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# Summary of “Identifying Value Chain Variables and Attributes for Urban Factories and Proposal of a Model to Support Eco-designers in their Characterization”

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## Abstract

This summary presents results from the paper “**Identifying Value Chain Variables and Attributes for Urban Factories and Proposal of a Model to Support Eco-designers in their Characterization**” which has been submitted to **Sustainable Futures** and is still in the review process. In this summary, a new model has been developed to allow designers to determine relevant parameters to consider when designing value chains for urban factories. This has been conducted through a systematic literature review on value creation of urban factories, which has resulted in identifying variables and attributes for each value chain activity.

**Keywords:** urban factory; characterization; value chain model; eco-design

## 1. Introduction

Factories have been subject to delocalization from urban areas for various reasons such as their environmental impacts exceeding restrictions set inside the urban area [1]. The new wave of cleaner production technologies, circular economy and sustainable business models have enabled their re-localization inside urban areas [2]–[5]. This concept has been referred to as urban factories [6], [7]. Urban factories have been defined as factories located inside an urban environment whose characteristics are utilized in the value creation [1], [8]. Eco-designing value chains for urban factories can be extremely challenging due to the multitude of variables related to production factors, the urban environment, and their interactions [9]. Urban environments characteristics for example vary from one urban area to another due to many differences such as governance, infrastructure, size, and culture [10]. To start this design, an explorative step of the value chain is needed to describe and conduct a diagnosis of the current situation. This will then be compared with other successful local urban factories. To date, many studies have explored the concept, but no study has covered all relevant activities of the value chain. From a benchmarking perspective, a model is needed to provide a structure for analysis to eco-designers in order to result in sustainable value chain architectures relevant to the local context. Covering this gap represents the main purpose of the paper associated to the present summary, which is led by the following research questions: How to model value chains for urban factories throughout all value creation activities?

## 2. Methodology

To design a framework that allows the modeling of value chains for urban factories throughout all their value creation activities, two main steps have been used. First, the identification and analysis of relevant case studies that presents various models of value chains for urban factories. Then, the mapping of the analysis results on Porter’s value chain model. To overcome the lack of studies in the literature where the term ‘urban factory’ has been cited, other case studies have been considered. These represent value chains with similar patterns as the definitions presented in the typology [11]. To identify such case studies, a systematic literature review has been conducted using the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines [12]. An initial screening of results has been conducted on titles and abstracts to identify potential case studies that fall under one of the urban factory definitions. Finally, full texts have been screened to keep only studies with a presentation or a

description of at least a value chain activity. To make sure all activities are included in the scope of the study, Porter's value chain model has been used as it includes "*the full range of activities which are required to bring a product or service from conception, through the different phases of production*" [13]. Based on results of the systematic literature review, each value chain activity has been described or presented explicitly with various attributes. Semantic similarities of the extracted attributes have allowed the definition of relative instances using meanings of words and their intuitive relatedness such as defining the instance 'beverage' for the two attributes 'coffee' and 'tea' [14]. The resulting instances have been projected on Porter's value chain model.

### **3. Result: proposal of a value chain model for urban factories**

In order to describe and characterize value chains in the context of urban factories, each instance has been projected in the box relating to the value adding activity it presents. This has led to the creation of the model presented in Fig. 1. All value chain activities are identified by integers ranging from 1 to 4 for secondary activities, and 5 to 9 for primary activities. Each activity box includes the all associated instances with each an identification number that starts with the same number of the activity it represents, followed by a point, then a positive integer ranging from 1 to the total number instances. For example, with a total of 4 instances identified for infrastructure activities which are identified by number 1, the possible identification numbers for these instances are 1.1 to 1.4. To determine the orders, the number of mentions in the literature has been used to sort instances inside the same activity box by giving the smallest identification numbers to the most mentioned instances in the literature. To better support the use of this model and to maintain a standard form intended for data analysis purposes, the types of instances have been included using a code put between brackets following the name of each instance. For example, transportation distances in inbound and outbound logistics are followed by the code RN which indicated the attribution of a real number for these two instances. Other codes are explicated in the lower part of Fig. 1. This has been mainly done to avoid having irregularity issues such as affecting continuous attributes to a discrete instance, or categorical attributes to a numeric instance.

### **4. Conclusion**

To model value chains for urban factories throughout all value creation activities, Porter's model has been used as a foundation to build the model proposed in this summary. Firstly, an extensive systematic literature review has been conducted and the results have been analyzed for each value chain activity. Identified characteristics have been grouped according to their semantic similarity into instances for which they represent attributes. All resulting instances have been mapped in Fig. 1 to represent the proposed model.

The proposed model can be used by eco-designers to identify adapted attributes based on value chains architectures and patterns resulting from analyzing models of successful urban factories. In addition to setting a logical context, the model provides designers with a standard structure to collect data on existing urban factories and have a homogeneous dataset.

<b>1. Infrastructure</b>				
1.1. Source of funds (SC)				
1.2. Type of administrative structure (SC)				
1.3. Managing structure (SC)				
1.4. Number of managers (PI)				
<b>2. Human Resources Management</b>				
2.1. Percentage of local employees (RN)				
2.2. Type of training of employees (SC)				
<b>3. Technological Development</b>				
3.1. Location of R&D activities (SC)				
3.2. Integration of customers in R&D activities (B)				
3.3. Distance to R&D activities (RN)				
<b>4. Procurement</b>				
4.1. Distances to suppliers (RN)				
4.2. Procurement of resources in end-of-life (B)				
<b>5. Inbound Logistics</b>	<b>6. Operations</b>	<b>7. Outbound Logistics</b>	<b>8. Marketing &amp; Sales</b>	<b>9. Service</b>
5.1. Transportation distances (RN)	6.1. Used processes (SC)	7.1. Transportation distances (RN)	8.1. Distance to the market (RN)	9.1. Offering of additional services (B)
5.2. Stocking strategy (SC)	6.2. Offering of personalization or customization (B)	7.2. Means of transportation (SC)	8.2. Location of sales (SC)	9.2. Type of additional services (SC)
5.3. Means of transportation (SC)	6.3. Production area's surface (RN)	7.3. Stocking strategy (SC)	8.3. Independent management of sales (B)	9.3. Percentage of revenues deriving from additional services (RN)
	6.4. Location of operations (SC)		8.4. Means of promotion (SC)	
	6.5. Batch size (SC)			
	6.6. Possibility of vision from the outside (B)			
	6.7. Variety of products (PI)			
	6.8. Main activity (SC)			

SC: Sequence of Characters; PI: Positive Integer; RN: Real Number; B: Boolean

**Fig. 1.** Porter's value chain model adapted to urban factories.

## References

- [1] C. Herrmann, M. Juraschek, P. Burggräf, and S. Kara, “Urban production: State of the art and future trends for urban factories,” *CIRP Ann.*, 2020, doi: 10.1016/j.cirp.2020.05.003.
- [2] K. Meyer, S. Görgens, M. Juraschek, and C. Herrmann, “Increasing resilience of material supply by decentral urban factories and secondary raw materials,” *Front. Manuf. Technol.*, vol. 3, Jan. 2023, doi: 10.3389/FMTEC.2023.1106965.
- [3] T. Tsui, D. Peck, B. Geldermans, and A. van Timmeren, “The role of urban manufacturing for a circular economy in cities,” *Sustainability (Switzerland)*. 2021, doi: 10.3390/su13010023.
- [4] A. Bathen *et al.*, *Handbook on Urban Production*. Bochum: UrbaneProduktion.Ruhr, 2022.
- [5] S. M. M. Sajadieh, Y. H. Son, and S. Do Noh, “A Conceptual Definition and Future Directions of Urban Smart Factory for Sustainable Manufacturing,” *Sustain.*, vol. 14, no. 3, Feb. 2022, doi: 10.3390/SU14031221.
- [6] F. Kreuz *et al.*, “Urban factories-interdisciplinary perspectives on resource efficiency,” in *Urban Freight Transportation Systems*, 2019.
- [7] M. Juraschek, B. Vossen, H. Hoffschroer, C. Reicher, and C. Herrmann, “Urban Factories: Ecotones as Analogy for Sustainable Value Creation in Cities,” *1. Interdiszip. Konf. zur Zukunft der Wertschöpfung*, 2016.
- [8] M. Juraschek *et al.*, “Urban Factories and Their Potential Contribution to the Sustainable Development of Cities,” 2018, doi: 10.1016/j.procir.2017.11.067.
- [9] S. H. A. Koop, C. Grison, S. J. Eisenreich, J. Hofman, and K. J. van Leeuwen, “Integrated water resources management in cities in the world: Global solutions,” *Sustain. Cities Soc.*, vol. 86, p. 104137, Nov. 2022, doi: 10.1016/J.SCS.2022.104137.
- [10] C. McFarlane, J. Silver, and Y. Truelove, “Cities within cities: intra-urban comparison of infrastructure in Mumbai, Delhi and Cape Town,” <https://doi.org/10.1080/02723638.2016.1243386>, vol. 38, no. 9, pp. 1393–1417, Oct. 2016, doi: 10.1080/02723638.2016.1243386.
- [11] W. Ijassi, D. Evrard, and P. Zwolinski, “Characterizing urban factories by their value chain: a first step towards more sustainability in production,” *Procedia CIRP*, 2022, doi: 10.1016/j.procir.2022.02.048.
- [12] A. A. Selçuk, “A Guide for Systematic Reviews: PRISMA,” *Turkish Arch. Otorhinolaryngol.*, vol. 57, no. 1, p. 57, May 2019, doi: 10.5152/TAO.2019.4058.
- [13] R. Kaplinsky and M. Morris, “A handbook for value chain research. Prepared for the IDRC.,” *Inst. Dev. Stud. Brighton. UK*, 2000.
- [14] S. Harispe, S. Ranwez, S. Janaqi, and J. Montmain, “Semantic Similarity from Natural Language and Ontology Analysis,” *Synth. Lect. Hum. Lang. Technol.*, vol. 8, no. 1, pp. 1–256, 2015, doi: 10.2200/S00639ED1V01Y201504HLT027.