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Short Communication

Cooley's Break in Transportation and the Physical-Digital Divide

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Abstract
Charles Cooley presented a theory of transportation and its effects on society. However, while the specific theory was grounded in the technology of the time, it can be extrapolated into a principle that applies agnostic of technology. This paper develops a theoretical framework based on Cooley's Theory of Transportation that can be validated in a modern context by breaking down the prevalence and growth of online companies into their relevant rewards, metrics, and breaks to justify the unprecedented growth and size of modern technological companies.

Keywords Information Systems, Framework, FAANG

1 Introduction

Charles Cooley was a foundational researcher in modern sociology (Jacobs, 2006). However, one of his earliest published works was a book about transportation (Cooley, 1893), published in the field of economics. In modern frameworks, it would likely be considered in the Logistics and Supply Chain Management within the broader field of Management Science.

Within The Theory of Transportation (1893), Cooley proposes several maxims that have reasonably held up throughout the 20th century. One of those theories, Break in Transportation, states "population and wealth tend to collect at a break in transportation" (Cooley, 1893). However, this conclusion comes at the end of a broad discussion revolving around the idea of defining such a break. The culmination of that discussion could be reduced to "What is required is a break—transfer, storage and change of ownership—and if the break exists, no intersection is necessary" (Cooley, 1893).

Most of his argument is premised on the visualization of rail lines and intersections between them. This is certainly the height of technological conceptualization in 1893. An example would be leaving the city of Dallas and heading north following US-75. The cities of Richardson, Plano, Allen, Fairview, McKinney, Melissa, Anna, Van Alstyne, Howe, etc. are all approximately within similar ranges of each other. The justification for this is that steam-powered trains needed to stop every 7-10 miles to refill their water stores (Van Alstyne History Commission, 2014). This would fit the broad idea of a break in transportation, as the transporting medium (the train) literally stops and takes a break while the water reserves are refilled.

However, a broader discussion needs to rely on more specificity. So, within the framework of Cooley's "transfer, storage, and change of ownership" (1893), there is room for defining a broader and more modern conceptualization of what it means for "population and wealth… to collect". Thus, the framework will divide Cooley's break in transportation theory into three components: reward ("population and wealth"), metric ("to collect"), around a break of some kind ("break in transportation"). The framework will then need to explore what is meant by the three kinds of break: "transfer", "storage", or "change in ownership".

Cooley saw transportation as an inherent societal function (López-Escobar & Breeze, 2012), but by broadening the constraints, it should be possible to demonstrate that this break in transportation is a specialized form of a more general model. Demonstrating that it holds true for a modern organization, unrelated to the forms of transportation familiar to Cooley would provide support that this generalization should be explored more fully.

FAANG companies are the moniker tied to Facebook, Apple, Amazon.com, Netflix, and Google (Cramer, 2013). They have, since, developed into 5 of the top 6 companies listed on the NASDAQ— Netflix is number 11, but Google [Alphabet] has 2 classes of stock (NASDAQ, 2019). There is a correlation between the concept of Internet-related companies and success on the Stock Market. Justifying this would prove substantial. It's possible to extend other top performers (Microsoft, Intel, Cisco, Comcast, etc) as evident of internet-related success. However, the FAANG companies are more closely aligned in their digital storefront and direct involvement with consumers (Simon, 2011).

It's important to consider these companies within their current environment, as they have the very real potential of developing unprecedented levels of integration into every day life, making them effectively unbeatable (Dolata, 2017). Using the broadened definition of Cooley's model, it should be possible to identify the modern analogues that are evident in one of these modern companies. In this case, Amazon.com will be selected as an indicator company. Amazon.com is a good moderate choice between Cooley's era and the modern era, since it still operates with the transfer of physical goods even though it's doing so over the Internet and also extends, in addition, to less concrete industries (Williams, 2017). It can be shown that Amazon.com fulfills the intention of the theory of breaks in transportation.

In more formalized terms, Cooley's theory on breaks in transportation is an aborted conceptual framework tied to a specific technological advancement that should be revised with broader constraints to develop a theoretical framework that applies to a broader cross-section of the business and societal enterprise. Deriving a broader application from a conceptual foundation is a common first step preceding empirical support for theoretical framework development (Dubey, et al., 2017, Alhazmi, 2018, Shahbaz, et al., 2018).Methods

2 Literature Review

Hubbard (2017) highlights Cooley as a principal instigator of the aerotropolis model of economic development and establishes a conceptual chain to the principal that the specific theory of breaks in transportation can be generalized to modern technology. Hubbard's conclusion is supported by referential evidence of the applicability of the theory of breaks in transportation to five successive waves. A selected progression details that (a) Rome and Constantinople accrued wealth and population due to their seaport (Grover, 2013, Kasada, 2000), (b) Europe developed industrial and domestic distribution networks (Ellis, 2011, Rodrigue, Comtois, & Slack, 2013), (c) Rail lines allowed larger development of inland cities within the United States (Rodrigue, et al., 2013, Lindsay & Kasarda, 2011), (d) the development of automobiles and highway systems allowed longer commutes expanding the effective size of metropolitan statistical areas (Appold & Kasarda, 2013, Ellis, 2011), and (e) air-based travel further extends the distance traveled between breaks, concentrating the accrual of wealth and population further towards aerotropolis (Hubbard, 2017).

The prevalence of a digital-physical distinction exists. Mishra and Mathew (2017) discusses the adoption of eCommerce in India, highlighting the distinctive approaches that are taken towards online purchases. There are several other country-specific discussions of the adoption of technology (Agwu & Murray, 2018, Malaquias, Malaquias, & Hwang, 2017, Jaynal & Hasan, 2016). However, the overwhelming presumption is that online activities mirror physical activities. On one hand, this contraindicates the prevalence of internet companies among the highest market cap. On the other hand, it supports the extension that breaks in transportation may have an online reflection.Finally, the prevalence of discussion about the FAANG companies is prevalent, but tangential. Discussions on Amazon.com, in particular, center around their business strategy. Of particular interest: Zhu (2018) highlights their tendency to compete within successful product spaces rather than ones that require substantive effort. Smith and Linden (2017) have two overviews of Amazon.com's recommendation system, highlighting their methodology and effectiveness. Castelli, et al. (2017) document an algorithmic approach to identifying successful products on Amazon.com through a sentiment analysis of customer reviews.

The discussion supports the following presuppositions: The theory of breaks in transportation as related by Charles Cooley is a specific model that begs a general model. The Internet exists as an extension of physical logistical pipelines. Amazon.com competes both in the digital and physical marketplaces through a hybrid of traditional and modern forms.

3 Reward

Cooley's phrasing of the theory of breaks in transportation is "population and wealth". This reflects his presumption that transportation was an inherent function of society. Within that framing, it could be said that he posited the reward worthy of motivation for the societal function is an increase in population or wealth. Rephrased, societies succeed when the produce wealthy cities.

However, there are numerous metrics for success. Within a business, it's to maximize stakeholder value which can be considered solely through a perception of worth by the stakeholder and might include things such as providing sufficient salary or avoiding environmental pollution (Lankoski & Craig, 2016). Corporations have a duty to do this through increasing profit (Roche, 2017). Non-profit organizations seek proper stewardship and governance of donated resources (Harris, Petrovits, & Yetman, 2015). Even Maslow suggests that human reward is stratified and circumstance-dependent (Maslow, 1943). These could broadly be grouped together as metrics of what the target does.

The key distinction is that the reward is self-determined and reflective. Organizations determine their own reward-goals, and in turn are successful if their reward-goals are successful. This is directly analogous to Cooley's presumption that transportation resulted in wealthy cities (Cooley, 1893). And, since wealthy cities are a de facto going concern, this means that the analytical metric for a successful society was the prevalence of wealthy cities that were prima facto developed in the framework of the theory of transportation.

This leads to the need for determining the reward structure that determines whether the model for the general break in transportation theory within the context of the organization's terms. Amazon frames themselves as targeting "four principles: customer obsession…, passion for invention, … operational excellence, and long-term thinking" (Amazon.com, 2014, 2015, 2016, 2017, 2018). Prior to that, they framed themselves as "we serve our primary customer sets, consisting of consumers, sellers, enterprises, and content creators" (Amazon.com, 2013) and "we generate revenue through other marketing and promotional services" (Amazon.com, 2011).

These quotes have been selected for brevity from the same Part I, General section of Amazon.com's Letter to Investors. This is a severely reduced summary, and a more in-depth content analysis could be made to more fully support the selected quotes as representative. However, this distinction is important, as it demonstrates that whereas businesses seek solely to increase stakeholder value, the phrasing of Amazon.com's Letter to Investors clearly emphasizes both revenue generation and "customer sets". Customer sets implies that they seek to increase largely the number of people within their bounded economy.

This concern with increasing the number of people associated with Amazon.com places the company much more closely aligned with a Cooley-derived conceptualization of the reward structure for a break in transportation than in traditional conceptualizations of the nature of a business's reward-goals..

4 Metric

Cooley's phrasing within the Break in Transportation is "to collect". This is a broad and ill-defined measure. Instead, we should consider models that are more specific. The Aerotropolis model (Kasarda & Appold, 2014) establishes a specific model of measurement for the break in transportation, narrowly constrained within the air travel industry. Specifically, it refers to the Airport City as the buildings at the site of the airport directly related to the air travel industry. The Airport Community is every building to a certain radius from the airport not directly related to the airport that is assumed to be indirectly related to the airline industry. Finally, the Aerotropolis itself, is the area that is not related to the airport but reaps benefits from being in proximity to the airport.

Hubbard (2017) presumes from the literature that the aerotropolis model is an application of the Break in Transportation. However, the aerotropolis model's constraints can be removed. In that case, the central Airport City zone would simply be the actual site of the break in transportation. The Airport Community would be the immediate area that is impacted by proximity to the break in transportation. And the Aerotropolis would be the broader geopolitical area that can conceivably be rewarded by the presence of the break in transportation. In other words, the three zones would be: Direct Relation, Indirect Relation, and Indirect Benefit.

Applying this more generalized model to a specific company would mean identifying physical locations for the company and identifying the distance of indirect relation and indirect benefit. However, with regard to online companies such as Amazon.com, this would also revolve around considering how the online space interacts with the physical world. If this demarcation is of value, there would need to be some metric for identifying direct and indirect relation as well as indirect benefit.

One approach would be to identify the sites owned by Amazon.com as the zone of direct relation, customers and vendors as the zone of indirect relation, and the areas in the physical world that Amazon.com provides service to as the zones of indirect benefit.

One caveat would be that the term benefit would need to be acknowledged as not necessarily a positive value. For example, dollar stores indicate a possible negative benefit associated with childhood obesity (Florida, 2012). Although this is argued as non-causal by Drichoutis, et al. (2015), an analysis would likely still want to consider it.

5 Break

When Cooley refers to a break in transportation, the term is more fully explored within The Theory of Transportation (1893). However, since that description primarily revolves around the substance of technology and societal structures of the late 1800s, it is more vague in a modern setting. As a result, it is important to delineate what would constitute a break. The clearest definition given is "transfer, storage, or change of ownership". Specifically, when goods or materials are transferred to or from a train (such as cargo or water), where the goods or water are stored for distribution, and where that ownership changed hands. This was a relatively straightforward process, in hindsight, for the steam-powered train era, since all of that happened effectively in the same location.

Within the modern environment, however, there is a difficulty in conceptualizing these concepts. That difficulty relates to the distributed nature of ownership, storage, and point of purchase. For example, if a consumer product is produced in one country, stored in another, shipped to a online purchaser's physical address in a third country upon payment to a titular owner in a fourth country, where is the purchase located from the perspective of Cooley's model? Forman, Ghose, and Goldfarb's argument about the relative costs and utility of online versus retail purchase have an unstated presumption that the point of import is the end purchaser's location (2008). Brow, Pope, and Voges have a lengthy list of factors involved with online purchases, but location is not mentioned as a factor (2003). Pookulungara and Koesler discuss the concept of distance in online shopping in terms of social networks rather than physical location (2011).

Further support is in the context of the purchase itself. The nature of a purchase from Amazon.com is a transfer. Amazon.com spends billions of dollars in transportation costs transferring purchases from their point of origin to the purchaser (Garcia, 2018). The physical movement of goods from one place to another is intrinsic in their process.

Amazon.com also has a large storage capacity. Their warehouse space increases in size every year and stood at approximately a quarter-billion square feet as of 2017 (Kim, 2018). This storage likely has a cost and a competitive value to it, but the Cooley model simply targets its presence as a predictor. Their HQ2 proposal was intended to come not just with office space, but also entail storage, logistics, and transport facilities (Parlilla, 2018).

Finally, Amazon.com sells products, changing ownership. However, more than the straightforward retail experience, there are several layers of ownership change. Amazon.com offers products it owns. But it also offers First Party seller contracts— where the sale is on behalf of a vendor on its Amazon Marketplace who ships it themselves— and Third Party seller contracts—where the sale is on behalf of a vendor on its Amazon Marketplace and it stored and shipped by Amazon.com (Amazon.com, n.d.).

A broad conclusion would be that the uniting factor in consideration is that the Internet is a separate location for purchasing than physical space, and that there cannot be an assumption in location synchronicity for a purchase. This implies that purchases on the Internet are the break in transportation according to Cooley's theory. This model can be superficially applied on the presumption of a break on the nature of the purchase mode or it can be broken down by each individual area.

6 Conclusion

It's patently true that Amazon.com can be classified as the largest company in history (Kilgore, 2019). However, the question is whether Charles Cooley's Theory of Transportation (1893) predicted it as a fundamental societal maxim that the niche that Amazon.com fulfills necessitates that it would grow to such large size. Since the initial argument regarded the railroad industry and predated the Internet by almost a century, it is a superficially farcical question.

However, with some allowances made for removing constraints imposed by limited technology, it's possible to redefine the special theory of transportation into a more general theory of transportation. This more general theory would posit that Amazon.com and any other companies in the same role would continue to grow.

Questions that need to be explored further start with causal explorations. Cooley's theory starts with the concept that transportation is a societal need and that it emerges naturally from supply and demand: one location wants what is scarce and wants to get rid of what is abundant. However, the Internet itself is not a specific location, so why does it continue with Cooley's model?

Further, because Cooley's model's reward structure dealt with aggregate values in a socio-political context, it begs the question about applicability to corporations, which are not socio-political entities but capitalistic ones. Is it a feasible line of research to consider whether there might not be a fifth wave of commerce, expanding on the diversification of risk amongst stockholders by the corporation, suggesting that the more a company can adhere to nationalistic tendencies, the more it will be able to diversify its risk across a larger stakeholder-base?.

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