Crowdsourced Local Delivery in Developing and Developed Countries: A Comparison of Stakeholder Expectations

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Abstract

Crowdsourced delivery is a potential solution for last-mile challenges. It requires a critical mass of both customers and couriers, whose expectations need to be matched. This proves to be difficult in developed countries, but might be easier in developing ones. Thus, the purpose of this paper is to investigate whether matching stakeholder expectations for crowdsourced local delivery is easier to achieve in developing than in developed countries. A framework with six expectations is designed and tested with an online survey conducted with potential customers and couriers in Sri Lanka and Germany. Results show that matching stakeholder expectations is easier in Sri Lanka than in Germany. Out of the six expectations, three were better aligned in Sri Lanka and three were equally well aligned.

Keywords
crowdshipping, crowd logistics, sharing economy, crowdsourced delivery, last-mile delivery

1. Introduction
E-commerce is rapidly growing. Until recently, this growth took place mostly in more developed countries. Yet, this trend is changing as internet proliferation in the developing world continues to rise (Alwahaishi et al. 2009). The E-commerce growth in developing countries presents two challenges: a large increase in shipping volume (World Economic Forum 2020) and local SMEs becoming uncompetitive (KPMG and Snapdeal 2015).

First, a surge in online sales results in more packages being delivered affecting the last-mile delivery. By 2030, this trend is estimated to cause 36% more delivery vehicles in the top 100 cities globally, leading to additional 6 million tons of CO_2 to be emitted and additional 11 minutes on passengers' daily commute (World Economic Forum 2020). Developing countries are ill-equipped to deal with these challenges. Traffic congestion there is rampant due to limited road infrastructure and lack of traffic management resources (Bashingi et al. 2020). The environmental Kuznets curve (EKC) hypothesis, economic growth causes environmental degradation during the early stages of economic development, is prevalent in developing countries (Al-Mulali et al. 2015). They struggle to straddle the fine line between economic growth and curbing their CO_2 emissions (Al-Mulali et al. 2015). An increase in last-mile delivery emissions is likely to make this challenge even harder.

Second, local SMEs that are not able to integrate E-commerce into their business models will become un-competitive (KPMG and Snapdeal 2015). For example, only 27% of SMEs with an online presence in India utilize E-commerce (KPMG and Snapdeal 2015). This disparity is due to inadequate financing and support (KPMG and Snapdeal 2015).

One potential solution to those drawbacks caused by E-commerce growth is the use of crowd-based platforms for crowdsourced local delivery (Chen and Chankov 2017). Crowdsourced delivery, or crowd-shipping, is a concept that hinges on citizens delivering goods to each other along their way (Ciobotaru and Chankov 2021). Ideally, there would be minimal detour, hence minimizing the environmental impact associated with the delivery (Paloheimo et al. 2016). Crowdsourced local delivery consists of last-mile delivery for E-commerce or brick-and-mortar stores (Carbone et al. 2017).

One of the main obstacles for crowdsourced delivery is the chicken-and-egg problem (Rougès and Montreuil 2014). A critical mass of couriers ensuring fast service is needed to attract customers, but at the same time a critical mass of customers is needed to feed the couriers (Rougès and Montreuil 2014).Very few crowdsourced delivery companies have managed to address this pain point, with many of them failing to establish a lasting market by attracting a critical mass of both couriers and customers (Punel and Stathopoulos 2017). This is evident by the closure of UberRUSH and other such initiatives that have gone out of business (Ciobotaru and Chankov 2021). To solve the issue of critical

mass, one needs a better understanding on how to incentivize the two key stakeholders (couriers and customers) and match their expectations (Rougès and Montreuil 2014).

Given that crowdsourced delivery is a relatively new concept there is a lack of research into the behavioral aspects of the topic (Le and Ukkusuri 2019). Only a few studies address the key stakeholders (couriers and customers) and the predicament of critical mass (Ciobotaru 2016; Le and Ukkusuri 2019; Marcucci et al. 2017). Ciobotaru (2016) explored how closely customers' and couriers' expectations matched with regards to time, place, price, and product. A limitation of the study is the lack of an exact value associated with each factor. For instance, she derived that most customers and couriers prefer to set the price for their delivery, however, the study did not examine the numerical value of this price. Marcucci et al. (2017) obtained couriers' values associated with several factors, for instance, the expected remuneration is €5-10. However, a limitation is the lack of customers' value to compare them to. Le and Ukkusuri (2019) analyzed the behaviors and expectations of both couriers and customers. They did obtain values for both the demand and supply sides, yet a comparative analysis of these expectations was not presented.

Further, there is no research on how to incentivize and match crowdsourced delivery stakeholder expectations particularly in developing countries. Developing countries have higher levels of income inequality in comparison to developed countries (Nissanke and José 2019), so it is interesting to investigate if this might make it easier to match stakeholder expectations in developing countries than in developed countries. For instance, when exploring the expectation of price, the value a courier considers to be appropriate for services rendered might be in the range a richer customer is willing to pay.

The current research gap is threefold. First, existing literature does not fully address the issue of critical mass by comparatively analyzing stakeholder expectations. Second, behavioral studies within this scope have not been carried out in developing countries. Third, studies have not comparatively analyzed matching stakeholder expectations in developing and developed countries. Addressing these research gaps is important for both theory and practice. It sheds light on how to mitigate the chicken-and-egg problem and helps companies develop sustainable crowdsourced delivery business models.

1.1 Objectives

Thus, the purpose of this paper is to investigate whether matching stakeholder expectations for crowdsourced local delivery is easier to achieve in developing countries in comparison to developed countries. Accordingly, we first develop hypotheses and a framework for stakeholder expectations. Second, we conduct an online survey (sample size 339) with potential couriers and customers in one developing country (Sri Lanka) and one developed country (Germany). Third, we analyze the gathered data with Mann-Whitney U tests and Chi-square tests.

The paper is organised as follows. Section 2 presents the hypotheses and framework development. The research design is described in section 3. The findings are presented in section 4 and discussed in section 5. Finally, section 6 concludes the paper.

2. Hypothesis and framework development

2.1 Framework Development

Crowdsourced delivery is part of the sharing economy (Alnaggar et al. 2021). The motivations of stakeholders within the sharing economy are often analyzed by using the Self-Determination Theory (SDT) (Hamari et al. 2016; Quirós and Chankov 2021). SDT suggests that people's motivations are either intrinsic (e.g. enjoyment) or extrinsic (e.g. monetary gain) (Deci and Ryan 1985). Applying the SDT to stakeholder expectations for crowdsourced delivery, a framework was developed, including both intrinsic and extrinsic motivations.

Four types of motivations were identified from previous studies (Ciobotaru 2016; Le and Ukkusuri 2019; Marcucci et al. 2017): (1) convenience (intrinsic), (2) flexibility (intrinsic), (3) monetary compensation (extrinsic), and (4) sustainability (extrinsic). Within these four groups of motivations, there exists a plethora of different stakeholder expectations (see Table 1). Six expectations were selected for our framework (see Table 2). The selection was done based on the frequency of occurrence and importance within our context. Delivery time, product specifications, and payment amount have been investigated in two out of the three studies. Payment terms was only studied by Ciobotaru (2016) but is an important expectation to consider due to the prevalent issue of income inequality in developing countries. Likewise, GPS usage and environmental impact are expectations that can vary greatly between a developing or developed country.

Table 1. Types of stakeholder expectations

Motivation	Customer's Expectation	Courier's Expectation
Convenience	Delivery Time (Ciobotaru 2016; Le and Ukkusuri 2019) Place of Delivery (Marcucci et al. 2017) GPS Usage (Le and Ukkusuri 2019) Payment Gateway (Le and Ukkusuri 2019)	Delivery Time (Ciobotaru 2016; Le and Ukkusuri 2019)
Flexibility	Product Specifications (Ciobotaru 2016) Personalization (Le and Ukkusuri 2019)	Product Specifications (Ciobotaru 2016; Le and Ukkusuri 2019)
Monetary compensation	Payment Terms (Ciobotaru 2016) Payment Amount (Le and Ukkusuri 2019)	Payment Terms (Ciobotaru 2016) Payment Amount (Le and Ukkusuri 2019; Marcucci et al. 2017)
Sustainability		Environmental Impact (Marcucci et al. 2017)

Table 2. Framework for expectations

Intrinsic Motivation	Expectation	Extrinsic Motivation	Expectation
Convenience	Delivery Time	Monetary Compensation	Payment Amount
	GPS Usage		Payment Terms
Flexibility	Product Specifications	Sustainability	Environmental Impact

2.2 Hypotheses Development

Six hypotheses were derived from the six expectations present in the framework. The first hypothesis investigates the expectation of delivery time. Customer expectations for faster delivery times are increasing as same-day delivery and next-day delivery become the standard (Ecker et al. 2020). Amazon, the company at the forefront of this change, currently operates mostly in developed countries (Amazon 2021). Due to poor infrastructure and logistics networks, the standard of same- or next-day shipping remains only a concept in the developing world (Huria 2019), resulting in customers being more accepting of longer delivery times. The utilization of citizens as couriers in crowdsourced logistics requires a higher degree of flexibility because potential couriers might not be available for same-day delivery. The acceptance of longer delivery times in developing countries makes it easier to match the expectation of delivery time in the developing world. In developed countries, same-fast delivery has become the norm, resulting in customers being less accepting of longer delivery times, but the couriers expect some flexibility, hence a mismatch of their expectations (Ciobotaru 2016). This leads to the first hypothesis:

H_1: *Customers' and couriers' expectations for crowd-shipping delivery times are better aligned in developing than in developed countries.*

The second hypothesis explores the GPS usage. Customers expect to be able to track their packages via GPS (Le and Ukkusuri 2019), however couriers might not want to share their location. Individuals in collectivist societies tend to have more trust and faith in their fellow citizens in comparison to those in individualist societies (Baird and Lopresti 2005). Hence, individualist internet users are less suspicious and more willing to share their data on the internet in comparison to their collectivist counterparts (Baird and Lopresti 2005). This indicates that couriers in collectivist societies might be more willing to share their location via GPS in comparison to couriers in individualist societies. As collectivism is more typical for developing countries, whereas individualism is more synonymous with developed countries, the following hypothesis ensues:

H_2: *Customers' and couriers' expectations for crowd-shipping GPS usage are better aligned in developing than in developed countries.*

The third hypothesis examines the expectation of product specifications. In the developed world couriers are reluctant to deliver certain product types, while customers expect delivery of all types, hence a mismatch of their expectations (Ciobotaru 2016). However, income inequality in developing countries could resolve this mismatch (Nissanke and José 2019). For instance, couriers might be incentivized to deliver a bulky and inconvenient product against a higher payment provided by a richer customer, who is able to pay due to a skewered distribution of wealth. This leads to H3:

H_3: *Customers' and couriers' expectations for crowd-shipping product specifications are better aligned in developing than in developed countries.*

The fourth hypothesis analyses the expectation of payment amount. Akin to the third hypothesis, it was derived from the income inequality in the developing world (Nissanke and José 2019), which might make it easier to match the expectation of payment amount there. For instance, the monetary compensation a low-income courier in a developing country expects for delivering a package is likely to be affordable by a high-income customer. Whereas, in developed countries, the expectations of couriers are likely to go beyond what customers are willing to pay due to a more even distribution of wealth. This culminates in the fourth hypothesis:

H_4: *Customers' and couriers' expectations for crowd-shipping payment amounts are better aligned in developing than in developed countries.*

The expectation of payment terms was found to be similar between couriers and customers in developed countries (Ciobotaru 2016). In developing countries, there has been a surge in ride-sharing platforms such as Uber (Uber 2021), suggesting the normalization of crowdsourced payment models in the developing world. As crowdsourced delivery and ride-sharing share similar payment models, we would expect an alignment in the expectation of payment terms between couriers and customers in the developing world. This results in the fifth hypothesis:

H_5: *Customers' and couriers' expectations for crowd-shipping payment terms are well-aligned in both developing and developed countries.*

Lastly, the sixth hypothesis studies the expectation of environmental impact. Developed countries are at a later stage of the EKC where they are reducing their environmental degradation (European Commission 2021a), whereas developing countries are at the stage where their economic development is causing environmental degradation (Al-Mulali et al. 2015). Thus, people in developed countries have a better understanding of their environmental impact (European Commission 2021b), while people in the developing world are yet to reach the same levels of understanding. Hence, a set of two hypotheses were formulated with regards to environmental impact for customers and couriers respectively:

H6a: *Customers' expectations for crowd-shipping positive environmental impact are better aligned in developed than in developing countries.*

H6b: *Couriers' expectations for crowd-shipping positive environmental impact are better aligned in developed than in developing countries.*

3. Research Design

An online survey was chosen over a paper-based one due to the advantages it provides in reaching a larger sample. Utilizing the outline provided by (Saris and Gallhofer 2014), the expectations for both stakeholders were translated into questions, the questions were validated, and the final survey was created. The questions for delivery time, product specifications and payment terms were adapted from (Ciobotaru 2016) and the rest were self-developed. This resulted in 15 Likert-type questions and five open-ended questions (for payment amount). A five-point Likert scale was employed to increase the response rate.

A developing country (Sri Lanka) and a developed country (Germany) were selected to test the developed framework. The survey was shared through social media platforms and was available for 10 days in May 2021. 339 participants took part in it on a voluntary basis. The target sample were people who are willing to participate in a crowdsourced local delivery initiative as a customer, a courier, or a customer and a courier.

4. Findings

4.1 Sample Description

Out of the 339 participants, 158 were residing in Sri Lanka and 181 were residing in Germany. 53% of Sri Lankan participants wanted to be customers, 13% wanted to be couriers, and 34% wanted to be both. Likewise, the following is the distribution in Germany – 56% wanted to be customers, 9% couriers, and 35% both. In Sri Lanka, most customers were between the ages of 18-25 (40%) and the ages of 46-55 (28%). Participants who were interested in being couriers were between the ages of 18-25 (38%) and 36-45 (29%). Those who opted to be both were between the ages of 18-25 (33%) and 46-55 (28%). Whereas, in Germany customers were predominantly between the ages of 18-25 (62%) and 26-35 (33%). Likewise, couriers and those who were interested in being both a customer and a courier, were between the same age ranges. More details about the sample can be seen on Table 3.

Table 3. Sample description Sri Lanka and Germany

	Sri Lanka			Germany		
	Customers	**Couriers**	**Both**	**Customers**	**Couriers**	**Both**
Gender						
Male	50%	15%	35%	40%	47%	38%
Female	57%	11%	32%	60%	53%	62%
Age						
18-25	40%	38%	33%	62%	76%	78%
26-35	8%	10%	13%	33%	18%	17%
36-45	12%	29%	15%	1%	0%	2%
46-55	28%	19%	28%	3%	0%	2%
56-65	11%	5%	11%	1%	0%	2%
66+	1%	0%	0%	0%	6%	0%
Education						
Currently in high school	1%	5%	2%	1%	0%	2%
High school diploma	8%	33%	9%	3%	18%	0%
Currently in college	22%	10%	19%	34%	35%	43%
Bachelor's degree	42%	33%	48%	46%	29%	48%
Master's degree	25%	19%	22%	16%	18%	6%
PHD	1%	0%	0%	1%	0%	2%
Income						
Less than €250/LKR 60k	25%	19%	20%	17%	24%	33%
€250-€500/LKR 60k-120k	12%	33%	24%	16%	35%	25%
€500-€1000/LKR 120k-235k	14%	14%	11%	27%	12%	19%
€1000-€1500/LKR 235k-350k	8%	10%	11%	11%	12%	8%
€1500-€2000/LKR 350k-470k	2%	0%	4%	7%	0%	2%
€2000-€3000/LKR 470k-700k	7%	0%	9%	4%	0%	2%
€3000-€4000/LKR 700k-950k	6%	0%	0%	1%	6%	0%
€4000-€5000/LKR 950k-1200k	0%	0%	0%	1%	0%	2%
€5000+/LKR 1200k+	1%	5%	0%	0%	0%	0%
Prefer not to answer	23%	19%	20%	16%	12%	10%

4.2 Methodology

Independent t-test are considered the norm when analyzing the differences between two different groups (the customers and the couriers in this analysis) (Brace 2008). However, it has been argued that Likert-type items are ordinal in nature and should be analyzed with non-parametric tests and median, mode, and frequency as descriptive statistics (Carifio and Perla 2008). Thus, the Wilcoxon rank-sum test and the Chi-square test were used as non-parametric substitutions for the t-test. The Wilcoxon rank-sum test analyses the data between two groups by ranking the data (Field et al. 2003). Whereas the Chi-square test analyses the two groups by calculating the frequency of the data (Field et al. 2003).

For the Likert-type questions, the null hypotheses for both tests were that the expectations of customers and couriers (in their respective countries) match completely (i.e., there are no differences between the two groups). There were two instances where the null hypotheses were different – when investigating the expectation of environmental impact. The null hypotheses for environmental impact were that the expectations of customers/couriers in Sri Lanka and Germany match completely. For the Wilcoxon rank-sum test, the null hypothesis was rejected if the p value was below 5% (Field et al. 2003). For the Chi-square test, the null hypothesis was rejected if the x^2 value was larger than 9.49 (the Chi-square test had 4 degrees of freedom, values larger than 9.49 are equivalent to a p value below 5%) (Field et al. 2003). Further, for the Wilcoxon rank-sum test, the effect size was analyzed by observing the r value, and for the Chi-square test, the Cramer's V indicator was utilized (Field et al. 2003). The interpretation of the effect sizes was based on the well-established guidelines: values between 0.1 and 0.3 indicate a low, between 0.3 and 0.5 a medium, and values larger than 0.5 a strong effect.

Five open-ended questions were used for the expectation of payment amounts. Some answers were deemed unrealistic (too high payment amounts) and were deleted from the analysis. However, the data was still not normally distributed, thus the non-parametric Wilcoxon rank-sum test was used for the analysis.

4.3 Analysis and results

4.3.1. Delivery time. Table 4 shows the results for the expectation of delivery time between couriers and customers in Sri Lanka and Germany.

For same-day delivery, the Wilcoxon rank-sum tests did not identify a difference between customers' and couriers' expectations in either country. However, the Chi-square test illustrated a small difference in expectations between customers and couriers in Germany (a Cramer's V indicator value of 0.246), while there was no difference in Sri Lanka. The mismatch of customers' and couriers' expectations in Germany can also be seen in the descriptive statistics with the mode for customers being 5, while the mode for couriers is 4, showing that the German customers who expect same day delivery are more than the German couriers willing to provide a same-day delivery.

The results for on-demand delivery were different from same-day delivery. Both the Wilcoxon rank-sum test and the Chi-square test showed small differences in expectations between customers and couriers in Sri Lanka (effect sizes of 0.203 and 0.250 respectively). While in Germany, the Wilcoxon rank-sum test showed that there was no significant difference between the expectations of couriers and customers. Still, the Chi-square test illustrated a small difference between their expectations (a Cramer's V indicator value of 0.201).

The expectation of weekend delivery was poorly aligned in both countries. This mismatch of expectations was confirmed by both tests that depicted small differences in the expectations of customers and couriers in both countries. Surprisingly, couriers were more willing to participate in weekend delivery (mode of 4 and 5) in comparison to customers (a mode of 3).

Table 4. Delivery time descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Sri Lanka								
Same day delivery	**Customer**	4	4.5	2.2%	5.1%	12.4%	40.1%	40.1%
	Courier	4	4	5.3%	5.3%	17.3%	38.7%	33.3%
On demand delivery	**Customer**	4	4	2.2%	7.3%	29.2%	31.4%	29.9%
	Courier	3	3	2.7%	24.0%	29.3%	25.3%	18.7%
Weekend delivery	**Customer**	3	3	18.2%	19.7%	35.8%	19.0%	7.3%
	Courier	3	4	17.3%	9.3%	28.0%	30.7%	14.7%
Germany								
Same day delivery	**Customer**	4	5	1.2%	2.4%	15.2%	37.8%	43.3%
	Courier	4	4	1.3%	3.8%	8.8%	62.5%	23.8%
On demand delivery	**Customer**	4	4	2.4%	15.2%	28.7%	33.5%	20.1%
	Courier	3	4	10.0%	22.5%	20.0%	31.3%	16.3%
Weekend delivery	**Customer**	3	3	3.0%	17.7%	30.5%	34.1%	14.6%
	Courier	4	5	1.3%	15.0%	23.8%	26.3%	33.8%

		Wilcoxon Rank-Sum Test		Chi-Square Test		Customers Median	Couriers Median
Same day delivery	**Sri Lanka**	W =4590.5	r = –	$x^2(5)$ =2.908	V = –	4	4
	Germany	W =5684	r = –	$x^2(5)$ =14.763*	V =0.246	4	4
On demand delivery	**Sri Lanka**	W =3919.5*	r =-0.203	$x^2(5)$ =13.258*	V =0.250	4	3
	Germany	W =5658	r = –	$x^2(5)$ =9.931*	V =0.201	4	3
Weekend delivery	**Sri Lanka**	W =6112.5*	r =0.161	$x^2(5)$ =9.681*	V =0.213	3	3
	Germany	W =7813.5*	r =0.161	$x^2(5)$ =12.264*	V =0.224	3	4

4.3.2. GPS usage. Table 5 shows the results for the expectation of GPS usage in Sri Lanka and Germany. This expectation was poorly aligned in both countries. This can be observed in the descriptive statistics and was confirmed by both statistical tests (small effect size). In both countries, most customers strongly agreed that they would like access to their courier's location via GPS (mode of 5), however not that many couriers were willing to share their location via GPS (mode of 4).

4.3.3. Product specifications. Table 6 shows the results for product specifications, indicating a better alignment in Sri Lanka for three (out of five) sub-expectations and no difference between Germany and Sri Lanka for the other two.

Table 5. GPS usage descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Sri Lanka								
GPS usage	**Customer**	5	5	1.5%	0.7%	7.3%	39.4%	51.1%
	Courier	4	4	0.0%	4.0%	16.0%	49.3%	30.7%
Germany								
GPS usage	**Customer**	4	5	2.4%	7.9%	14.6%	37.2%	37.8%
	Courier	4	4	6.3%	20.0%	15.0%	46.3%	12.5%

		Wilcoxon Rank-Sum Test		Chi-Square Test		Customers Median	Couriers Median
GPS Usage	**Sri Lanka**	W =3929.5*	r =-0.212	$x^2(5)$ =13.099*	V =0.248	5	4
	Germany	W =4501.5*	r =-0.268	$x^2(5)$ =21.483*	V =0.296	4	4

Both customers and couriers in Sri Lank were willing to receive/deliver small packages to an equal extent. The matching expectations in Sri Lanka are shown in the descriptive statistics and confirmed by the statistical tests. On the other hand, in Germany, there was a misalignment between customers and couriers. Only 27.4% of customers strongly agreed that they would like to order small products, while 46.3% of couriers in Germany strongly agreed that they would be willing to deliver said products. This misalignment was confirmed by the statistical tests that portray a small difference between customers and couriers in Germany.

For bulky products, the Chi-square test showed small differences in expectations between customers and couriers in both Sri Lanka and Germany (effect sizes of 0.257 and 0.207 respectively). However, the mismatch of expectations was bigger in Germany, which is shown by the Wilcoxon-rank sum test which was significant for Germany and not significant for Sri Lanka. German customers' desire to get bulky products crowd-shipped was higher (mode of 4) than German couriers' desire to deliver bulky products (mode of 2). With regards to the ordering of groceries, both tests showed no difference customers' and couriers' expectations in Sri Lank and small differences in Germany. This illustrates a mismatch of expectations in Germany and an alignment in Sri Lanka. The frequency distribution show that couriers in Germany would like to deliver groceries, but customers were not that receptive towards this category.

The expectations of customers and couriers with regards to the delivery of restaurant food was well aligned in both countries, confirmed by both tests. The delivery of alcohol was a contentious topic for customers and courier in both countries and their expectations were poorly aligned. The majority of couriers in Sri Lanka strongly disagreed with wanting to deliver alcohol (mode of 1) and the majority of customers remained neutral (mode of 3). In Germany, more couriers were inclined to deliver alcohol (median of 4) than customers wanted to order alcohol (median of 3). The Wilcoxon rank-sum test established a small difference in expectations in both countries.

4.3.4. Payment amount. Table 7 illustrates the alignment of expectations (with regards to payment amount) in Sri Lanka and Germany. The expectation of payment amount was better aligned in Sri Lanka in all the queried scenarios, except for a fragile item, which was equally well aligned in both countries. When observing the descriptive statistics (mean and median), couriers in both countries tend to require a higher level of monetary compensation in comparison to the amount customers are willing to pay. However, the Wilcoxon rank-sum test clarifies that in Sri Lanka; the monetary values couriers require (and customers are willing to pay) are better aligned. For delivering 2 bags of groceries and a TV, there is no significant difference in expectations in Sri Lanka, whereas in Germany, there exists a small difference in expectations. For 5 bags of groceries, there is a small difference in Sri Lanka (effect size of 0.205), whereas in Germany, there exists a medium difference in expectations (effect size of 0.355). With regards to 3 books, Germany has a medium difference, and in Sri Lanka there is no significant difference in the expectations.

4.3.5. Payment terms. Similarly, to the expectation of payment amount, payment terms (see Table 8) are better aligned in Sri Lanka in comparison to Germany - except for negotiation-based terms, where both countries were equally well aligned. Payment methods based on time, distance, and time and distance, were significantly better aligned in Sri Lanka than in Germany. For Sri Lanka, the two statistical tests showed no significant difference in the customers' and couriers' expectations. Whereas, in Germany, both tests indicated a small difference in expectations between the two groups.

4.3.6. Environmental impact. Customers in both Sri Lanka and Germany have similar expectations with regards to environmental impact. The statistical tests employed showed no difference of expectations between German and Sri

Lankan customers for both of the questions for this expectation (see Table 9). Similarly, the expectations of couriers in both countries were well aligned. The statistical tests showed that there was no significant difference between the couriers in Sri Lanka and Germany for both questions (see Table 10).

4.3.7. Summary of sub-expectations and hypotheses. Table 11 contains a summary of all sub-expectations. Six main expectations were investigated in this paper. They had twenty-one sub-expectations, out of which, eleven were better aligned in Sri Lanka, one was better aligned in Germany, and ten were equally well aligned in both countries.

Table 6. Product specification descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Sri Lanka								
Small packages	**Customer**	4	4	2.9%	6.6%	19.7%	47.4%	23.4%
	Courier	4	4	4.0%	2.7%	22.7%	42.7%	28.0%
Bulky packages	**Customer**	4	4	5.8%	24.1%	18.2%	33.6%	18.2%
	Courier	3	4	8.0%	18.7%	30.7%	40.0%	2.7%
Groceries	**Customer**	4	4	4.4%	5.8%	19.0%	41.6%	29.2%
	Courier	4	4	1.3%	6.7%	20.0%	50.7%	21.3%
Restaurant Food	**Customer**	4	4	8.0%	9.5%	13.9%	36.5%	32.1%
	Courier	4	4	2.7%	14.7%	20.0%	40.0%	22.7%
Alcohol	**Customer**	3	3	18.2%	16.1%	31.4%	17.5%	16.8%
	Courier	3	1	36.0%	12.0%	24.0%	17.3%	10.7%
Germany								
Small packages	**Customer**	4	4	2.4%	8.5%	15.9%	45.7%	27.4%
	Courier	4	4	0%	3.8%	2.5%	47.5%	46.3%
Bulky packages	**Customer**	3.5	4	9.1%	23.8%	17.1%	31.7%	18.3%
	Courier	3	2	11.3%	33.8%	25.0%	23.8%	6.3%
Groceries	**Customer**	4	4	4.9%	20.1%	14.6%	34.8%	25.6%
	Courier	4	4	1.3%	7.5%	8.8%	45.0%	37.5%
Restaurant Food	**Customer**	4	5	2.4%	4.3%	8.5%	41.5%	43.4%
	Courier	4	4	2.5%	6.3%	8.8%	42.5%	40.0%
Alcohol	**Customer**	3	4	10.4%	17.7%	24.4%	27.4%	20.1
	Courier	4	4	8.8%	15.0%	11.3%	35.0%	30.0%

		Wilcoxon Rank-Sum Test		Chi-Square Test		Customers Median	Couriers Median
Small packages	**Sri Lanka**	W =5334.5	$r = -$	$x^2(5)$ =2.458	$V = -$	4	4
	Germany	W =8427.5*	r =0.249	$x^2(5)$ =17.773*	V =0.269	4	4
Bulky packages	**Sri Lanka**	W =4516.5	$r = -$	$x^2(5)$ =14.083*	V =0.257	4	3
	Germany	W =5156*	r =-0.179	$x^2(5)$ =10.542*	V =0.207	3.5	3
Groceries	**Sri Lanka**	W =4933	$r = -$	$x^2(5)$ =3.464	$V = -$	4	4
	Germany	W =8178*	r =0.209	$x^2(5)$ =12.800*	V =0.229	4	4
Restaurant Food	**Sri Lanka**	W =4701	$r = -$	$x^2(5)$ =6.218	$V = -$	4	4
	Germany	W =6285.5	$r = -$	$x^2(5)$ =0.584	$V = -$	4	4
Alcohol	**Sri Lanka**	W =4224.5*	r =-0.150	$x^2(5)$ =8.934	$V = -$	3	3
	Germany	W =7609.5*	r =0.133	$x^2(5)$ =8.269	$V = -$	3	4

Table 7. Payment amount descriptive statistics and analysis

		Wilcoxon Rank Sum-Test		Customers Mean	Couriers Mean	Customers Median	Couriers Median
2 bags of groceries	**Sri Lanka**	W =4049.5	$r = -$	LKR 166	LKR 200	LKR 100	LKR 175
	Germany	W =6473*	r =0.299	EUR 3.7	EUR 5.5	EUR 3.0	EUR 5.0
5 bags of groceries	**Sri Lanka**	W =4379*	r =0.205	LKR 297	LKR 387	LKR 250	LKR 325
	Germany	W =6831.5*	r =0.355	EUR 6.6	EUR 10.8	EUR 5.0	EUR 8.0
A TV	**Sri Lanka**	W =3768.5	$r = -$	LKR 737	LKR 979	LKR 500	LKR 650
	Germany	W =6000*	r =0.214	EUR 11.1	EUR 14.5	EUR 10.0	EUR 10.0
3 books	**Sri Lanka**	W =3928.5	$r = -$	LKR 213	LKR 270	LKR 150	LKR 200
	Germany	W =7041*	r =0.393	EUR 3.5	EUR 6.6	EUR 3.0	EUR 5.0
A fragile item	**Sri Lanka**	W =3505.5	$r = -$	LKR 466	LKR 500	LKR 375	LKR 375
	Germany	W = 5183	$r = -$	EUR 7.9	EUR 9.0	EUR 6.5	EUR 7.0

Table 8. Payment terms descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Sri Lanka								
Based on negotiation	**Customer**	3	2	22.6%	25.5%	24.8%	22.6%	4.4%
	Courier	3	4	24.0%	13.3%	21.3%	36.0%	5.3%
Based on time taken	**Customer**	4	4	5.8%	14.6%	26.3%	41.6%	11.7%
	Courier	4	4	10.7%	12.0%	26.7%	41.3%	9.3%
Based on distance	**Customer**	4	4	3.6%	5.8%	22.6%	52.6%	15.3%
	Courier	4	4	8.0%	5.3%	18.7%	42.7%	25.3%
Based on time and distance	**Customer**	4	4	1.5%	8.8%	13.9%	45.3%	30.7%
	Courier	4	5	0.0%	6.7%	20.0%	36.0%	37.3%
Germany								
Based on negotiation	**Customer**	2	2	17.7%	38.4%	19.5%	19.5%	4.9%
	Courier	2	2	18.8%	41.3%	22.5%	13.8%	3.8%
Based on time taken	**Customer**	3	4	3.7%	26.8%	26.2%	35.4%	7.9%
	Courier	4	4	7.5%	17.5%	15.0%	45.0%	15.0%
Based on distance	**Customer**	4	4	1.2%	12.8%	25.6%	51.8%	8.5%
	Courier	4	4	1.3%	11.3%	12.5%	51.3%	23.8%
Based on time and distance	**Customer**	4	4	0.6%	8.5%	19.5%	46.3%	25.0%
	Courier	4	5	0.0%	6.3%	7.5%	42.5%	43.8%

		Wilcoxon Rank-Sum Test		Chi-Square Test		Customers Median	Couriers Median
Based on negotiation	**Sri Lanka**	W =5746.5	$r = -$	$x^2(5)$ =6.956	$V = -$	3	3
	Germany	W =6178	$r = -$	$x^2(5)$ =1.542	$V = -$	2	2
Based on time taken	**Sri Lanka**	W =4884.5	$r = -$	$x^2(5)$ =1.985	$V = -$	4	4
	Germany	W =7550*	r =0.128	$x^2(5)$ =10.506*	V =0.207	3	4
Based on distance	**Sri Lanka**	W =5413.5	$r = -$	$x^2(5)$ =5.685	$V = -$	4	4
	Germany	W =7944*	r =0.186	$x^2(5)$ =13.648*	V =0.236	4	4
Based on time and distance	**Sri Lanka**	W =5368.5	$r = -$	$x^2(5)$ =4.138	$V = -$	4	4
	Germany	W =8138.5*	r =0.209	$x^2(5)$ =12.076*	V =0.222	4	4

Table 9. Customer's environmental impact descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Actively use C.D because of sustainability	**Sri Lanka**	4	4	0.7%	2.2%	21.2%	46.0%	30.0%
	Germany	4	4	0.0%	8.5%	22.6%	47.0%	22.0%
Pay a higher fee if environmentally friendly modes of transport are used	**Sri Lanka**	3	3	3.6%	17.5%	35.0%	29.2%	14.6%
	Germany	3	4	2.4%	26.2%	25.6%	34.1%	11.5%

	Wilcoxon Rank-Sum Test		Chi-Square Test		Sri Lanka Median	Germany Median
Actively use C.D because of sustainability	$W = 9880$	$r = -$	$x^2(5) = 8.458$	$V = -$	4	4
Pay higher fee if environmentally friendly modes of transport are used	$W = 10812$	$r = -$	$x^2(5) = 6.219$	$V = -$	3	3

Table 10. Courier's environmental impact descriptive statistics and analysis

		Median	Mode	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Actively deliver because C.D is more sustainable	**Sri Lanka**	4	4	2.7%	2.7%	20.0%	41.3%	33.3%
	Germany	4	4	1.3%	10.0%	10.0%	51.3%	27.5%
Use eco-friendly modes of transport if a higher fee is provided	**Sri Lanka**	4	5	0.0%	14.7%	26.7%	26.7%	32.0%
	Germany	4	4	1.3%	10.0%	13.8%	43.8%	31.8%

	Wilcoxon Rank-Sum Test		Chi-Square Test		Sri Lanka Median	Germany Median
Actively deliver because C.D is more sustainable	$W = 2906.5$	$r = -$	$x^2(5) = 7.490$	$V = -$	4	4
Use environmentally friendly modes of transport if a higher fee is provided	$W = 3285$	$r = -$	$x^2(5) = 8.045$	$V = -$	4	4

Table 11. A summary of the sub-expectations

Expectation	Wilcoxon Rank-Sum Test		Chi-Square Test		Better Alignment (Based on Country)
	Sri Lanka	Germany	Sri Lanka	Germany	
Delivery Time					
Same day delivery	No Difference	No Difference	No Difference	Small Difference	Sri Lanka
On demand delivery	Small Difference	No Difference	Small Difference	Small Difference	Germany
Weekend delivery	Small Difference	Small Difference	Small Difference	Small Difference	Equal
GPS Usage					
GPS	Small Difference	Small Difference	Small Difference	Small Difference	Equal
Product Specifications					
Small Packages	No Difference	Small Difference	No Difference	Small Difference	Sri Lanka
Bulky Packages	No Difference	Small Difference	Small Difference	Small Difference	Sri Lanka
Groceries	No Difference	Small Difference	No Difference	Small Difference	Sri Lanka
Restaurant Food	No Difference	No Difference	No Difference	No Difference	Equal
Alcohol	Small Difference	Small Difference	No Difference	No Difference	Equal
Payment Amount					
2 bags of groceries	No Difference	Small Difference	-	-	Sri Lanka
5 bags of groceries	Small Difference	Medium Difference	-	-	Sri Lanka
A TV	No Difference	Small Difference	-	-	Sri Lanka
3 books	No Difference	Medium Difference	-	-	Sri Lanka
A fragile item	No Difference	No Difference	-	-	Equal
Payment Terms					
Negotiation	No Difference	No Difference	No Difference	No Difference	Equal
Time Taken	No Difference	Small Difference	No Difference	Small Difference	Sri Lanka
Distance	No Difference	Small Difference	No Difference	Small Difference	Sri Lanka
Time and Distance	No Difference	Small Difference	No Difference	Small Difference	Sri Lanka
Positive Environmental Impact					
Environment 1	No Difference	No Difference	No Difference	No Difference	Equal
Environment 2	No Difference	No Difference	No Difference	No Difference	Equal

Table 12 shows the outcomes of the six hypotheses. H1, the expectation of delivery time is better aligned in developing than in developed countries, was not supported because an equal alignment in expectations in both countries was found. Likewise, H2, the expectation of GPS usage is better aligned in developing than in developed countries, was not supported because an equal alignment in both countries was observed. H3, the expectation of product specifications is better aligned in developing than in developed countries, was supported because a better alignment in expectations was found in Sri Lanka. Likewise, H4, the expectation of payment amounts was better aligned in developing than in developed countries, was supported because a better alignment was found in Sri Lanka. H5, the expectation of payment terms was equally well-aligned in both countries, was not supported, as the analysis showed a better alignment in expectations in Sri Lanka. H6a and H6b, the expectations of environmental impact were better aligned in developed than in developing countries, were not supported because an equal alignment was found.

Table 12. Overview of Hypotheses Support

Expectation	Hypotheses	Support
Delivery Time	H_1	No
GPS Usage	H_2	No
Product Specifications	H_3	Yes
Payment Amount	H_4	Yes
Payment Terms	H_5	No
Environmental Impact – Customer	H_{6a}	No
Environmental Impact - Courier	H_{6b}	No

5. Discussion

The purpose of this paper was to investigate whether matching stakeholder expectations for crowdsourced local delivery is easier to achieve in developing than in developed countries. Based on the analysis, it can be concluded that matching stakeholder expectations for crowdsourced delivery is easier in developing than in developed countries.

Table 13 summarizes the alignment of the studied expectations and reaffirms this notion. Out of the six expectations, three were better aligned in Sri Lanka (a developing country) and three were equally well aligned in both countries.

When shopping online, consumers prioritize delivery time and costs (Kovač et al. 2017). Due to the nature of crowdsourced delivery, delivery time and costs are greatly influenced by couriers' expectations. Our results indicate an equal alignment in the expectation of delivery time in Sri Lanka (developing country) and Germany (developed country). Still, the key expectation of delivery costs (payment amounts), is better aligned in Sri Lanka, signifying that matching expectations is easier in developing than in developed countries. Because matching expectations is easier in developing countries, solving the issue of critical mass, and the subsequent success of crowdsourced delivery will also be easier to achieve in the developing world (Rougès and Montreuil 2014).

Table 13. Alignment of the expectations

Expectation	Alignment of Expectation
Delivery Time	Equally well aligned
GPS Usage	Equally well aligned
Product Specifications	Better aligned in Sri Lanka
Payment Amount	Better aligned in Sri Lanka
Payment Terms	Better aligned in Sri Lanka

6. Conclusion

The alignment of customers' and curriers' expectations for crowdsourced local delivery in Sri Lanka (developing country) and Germany (developed country) were investigated for six expectations. The results showed that matching stakeholder expectations is easier in developing than in developed countries. Out of the six expectations, three were better aligned in Sri Lanka (product specifications, payment amount, and payment terms) and three were equally well aligned (delivery time, GPS usage, and environmental impact). This paper has two main limitations. (1) Only one developing and one developed country were studied. Further research should verify the findings in other countries. (2) The participants were potential customers and couriers; thus, their actual behavior might differ from their survey answers. Future research can study actual crowdsourced delivery stakeholders. This paper showed that crowdsourced local delivery can be successfully implemented in the developing world. Thus, logistics and E-commerce companies in developing countries can benefit from its findings.

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