Design with the past through organizational exaptation in rural Hong Kong

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Abstract: Overcoming eco-social disconnects between urban and rural areas is a critical design challenge. This article explores organizational exaptation as a strategy to regenerate opportunities in rural regions with scarce organizational capacities. Exaptation as social reinvention involves repurposing local resources for new uses. Examining a pilot in rural Hong Kong, a social enterprise for re-engaging untapped local legacies, we demonstrate how exaptation can create eco-social opportunities in previously lagging areas. Through the collective efforts of locals, entrepreneurs, and designers, exaptation revealed new affordances using what is locally available. Thus, designing with the past requires strategies like collaborative encounters, material prototyping, adaptive social formats, and inspiration transfer. Overall, exaptation as a catalyst for social innovation is not predicated on historical determinism but on re-enacting existing resources.

Introduction

Engaging with the past and future potential of marginalized rural regions requires urgent design responses, as planetary urbanization increasingly relies on the countryside's metabolic services.[1] It involves reinvesting excess food in abundant regions to replenish soil and people,

[1] Acknowledgment
We like to thank Growers Without Borders for their collaboration and Zero Foodprint Asia for funding Soil Trust with grant no. P0043094: "Soil-Care Hospitality, Intersectoral Research Partnership for Regenerative Strategies."

[1] See, for example, Christian Schmid and Topalovic Milica, "Territories of Extended Urbanization: Tracing Planetary Struggles," (Basel: Birkhäuser, 2023); and Tony Fry, *Remaking Cities: An Introduction to Urban Metrofitting* (London: Bloomsbury Academic, 2018).

for easing global food scarcity. Past agricultural practices excelled at managing metabolic flows within bioregional limits. Reviving these capabilities today can extend to vital human futures.[2] Previous research has highlighted inertia, fragmentation, and path-dependence that hinder the social dynamism needed for ecological reintegration.[3] Path-dependence or historical determinism explains the perpetuating societal practices and decision-making based on reinforced earlier precedents or preferences. In contrast to reductive or isolated approaches, we aim to understand how design can foster social innovation by constructively engaging with the often-bygone resource base of rural regions.

In response, we explore the dynamic of exaptation, which is insufficiently studied in organizational design. Exaptation [eg-zap-tey-shuh-n] involves adopting past or current resources toward new purposes they were not originally designed for.[4] It highlights how existing resources can be repurposed for value-adding uses. Our research suggests that exaptation is a relevant approach for designing with and from the past in rural environments, where communities and planners navigate scant organizational structures.

Our paper describes Soil Trust (泥玩), a social enterprise in rural Hong Kong, as the context to explore exaptation in mediating past, present, and future uses. Soil Trust collaborated with a farm, retailer, hotel, welfare center, and design school to revitalize fallow land and dormant environmental capabilities by recovering unused organic waste. Historically, Hong Kong's agriculture used organic residues from the city regeneratively to replenish soils, livestock, and fisheries. However, rapid urbanization and outsourced food production led to the decline of these practices, resulting in excess waste and environmental degradation. The launch of Soil Trust in 2021 initiated events that set promising new organizational countermeasures in motion.

Exaptation emerged as Soil Trust repurposed a fallow farm plot and social infrastructures for new, unrelated uses, fostering rural renewal. Navigating previously designed environments highlighted their indeterminacy and revealed unknown functions. We

[2] John Law and Annemarie Mol, "Globalization in practice: On the politics of boiling pigswill," *Geoforum* 39:1 (2008): 133–143.
[3] André Viljoen, *Continuous Productive Urban Landscapes* (London: Architectural Press, 2005).
[4] Stephen Jay Gould and Elisabeth Vrba, "Exaptation—A Missing Term in the Science of Form," *Paleobiology* 8:1 (1982): 4–15.

argue that designing unprecedented opportunities (change-of-kind) within existing, often unseen resources strengthens their local viability. This approach contrasts with importing costly external investments (change-of-degree), which can hinder integrative entrepreneurial opportunities and bioregional suitability (fitness-for-purpose).

Organisational innovation by designing with the past

Existing research on innovation with the past foregrounds local embeddedness, which opens pathways to existing resources through regional networks.[5] These discussions highlight the importance of tangible resources like landscapes or logistics and intangible resources like heritage or customs, all intertwined through the spatial context.[6] Also, social innovation literature addresses this socio-material configuration in regional development.[7]

Historically cemented socio-materiality that resists change (path-dependencies)[8] or regional industry concentrations for competitive advantage (socio-technical clustering)[9] can restrict social dynamism. Given the impact of these context-stricken perceptions of the past on a region's prospects, it is crucial to understand the intersection between design intervention and the institutional, spatial, historical, and cultural context.[10]

[5] Karin Hansson, Laura Forlano, Jaz Hee Jeong Choi, Carl Disalvo, Teresa Cerratto Pargman, Shaowen Bardzell, Silvia Lindtner and Somya Joshi, "Provocation, conflict, and appropriation: The role of the designer in making publics," *Design Issues* 34:4 (2018): 3–7.

[6] Philip Hector and Andrea Botero, "Generative repair: Everyday infrastructuring between DIY citizen initiatives and institutional arrangements," *CoDesign* 18:2 (2021): 1–17.

[7] Alexandra Crosby, "Design Activism in an Indonesian Village," *Design Issues*, 35:3 (2019): 50–63; Annapurna Mamidipudi, "Constructing Common Knowledge: Design Practice for Social Change in Craft Livelihoods in India," *Design Issues*, 34:4 (2018): 37–50; Ezio Manzini, "Making Things Happen: Social Innovation and Design," *Design Issues* 30:1 (2014): 57–66.

[8] Ron Martin and Peter Sunley Peter, "Path dependence and regional economic evolution," *Journal of Economic Geography* 6:4 (2006): 395–437.

[9] Ron Boschma, Koen Frenken, "Technological relatedness, related variety and economic geography," in *Handbook of Regional Innovation and Growth*, Philip Cooke, Bjørn Asheim, Ron Boschma, Dafna Schwartz, Franz Tödtling, eds. (Cheltenham: Edward Elgar, 2011): 187–197.

[10] Danielle Galliano, Amélie Gonçalves and Pierre Triboulet, "Eco-Innovations in Rural Territories: Organizational Dynamics and Resource Mobilization in Low Density Areas," *Journal of Innovation Economics and Management* 24:1 (2017): 35–62.

Shifting from individual changemakers to collective agency, scholarship shows that local actors are pivotal in rural transitions, not just passive beneficiaries.[11] Community-driven change involves contesting existing worldviews and creating new ones. As communities evolve and transform, the identities and recognition of a place and its inhabitants are continuously renegotiated.[12] The contestation of narratives underpinning dormant rural capacities is further explored by combining local embeddedness with nonlocal interconnections.[13]

Only recently has design research addressed rural innovation as social practices of reuse, repurposing, or rehabilitation. These studies often follow charismatic rural actors who mobilize "relational assets" or "infrastructuring" to respond to external challenges with local resilience.[14] Such goals can put well-intentioned ideas ahead of the design process, constrained by a locality's assumed purpose or identity.[15] Yet, preconceived utility cannot fully explain how often social transformation arises from emergent intuition, (dis)engaged actions, and grounded experiences that lead to unintended possibilities. We address this gap by examining exaptation as a lens for exploring multiplayer affordances and organizational emergence *with* the past.

Organizational exaptation

Exaptation, a concept from evolutionary biology, refers to a functional change in a trait leading to unprecedented evolutionary pathways. Bird feathers, initially providing thermal

[11] Amollo Ambole, "Embedding Design in Transdisciplinary Research: Perspectives from Urban Africa," Design Issues 36:2 (2020): 28–40; and Bengt Johannisson, Anders Nilsson, "Community entrepreneurs: networking for local development," *Entrepreneurship and Regional Development* 1:1 (1989): 3–19.

[12] Alexandre Apsan Frediani, "Re-imagining Participatory Design: Reflecting on the ASF-UK Change by Design Methodology," *Design Issues* 32:3 (2016): 98–111.

[13] Alexandre Dubois, "Transnationalising entrepreneurship in a peripheral region: The translocal embeddedness paradigm," *Journal of Rural Studies* 46:1 (2016): 1–11.

[14] Yoko Akama, Yuki Uchida, Fumiko Ichikawa, and Hiroshi Tamura, "Infrastructuring resilience for sustaining ecosystems: A story from Chikugo, Japan," in *Entanglements of Designing Social Innovation in the Asia-Pacific*, Yoko Akama, Joyce Yee eds. (London: Routledge, 2023): 124–141 and Ann Light, "Trust in Collaborative Economies and How to Study It: Relational Assets and the Making of More-than-Strangers," in *Ethnographies of Collaborative Economies across Europe: Understanding Sharing and Caring*, Penny Travlou, Luigina Ciolfi eds. (London: Ubiquity, 2022):13–29.

[15] Daniel Hjorth and Bengt Johannison, "Conceptualizing the opening phase of regional development as the enactment of a 'collective identity'," *Concepts and Transformation* 8:1 (2003): 69–92.

insulation and later adapted for flight, exemplify exaptation.[16] Innovation studies adopted this concept to challenge the linear creation paradigm focused on desired functionality, efficient solutions, and advanced technology.[17] Many innovations, like the laser or various pharmaceuticals, emerged from repurposing existing competencies for new functions.[18]

In the social domain, exaptation arises from chance variations, invisible introductions, and intentional experimentation, also discussed as interdependency, whereby organizations benefit from asset transfers between similar domains.[19] The inherent qualities of organizations, materials, imaginaries, and competencies are central to exaptation. All factors, even path-dependencies, become emergent resources with latent usefulness beyond calculative search procedures. This resourcing by exaptation is not practically efficient but allows for designing with generative uncertainty.[20] Terms like randomness, serendipity, resource transfer, or relational assets only vaguely conceptualize the repurposing of prior legacies, prompting sociologists to adopt exaptation.[21]

Although exaptation is relevant across all social arenas, existing research has focused on product development, urban planning, and technology-driven business incubation.[22] It neglects renewal processes in rural contexts, where finance, engineering, and workforce influx are scarce. In these margins, social innovation relies foremost on preconditioned environments and transforming what is locally available.[23]

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[16] Stephen Jay Gould and Elisabeth Vrba, "Exaptation—A Missing Term in the Science of Form," *Paleobiology* 8:1 (1982): 4–15.

[17] Pierpaolo Andriani and Gino Cattani, "Exaptation as source of creativity, innovation, and diversity," *Industrial and Corporate Change* 25:1 (2016): 115–131.

[18] Nicholas Dew, Saras Sarasvathy, Sankaran Venkataraman, "The economic implications of exaptation. *Journal of Evolutionary Economy*," 14:1 (2004): 69–84.

[19] Philip Cooke and Arne Eriksson, "Design-Driven Regional Innovation," in *Handbook of Regional Innovation and Growth*, Philip Cooke, Bjørn Asheim, Ron Boschma, Dafna Schwartz, Franz Tödtling, eds. (Cheltenham: Edward Elgar, 2011): 587–596.

[20] Richard Buchanan, "Wicked Problems in Design Thinking," *Design Issues* 8:2 (1992): 5–21.

[21] Pierpaolo Andriani and Gino Cattani, "Exaptation as source of creativity, innovation, and diversity," *Industrial and Corporate Change* 25:1 (2016): 115–131.

[22] Alessandro Melis and Telmo Pievani, "Exaptation as a Design Strategy for Resilient Communities," in: *Transdisciplinarity: Integrated Science 5*, Nina Rezaei, ed. (Cham: Springer 2022): 307–327; and Giuseppe Davide Longhin, "Dancing with the Urban Exaptation," in: *Understanding Innovation Through Exaptation*, Caterina La Porta, Stefano Zapperi, Luciano Pilotti, eds. (Cham: Springer, 2020): 157–181.

[23] Angus Donald Campbell, "Lay Designers: Grassroots Innovation for Appropriate Change," *Design Issues* 33:1 (2017): 30–47.

Rural regions are rich with resources that have historically defined uses, disuses, or misuses, but often remain invisible because they are confined to shared norms.[24] Interventions can uncover new uses to bypass this fixedness. Understanding the evolution of organizational exaptation over time is crucial to grappling with its dynamic nature. We explore how exaptation fosters social innovation by engaging predefined factors in the rural context. Through an ethnographic case study of the Soil Trust social pilot in rural Hong Kong, we examine durational change processes and identify their underlying dynamics in their natural setting.[25]

Trans-organizational piloting with agricultural legacy

From 2021 to 2023, the authors, collaborating with two local permaculturists, prototyped trans-organizational change over three years through community-integrating work.[26] Our research straddled various workplaces to return urban organic wastes to rural agricultural soils. In response to Hong Kong's agricultural depletion, we, as design researchers, have experimented for a decade with collective farming formats to engage younger, more diverse populations in land care. Concurrently, our permaculture members aimed to rebuild local soil care competencies that have disappeared in conventional agriculture.

In this exploratory process, a veteran farmer offered our research team a fallow farm plot to test improving local soil vitality without imported inputs. It led to the establishment of the Soil Trust composting venture, operational for nine months, involving an organic farm, four-star hotel, food localization retailer, municipal welfare center, and design school (September 2022 to May 2023). Our data indicated that exaptation activated a culture of social experimentation and entrepreneurship. Soil Trust began as an eco-social farm

[24] Teppo Felin, Stuart Kauffman, Antonio Mastrogiorgio, Mariano Mastrogiorgio, "Factor markets, actors, and affordances," *Industrial and Corporate Change* 25:1 (2016): 133–147.
[25] Ilpo Koskinen and Peter Krogh, "Design Accountability: When Design Research Entangles Theory and Practice," *International Journal of Design* 9:1 (2015):121–127.
[26] Inspired by social piloting in localized energy transitions, see for example Marianne Ryghaug, and Tomas Moe Skjølsvold, *Pilot Society and the Energy Transition: The co-shaping of innovation, participation, and politics* (Cham: Palgrave Pivot, 2021).

experiment and evolved into an ecosystem service provider, agricultural destination, and entrepreneurial activator for the local community.

Our multipronged design endeavor emerged from the inventive use of existing regional resources, such as fallow land, wasted excess, and underutilized logistics, tied to Hong Kong's frugal and prosperous agricultural past.[27] Until the 1970s, Hong Kong maintained high food self-sufficiency with Hakka rice cultivation and Tanka fisheries by reintegrating local organic excess, including human waste. Since the 1980s, food production has been outsourced to make room for urbanization, upending many farm villages.[28] In opposition, a small but steady number of city dwellers, including designers and artists, started adopting farming on the margins to explore symbiotic human-land relationships, retain local flavors, and expand communal life prospects.

Social piloting became crucial for advancing farm techniques, distributing care responsibilities, and rebuilding capacities in a fragmented countryside and city. Implementing ancient climate-mitigating farm techniques, Soil Trust trained hotel staff, retail subscribers, and volunteers, including design students, to ferment their kitchen scraps at the source (Figure 1). This pickled food waste was then transported to Soil Trust's farm for composting, soil reintegration, and cultivating over 40 crops.[29]

[27] Markus Wernli and Kam Fai Chan, "Cosmotechnic Encounters: Designing with food waste, landscapes, and livelihoods," *Contexts—The Systemic Design Journal* 2 (2023).
[28] Sze-chung Chow, "The Long 1980s: Vegetables, Farmers and the Making of Hong Kong," PhD diss. (Hong Kong: Lingnan University, 2019).
[29] Markus Wernli and Kam Fai Chan, "Provocation Soil Trust: Designing economies inside an interspecies world of feeders," *Journal of Cultural Economy* 16:4 (2023): 594–603.

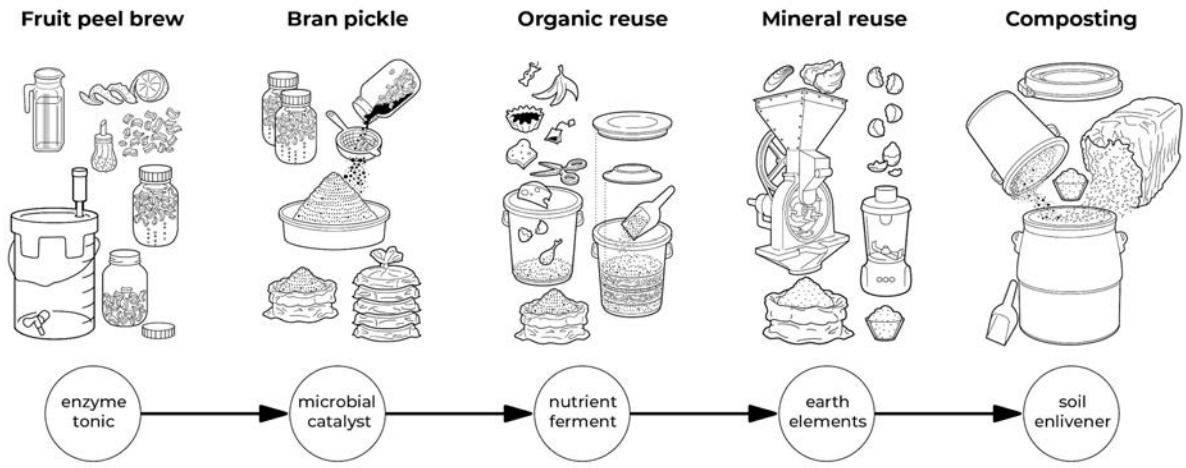

Figure 1: *Soil Trust generated a microbial carrier from fruit peel brew pickled with bran (bokashi), enabling hotel chefs and home cooks to upcycle organic and mineral byproducts without odors, directly connecting to Hong Kong's agricultural heritage. Illustration by the authors.*

From impasse to cross-appropriation, unlearning, and multiplication

Our empirical analysis uses the temporal bracketing technique[30] to identify distinct phases of organizational reconfigurations whereby the team members reflected on their activities and the responses on the field concerning the region's overall development. This analysis helped specify the onboarding process of Soil Trust that drove transitions across distinct organizational phases. We implemented three analytical units to study organizational exaptation: (a) *interventions* that help define the context via operational specificity or semiotic signification; (b) *devices* that involve parties via enabling deliberation and transmission; and (c) *dynamics* that co-constitute design strategies and value propositions as articulation of motivators propelling these interventions and devices.[31] By identifying relevant phases and outlining smaller analytical units, we revisited the data and populated the phases with exemplary empirical expressions. It provided a reality check and enabled a detailed account of varieties in collective organizing and the advancement of central themes.

[30] Ann Langley, "Strategies for Theorizing from Process Data," *The Academy of Management Review* 24:4 (1999):691-710.
[31] Brian Pentland, "Building Process Theory with Narrative: From Description to Explanation." *The Academy of Management Review*, 24:4 (1999):711–724.

The analysis was conducted and all content for this article was created solely by the authors without assistance from artificial intelligence technologies.

Soil Trust addressed past legacies of rural depletion and excess organic waste to foster socio-economic reinventions. Our analysis chronicles how rural conditions, enablers, and motivators informed our design strategies across four evolutionary phases and their organizational transitions between them: (i) *collecting* in adaptation, (ii) *probing* in preadaptive exaptation, (iii) *bouncing* in nonadaptive exaptation, and (iv) *rippling* in post-exaptive integration. Table 1 outlines these phases, including characterization, constituents, and value proposition in correlation to the three analytical units.

Table 1: **Case study's journey through four exaptive phases**

TIME FRAME			
March–Nov 2021	Oct 2021–Sep 2022	Oct 2022–May 2023	March 2023–ongoing
EMERGENT PHASES OF ORGANIZING			
Adaptation: Unproductive, degenerative functional fixation	**Preaptative exaptation:** Intentional, exaptive cross-appropriation	**Nonadaptive exaptation:** Emergent, epistemological displacement	**Post-exaptive integration:** Functional expansion and multiplication
DEFINITION OF CONTEXT (via interventions)			
Functional restriction of local resources, with preconceived use value attached to them, prohibiting new uses.	Cooptation of local resources by transferring concepts or methods from an outside domain into the focal domain.	Suspension of functional fixation by exaptation, opening space for new arrangements involving unseen local resources.	Collective repurposing of initial exaptive function into multiple new functions and inspiration for unrelated applications elsewhere.
INVOLVED PARTIES (via devices)			
University	Farmer, retailer, university	Farmer, hotel, welfare center, retailer, university	Entrepreneurs, villagers, incubators, educators, researchers, public
DESIGN STRATEGIES (via dynamics)			
Collecting: Invite collaborative encounters to mobilize local resources and legacies, visible or invisible.	**Probing:** Use material and social prototypes to scope the cooptation of legacies follow through with what happens.	**Bouncing:** Diversify organizational structure and integrate redundancies to lend robustness to enterprise.	**Rippling:** Provide legacy to the emergent functional reorganization of local places and competencies.

Collecting in adaptation

The *collecting* phase took place throughout Hong Kong's countryside before forming the Soil Trust pilot. Over the summer of 2021, we conducted six months of fieldwork among rural communities to understand the organizational milieu. While we found a sense of place and belonging, the potential of these settings remained stagnant due to the weak retention of

younger generations, lack of entrepreneurial dynamism, and absence of prospects. Increasingly, Hong Kong's rural New Territories are relegated to inaccessible brownfields, container storage, garbage deposits, or bedroom suburbs serving urban centers, obstructing alternative visions for new social arrangements. This overall sentiment can create an impasse, preventing the region from moving out of depletion.

One example we encountered is a fallow farm plot rented by a time-pressed farmer unable to cultivate it. Another is the massive output of organic waste burdening rural environments through uncontrolled putrefaction in landfills, waterways, or atmospheres, rendering these resources useless or toxic due to prejudices and loss of local skills. A third example is underused infrastructures focused on forward-supply logistics, like a food retailer's driver network that delivers vegetables but has empty back-haul trucks. Thus, in this adaptive phase, we refer to the design strategy as *collecting*, illustrated in Figure 2.

Figure 2: Collecting *implied to engage diverse actors in Hong Kong's food system with unproductive functional fixation around food waste through site visits (1, 2) and ancient collective fermentation (3, 4). Photographs by the authors.*

The term collect derives from the Latin root 'leg-,' linking it to *legacy*, meaning 'to gather words and appoint on behalf of predecessors.' In our fieldwork, collecting involved inviting rural protagonists into "collaborative encounters" to mobilize local legacies and

resources.[32] We facilitated these encounters by unifying making and living, where the question of a well-lived life prompts affective contingency through every activity, routine, or arrangement. This Daoist idea of reflexivity-in-living, foundational to Hong Kong's frugal heritage, acknowledges the provisional nature of human life. Thus, staying attentive to the interplay of receiving from and giving to all that matters (human or not) is vital to a nourishing and enjoyable life.[33]

In the summer of 2021, we conducted 34 site visits to farms, gardens, orchards, restaurants, waste treatment facilities, science labs, and biotech start-ups to explore a reverse supply chain redirecting organic waste from the city to agricultural landscapes. To highlight the Daoist connection between human enjoyment and environmental nourishment, we named Soil Trust in Chinese, 泥玩: 集「棄」還田, translating to 'come and play the soil: collect the abandoned for return to the field.' The character for 'abandoned' 「棄」is a Cantonese pun, sharing pronunciation with 「氣」(Jyutping: hei3; Mandarin: ch'i4), meaning 'vital energy.' Daoist thinking links the unused with vital nourishment. This cultural proposition invited participants to address Hong Kong's organic waste challenge, resonating with the government's announcement of a waste charging scheme and pandemic-related disruptions to food supply.

During the visits, we presented fermented food waste fertilizer ('bokashi'). Through this "thingness that matters,"[34] respondents assessed their organic resource flow and explored localized strategies using time-tested upcycling techniques like composting. In this adaptation phase, facilitating productive provocations with the given resource base revealed unseen uses that could drive organizational change. This involved:

INTERVENTIONS

> **'Unwaste!' Call-to-task:** Conduct site visits with 34 food system actors, confronting them with soil-bound food waste ferment by asking: ***What needs to be reorganized to make this useful in your context?*** Harness responses and referrals and grow a continuous network.

DEVICES

[32] Markus Wernli and Kam Fai Chan, "Cosmotechnic Encounters: Designing with food waste, landscapes, and livelihoods," *Contexts—The Systemic Design Journal* 2 (2023).
[33] Charlene Tan, "Revisiting Donald Schön's notion of reflective practice: A Daoist interpretation," *Reflective Practice*, 21:5 (2020): 686–698.
[34] Peter-Paul Verbeek and Petran Kockelkoren, "The things that matter," *Design Issues* 14:3 (1998): 28–42.

Collective fermenting: Co-opt organic waste as a social technique with a gratifying experience and unifying purpose.

DYNAMICS

Conditions: Fertile ground for change, surplus capacity, unused local resources, inward-looking priorities.

Enablers: Opportunistic hybridization.

Motivations: Desire to counteract depletion, relevance beyond environmental advocacy.

The collaborative fieldwork laid the foundation for the Soil Trust social pilot, realized through the clever exaptation of existing resources. The organizational intervention around the fallow farm plot revealed conditional factors conducive to *internalized* transformation, such as surplus capacities and underused resources. Some villagers later described this as 'fertile ground for change.'

Probing in preadaptive exaptation

The intentional *probing* phase initiated fresh momentum in the village community. The farm with a decommissioned plot and a food retailer with underutilized transport logistics were intrigued by the idea of returning organic waste to local soils. We invited the farmer, retail directors, and permaculture experts to a meeting to share a vision for an alliance between food consumers and producers inspired by 'renewable energy communities' that locally coordinate power supply and demand.[35]

Without dedicated agroecological university research in Hong Kong, our permaculturists adopted regenerative farm practices from abroad to suit local conditions. Soil Trust aimed to pioneer community-led land care by reusing excess and minimizing external inputs. It led to meetings with the customer base of the food localization retailer to organize training and distribute farm work responsibilities. The promise of closing the food loop excited and motivated 18 locavore families, as shown in Figure 3.

[35] Marianne Ryghaug, and Tomas Moe Skjølsvold, *Pilot Society and the Energy Transition: The Co-Shaping of Innovation, Participation, and Politics* (Cham: Palgrave Pivot, 2021).

Figure 3: Probing *organizational cross-appropriation implied launching the Soil Trust experimental farm on fallow land (1) and co-piloting organic cycling with customers of a food localization retailer (2, 4) using existing transportation logistics (3). Photographs by the authors.*

Transferring a model from one domain to another is known as cross-appropriation. Soil Trust's vision of a consumer/producer tie-up was not new; researchers had explored it in previous initiatives, and collaborators were familiar with it. However, the cross-appropriated model needed to be tested through extensive interactions with farmers, retailers, customers, and villagers to gauge the conditions and dispositions of all involved.

The yearlong upcycling arrangement, 'Belongs-to-the-Field' (回歸田嘢), extended the concept of 'cultural probes' from product development to the organizational level.[36] The probing revealed that the food waste diverted by the retailer's customers was insufficient to replenish the entire farm plot and increase yields. Additionally, with most customers living an hour away, they volunteered less than needed to maintain labor-intensive climate farming practices. While the initial trial promoted collective environmental agency, Soil Trust could not reach its full potential without additional backing involving:

[36] Vesa Jääskö and Tuuli Mattelmäki, "Observing and probing" in *Proceedings of the 2003 International Conference on Designing Pleasurable Products and Interfaces* (Pittsburgh, June 23–26. New York: ACM Press, 2003): 126–131.

INTERVENTIONS

'Soil Trust' research program: Use existing resources and methods by applying them in different contexts: Transform fallow plot into the social arena, waste into fertilizer, and design into equipment for social learning.

'Belongs-to-the-Field' upcycling: Instigate with food retailer and its 18 customers food waste recovery, harnessing fallow farm plot, retailer's driver network, salvaged containers, and volunteer time.

DEVICES

Eco-social pitch deck: Interlock reduction of hotel's environmental load with a climate-mitigating farming approach aimed at eco-hospitality roadmap to reach fuller organizational potential.

DYNAMICS

Conditions: Inward-looking priorities.

Enablers: Cross-appropriation, epistemological displacement, recognition building.

Motivations: Desire to counteract depletion, entrepreneurial vision, relevance beyond environmental advocacy.

The cross-appropriating probing revealed the collective nature of organizational exaptation. Multiple individuals, including a veteran farmer, retail directors, and consumers, played critical roles. When retail directors were indifferent to Soil Trust's advancement, researchers and villagers engaged other parties. Thus, exaptive generativity resulted from the ongoing, explorative journey where community members saw themselves as co-choreographers. Design interventions created conditions for social forms and communities to emerge, defining on their own terms what is relevant and what is not.[37]

Bouncing in nonadaptive exaptation

Following the mixed enthusiasm and indifference in the initial cross-appropriation phase, the design strategy for advancing the social enterprise can be described as *bouncing*. This process of unlearning and relearning in an uncertain setting involved engage-learn-respond, allowing the reconfiguration of Soil Trust's purpose and structure. This tipping point triggered a persuasive reinterpretation in villagers' relations to their environment, an epistemological displacement conducive to unintentional exaptation.[38] It ruptured the

[37] Ilpo Koskinen, "Agonistic, Convivial, and Conceptual Aesthetics in New Social Design," *Design Issues* 32:3 (2016): 18–29.

[38] Johan Gaddefors, Steffen Korsgaard, and Ingstrup Bruun, "Regional development through entrepreneurial exaptation: Epistemological displacement, affordances, and collective agency in rural regions," *Journal of Rural Studies* 74 (2020): 244–256.

cognitive bias or functional fixation that limits possibilities, as presented in disused farm plots, organic wastes, or collective agony.

Soil Trust perpetuated this epistemological displacement by simultaneously engaging an eco-hospitality foundation, a hotel, a local welfare center, and a design school. Diversifying social assets aimed at co-invigorating local agriculture led to fresh perspectives and engagement with the region in unprecedented ways. This process of "unlearning" and "nonadaptation" broke the perceptive impasse between local people and resources.[39] It indicated how resource bases are enacted, thus open for reassessment.[40] Unlearning before relearning aligns with James Gibson's concept of "perceived affordances," where individuals discover old or new uses by engaging differently with objects, groups, and the environment.[41]

The epistemological displacement was achieved through a corporate-sponsored research contract with the eco-hospitality foundation. This contract, named 'SoilFeeders' (沃土方), committed Soil Trust to conduct field trials on reusing organic waste while the collaborating hotel diverted kitchen scraps to reduce its environmental impact. The arrangement compensated Soil Trust's permaculturists for their ecosystem services aimed at landscape biodiversity—an uncommon practice in Hong Kong, where agriculture focuses on food production or nature education. Another example was Soil Trust's service-learning program 'Growers Without Borders' (泥玩無國界), involving ethnic minority mothers, undergraduate students, and volunteers, as shown in Figure 4.

[39] Tony Fry, *Remaking Cities: An Introduction to Urban Metrofitting* (London: Bloomsbury Academic, 2018), 153–162.
[40] Ted Baker and Reed Nelson, "Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage," *Administrative Science Quarterly* 50:3 (2005): 329–366.
[41] Henrik Enquist, "A Socio-Material Ecology of the Distributed Self," *Design Philosophy Papers* 6:2 (2008): 123–140.

Figure 4: Bouncing *implied shifting perceptive affordances through SoilFeeders' intersectoral contract that committed a hotel to recover food waste (1), volunteers to operate the farm for access to harvest (2), design students to improve tooling (4), and artists to experiment on the farm (3). Photographs by the authors.*

Soil Trust boosted its composting capacities by offering soil-bound nutrient cycling to the hotel. Concurrently, 'Growers Without Borders' volunteers received free access to land, harvest, upskilling, and companionship. The 30-person volunteer group and the 'SoilFeeders' initiative encouraged an engagement with farming in people who typically forego it or view local agriculture as a sunset industry. Soil Trust also involved students, performance artists, and television producers in design research and media productions, enacting the farm and village as a versatile studio. These examples show how existing, non-obvious affordances were transformed into new opportunities involving:

INTERVENTIONS

'SoilFeeders' intersectoral contract: Implement with corporate sponsors, 15 chefs, and 5 hotel kitchens the regenerative use of food waste to invigorate local soils and hotel/farm linkages.

'Growers Without Borders' eco-social farming: Coordinate with welfare center a service-learning program for 30 ethnically diverse volunteers to distribute farm work for harvest, skills, and companionship.

Soil Trust 'Farm Studio': Enrol 20 final-year BA design students in a farm-integrated education program to foster transdisciplinary and regional exchanges.

DEVICES

Service menu for feeding soils: Repurpose catering service model to instruct chefs on soil-bound waste recovery.

Farm-embedded design curriculum: Contextualize reflective studio practice with environmental contingency of outdoor agriculture.
Mobile messaging technology: Harness as a relay changeover platform and farm co-management tool.

DYNAMICS

Enablers: Collective repurposing, opening entrepreneurial spaces, precedence setting.
Motivations: Desire to counteract depletion, entrepreneurial vision, relevance beyond environmental advocacy.

Design-led bouncing in the face of confusion means not just bouncing back after disruption but bouncing forward—reflecting on the new conditions for exploring design and operational flexibility. Bouncing relates to what Krogh and Koskinen call "drifting by design," where prototyping social action deviates from the initial brief, resulting in what was not anticipated at the outset.[42] Examples include creating a pitch deck with the eco-hospitality foundation to attract corporate sponsors for SoilFeeders' research, issuing a 'Soil Service Menu' with hotel management for kitchen waste diversion,[43] developing a farm-integrated curriculum with university teachers for design students, and facilitating a mobile messaging group with farm volunteers for running the operation.[44]

Rippling in post-exaptation integration

The preceding intentional and unintentional exaptation phases quickly reverberated through the village and region, creating what we call *rippling* in the local environment. It led to various follow-up initiatives, as shown in Figure 5. We identify two types of rippling, each stemming from different affordances induced by epistemological displacement.

[42] Peter Gall Krogh and Ilpo Koskinen, "How Constructive Design Researchers Drift: Four Epistemologies," *Design Issues* 38:2 (2020): 33–46.
[43] Markus Wernli and Kam Fai Chan, "Rendering soil care across hotel, retailer, and farm, with a Mutuality Service Blueprint," in *Proceedings of DRS 2024,* Boston (2024).
[44] Markus Wernli and Ilpo Koskinen, "Growers Without Borders: Community and Remote Sensing of Encounters with Nature," *CoDesign* (2025): 1–17.

Figure 5: Rippling *implied functional expansion and multiplication, with design students gauging the value of local agriculture (1), public screenings or advocacy (2), and continued media attention and international recognition (3) even after Soil Trust lost its farm plot to land speculation (4). Photographs by the authors.*

The first rippling involved tangible affordances directly linked to the new social venture, while the second rippling inspired unrelated initiatives. As Soil Trust gained momentum, local and nonlocal organizations recognized the potential for additional functions. Examples of first rippling include public events at and beyond the experimental farm. Partner organizations co-hosted biannual planting festivals, bringing hospitality professionals, volunteers, and villagers together for compost care, potato seeding, and farm tours. Outside the farm, design students and volunteers organized Soil Trust's showcases and workshops at waste reduction festivals. During their Farm Studio service-learning, students valued local food cultivation, leading to farm-to-fork banquets, graduation projects, and career pursuits in agricultural start-ups. Finally, Soil Trust's excess harvest was distributed as food aid to underprivileged families who could not afford high-quality, local vegetables.

These examples show how Soil Trust's initial exaptation expanded functions in an open-ended way. Sequential cross-appropriation led the community to reconsider their local resources from new perspectives, enabling unconventional and legitimate uses. It created opportunities for reorganization and entrepreneurship. The exaptation of the farm plot as a

social venture opened new avenues for collective action, distribution channels, and services, rippling through the region and beyond as functional expansion involving:

INTERVENTION

> **'Prototyping Economies for the Ecologically Regenerative City' symposium:** Host film screening with a panel discussion involving farmers, entrepreneurs, researchers, and 100 guests to review learning from Soil Trust.

DEVICE

> **Metabolic brokerage service:** Harness design research for coordinating function-leaping arrangements across producers, consumers, and societal sectors grounded in local legacies under uncertainty.

DYNAMICS

> **Enablers**: Functional multiplication, role-modeling, inspiration.
> **Motivations**: Desire to counteract depletion, entrepreneurial vision, relevance beyond environmental advocacy.

The second kind of rippling presented new initiatives inspired by Soil Trust's exaptation in unrelated settings and resources. These resonances emerged after Soil Trust lost its farm plot to land speculation and ceased operation. Emergent exaptations arose from the potential to instigate change independently—rippling as functional multiplication. For example, villagers aspired to boost and legitimize tourism in the countryside. Inspired by Soil Trust, several local business owners actively sought exemptions from rural zoning regulations that impeded business licenses in agricultural areas.

Soil Trust enriched the affordances of the regional economy by setting precedents and providing inspiration. It offered a proof-of-concept for new value creation and intersectoral collaboration in service design and hospitality. It is a reminder that organizational shifts from expanding or multiplying prior functions rely on the community enacting their locality in collective, inventive ways.

Discussion

For organizational design, exaptation involves shifting prior socio-material structures through opportunity, unlearning, and emergence, invigorating communities locally. For researchers, it offers an analytical lens on exaptation's role in design processes. For practitioners, the exaptation model can diagnose local conditions and help strategize organizational cross-

appropriations to open regional futures. The oscillation between enabling constraints and environmental exploration, as seen in the Soil Trust case, co-choreographed paradigmatic change-in-kind from and with the past, as illustrated in Figure 6.

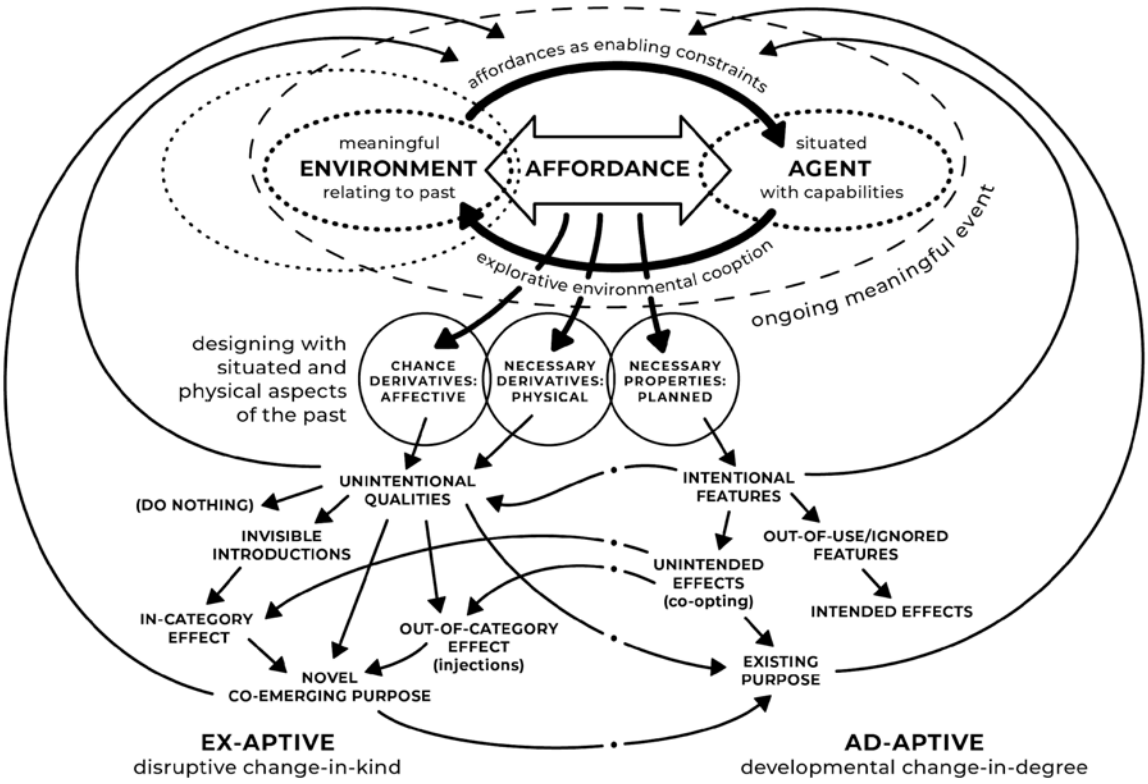

Figure 6: *Exaptation implies designing with the past through the pragmatics, challenges, and negotiations of a given resource base by embracing uncategorizable effects. Adopted from Iain Kerr and Jason Frasca,* Innovating Emergent Futures: The Innovation Design Approach for Change and Worldmaking *(Whitehouse Station: Emergent Futures Lab, 2021): 84–85.*

The concept of exaptation raises several implications: (i) prior designed resource environments are enacted and thus indeterminate; (ii) defamiliarization strategies can overcome stagnation; (iii) collective agency validates the process, and (iv) hybrid 'third spaces' can mobilize abundant local resources and competencies.

Ontologically, our study confirms that seemingly objective and intentional aspects of organic wastes and rural margins give way to unintentional aspects like collectivity and sensoriality from agroecological practices across sectors. It shows how given resources are

culturally enacted and open to previously unknowable uses.[45] Exapting novel uses of prior arrangements is pivotal in regional evolution, challenging deterministic views on path-dependencies. While linked to local resources, historical socio-technical patterns do not have to dictate future regional directions. Exaptation foregrounds the initial *collecting* phase for revealing preconceived aspects and values that are no longer useful.

Organizational and entrepreneurial inventiveness can revitalize what was overlooked or stagnant by revealing hitherto unseen affordances. Predicting when and how exaptive processes unfold is likely futile. However, the precedence of exaptation and understanding the conditions that enable it do encourage ongoing experimentation.

Epistemologically, our study examines functional fixations attached to resources to understand regional stagnation, impasse, unblocking, and evolution.[46] Local resources often remain tied to past uses and detrimental binds, making it challenging for locals to reimagine new uses through exaptation. The study supports previous findings that outsiders are often overrepresented among rural changemakers.[47] In our case, unlocking functional fixation and low public recognition for rural affairs was initiated by in-migrating researchers, followed by volunteers and hospitality personnel. They introduced a piloting model familiar to them but new to the locals. This underscores the importance of the *probing* phase, which transfers concepts and methods across domains for creatively co-opting local resources.

Axiologically, our research highlights collective agency driving the exaptation of local resources. While external actors were crucial to the initial exaptation, the collective embeddedness of social enterprises is essential.[48] Various groups and individuals played key roles in encounters, meetings, and activities, enabling the explorative journey. The functional extensions and changes in the village were realized through the combined efforts of local and nonlocal participants. The bouncing phase and its emergent organizational capacities

[45] Nicholas Dew, Saras Sarasvathy, Sankaran Venkataraman, "The economic implications of exaptation." *Journal of Evolutionary Economy*, 14:1 (2004): 69–84.
[46] Björn Asheim and Lars Coenen, "Knowledge Bases and Regional Innovation Systems," *Research Policy* 34:8 (2005): 1173–1190.
[47] Gary Bosworth, Ivan Annibal, Terry Carroll, Liz Price, Jessica Sellick, John Shepherd, "Empowering local action through neo-endogenous development," *Sociologia Ruralis,* 56:3 (2016): 427–449.
[48] Bengt Johannisson, Anders Nilsson, "Community entrepreneurs: networking for local development," *Entrepreneurship & Regional Development*, 1:1 (1989): 3–19.

prompted people to reinterpret their relationship with the local environment and make room for the unprecedented.

Our research suggests investing in organizational scaffolding and entrepreneurial agency rather than imposing new resources on rural regions. The case shows that slack and underutilized resources already existed in abundance. The key was investing in organizational dynamism. Engaging enterprising researchers and inventive practitioners from outside and fostering local entrepreneurial talent was pivotal.[49]

Soil Trust has created a 'third space,'[50] straddling academia with practice and rurality with urbanity. This hybridity fosters dialogues across differences, shifting from individual assumptions to collective reinterpretations due to the challenges and renegotiations involved. It promotes a third function between waste and reuse, survival, and mutuality. It relates to the phase where continued investments in diverse domains and sectors created fertile ground for the functional expansion and multiplication of Soil Trust. As our understanding of biological evolution evolves with exaptation, including perceptive affordances and niche construction, our understanding of design also shifts through nonlinear innovation, movement reservoirs, and heteronomous transdisciplinarity. Amidst planetary crises, we believe interlocking research on biology and design holds heuristic relevance. It extends post-structuralist discussions about interventionist design for change from *within* that is not only a dialogue with tools and tactics but also a strategy in its own right.[51]

Exaptation suggests that prior structural redundancy is more likely to stay functional over time, especially in complex, unstable environments. The most inventive biological systems (microbiomes, genomes, ecosystems, brains) are redundancies from the past. In contrast, functional specialization poses significant risks during fluctuations. It also explains why expert-driven design and disciplinary silos are incompatible with biological concepts.[52]

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[49] Gary Bosworth, Ivan Annibal, Terry Carroll, Liz Price, Jessica Sellick, John Shepherd, "Empowering local action," *Sociologica Ruralis*, 56:3 (2016): 427–449.

[50] Discussed in postcolonial studies as the hybridising and uncategorizable effects of pragmatic contestation that can force open third functions beyond dichotomies and presumptions, see Homi Kharshedji Bhabha, Third Space: The Location of Culture (London: Routledge, 1994).

[51] Tau Ulv Lenskjold, Sissel Olander, Joachim Halse, "Minor Design Activism: Prompting Change from Within," *Design Issues*, 31:4 (2015): 67–78.

[52] Jennifer Whyte, "Evolutionary Theories and Design Practices," *Design Issues* 23:2 (2007): 46–54.

Exaptation suggests that each characteristic has a function and unpredictable effects. Exploring these can reveal new evolutionary possibilities. Limiting design to conventional approaches like ‘minimalist,’ ‘standardized,’ or ‘resilient,’ which target hypothetical future visions, can be risky. Design, then, should follow paradigms where redundancy and diverse organizational structures support open-ended functioning to unleash possibilities.

In the exaptive view, past failures of planned functions are not negative, irreversible legacies of material or developmental shortages. Instead, they offer opportunities to reinvent structures, organizations, or systems initially designed for obsolete or different functions to address unexpected constraints. Like in evolutionary biology, design should operate within economic terms, reusing past resources rather than starting from scratch. If robustness drives functional change, design is about discerning opportunities for repurposing what the past provides and inventively transforming those legacies.