technological Forecasting and Social Change* 136: 49–58.

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