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Systemic design through the lens of incumbent firms to address complex sustainability transitions:

A systematic literature review and comparison between commercial and non-commercial environments

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Abstract

In response to the urgency of sustainability challenges, there is a growing recognition of the incumbent firm's role to engage in sustainable transitions. This paper explores the potential of systemic design as an approach for incumbent firms to facilitate sustainability transitions.

A systematic literature review was conducted, focusing on research contributions between 2000 and 2023 in Scopus, Web of Science, and Google Scholar databases. To synergize the review, the TCCM typology (Theory, Context, Characteristics, and Methods) was applied.

The analysis contrasts systemic design interventions in commercial and non-commercial contexts. It has been found that existing research in a commercial environment primarily focuses on small to midsized (social) enterprises facilitating local circularity transitions. Differing from the non-commercial environment, where research focuses on diverse wicked societal problems.

By identifying this gap, this contribution aims to advocate for a holistic perspective and interventions addressing sustainability transitions in a commercial context and advance the role of incumbent firms to such transitions. By that this paper contributes to advancing understanding and practice in systemic design for sustainable transitions in a commercial context.

Keywords: Systematic literature review, systemic design, incumbent firms, sustainability transitions

I. Introduction

In recent years there has been a rising number of firms striving to have a sustainable impact (Danciu 2013), which is accompanied by increased engagement in developing new technologies and businesses addressing sustainability challenges (Magnusson and Werner 2023). However, achieving the much-needed sustainability transitions will require greater efforts. Significant shifts across society, including changes in current modes of production and consumption, will be necessary.

Since sustainability transitions are complex and require moving away from linear approaches to more holistic thinking (van der Bijl-Brouwer & Malcolm, 2020; Murphy & Jones, 2021), systemic design offers a promising pathway. SD (Systemic Design) is an interdisciplinary approach to complex problems that combines systems thinking and design thinking to drive system change through a range of methodologies and tools (van der Bijl-Brouwer & Malcolm, 2020; Jones & van Ael, 2022; Ryan, 2014). This paper explores the use of SD to address sustainability transitions within a commercial context.

The commercial context within this work is defined as an environment in which incumbent firms operate. Incumbent firms are profit-seeking actors that are established and positioned in markets (Steen and Weaver 2017), and play a crucial role in sustainability transitions due to their control over vital resources, interorganizational relationships, and ties to policymakers and other power brokers (Magnusson and Werner 2023). The non-commercial context in this work is therefore defined as the context where public and social sector organisations with non-profit seeking actors operate, such as government, NGOs, public institutions such as hospitals, universities etc.

While reviewing literature on SD, the authors have noticed that there is a lot of conceptual work on SD, with many examples focusing on complex societal issues faced by non-commercial organizations, such as gender issues (Faiz et al. 2020). However, when researching literature on complexity in commercial contexts, the focus seems to shift to business and production processes. This observation leads to the assumption that there SD might lack a comprehensive understanding of its potential for facilitating sustainability transitions in commercial settings.

This results in the research gap of SD contributions exploring the role of incumbent firms addressing complex societal transitions, particularly sustainability transitions. This knowledge gap is inhibiting researchers, designers, and businesses who wish to contribute to sustainability transitions. To address this research gap the following research question with a sub question were defined:

What are the differences between commercial and non-commercial context in SD?

- *To what extent does (the application of) systemic design for sustainability transitions differ between commercial and non-commercial contexts?*

By addressing this question, this paper aims through a systematic literature review to advance knowledge on SD and sustainability transitions in commercial contexts by examining the current use cases of SD in commercial and non-commercial settings. The goal is to fill the research gap regarding the potential of SD to facilitate sustainability transitions in commercial settings.

II. Methodology

A systematic literature review was conducted using a framework-based approach, following the PRISMA checklist (Page et al. 2021). The TCCM (Theory, Context, Characteristics, and Methods) typology (Paul and Menzies 2023) was applied to synergize the selected review sample. The review analysed English research articles published between 2000 and 2023 from Scopus, Web of Science, and Google Scholar.

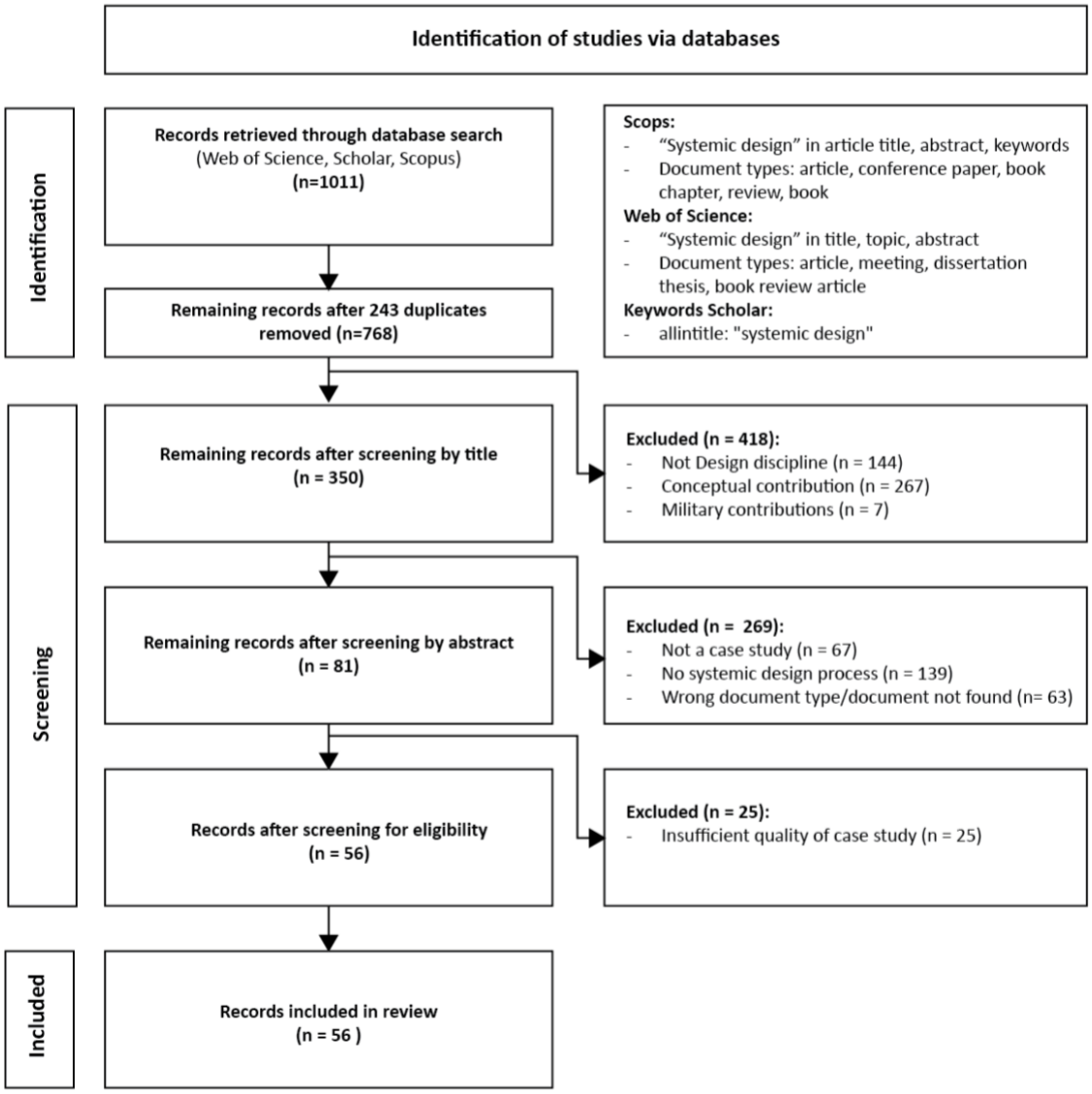

Figure 1: Flow chat following PRISMA 2020 approach, adjusted after Page et al. 2021

The selection of records followed the PRISMA 2020 flow diagram in Figure 1. The process began with the identification step, where the broad keyword of "systemic design" was searched in the title, abstract, and keywords of all three selected databases. To ensure that the identified studies provided a sufficient overview of the field of SD, a variety of diverse document types (e.g., journal articles, meetings, dissertations, books, book chapters, review articles, conference contributions) were included (n = 1,110). The identification phase concluded with the exclusion of duplicates (n = 342 excluded), resulting in a sample of 768 papers for screening. These papers were screened on title and abstract according to the inclusion and exclusion criteria (Table 1), resulting in 56 relevant papers.

In order to address the research questions, the case studies were analyzed through the TCCM (Theory, Context, Characteristics, Method) typology, with a focus on Theory, Context, and Characteristics while leaving out the Methods. Firstly, the dominant conceptual approaches in SD within the case studies were identified (Theory), after which the chosen case studies were distinguished between commercial and non-commercial contexts (Context). Finally, the characteristics of the case studies were analyzed (Characteristics).

Inclusion criteria
Case studies, which apply systemic design approaches to advance design problems
Large part of the systemic design process is being showed and discussed
Journal papers, conference papers, book chapters
Real life case study
Exclusion criteria
Conceptual contributions
Military related contributions
Contributions focusing on one systemic design tool/method without any process
Poorly described systemic design process
Books, Workshops, Talks, PhD thesis, Master thesis
Labs as main approach to facilitate transitions
Speculative case studies
Suggested case studies for future research

Table 1: Overview of inclusion and exclusion criteria

III. Results

By mapping the case studies into the framework of the TCCM methodology, a final overview of the SD field and its case studies in commercial and non-commercial contexts was obtained (Figure 2). The detailed table where all selected academic contributions were mapped and analyzed, can be found in the appendix.

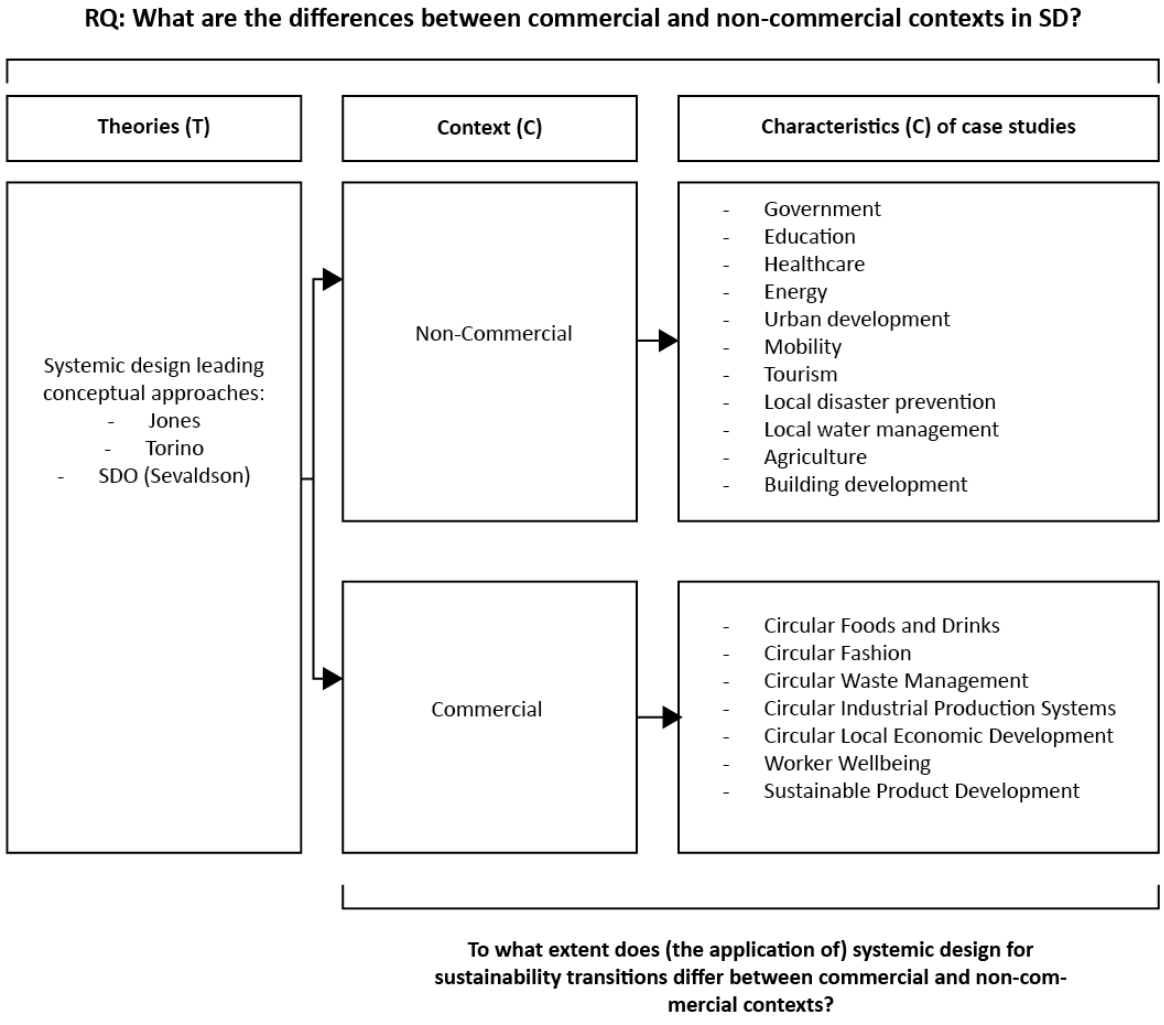

Figure 2: Analysis and synergy though TCCM and approach to address overarching research question (own visualization)

Findings on Theory

Through the mapping of the case studies in their conceptual approaches, three leading academic groups in the development of SD were found at Politecnico di Torino (Italy), Strategic Foresight and Innovation MDes programme at OCAD University (Toronto, Canada) and Systems Oriented Design (SOD) at the Oslo School of Architecture and Design (Norway).

The approach of Politecnico di Torino is inspired by the work of by Luigi Bistagnino (Bistagnino and Campagnaro 2014) which focuses 5 principles: 1) Output / Input – the waste of one production system becomes resources for another; 2) Relationships – relationships within the system generate the system itself; 3) Autopoiesis – an autopoietic system is a resilient system, able to regenerate and evolve; 4) Local Action – the context of operation is fundamental to localise innovation based on available resources; 5) Humanity at the centre of the project – the human being, in relation to its environmental, social, cultural and economic context, is at the centre of the project.

OCAD University's approach to SD, led by Peter Jones, focuses on identifying and grasping complex problems though diverse SD principles and approaches (Jones 2014b), as well as exploring the application of design action research (Jones 2014a), leverage analysis (Murphy and Jones 2021) and mapping approaches within SD (Jones and Bowes 2017). Peter Jones has also collaborated with many different partners, amongst them industry professionals and fellow academics. Notable among these collaborations are those with Van Ael (Jones and van Ael 2022) and Alex Ryan (Ryan 2014), who have also made significant academic and non-academic contributions to SD.

Finally, Systems Oriented Design (SDO) is an approach developed by Birger Sevaldson at the Oslo School of Architecture and Design. It is described as a living and adaptable methodology and design practice that aims towards understanding and working with complex systems (Sevaldson 2022).

A difference in application has been identified between the approach of Torino and the approaches by Jones and Sevaldson. The Torino approach is applied the most applied approach in the case studies to address complex problems (n = 40) and in the commercial context. All these case studies follow Torino's systemic design approach (SDA) with its 5 principles (Bicocca 2016), except one that chose to follow 3 out of the 5 principles based on its case studies' requirements (Toso and Re 2014). It was also observed that the holistic diagnosis (HD) method (Battistoni, Giraldo Nohra, and Barbero 2019) was commonly employed within this approach to effectively comprehend the complexity of the case studies, such as in advancing economic development in rural areas (Barbero 2018).

The approaches by Jones and Sevaldson were used less frequently (n=16) and occasionally in combination. As these two approaches have a less strictly defined framework on SD, researchers have been developing and adopting these approaches within their case studies and views on SD. For instance, Ryan and Leung (2014) conducted case studies focusing on public procurement within the University of Toronto and improving the effectiveness of the clean energy and natural resources group within the Government of Alberta. In addition, researchers have also combined the SD approaches of Jones and Sevaldson with other systemic theories such as the 12 leverage points by Meadows (1997). Dudani (2019) used a combination of SOD and Meadows' leverage points to address gentrification in Norway.

> → *The analysis of the conceptual approaches of SD has resulted in the predominant usage of the Torino approach in case studies.*

Findings on Context

As it is the aim of this study to explore the application of SD for incumbent firms, the chosen case studies were distinguished between commercial and non-commercial contexts.

Out of the selected 56 contributions, 32 fall under the category of non-commercial, which include case studies like Ryan and Leung's (2014) and 5 case studies were identified as falling in-between, which emphasized advancing the circular economy on a regional level through policy-making and local entrepreneurial collaborations, such as creating shared value and positive impacts from a mining landscape to an agricultural transition in Panama (Anderson, Foot, and Bonilla 2023).

The Torino approach been most frequently applied to case studies becomes even more evident when looking into the commercial context where all case studies follow this approach. In total 19 case studies were categorized as commercial, primarily following the approach of Torino. This approach, grounded in its five principles, focuses on local small to mid-sized enterprises and social enterprises.

> *→ The analysis of comparing commercial and non-commercial contexts of the case studies revealed a predominant focus on the Torino approach in the commercial context and, therefore, emphasizing regional small- to mid-sized (social) enterprises.*

Findings on Characteristics

The application of SD in the non-commercial context was predominant in governmental and healthcare cases. The topics of these case studies were varied, with some governmental case studies focusing on developing circular policies (Barbero and Pallaro 2018), and others on social licenses (Veale 2014), or taxation (Kaur 2021). Similarly, the healthcare case studies addressed circular waste management of laundry (Min and Long 2018), elderly care (Lu, Pereno, and Barbero 2023), circular medical products (Barbero, Pereno, and Tamborrini 2017), health inequality (Cáceres, López, and Córdoba 2021) among other topics. Yet other case studies were characterized by the complex societal issues of race (Meyers 2021), gender (Faiz et al. 2020), and others. Thus, the non-commercial case studies showed a wide variety of complexity problems and the scale of problems, from circularity in products to social inequality.

On the other hand, the commercial case studies had a strong focus on sustainability and circularity across all characteristics of the case studies. This focus was grounded in the predominant SD approach of Torino in the commercial context. Due to this application of the Torino approach, complex problems focusing on advancing circularity in food and beverage proved to be prevalent case studies for this approach. For instance, using the waste (output) of local coffee bars as input to grow mushrooms in the region of Turin (Barbero and Toso 2010). SD defines itself as an effective methodology for the transitions to circular economy, as it's 5 principles are aiming to design new systems for local actors enable this (Barbero 2017).

> *→The analysis of the characteristics of commercial and non-commercial contexts of the case studies resulted in a different level of potential impact. As the Torino approach is focusing on local circular economy transitions, the potential impact of the commercial case studies stays within these boundaries.*

IV. Discussion

Theory:

> *→The analysis of the conceptual approaches of SD has resulted in the predominant usage of the Torino approach in case studies.*

Looking at the high usage of the Torino approach for case studies, it seems to be a practical and pragmatic solution that effectively addresses complexity based on clearly defined principles and methods. While there are a significant number of conceptual publications that advance the field of SD, there is a lack of case studies to represent and explore these approaches, which can shape the field with different perspectives. This may reinforce more case studies following the Torino approach and create a general perception that other concepts and approaches are too theoretical to be applied.

This raises the question of future research following the other approaches to move beyond conceptual contributions.

Context:

> *→The analysis of comparing commercial and non-commercial contexts of the case studies revealed a predominant focus on the Torino approach in the commercial context and, therefore, emphasizing regional small- to mid-sized (social) enterprises.*

The commercial case studies following the Torino approach offer valuable insights, such as discussing the challenges faced by small- to mid-sized enterprises when it comes to circular economy transitions (Battistoni

and Barbero 2019) and the role of policies for such sized enterprises (Nohra, Pereno, and Barbero 2020). Further, despite case studies showcasing collaborations with lager scale companies such as Lavazza (Barbero and Tamborrini 2015) and BP (Barbero and Campagnaro 2008) but their impact stays local and within their internal business processes.

Therefore, it would be relevant to explore SD with larger international firms beyond local impact in order to promote behavioral change and have impact beyond locality. Conceptual contributions, such as the Strongly Sustainable Business Model Canvas, which is grounded in SD (Jones and Upward 2014) provides first directions for future research .

Characteristics

> → *The analysis of the characteristics of commercial and non-commercial contexts of the case studies resulted in a different level of potential impact. As the Torino approach is focusing on local circular economy transitions, the potential impact of the commercial case studies stays within these boundaries.*

As we previously discussed, sustainable development implementation in commercial settings tends to have a local impact, with a focus on local circular transitions. Hua et al (2016) argues that SD following the Torino approach mainly focus on the industrial and agricultural production process and limited research has been carried out other topics, such as sustainable consumption.

On the other hand, non-commercial case studies that apply a mix of SD approaches address different levels of complexity, showing a wide range of topics, from challenging existing modes of operation, mental models, and paradigms. Therefore, it is advisable for future research to explore sustainable approaches beyond the Circular Economy with larger firms beyond the local context, using other SD concepts.

Limitations

There were several limitations to this study which need be considered.

Firstly, the exclusion and inclusion criteria focused on case studies resulted in the retrieving mainly contributions applying the SD approach by Torino. As a result, other conceptual views on SD and other frameworks, were not as well represented.

Secondly, it is reasonable to assume that a significant number of contributions related to SD might not be retrieved by using the keyword "systemic design". This assumption is based on the fact that Systems Theory has a long history of applying systemic/holistic thinking, which might fall into the scope of SD without explicitly being labeled as such.

Thirdly, this paper mainly focused on the academic perspective of the field. It is important to acknowledge that there might be more case studies following these and other approaches, but they have not been published or have remained within universities or industries.

Finally, the collection of data also had limitations, as the Scholar database was unreliable and kept changing the number of found results. Moreover, not all papers were accessible, and some couldn't be found as they were removed.

V. Conclusion

Based on the literature review, it can be observed that the Torino approach is the most predominant SD approach which has come up in the most case study publications is currently being used in a commercial setting. This approach is aiming to advance circular economy with small to mid-sized (social) enterprises on a local level.

However, it comes to the urgency of the climate crisis, other SD approaches are additionally going beyond local levels and circular economy. SD approaches such as those proposed by Jones and Sevaldson are aimed at

challenging and questioning current societal paradigms, mindsets, and modes of operating. However, they lack academic publications to show their potential in sustainable transitions in commercial contexts.

Overall, it can be concluded based on the reviewed case studies that SD is a developing field and requires further exploration when it comes to enabling incumbent firms to facilitate the much-needed sustainability transition. This includes small- to mid-sized (social) enterprises as well as large-scale profit-focused incumbent firms. This approach has the potential to impact the local level while also challenging the current mindset and status quo. Therefore, more research is needed to explore how SD can be applied in a commercial context, and how interventions can be developed that target the root causes of the climate crisis, challenging behavioral patterns and mental models of companies, consumers, and governments in collaboration.

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Appendix

Title paper	Authors	T (Theory)	C (Context)	C (Characteristics)
Systemic Design in AgroFood Sector: EN.FA.SI project	Barbero and Tamborrini 2012	Following the Torino SD conceptual approach	Commercial (local enterprises)	**Circular Food and Beverage :** EN.FA.Si project in Piedmont focusing on Cuneo bean system
Systemic Design goes between disciplines for the sustainability in food processes and cultures	Barbero and Tamborrini 2015	Following the Torino SD conceptual approach	Commercial (local enterprises)	**Circular Food and Beverage** with 2 case studies: EN.FA.Si project in Piedmont focising on Cuneoo bean system + Fondo Noir-Lavazza: spent coffee ground from the coffee bars in the metropolitan city center are collected in order to generate new businesses
Systemic design: case studies open industrial systems and new local economies	Barbero and Campagnaro 2008	Following the Torino SD conceptual approach	Commercial (small-middle local enterprises)	**Circular transition of production systems** with 2 case studies: Agrindustria - renewable energy output is resource input in the territory + Production steel ball by using natural surface agents instead of solvents coming from petroleum; the results is not polluted outputs to use as raw material (INPUT) for other productions on territory and the concrete possibility to manage wastewater (now expensive waste) in a sort of natural metabolization
Systemic Design for a sustainable local economic development: Lea-Artibai case study	Battistoni, Pallaro, and Arrizabalaga Arambarri 2016	Following the Torino SD conceptual approach	Commercial (small-middle local enterprises)	**Circular transition to a local economic development:** Basque Country economy is historically based on forestry and fishing that is currently facing a long-lasting crisis
From linear to systemic: an integrated design solution for sustainable household consumption in Iceland	Hua, Huang, and Child 2016	Following the Torino SD conceptual approach	Commercial (product development)	**Sustainable Product development:** Sustainable household consumption though a systemic fridge design in Iceland)
A Systemic Design Approach Applied to Rice and Wine Value Chains. The Case of the InnovaEcoFood Project in Piedmont (Italy)	Fiore, Stabellini, and Tamborrini 2020	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Food and Beverage :** InnovaEcoFood project focusing on rice/wine waste products
Designing a Sustainable, Circular Culinary System	Grèzes-Bürcher and Grèzes 2023	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Food and Beverage:** Canton of Valais producer for vegetables and fruits in Switzerland - more efficient system and food waste
Systemic Incubator for Local Ecoentrepreneurship to Favour a Sustainable Local Development: Guidelines Definition	Battistoni and Barbero 2019	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Fashion:** Wool transformation in Piedmont Region
Improvement of Certified Artisan Cheese Production through Systemic Analysis—Serra da Estrela PDO	Coelho, Carrola, and Couvinhas 2017	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Food and Beverage:** Improving the overall efficiency of cheese production
Systemic Design of a Productive Chain: Reusing Coffee Waste as an Input to Agricultural Production	Barbero and Toso 2010	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Food and Beverage :** From coffee waste to mushrooms in Turin
Food-pack waste systemic management. Alternative ways to reuse materials and to develop new business, products and local markets.	Ceppa and Marino 2012	Following the Torino SD conceptual approach	Commercial (small local enterprises)	**Circular Waste management:** Packaging of chocolate packaging within the company
Understanding fashion complexity through a systemic data approach	Marino, Remondino, and Tamborrini 2020	Following the Torino SD conceptual approach + Meadows' leverage points	Commercial (no company - industry focus)	**Circular Fashion:** Industry improvement
Data, Fashion Systems and Systemic Design approach: an information flow strategy to enhance sustainability	Marino, Remondinoa, and Tamborrini 2018	Following the Torino SD conceptual approach +	Commercial (no company - industry focus)	**Circular Fashion:** Industry improvement

		Meadows' leverage points		
Sustainable production networks: A design methodology based on the cooperation among stakeholders	Castiglione and Fiore 2022	Following the Torino SD conceptual approach + MEIO method	Commercial (small local enterprises)	Circular **Food and Beverage:** Circularity in rice/wine/bread
How can Systemic Design path the way to innovation in social cooperative?	Rosini and Barbero 2020	Following the Torino SD conceptual approach but uses mainly the holistic analysis	Commercial (social enterprises)	**Worker wellbeing:** Agridea's workforce (job integration of disadvantaged people)
Sustainability and its paradoxes: the case study of a big coffee roasting company in the Turin Metropolitan Area on the lens of Systemic Design.	Campolmi et al. 2021	Following the holistic diagnosis of the Torino SD conceptual approach	Commercial (local enterprises)	Circular **Food and Beverage:** Sustainability for a coffee roasting company – challenging current ways of approaching sustainability
Systemic Design: How to Compete by Leveraging the Value System	Mosca, Tamborrini, and Casalegno 2015	Following the holistic diagnosis of the Torino SD conceptual approach	Commercial (local enterprises)	Circular **Food and Beverage:** following knows case studies of Torino but looking at them though a strong business perspective (The flavours of coffee ground with Lavazza SPA)
CO2 Emission Reduction Through a Sustainable Local Suppliers Network of Raw Materials. Focus on a Delicatessen Shop.	Marino 2013	Following the Torino SD conceptual approach	Commercial (small/medium local enterprise)	Circular **Food and Beverage:** Reducing the Co2 emissions of a Italian delicatessen shop by improving a local network of suppliers
Facing a Phytosanitary Emergency through Transdisciplinary Approach of Systemic Design	Alessandra and Peruccio 2019	Following the Torino SD conceptual approach	Non-commercial (Agriculture)	**Local biodiversity**: Olive Quick Decline Syndrome in Italy
Systemic Design Research for Hospital Laundry	Min and Long 2018	Following the Torino SD conceptual approach	Non-commercial (Healthcare)	Circular **waste management:** Hospital laundry
Tourism, Culture and environment: Design Systemic Realtions, Human, Social and Strategic Factors in the Estrada Real	Oliveira and Bistagnino 2012	Following the Torino SD conceptual approach	Non-commercial (Tourism)	**Reginal (sustainable) development:** Case study of Estrada Real Territory in Brasil - create a wider vision and new opportunities for the region
Systemic design applied to water treatment for domestic purposes	Toso and Re 2014	Following the Torino SD conceptual approach (3 out of 5 principles applied)	Non-commercial (Local water management)	**General water management**: case study about design of an alternative system of water treatment for domestic purposes able to enhance the qualities of water for specific uses by adopting alternative water treatment methodologies able to reduce the amount of water needed, the harmful byproducts production, and the re-use of wastewater
Mountain water management through systemic design: the Monviso Institute real-world laboratory	Carraro, Barbero, and Luthe 2021	Following the Torino SD conceptual approach (not clearly stated but assumed based on authors)	Non-commercial (Local water management)	Sustainable **water management**: Case study about water resources and design of integrated water systemsin rural areas in mountain environment
Systemic Design in Energy sector: theory and case studies	Barbero 2011	Following the Torino SD conceptual approach	Non-commercial (Energy transition)	Sustainable **energy transition** with two case studies: City of Linköping:Biogase reuse + Östra Tommarp: reduce greenhouse gas output at the agricultural sector
Systemic design and policy making: The case of the RETRACE project	Barbero and Pallaro 2018	Following the Torino SD conceptual approach	Non-commercial (Government)	Circular **policy making:** RETRACEInterreg Europe - focusing on Piedmont region in Italy
Systemic Design for Policy-Making: Towards the Next Circular Regions	Nohra, Pereno, and Barbero 2020	Following the Torino SD conceptual approach	Non-commercial (Government)	Circular **policy making:** RETRACEInterreg Europe - focusing on Piedmont region in Italy

Systemic Design approach in policy-making for sustainable territorial development	Barbero and Bicocca 2017	Following the Torino SD conceptual approach	Non-commercial (Government)	**Circular policy making:** RETRACEInterreg Europe - focusing on Piedmont region in Italy
Systemic Design For Elderly Healthcare: Analysis of the current responses in China, Italy and Japan	Lu, Barbero, and Pereno 2022	Following the Torino SD conceptual approach	Non-commercial (Healthcare + Government)	**Elderly care and sustainable care development:** Cross-analysed models of cross-scale community care and community care stakeholder map derived from differences in healthcare policies and levels of sustainability under different political regimes in China, Italy and Japan
Systemic design for sustainable community care for older adults: a case study in Turin, Piedmont, Italy	Lu, Pereno, and Barbero 2023	Following the Torino SD conceptual approach	Non-commercial (Healthcare + Government)	**Elderly care and sustainable care development**: impact and challenges of the COVID-19 pandemic governance model on older adults care in the Turin A.S.L.TO3 community
Systemic innovation in sustainable design of medical devices	Barbero, Pereno, and Tamborrini 2017	Following the Torino SD conceptual approach	Non-commercial (Healthcare)	**Circular medial products:** Developing a medical circular equipment (dialysis equipment)
Systemic Design towards user-centered sustainability in medical treatments	Pereno 2017	Following the Torino SD conceptual approach	Non-commercial (Healthcare)	**Circular medical products:** Medical treatment focusing on chronic kidney disease
Systemic Design approach applied to Building – Definition of a co-operative process	Montrucchio 2013	Following the Torino SD conceptual approach	Non-commercial (Building development)	**Circular building analysis:** SD approach is being used to understand buildings and their impacts in term of consumption and waste production
Post-industrial areas on the lens of systemic design towards flourishing urban resilience	Giraldo Nohra and Barbero 2018	Following the holistic diagnosis of the Torino SD conceptual approach	Non-commercial (Urban development)	**Circular urban development:** circular strategies in in post-industrial urban areas
Mind the Gap: The Outcome map as a bridge from systemic sensemaking to PSS Design in a case study about children with incarcerated parents	Gruyters et al. 2023	Combination of Systemic Sense Making (van Ael) to develop a Product Service System Design	Non-commercial (Child welfare)	PSS for Children of Prisoners
Designing a Design-Driven Human-Centered Engineering Program	Hira et al. 2022	Combining Jones and Sevaldson	Non-commercial (Education)	**Education development at university:** Developing a Design-Driven Human-Centered Engineering program
Systemic Government and the Civil Servant: A new pattern for systemic design	Veale 2014	Combining Jones, Ryan and Sevaldson	Non-commercial (Government)	**Policy making:** Alberta Public Service in Edmonton, Canada as a approach for cultural change and decision-support - future of social license and engagement to 2042
Developing a Systemic Design Practice to Support A Regulatory Agency in Addressing Complex Problems	Malcom and van der Bijl-Brouwer 2016	Following Jones conceptual approach	Non-commercial (Government)	**Policy making:** Government regulatory agencies in Australia for ensuring quality of goods and services provided by a specific business sector
Systemic Design as a participatory tool framing perinatal care policies in Colombia	Cáceres, López, and Córdoba 2021	Following Jones conceptual approach	Non-commercial (Healthcare + Government)	**Health inequality:** Perinatal care in rural areas of Colombia
Applying a systemic approach to gender transport poverty	Faiz et al. 2020	Following Jones conceptual approach	Non-commercial (Mobility)	**Gender issues in transportation:** Gender transport poverty in Pakistan (Wemobile project)
A Systemic Design Approach to Sustainable Value Chains in Norwegian Forestry	Wigum 2022	Following Jones conceptual approach + Meadows leverage points	Non-commercial (Agricultural)	**Sustainable coastal forestry:** stakeholder roles for sustainable transitions and establishing sustainable value chains in Norway
Systemic Design: Two Canadian Case Studies	Ryan and Leung 2014	Following Jones conceptual approach but developed own approach (from military context)	Non-commercial (Education, Energy transition)	**1.Case study:** public procurement project within University of Toronto - re-envision how public policy is implemented and how value is created in the broader university purchasing ecosystem. **2.Case study**: improving the effectiveness of the clean energy and natural resources group within the Government of Alberta
Beyond service design: understanding complex challenges on a systemic level	Santos and Sustar 2023	Following Ryan + Jones + Meadows leverage points	Non-commercial (Local disaster prevention)	**Fire prevention system:** Rural fires in Portugal

Radical design processes for systemic change	Lurås and Nordby 2013	Following Sevaldson + Meadows leverage points	Non-commercial (Mobility)	**Ship bridge development:** radical design in safety-critical collaborative workplaces (Ulstein case study) - focus here is on presentations as interventions to archive systemic change
Unpacking Gentrification 2.0 A systems oriented design study uncovering underlying systemic forces in the context of access to housing	Dudani 2019	Following Sevaldson + Meadows leverage points	Non-commercial (Urban development)	**Gentrification**: Making housing affordable for immigrants and reduce gentrification in Norway
A systemic framing of the challenges faced in design education during the COVID-19 lockdown	Meyers 2021	Following van Ael + Jones + Sevaldson	Non-commercial (Education)	**Racial inequality at universities:** Challenges faced in design education during the COVID-19 pandemic In South Africa
Bringing systemic design in the educational practice: the case of gender equality in an academic context	Jacoby and Van Ael 2021	Following Ryan, Jones and approach by van Ael (Namahn)	Non-commercial (Education)	**Gender issues at university**: Gender representation among the staff in an academic context (part of a course)
Systemic design in the Australian Taxation Office – Current practice and opportunities	Kaur 2021	Systems-led design based on Ryan systemic design framework, Jones systemic design methodology, Sevaldson systems-oriented design and ThinkPlace design system methodology	Non-commercial (Government)	**Policy making**: Government by Australian taxation office (COVID-19 economic stimulus measures, internal organizational transformations, black economy, data transformation and optimize client interactions
Inclusive Systemic Design for Health System Flourishment	Pennefather, Seaborn, and Fels 2018	Referring to Jones to built own framework in their case study	Non-commercial (Healthcare)	**Health inequality:** Design of a system for registering evidence of patient experienced flourishment (patient-centered collaborative care for a person living with chronic pain)
How Does Systemic Design Facilitate the Sustainability Transition of Rural Communities? A Comparative Case Study between China and Italy	Zang et al. 2023	Own framework drawing from diverse systemic design approaches: Situation-Cognition-Action framework	Non-commercial (rural development)	**Sustainable development in rural areas:** Comparative study between a village in China and one village in Italy (this approach works with labs, however there is an interesting systemic design process applied in combination with the lab approach)
Ecological and digital transition: Systemic Design in SMEs open innovation processes	Barbero and Ferrulli 2023	Following the Torino SD conceptual approach	Commercial (small and medium sized enterprises) + Non-commercial (government)	**Ecological and digital transition:** DigiCirc project by the EU
Systemic Design for territorial thinking. Circular urban transitions for post-industrial cities	Nohra and Barbero 2019	Following the Torino SD conceptual approach	Non-commercial (Government) + Commercial (Urbanism sector - social local enterprises)	**Circular urban transitions for post-industrial cities:** Mirafiori Sud District in Turin
Local Ruralism: Systemic Design for Economic Development	Barbero 2018	Following the Torino SD conceptual approach **(2 case studies)**	Non-commercial (Government) + Commercial (social local enterprises)	**Circular Food and Beverage** with 3 case studies: EN.FA.Si project in Piedmont focusing on Cuneo bean system + Ahuehuetla Project in Mexico, fruits + Azaro Project in the Basque, fish
Design of an ecosystem to foster systemic eco-innovation Systemic design for autopoietic local economies	Battistoni and Barbero 2020	Following the Torino SD conceptual approach	Non-commercial (local sustainable enterprise) + Commercial (Government)	**Circular Alpine region** (city mayo asking for a sustainable future vision for the Italian alps in Piedmont region) + **Circular Food and Beverage** (large French biscuit factory)

Rural development and sustainable innovation. How Systemic Design approach can contribute to the growth of marginal regions	Bicocca 2016	Following the Torino SD conceptual approach	Non-commercial (rural development) + commercial (local farmers and small enterprises)	**Sustainable development (triple P) in rural areas:** though SDA managing local resources and local products to strengthen the farmers and community in Mexico
Creating shared value and positive legacies from a transitional working landscape in Panama	Anderson, Foot, and Bonilla 2023	SDA (Systemic Design Approach) by Torino	Non-commercial (Agriculture) + Commercial (social entrepreneurship)	**Agricultural development:** Creating shared value and positive impact from mining landscape to a agricultural transition in Panama