Towards most valuable city logistics initiatives - crowd logistics solutions' assessment model

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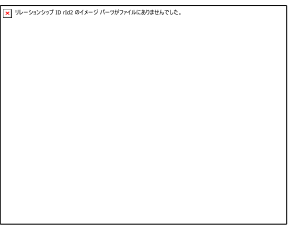
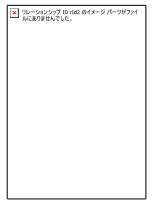




Introduction

The sharing economy is about making use of any idle resource out there. We do love seeing other sharing-economy companies flourish.

(Joe Gebbia, CPO of Airbnb)

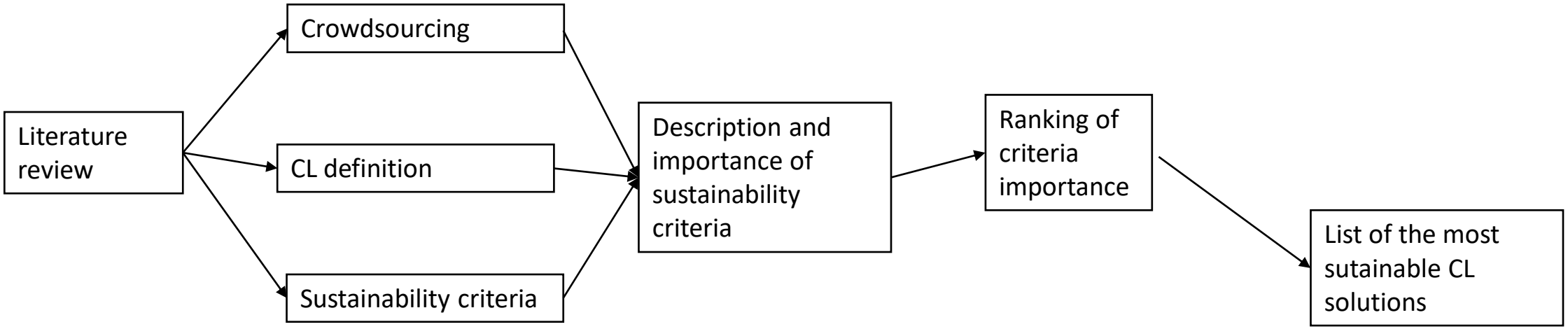
Current situation:

- 52% of world's population live in cities. In 2050 it will be 67% (*World Urbanization Prospects,* 2014)
- Freight transport will have been tripled by 2050 (Lindenau and Böhler-Baedeker 2014)
- Problems with traffic in cities (Buldeo Rai et al. 2017a)
- Lack of holistic view on logistics problems in cities (Dablanc 2007; Russo and Comi 2011)
- Development of sharing-economy solutions, green economy and circular economy (Botsman 2013; Castillo et al. 2018; Bardhi and Eckhardt 2015)

Goal of the research

Main goal of the research: to provide a ready-to-use tool for assessment of the crowd logistics (CL) solutions

Procedure


Literature review
Crowdsourcing
CL definition
Sustainability criteria
Description and importance of sustainability criteria
Ranking of criteria importance
List of the most sutainable CL solutions

Literature review – crowdsourcing in logistics

Approach: Denyer and Tranfield's (2009) approach (modified), Boolean logic, chosen research search engines (9)

Literature base size: 69 items

Crowdsourcing initiatives in logistics (Carbone et al. 2017; Carbone et al. 2018; Klingebiel and Wagenitz 2012)**:**

- *peer-to-peer logistics* – exchange between individuals (C2C)
- *business logistics* – business platforms to enable exchange between businesses and individuals (B2C)
- *open logistics* - enabling individuals to control logistics chains related to the supply and distribution of goods (non-profit organizations)
- *logistics-as-a-service (LaaS)* – IT platforms for enabling providing services for supply chain transparency, logistics planning, demand collaboration (B2B)
- ***crowd logistics*** - a concept of sharing assets in transportation, that aims to improve efficiency and sustainability of the way people are transported or objects are moved, stored, supplied; supported by IT (C2B, C2C)

Literature review – crowdsourcing in logistics

Groups of CL solutions:

- services for people mobility
- services for freight delivery
- cargo-hitching services

CL solutions: pure crowd logistics activity should use existent flows – it's one of the necessary condition of this phenomenon. If existent flows are used for services fulfilment, this will contribute to more sustainable city logistics

Methods

Variables: 20 variables in the area of sustainability (Hopwood et al. 2005; Buldeo Rai et al. 2017a; Frehe et al. 2017)**:**

- 6 environmental,
- 7 economic,
- 7 social.

Group	Criterion	Group	Criterion	Group	Criterion
Environmental	1. Reduction in CO2 emissions	Social	7. Building the crowd network	Economic	14. Access to adequate IT infrastructure
	2. Effective use of loading space		8. Voluntary character		15. Free capacity, flexibility, accessibility
	3. Resource use model		9. Tracking, transparency		16. Attractive revenue model
	4. Reducing noise		10. Simplicity and trust		17. Short time of delivery
	5. Less waste		11. Safety		18. Strategy of cooperation
	6. Less congestion and traffic		12. Health benefits		19. Geographical scale
			13. Country specifics and ethics		20. Insurance

Method: AHP (Analytic Hierarchy Process) method (Saaty, 1987)

Variables matrix: In this research, only a part of the AHP process will be presented, namely – ranking the selection criteria used by customers to choose the best CL solution. To build this model, the literature review was made to specify the criteria, then assessing and comparing their importance in the CL user decision-making process

Methods – base for criteria matrix

No.	Criterion	Description	Information - importance
1	reduction of CO2 emissions	choosing zero- or low-emission transport mode (bike, going on foot; public transportation)	low attention paid by users and providers (Buldeo et al., 2017); important for ca. 30% of drivers (Frehe, Mehmann, Teuteberg 2017)
2	effective use of loading space	reducing a number of routes to deliver goods	low importance (Frehe, Mehmann, Teuteberg 2017)
3	resources use model	enabling the service in a sustainable way by using the existing resources (both companies and individuals)	low-medium importance (Mladenow, Bauer, Strauss, 2016; Carbone, Rouquet, Roussat 2018, Carbone, Rouquet, Roussat 2017, Frehe, Mehmann, Teuteberg 2017)
4	reducing noise	using quiet transport modes (bikes and going on foot, using public transportation); recording the noise and keep the users informed about its level	important for local society (Mladenow, Bauer, Strauss, 2016)
5	less waste (e.g. tires)	less waste caused by decreasing use of the modes of transport polluting the environment	as important as reducing noise (Abdul-Rahman et al.. 2015, Buldeo et al. 2017)
6	congestion and traffic	less traffic caused by growing active transport modes' popularity	as important as reducing noise (Abdul-Rahman et al.. 2015; Carbone, Rouquet, Roussat 2018, Carbone, Rouquet, Roussat 2017)
7	building the crowd network	connecting business and individual providers and consumers, freelancers and CEP service providers ;the crowd logistics company itself acts as a mediator between these two networks	the network is essential (Buldeo et al. 2017, Frehe, Mehmann, Teuteberg 2017); the importance of non-monetary incentives, such as events to strengthen the crowd's community feeling (Buldeo et al. 2017)
8	voluntary character	people self-select logistics services they wish to fulfil	it remains a basic element (Buldeo et al. 2017)
9	tracking, transparency	the platform registers and tracks the crowd, but usually, quality and service are more difficult to monitor and cannot be guaranteed	this as an essential element of CL but indicated as a source of stress if the crowd identity is uknown (Buldeo et al. 2017)
10	simplicity and trust	the customer is not interested in contractual details, but ordering and safety (Schreieck et al., 2016, Mladenow, Bauer, Strauss 2016))	important to the individual provider and customer (Mladenow, Bauer, Strauss 2016; Frehe, Mehmann, Teuteberg 2017); schedule fit and ease of use are crucial (Buldeo et al., 2017)
11	safety	the security of goods has to be delivered, as also the procedure in the case of damage	very important for the customer (Carbone, Rouquet, Roussat 2017)
12	health benefits	modal choice can influence lower CO2 emissions, better air quality and better health	as important as environmental issues (Buldeo et al. 2017)
13	country specifics and ethics	culture and ethics may have an impact on the safety of transactions and delivering parcels	it may have an impact on customer's decision, but not for sure (Frehe, Mehmann, Teuteberg 2017)
14	access to adequate IT infrastructure	the IT solution (portal, mobile app) provides the opportunity to engage a broad spectrum of users; many mechanisms can be introduced: rigorous selection process, feedback system etc. (Chen et al. 2014)	the main enabling factor - crucial for every CL solution (Buldeo et al. 2017)
15	free capacity, flexibility, accessibility	the CL solution can provide a range of possibilities and providers every time and every place, to every route needed	very important for the customer (Buldeo et al. 2017; Frehe, Mehmann, Teuteberg 2017)
16	attractive revenue model	available revenue models: fixed price, resale margin, financial or matching fee, negotiated price, membership, reward, barter and discount; mostly the CL platform provider receives a part of the final revenue from the service provided by the crowd	the most important factor; it is important for the crowd to be paid accordingly to their competitive advantage (faster deliveries). The essential element of CL (Buldeo et al. 2017)
17	time of delivery	the most attractive is the same-day delivery	very important - customers are willing to pay up to 10% more for these deliveries (Frehe, Mehmann, Teuteberg 2017)
18	strategy of cooperation	it includes effective marketing to gain the competitive advantage, number of users (Internet advertising, social media and bonus programs), cooperation in local and regional scale which refers particularly to partnerships with IT specialists, investors and most prominently, retailers and individuals	the conditions of cooperation (including access to personal data) are very important for both sides of transactions; the same person can be customer and provider (Mehmann, Frehe, Teuteberg 2015, Buldeo et al., 2017)
19	geographical scale	the distinction can be made between intra-urban, inter-urban and global scale on the one hand and regional, national, international and worldwide scale on the other hand	very important, even after the price-most crucial for customers (Mladenow et al.. 2016, Buldeo et al.., 2017)
20	insurance	the customer wants to know that his parcel is safe and there is some insurance	important; the key role of the platform to meet the requirements in this area (Frehe, Mehmann, Teuteberg 2017)

Methods – criteria matrix

Criteria	Result	Criteria	Result
1	0,012294	**14**	**0,099503**
2	0,012294	**15**	**0,099503**
3	0,012294	**16**	**0,181781**
4	0,012294	**17**	**0,099503**
5	0,012294	**18**	**0,099503**
6	0,012294	19	0,054534
7	0,028321	20	0,054534
8	0,028321		
9	0,028231		
10	0,028231		
11	**0,099503**		
12	0,012294		
13	0,012294		

access to IT infrastructure

attractive revenue model

safety

Results

Total characteristic of CL solutions: 20

Advantages: criteria 1-6, 7-10, 12, 15-19

Barriers: criteria 8, 9, 11, 13, 14, 20

Sources for final matrix: business reports and literature focused on chosen sustainability criteria

Most important criteria for the customer:

a) Area of environmental sustainability:0

b) Area of social sustainability: safety;

c) Area of economic sustainability**:** an attractive model of remuneration of individual service providers, 100% availability of services for clients and a flexible form of cooperation (criterion strategy of cooperation), including flexible working hours and weekdays,the same day delivery, access to adequate IT infrastructure;

Least important criteria for the customer:

a) Area of environmental sustainability: 1-6

b) Area of social sustainability: health benefits, country specific and ethics

c) Area of economic sustainability: to provide insurance in the event of a delay or lack of delivery and damage to transported goods, and geographical scale

Research results

Model of CL solutions' assessment:

- Domination of economic criteria (14-20) over the environmental (1-6) and social (7-13)
- The revenue model received a higher weight in the assessment and is responsible for almost 20% of the final grading of the chosen solutions
- Advantages: short time of delivery, accessibility and flexibility of CL solutions, strategy of cooperation
- Barriers: safety, access to IT infrastructure

Discussion and conclusions

Limitations of the study:

- the literature review could be not full, despite the implemented search method, using search criteria and many literature search engines
- using other multi-criteria methods than AHP for research goal implementation may give different results

Results of the research are:

- a proposition of the tool, approach and implementation of crowd logistics solutions' assessment

Future research:

- obtaining primary data on the studied topic (interviews with experts, surveys for users, case studies)

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