Intangible commodities with free delivery: Finding the limit in digitally mediated e-commerce and workforce injustice.

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ABSTRACT

Increasingly digital technology is implicated in promoting ever more convenient access to products and services. At just a click, user interfaces promote 'instant gratification', deliberately leveraging human behaviours and addictions, to promote frequent interactions and drive consumer demand. Behind the friendly interface, digital services hide the complex impacts and externalities associated with products and services, which often involve human actors. This, coupled with the lack of attachment and transparency of the underlying actions and processes contributes towards a model in which consumerism is encouraged, and workforces can easily be marginalised as part of services that promote limitless growth in consumption. In this article we use the example of 'free' parcel deliveries where digital services hide the true impact and costs of consumer actions, and are leveraged by industry to gain competitive advantage. To help prompt discussion surrounding the role of technology and technologists in challenging the assumptions behind this conspicuous consumption and the impacts on workforces and infrastructures, we focus on two main themes for further exploration: 1) the impact of e-commerce on the social justice of delivery workforces; and, 2) how we might find a limit in e-commerce to help curb limitlessness in the demand on energy intensive infrastructures and parcel delivery services.

CCS CONCEPTS

Information systems → Collaborative and social computing systems and tools;
Human-centered computing → Collaborative and social computing;

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Figure 1: Is there such as thing as too large for free delivery? Free, next day, delivery is offered on a wide range of items. It is even offered on items of obscene sizes and shapes (width = 61cm (24.0"), height = 120cm (47.2"), depth = 23cm (9.1")). Door included for scale.

KEYWORDS

last-mile logistics, social justice, responsibility, social good, e-commerce, limits, intangible commodities, free delivery, human cost, commodities, digital mediation, workforces

ACM Reference Format:

Oliver Bates and Adrian Friday. 2018. Intangible commodities with free delivery: Finding the limit in digitally mediated e-commerce and workforce injustice.. In *Proceedings of LIMITS (LIMITS'18)*. ACM, New York, NY, USA, 8 pages. https://doi.org/xxxx

1 INTRODUCTION

In 2014 £104 billion was spent online in the UK, more than double that in 2009 [20]. Online retail spending alone accounted for £50 billion per year in 2016 [30]. This growth in e-commerce is generating ever more demand on the last mile delivery sector [27]. E-commerce and online shopping retailers leverage digital technology, customer behaviours, and customer's desires for instant gratification and convenience to increase profits [36, 47, 49].

Digital mediated services are increasingly integrated into our everyday lives [17], and 'not often more than an arms length away' [3, 50]. This provides internet retailers with a portal to our every waking second. From here they are able to ply our inboxes with coupons, delivering a seemingly never ending calendar of sales and promotions that encourage us to part with our money¹.

Yet, hidden behind this convenience, an army of workers, infrastructures and technologies enable increasingly rapid delivery of goods 'on demand'. Last mile logistics accounts for the 'final hop' in a parcel's journey from a local delivery depot to its final destination. This freight has a substantial impact on our cities and the environment at large. In 2006, Stern estimated that transport accounted for 14% of UK's total greenhouse gas emissions, with three-quarters of these emissions arising from road transport [43]. Not only contributing to congestion on our roads, freight traffic is thought responsible for 22% of all UK CO₂ emissions, and 39% of the PM10 (2015 figures, cited in [33]). Traffic congestion in our central London is projected to worsen by up to 60% by 2030 [46].

There is also a human cost. The availability of low cost labour is essential. Freight logistics is highly cost sensitive, with fierce market competition and slim profit margins. Underpinning this industry are a mixture of permanent staff and 'lifestyle couriers'. One-hour and same day parcel services such as UberRush and Amazon Flex offer gig economy workforces more opportunity to earn more money whilst encouraging convenient expedited deliveries. However, in UK law life-style couriers are regarded as self-employed, meaning varied and often no guaranteed work, flexible even zero-hour or fixedterm contracts based on current industry demand [4]. The workers rights of life-style couriers (and gig-economy workforces) are highly contested social and political issue [29, 51]. Bates et al. highlight the similarities between life-style couriers and gig-economy workforces, especially how knowledge and relationships are linked to livelihood and job security [4]. The impact of growing demands on delivery workforces can lead to social injustice, in which droves of workers are often

exploited to ensure the timely delivery of consumer goods, food, and other items to the doors of consumers.

In this essay we reflect on our experiences of last-mile logistics, exploring the impact on infrastructures, the role of consumers and the potential exploitation of workforces linked to the apparent growth in low cost or even 'free to the consumer' delivery services. Our article is strongly influenced by our field work with urban freight operations in central London, UK. Given the global nature of e-commerce, digital services and gig economy platforms—that are projected to continue growing, our discussion is timely and has implications beyond the UK (cf. [12, 23, 52]). The growing number tech start ups working in e-commerce and last mile deliveries (e.g. Uber Eats, UberRUSH) has implications for global workforces, transport authorities and national and local authorities who mange parcel logistics infrastructures, and more broadly, the global logistics industry.

Our work builds on previous studies of digitally mediated labour markets [21, 37], who highlight inequities between buyers and sellers over payment, and the commodification of labour leading to poor pay and conditions. A theme echoed by Gui and Nardi, who demonstrate how in Western and Chinese contexts, lack of local knowledge and basic skills increase vulnerability if and when conditions worsen [16], and can lead to a widening wage gap [28].

Previous work relating to digital services has focused on understanding the growing energy consumption of digital technology and services [18, 50] and has looked to challenge designers in their approach to sustainable design [8, 35]. We extend this consideration to the social impact embedded in digital mediated services, and how e-commerce and the potential for limitless growth of consumption regarding demand for infrastructure and goods, can impact workers in this domain unbenownst to service users.

This article looks to develop a discussion within the Computing within Limits community that aims at tackling issues such as social injustice linked to consumer behaviours and business practices. Through our discussion we posit that whilst expanding sustainable interaction design [7] or engaging policy makers [45] on these issues is a necessary starting point, Computing within Limits is naturally scoped to consider the broader notions of commodities and detachment from services and is uniquely positioned in computer science to speak to unions and regulatory bodies to help reduce exploitation of workforces and challenge the ways in which consumers and customers are sheltered from the real costs and externalities of the services and products that they access.

¹Is there ever a day we don't get a coupon or email about a sale in our inboxes?

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Oliver, you will save £5.99 on this order with One-Day Delivery

Thank you for being a Member! Millions of items are available with delivery.

Delivery date: 10 Feb. 2018 If you order in the next 7 hours and 28 minutes (Details)

Items dispatched from



Figure 2: Here we are attempting to order a patio set so the authors can sit outside on a cold Saturday afternoon in the British Winter and reflect on our Computing within Limits submission. Using the website we have gone through the steps of adding the item to my basket and completing the purchase. The options for delivery can ensure that we are able to be sat eating our lunches in the cold winter weather by 1pm the next day.

2 CUSTOMER VALUE FOR MONEY VS. THE COURIER

As the brick and mortar retailers slowly fade from our high streets; digital products and subscriptions for non-digital products are increasingly bundled together, into popular and affordable subscription services. These often include ostensibly 'free' next day delivery of goods available 'at the touch of a button' [34]. Subscription services from online retailers provide customers with unlimited access to a substantial library of digital media (e.g. video-on-demand, music, books) as well as an indefinite number of free deliveries on a wide range of products. These subscriptions cost around £79 (\$99 USD) per year and can be shared between family and friends and discounted further if you are a student.

Ordering systems can be configured to default to purchasing with just a single click. This allows a purchase to be completed instantly with next day delivery by default. As seen in Figure 2, when a customer chooses to go through the shopping basket they are presented with multiple delivery options. These include a 'before 1pm' delivery, as well as multiple 'free' delivery options, ranging from next day to within 3–4 days. It is worth noting, that whilst this patio set was not available to be delivered same day (ordering at 11am), there are a growing number of products in the online retailer's range where 'same day delivery' *is* available (currently only to those living in or near major hubs or cities). This is all made possible through e-commerce giants owning their own logistics and distribution centres [31].

This fiercely competitive sector hinges on low cost yet highly efficient delivery services. To win more business, 'loss leading' and 'add-on' tactics are often employed, where large business (those who can afford to reduce profit margins and own their own logistics [31]) can make profits from a range of products and services are able to undercut their competitors by making a loss on a product (e.g. next day or same day delivery) [13]. Online retailers are able to use the elasticity of price across their product ranges to cover the loss from a product that is loss leading [13]. By providing next-day delivery or unlimited returns as a free service, companies undercut their competitors and provide a service that has better 'value' for the customer.

The true cost of delivery

In Figure 2 as the customer we are assured that we have saved $\pounds 5.99$ on our next day delivery thanks to subscription. If the real cost of next day delivery is $\pounds 5.99$ then a customer has to make only 14 next day purchases alone to make a financial saving from their subscription. The consumer is also incentivised to use the 'No-Rush' service with $\pounds 1$ of digital credit. Whilst this may seem like a good deal for the customer, our experiences working in last mile logistics for the last 18

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months have shown that often next day deliveries are not at all prioritised once they've made it to the local depot. Next day deliveries are delivered in and amongst 'No Rush' and non-expedited deliveries (Figure 2) and can even be loaded on the same van and go out for delivery the same day as items ordered for next day delivery.

Consumers now expect low cost delivery; a clear mismatch between the financial, environmental and human cost of deliveries and the expectations of customers [1]. In the US, around 56% of consumers expect to pay less than \$5.00 for same day delivery on items of furniture (28%), 73% for books and music [42]. The average cost (for the consumer) for next-day delivery is estimated at around 2 EUR in Germany and "*are only slightly higher in the UK and France*" [27]. UK users of similar same day services are only willing to pay up to £4.

The cost to retailers for expedited and click-and-collect compared to selling the items directly from the shop is substantial. 'Click and collect', where customers can collect items purchased online from nearby stores that don't necessarily stock these items, is costing UK retailers "*four times more than traditional in-store purchases*" [1]. Cost modelling and simulations demonstrate how the density of areas effects the cost of next day parcel deliveries by 5 EUR between urban and rural areas (2.75 EUR versus 7.75 EUR respectively) [14]. The difference in cost is due to variation in "level of consumer service, security & type of delivery, geographical area & market density/penetration, fleet & technology and the environment" [14].

Consumers no longer have to think carefully about combining items into a shopping basket to get the best value for money when they can click one button and have it dispatched for free. From a customer standpoint these kinds of services appear simply as incredible value; whilst the logistics companies, couriers and delivery workforces are squeezed ever tighter to deliver in shorter and shorter timescales, over longer hours, and at ever lower prices. This in itself is a challenge to the logistics sector, since consolidation, bulk ordering and combined ordering are all set aside by these kinds of subscription models. Efficiency gains can come from aggregating parcels together, and by providing optimisation of rounds and manifests to minimise fuel costs and the amount of time spent driving between delivery locations. Yet, in a market where orders can be placed later and later for *immediate delivery*, these kinds of optimisations are proving increasingly difficult to achieve, adding complexity and cost to the parcel delivery services [14, 48].

Revealing the human cost

The impressive logistical operation and human cost of delivering near immediate freight to consumers, is of course entirely hidden. It would be wrong and perhaps overly simplistic to problematise consumer behaviour, or offer our ire to freight logistics for their part in this global market endeavour, but, as Pike puts it in her recent article:

"The consumer [needs to] scrape the surface and question how on earth they can push a button one evening and get the jumper they've ordered the following day." [34]

Our fieldwork examining last-mile deliveries in Central London discusses focuses in dense urban areas where delivery drivers manage 150–200 parcels each per day [2, 4, 5]. Typically these delivery drivers work in a smaller and densely populated geographical area than those working outside major cities. Those working outside cities are still expected to deliver a similar number of parcels (150–200 per day) [6]. This works at roughly one parcel delivery every 2–3 minutes (assuming an 8 hour working day).

Pay is usually linked to performance, so increasingly drivers are having to take more extreme measures to meet these expectations and maintain desirable income levels. Media horror stories relating to the lives of life-style couriers and contract delivery drivers are regularly appearing in the news: falling ill due to long working hours; drivers urinating in a bottle to keep to his schedule [40]; and even the death of an employee who was fined because of missing work so that he could go to the doctors [9].

In this interest of focusing our discussion to freight, we omit other no less important secondary or tertiary human costs: social and environmental impacts due to road congestion; environmental pollution; contributions to global climate change; and the potential to exploit workers in global supply chains and manufacturing. Needless to say, we can also assume that these are substantial and hidden to consumers.

3 RECONCILING THE IMPACTS OF LOW COST AND FREE

Whilst many jobs put pressure on workers to perform highly (perhaps even beyond their limits) for little pay, poor benefits and in socially unjust working conditions, our discussion demonstrates that there are negative impacts on human lives that are implicated in the use of [digital] services and products that perpetuate digitally mediated lifestyles. It would be unbalanced to describe life style couriers or on-demand workers as worse off than employees on zero-hour contracts, working for minimum wage (cf. service industry, retail industry). What we must acknowledge is that free and subscription services have costs (that are non-zero) that are directly linked to how entire industries, such as last mile logistics, encourage injustice and work exploitation at different levels.

We acknowledge that our article doesn't provide a robust analysis of the financial or environmental cost of home deliveries vs. shopping trips using private vehicles (or any other Intangible commodities with free delivery:

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transport means). Our motivation was to point through illustrative and anecdotal examples (e.g. grounded in recent media) that the real cost of delivery services is likely not being covered by subscription services that given unfettered access to a range of digital services and products. These products and services put *invisible strain* on infrastructures, industry and workforces that are all under increasing demand.

To allow ourselves to be responsible computing practitioners, we must reconcile the convenience and perceived financial value of new services we help construct, against the potential to create febrile, exploitative and socially unjust working conditions for those embedded in these services. If we begin to design justice for workers into digital services and empower consumers to make purchasing choices, we may be able to challenge issues of social injustice whilst re-balancing the financial irresponsibility of free delivery services.

4 OPPORTUNITIES FOR CHALLENGING LIMITLESSNESS

The limitlessness of freight relating to environmental sustainability and social justice in the last-mile parcel and ecommerce sectors is an area in which Computing (within Limits) is uniquely skilled to tackle. As designers, systems architects, data scientists, and HCI researchers we are appropriately suited for tackling socio-technical challenges. We see a number of opportunities and research directions, grounded in existing research, that can help reform the parcel delivery sector as well as the cost models that are completely invisible to consumers.

Efficiency, Sufficiency and Non-growth

As we have previously argued [4], there are numerous ways in which technology can play a role in promoting greater efficiency and higher delivery performance from workers in last mile logistics, i.e. lowering per-parcel cost. Better still, we might be able to encourage or even enable new and more sustainable ways of working. But, analogous to adding an additional lane to a motorway, or as pointed to by William Stanley Jevons in 'The Coal Question' in 1865, there is a danger that further efficiency here could just accelerate further adoption due to the well known 'rebound effect'. After all, if it becomes even lower cost to ship goods from place to place, would we not use it more?

In the context of energy, and using vending machines in Japan as a case study, Hilty suggests that there can be limits to growth if there is 'sufficiency' [19] in addition to efficiency. An *upper bound* or *limit* can be found if there is a constraint *that limits growth*; here he suggests availability of affordable civic space. Might we start to conceive of a way in which freight is subject to quotas or time of use pricing to curtail use? Is there perhaps a rate cap or ceiling on what's reasonable to ask the drivers to deliver, core or limited hours, or a minimum price that should be mandated in order to protect workers in the industry? There must be a 'natural ceiling' due to competition for roads and kerbside space, but this is likely to take us *far beyond* the point of no return in climate terms.

To oppose growth is surely antithetical to good business, so would not be possible without wider and more systemic changes to the framework in which they operate or a major societal move toward less materialistic consumption. Paradoxically, it is surely here in a more toward 'changing the social logic' that we should engage [22, Ch. 11].

Are we really suggesting (another) interface for supply chain transparency?

If market economics is to be given a chance to optimise on the basis of reducing environmental impacts, then surely this can't be done without passing those impacts on at least in part to businesses and ultimately consumers. We must "internalise the external costs of economic activities" [32]. Inspired by Knowles et al. we wish to challenge "unfettered consumerism" [25] in e-commerce and parcel deliveries by developing socio-technical systems and asking questions as a community that: empower consumers to contribute to the progress of the social justice of workers; connect business and consumers more strongly to these workers, their the working conditions and the environment; and, help develop new economic models that internalise relevant social and environmental impacts relating to e-commerce and logistics. As Jackson argues, we must establish "clear resource and environmental limits and integrat[e] these limits into economic [...] and social functioning" [22].

One solution could be an artefact or interface (e.g. shopping cart) that informs consumers and shoppers or the 'true' costs of their delivery choices and consumption actions. Such an interface surely falls foul of the criticisms levelled at energy eco-feedback, namely focusing too closely on narrow conceptions of choice and behaviour [10], or a 'Resource Man' centred design which targets masculine rational actors, who make decisions based on the range of options presented that suit their specific needs [44]? Perhaps e-commerce shopping baskets could include information that challenge the exploitative employer practice through a 'Fairtrade like' certification² that may rely on blockchain to expose the truths about the supply chain. Whilst this is a step in the right direction in terms of consumer engagement, we are not confident that this is a solution that will promote a radical enough change in consumer behaviour, nor are we confident that blockchain (a notoriously high consumer of energy) is an appropriate technology in this case.

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²https://www.fairtrade.org.uk/What-is-Fairtrade. Accessed Feb 2018.

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So, where is the middle ground between protecting the workers from the behaviours of business whilst empowering consumers to make more sustainable, responsible and just choices with regards to e-commerce? One way that goes beyond a typical rational actor is to challenge the psychological limits of consumers. Engaging users and consumers with the bleak working conditions surrounding the sustainability of freight operations will undoubtedly challenge their psychological barriers (cf. [26]) and could be an essential tool in campaigning for reform in the e-commerce and logistics industries.

By going beyond just sticking a banner or label on a website it might be possible to develop digital services and deliveries as more of a tangible commodity which may in turn help empower users and consumers to challenge their own actions and practices. Loss-leading and cross-subsidisation hides the real costs of e-commerce and deliveries, subsequently promoting limitless next-day and same deliveries that have very real impacts on valuable commodities such as workforces, the environment and infrastructures. User facing artefacts are perhaps not the best tool in the fight against cross-subsidisation and loss-leading tactics that impact smaller (often more socially or environmentally responsible) businesses and encourage injust treatment of workforces in the logistics sector. As we've discussed, there are real costs in terms of environmental sustainability and social justice that are completely invisible to consumers.

One potential direction is to expose the social and human capital in these services and products [41]. By exposing the human workforces and their experiences and stories is a necessary step towards social justice. By using tools and ideas developed as part of 'Turkopticon' [21] the social and human capital and workforces can be made more more visible. Through the use of these tools we can help make the real costs on humans in the last-mile (and broader) freight industry more transparent.

Unions and regulating bodies

We feel that developing stronger links and working more closely with bodies that can help regulate and look out for people such as unions and regulating bodies might be the way to go. Perhaps this is optimistic given the depths of a very grey and murky backdrop of predatory business practices and the exploitation of workers. Solutions such as 'Turkopticon' [21] fill a gap where the lack of unionised work forces and the reach of quangos (quasi-autonomous non-governmental organisation) is limited in their ability to help workforces who are treated 'as a Service', making workers more visible, and helping challenge the potentially exploitative nature of work and contracts from employers. There is hope that the roles of unions and regulatory bodies can effectively challenge the exploitation of workforces technology companies and their products. For example, industrial action taken by Paris Taxis drivers challenged Uber's UberPop offering even cheaper transportation services [15], and Transport for London (the governing body for transport in Greater London) [11] stripped Uber's license due to "Uber's approach and conduct demonstrat[ing] a lack of corporate responsibility".

The lack of regulation of e-commerce (and international conglomerates) is reinforcing unregulated social imbalances [39] where humans are used as pawns in a game of profit at both the consumer and worker level. With the power and money that these businesses have it is hard to even begin to consider where technology and computing has substantial leverage. Our role, as pointed out by Schuler, is perhaps to enable a civic intelligence, where grounding the limits that we observe in 'the real world' through strong communication, and societal platforms that empower society to be part of a sustainable and just change. Let's bring on the communication revolution [38]!

5 CONCLUSION

We strongly believe that there shouldn't be such a thing as free delivery and that one battle worth fighting is that of challenging such cheap services that exploit workforces. We acknowledge that in our current economy and 'business-asusual' trajectories that if you start charging the real cost for deliveries and services that the divide between those who can and those cannot afford these products and services will grow. It's clear upon reflection that these topics deeply relate to inequality between workers and consumers, and how we as consumers are often shielded from such.

We call for Computing within Limits to lobby for the invisible cogs in the machine who are often under-represented in computing. We see our discussion as a first step in our (the researchers) journey in more tightly marrying social justice with the sustainability agendas that we focus on in our work. Perhaps an easy next step for the community is approaching quangos and third sector organisations to help develop digital services and products that promote fair costs, social justice for workforces together with environmental sustainability.

We finish with a quote from Klinksy and Golub's book *Justice and Sustainability* as a note (to ourselves) that environmental sustainability and social justice are intertwined:

"Although fully integrating justice and sustainability may not be entirely possible, sustainability without a consideration of justice would be nonsensical from a normative perspective and difficult to achieve strategically" Klinsky and Golub, 2016 [24] Intangible commodities with free delivery:

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ACKNOWLEDGMENTS

This work was made possible by EPSRC grant EP/N02222X/1. We offer our sincere gratitude to Jodie Barber for giving permission to use her front door and shoe (Figure 1), Vanessa Thomas for inadvertently nudging our research towards social justice, and the Computing within Limits community for providing us with a venue in which we are supported and enabled in our exploration of the limits (pun intended) of both our own research and ourselves as humans. Thank you to Lisa Nathan and Kurtis Heimerl for the insightful and constructive feedback and comments that helped us improve this work.

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