Digital Innovation and Taxi Services: The Case of Uru in Ghana

Completed Research

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Abstract

The purpose of this study is to understand how ridesharing as a form of digital innovation in taxi services creates affordances and constraints for riders and drivers in a developing country. Extant studies on digital innovation and taxi services primarily have focused on digital innovation for ridesharing in the taxi industry. However, less is known about how digital innovation for ridesharing in taxi services creates affordances and constraints for drivers and riders.

This study, therefore, follows an interpretive case study as a methodology and affordance theory as a lens to understand ridesharing in Ghana. The findings show three digital technology affordances that cause riders and drivers to use digital innovation in taxi services for ridesharing. These are security affordance with riders and drivers background information, automatic billing affordance for affordable transportation, and ubiquitous service affordance with anywhere and anytime service in the cities. The study finally provides concluding thoughts.

Keywords

Digital innovation, ridesharing, Uru, interpretive case study, affordance theory, Ghana.

Introduction

The purpose of this study is to understand how digital innovation in taxi services affords and constrains ridesharing in a developing country. Digital innovation (DI) is prevalent, which is shifting every part of life with cost-effective and transportation is not exempted (Greenwood and Wattal 2017; Gurumurthy and Kockelman 2018). DI is ideal for innovators to combine extant mainstream products, markets, and services with information and communication technology (ICT) to develop new forms.

Car ridesharing (ridesharing) is a digital arrangement that enables a rider to travel in a private car driven by a potential driver from a ridesharing company for a fee. A taxi all over the world is an important travel mode especially for riders without private vehicles in the urban transportation system to meet their travel needs (Wang, Zheng, and Lim 2018). Taxi drivers now have another set of competitors from DI for ridesharing companies to worry about their business all over the world (Billhardt et al. 2019; Lee, Lee, and Kim in press). This is because the taxi services have some limitations such as difficulty for riders to get taxis during the peak hours, raining periods, and unfair charges by drivers (Zhou et al. 2016). However, the introduction of DI for ridesharing has significantly reduced unproductive working hours and other limitations in the taxi services. Therefore, from the highlighted taxi services limitations, which have been resolved by digital technology affordances, are what lead riders and drivers to change their routine activities.
into DI for ridesharing. Riders are passengers who enjoy the services and drivers are those who provide the services via a physical car (Tan et al. 2017).

Extant studies on DI in taxi services for ridesharing have been in different contexts (e.g., Lee et al. in press; Wang, Kutadinata, and Winter 2019). However, less is known to understand how ridesharing as a form of DI in the taxi services creates affordances and constraints for drivers and riders as most of the extant studies primarily focus on DI for ridesharing in the taxi industry. For example, understanding the effects of taxi ride-sharing (Wang et al. 2018). However, the condition from the literature reviewed has led to a research gap that requires research attention. For example the need for research on on-demand ride services in other nations, which can also establish tailored strategies to develop and expand the markets (Lee et al. in press).

Therefore, there is a need to understand how DI in taxi services can increase ridesharing in a developing country context of Ghana. The research question for this study, therefore, concerns how DI in taxi services affords and constrains riders and drivers for ridesharing in Ghana. To address the research question, this study follows an interpretive case study approach (Klein and Myers 1999; Walsham 1995a; Walsham 2006) and affordance theory (Bygstad, Munkvold, and Volkoff 2015; Gibson 1979) as the analytical lens to understand the phenomenon. For this paper, actors refer to riders (commuters, passengers or travelers), drivers, and Uru information systems (IS) professionals; and ride refers to car.

The paper proceeds as follows: The following section provides a literature review on digital innovation, ridesharing, and theoretical foundation. The subsequent two sections provide interpretive case methodology and case description. The succeeding section analyses the findings from the case study. This is followed by the discussion section, and the final section offers concluding thoughts.

Literature Review

Digital Innovation

DI is pervasive and not limited to any specific industry. However, this innovation offers different functionalities by different actors or organizations like how Leonardi (2011a) describes blind men experience of touching an elephant with different interpretations. Therefore, there is no organization which can only grasp the entire innovation capabilities in digital technologies. DI is ideal for creating a new or renewing product, service, or market via the synergy of ICT and exiting business model (Demirkan et al. 2015). Upon the innovation definition, some authors maintain that the objective of DI is to provide superb services, products, and markets than existing ones (ibid) to meet the actors’ needs (Mounce and Nelson 2019). Simmons (2018) argues that innovation is no longer associated with new product development because the digital age has changed the status of innovation.

Ridesharing

The fundamental objective of DI in taxi services for ridesharing is to mitigate the challenges of taxi services. Ridesharing can be defined as digitally matching riders and drivers at proximity in cities on a ridesharing platform for travel transactions (Gecchelin and Webb in press). Ridesharing has been used in different contexts such as carsharing, ridesourcing (Mounce and Nelson 2019; Rayle et al. 2016); parataxis, vanpooling (Schreffler 2018); ride-hailing service (Tan et al. 2017); transportation network companies (Gurumurthy and Kockelman 2018), real-time ridesharing (Ge et al. 2017); and ride-sharing (Stiglic et al. 2018; Wang, Ardakani, and Schneider 2017).

Therefore, the definitions are vague as digital innovations in taxi services for ridesharing continue to advance in the taxi industry (Simmons, 2018). Ridesharing platforms afford riders to book rides with drivers willing to provide service within their proximity via ridesharing apps (Calo and Rosenblat 2017). As the digital economy continues to spread in the world economy, DI in taxi services for ridesharing companies such as Uber in the US, WhipCar in England, car2go in Germany, and goCatch in Australia have begun to challenge traditional transportation providers all over the world (Gecchelin and Webb in press; Mounce and Nelson 2019; Wang et al. 2017). A taxi, also known as a taxicab or a cab is defined as a means of conveying a rider or a maximum of four riders based on their pick-up and drop-off locations by a driver with a ride (Billhardt et al. 2019; Wynne 2017).
**Theoretical Foundation: Affordance Theory**

The theoretical foundation underpinning this study is affordance theory. The theory was originally coined by James Gibson in 1979 to refer the characteristics of objects available to actors in their environment (Cousins and Robey 2015; Pozzi, Pigni, and Vitari 2014). Gibson (1979) defines it as action possibilities that arise on the interactions between actors and the environment they operate. However, in most IS studies, the term environment has been replaced with the concept of ICT artefacts (Norman 2013), and the characteristics of objects also have been replaced by relationships between actors and ICT artefacts (Pozzi et al. 2014; Strong et al. 2014). In IS, an affordance refers to the possible actions available to actors to use ICT artefacts (Tan et al. 2017; Wang, Wang, and Tang 2018). Some authors maintain that technology creates affordance for individuals, however, there are constraints that may prevent them from achieving their goals when using it (Leonardi 2011b; Majchrzak and Markus 2013).

Therefore, they can use what technology affords and resist the limitations of using that technology (Leonardi 2011b). From these preceding definitions, affordances can be related to the context of DI in taxi services for ridesharing as relationships between actors’ abilities and ICT artefacts feature to perform travel transactions. On the other hand, constraints are technological challenges that may prevent them from achieving their goals. For example, reworked of the original concepts and principles in IS research has been used to understand how information technology associated with organizational change (Strong et al. 2014).

The concepts and principles of affordance theory in this study are based on the affordance structure developed by Bygstad et al. (2015) to understand affordance actualization in DI in taxi services for ridesharing. In spite of all these from the literature reviewed, there is still a gap to understand how DI in taxi services for ridesharing affords and constrains riders and drivers in a developing country. Therefore, there is a need for research on the phenomenon in Ghana.

**Methodology**

This study was based on an interpretivist research philosophy (e.g., Walsham 2006). The ontology in the study referred to the investigation of DI in taxi services for ridesharing in Ghana. Epistemologically, the authors believed that the research issue can be best understood from the lived experiences actors. Concerning methodology, the study used an interpretive case study approach to develop an in-depth understanding of how DI in taxi services affords and constrains riders and drivers for Uru ridesharing in Ghana. There were eight different ridesharing companies in Ghana as at February 2019, namely, Uber, Uru, Dropping, Yenko Taxi, Taxify, Enshika, Fameko Taxi, and Pokicab, and all were located in Accra, the capital city of Ghana.

However, Uru was selected as a case study via theoretical sampling (Seawright and Gerring 2008) and case selection techniques (Ponelis 2015) based on the research purpose, research question (Tan et al. 2017), and how interesting the case was (Baškarada 2014). Case studies are often conducted in IS research in order to gain a rich understanding of a phenomenon (Ponelis 2015).

**Data Collection and Data Analysis**

In interpretive tradition, data collection and data analysis can be concurrent (Myers 2009) and these informed the authors to ask further questions that needed clarifications from the respondents. Various sources were used for data collection, namely, interviews, ICT artefacts observations, printed and online information (Walsham 2006) in order to obtain rich insights into the phenomenon. The processes were guided by modified concepts of Bygstad et al. (2015) affordance theory. Field data were gathered between October 2017 and January 2019 via observations, telephone, and face-to-face semi-structured interview. Interviews are the main primary data source in interpretive research (Cousins and Robey 2015; Myers 2013; Walsham 2006) and these always support a researcher to access the interpretations of participants (Green et al. 2007). Snowballing was used to identify relevant documents (Boell and Cecez-Kecmanovic 2014) from the year 2011 to 2019 and for potential case selection (Ponelis 2015) as well as the respondents.

The study collected data from IS professionals (operations manager, administrator, and assistant administrator), riders, and drivers through an interpretive epistemology by ensuring that reality is socially constructed (Walsham 2006). The participants selected for the interview were thirty-seven through a
purposive sample (Yanchar, South, Williams, Allen, and Wilson, 2010). Table 1 below provides a summary of the participants.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>IS professionals</td>
<td>3</td>
</tr>
<tr>
<td>Drivers</td>
<td>16</td>
</tr>
<tr>
<td>Riders</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
</tr>
</tbody>
</table>

**Table 1. Interview Participants**

The interview was achieved via face-to-face and technically-enabled conversations. Green et al. (2007) maintain that the researcher must always immerse in the data collection in order to provide analysis beyond the interview transcript. The data collected were based on field notes and audio recording with permission from the interviewees. The authors coded and analyzed the interview transcripts (Walsham 1995b) to contextualize the Uru ridesharing. The study also adopted the hermeneutic process (Boell and Cecez-Kecmanovic 2014) for a restless back and forth movement in the process of understanding text.

Finally, follow-up interviews via telephone, WhatsApp, and e-mail were used to clarify essential points. This, however, occurred concurrently during and after data collection (Klein and Myers 1999) until the authors reached the saturation point for the analyses (Walsham 1995a).

**Case Description**

The authors’ identified Uru technologies LLC (Uru) as an appropriate case organization. Uru is a DI ridesharing company that uses mobile apps to match riders and drivers on its platform for travel transactions. the company operates with two mobile apps, namely, Uru driver and Uru app. Uru driver app is made for drivers with compatible mobile devices who are fully–licensed and commercially-insured their rides. Uru app, on the other hand, is available for riders with compatible mobile devices. Uru ridesharing was launched in Ghana on 21st April 2017 and also operates in Kenya and Nigeria. Uru offers convenient means of ridesharing giving both riders and drivers the most transparent dashboard that can easily be controlled to fit riders’ specification during trips. The outcome of Uru ridesharing has partially transformed the taxi business in Ghana. Thus, some of the taxi drivers and riders have migrated into the Uru system. The company is, therefore, described as a new generation means of transport in Ghana because of its DI in taxi services for ridesharing.

**Analysis of the Findings**

The findings addressed the research question with three processes from a modified framework of Bygstad et al.’s (2015) affordance theory. The processes are the description of events and issues, identification of key entities, and identification of candidate affordances.

**Description of Events and Issues**

The study identifies three main issues behind the DI in taxi services for ridesharing. These are riders’ and drivers’ preference for Uru ridesharing, availability and compatibility of mobile devices, and affordability of network.

**Riders’ and Drivers’ Preference for Uru Ridesharing**

The first issue concerns riders’ and drivers’ preference for Uru ridesharing DI in taxi services. The Uru ridesharing has made it possible for riders to use their mobile devices such as smartphones and have a ride arrive at their location in the minimum possible time. This involves riders to book an online request by setting a pick-up (location details of the rider) and drop-off (destination details of the rider) locations via the Uru apps. For instance, before Uru and other ridesharing companies in Ghana, most riders and drivers
describe taxi services as location restrictions. This means business locations where taxis are not allowed to operate. On the other hand, there is no restriction for ridesharing drivers to pick-up and drop-off riders and some of them expressed their views as:

Uru and other ridesharing companies provide me unlimited services in the cities unlike taxis, which have limited locations to operate like special locations with “no taxi allowed” indications. Uru ridesharing has reduced my stress for traveling in the cities. Because of these incentives, I have ignored the taxi services and now enjoying Uru ridesharing, which can pick and drop me everywhere at anytime without any restriction via my mobile phone arrangements.

Availability and Compatibility of Mobile Devices with Ridesharing Apps

The second issue concerns the availability and compatibility of mobile devices with ridesharing apps. The availability and compatibility of mobile devices such as Smartphones have partially transformed taxi services processes in Ghana. For instance, the manager of the company explained the availability and compatibility of mobile devices for their online services as:

Our service thrives on ICT. The availability and compatibility of mobile devices with our apps enable us to serve our potential riders with “one time, one task, and one-click” within our coverage by our drivers. This issue enables our potential riders more comfortable to book rides at anywhere and anytime within our coverage. Our work is to provide an accessible digital platform to connect riders and drivers together for travel transactions.

One of the drivers pointed the efficient way of getting riders from Uru digital platform as compared to the taxi services:

Uru provides me a flexible online selection of riders via my mobile phone. The modern ways of ICT for rider-driver transactions in the taxi business have improved my business and knowledge in ICT far better than taxi drivers. My former colleagues searching strategies for riders have some limitations as compared to us with ridesharing system. Thus, Uru drivers’ app provides me all the needed rider-driver transactions with ease, unlike the taxi business.

Some of the riders, on the other hand, described the roles of their compatible mobile devices play in ridesharing compared to taxi services in Ghana as:

Uru and other ridesharing companies have changed and improved my travel transactions in the cities via Smartphones. Based on these improved services in the travel activities, my option for buying a mobile device has changed by ensuring it is always Internet-enabled that can enable all ridesharing activities. The Uru app on my phone provides me opportunities to book a ride of my choice online at my convenient time for a fee automatically.

Affordability of Network (Internet and Mobile Network)

The third issue concerns the affordability of network subscription and usage. The activeness of Uru digital platform that establishes a link between riders and drivers depends on the service cost, which is associated with mobile devices and software applications. Two network types that underpin online activities for the actors, namely, the Internet and mobile network. Some of the drivers explained the roles of the Internet and mobile network with mobile data for their ridesharing activities in Ghana as:

Without the Internet and mobile network with mobile data, Uru and other ridesharing companies’ platforms will not work. The network for ridesharing is affordable. The infrastructure for rider-driver searching is not physical like the taxi services, however, our system of searching is controlled by the network. Thus, the network is able to link us with riders 24/7 for all our activities such as google map for automatic directions.

Some of the riders also expressed their view on the role of network and constraints for ridesharing as:

Ridesharing is all about a digital network for digital activities. Every rider needs the Internet as a gateway to Uru ridesharing platform via mobile data. This may come from the mobile network telecommunication service providers before a rider can book a ride online. Our online
activities are behind the mobile network and the Internet and they are affordable. On the other hand, poor Internet connectivity is a key challenge that constrains our online activities.

**Combination of the Issues to Create Technology Affordance**

Digital technology affordances have encouraged both riders and drivers to use Uru ridesharing instead of taxi services in Ghana. Therefore, a combination of those underscored issues enables Uru to provide riders and drivers with security affordance, automatic billing affordance, and ubiquitous service affordance. Because of the digital technology affordances, Uru is attracting most digital technology enthusiasts who are riders and drivers in Ghana. The operations manager of the company explained the combination of the issues as:

> Our service is just a DI in taxi services. As a result, there is no Uru ridesharing without ICT. This is because our online activities thrive on ICT. The company, on the other hand, uses only drivers who are fully-licensed and commercially-insured. The outcome, however, has transformed the taxi services in Ghana because of our digital technology affordances. Most riders and drivers consider our ridesharing as superb and convenience than the taxi services.

Some of the drivers explained their safety based on their mobile devices, networks, and Uru apps via digital technology affordance and how their businesses have improved in Ghana as:

> The taxi business in Ghana today has changed by security features from ICT. This time, there is no fear to pick-up and drop-off any rider at anytime. Because every rider’s bio-data and travel records are known to me for every transaction. This has improved my confidence to travel anywhere and anytime without fear. These features are not available in my formal taxi business whereby some riders turn to be robbers and snatch rides during the transactions, without any information to assist police for their actions.

On the other hand, one of the riders explained his view on security affordance for Uru ridesharing as:

> The state of drivers scheming with robbers to attack riders is over. Uru riders’ app via my mobile device and all the associated requirements have changed the traveling attitude in Ghana. I feel comfortable to travel at anytime and anywhere without fear. I am secure with Uru ridesharing because the ride and the driver’s details are always available to me including their pictures for any travel transaction. Today, I can easily retrieve my item left in a ride by arranging with the driver, unlike taxi services.

**Identification of Key Entities and Interrelationships**

The key entities behind DI in taxi services for Uru ridesharing are hardware devices, software, and network. The first entity is the hardware component and it could be any mobile device required by both riders and drivers in order to have access to Uru platform. Compatible features around the mobile device to facilitate its functions are the Uru apps-enabled, camera-enabled, global positioning system (GPS)-enabled, and Internet-enabled. Computers are the physical devices used by the company.

The second identified entity is software (Uru apps and system software). The Uru apps of which there are two types, namely, the rider app and driver app. The Uru apps are the gateways that enable both riders and drivers to join the Uru platform via an Internet connection. Other software applications that support the company’s operations are GPS, google map, and mobile money. The role of the system software is to link the hardware and Uru apps together to meet the riders’ and drivers’ needs.

Finally, the identified entity is the network (Internet and mobile network). The role of the Internet is to provide access for riders and drivers to download and install Uru apps before they can be part of the Uru platform for any online transaction. The mobile network provides both riders and drivers mobile lines and data to access the Internet via their mobile telecommunication service providers. However, poor Internet connectivity sometimes constrains their online activities to achieve their goals.

Uru operation thrives on the three aforementioned components, which constitute the ridesharing. Thus, the company can never operate if one is omitted. The interdependencies could be temporal, structural or complementary. The mobile device provides structural dependency for both riders and drivers, the network specifically the Internet provides temporal dependency, and the Uru apps provide complementary...
dependency. The network is the only way for riders and drivers to install Uru apps on their mobile devices. Therefore, what both riders and drivers can have access offline are the mobile device and Uru apps. The three aforementioned technology affordances are what the company processes for creating something new in the taxi services.

The case analysis shows that both riders and drivers have the cities maps in their palms for directions via Uru ridesharing for all the rider-driver transactions, unlike taxi services where the directions aspect for traveling are done manually with experience. For instance, in Ghana, taxi drivers’ directions for new locations especially for a rider drop-off always become a challenge. However, DI in taxi services for Uru ridesharing has resolved those challenges. Thus, google map provides location identity or geolocation for coordination between riders and drivers for their transactions. This available functionality has encouraged a lot of riders and even drivers in Ghana to use Uru ridesharing for all their rider-driver transactions instead of taxi services.

The IS professional, drivers, and riders are the individuals involved in the Uru ridesharing. They are the goal directors who decide the usage of digital technology and enable changes in an organization or the taxi industry. The organizational bodies involved for the effective regulatory transport operations in Ghana are ridesharing companies, commercial taxi drivers’ association of the Ghana private road transport union, and the Ministry of Transport. Their core mandate is to provide transport services for riders in Ghana.

**Candidate Affordances and Constraints**

Several technology affordances that are significant to both riders and drivers in the taxi industry could be realized to provide riders means of transportation in Ghana. The first is security affordance. In this case, as both riders and drivers are strangers in the ride, the ridesharing platform provides special security features to identify themselves with their bio-data. This security affordance by Uru digital platform provides a rider with vehicle details to track his/her arrival on the google map via his/her mobile device.

The second is Ubiquitous service affordance. This service is unlimited in the cities and only available to riders and drivers on the ridesharing platform. Riders who use taxis are restricted and do not enjoy this service. In Ghana, some places in the cities with “taxi is not allowed” prohibit taxis from operating. The situation, however, limits their areas of operation and income generation as compared to the ridesharing companies. Thus, this occurs when a rider with Uru ridesharing can pick-up or drop-off at any location instead of taxi services. Uru rides are unlike taxis with their lawful painted colours, which can easily be identified and prevented from entering the restricted areas.

The final is automatic billing affordance. This occurs when a rider opts for Uru ridesharing with transparent and lower fare instead of taxi services. The rider, however, ignores unfair and over charges of taxi services and uses Uru ridesharing affordable transportation instead. This is made possible by the Uru apps integrated with google map and advanced automatic billing, which depends on the distance covered in kilometers that are available on both riders’ and drivers’ mobile devices. This option provides openness to both riders and drivers with no talk for any bargain, unlike taxi services.

On the other hand, the study identifies poor Internet connectivity as a technological constraint, which sometimes affects the actors’ ability to achieve their goals.

**Discussions**

The findings raise a number of interesting issues for discussion. Based on the research question, purpose and the affordance theory as a theoretical lens, the findings show three interesting technology affordances that cause riders and drivers to use DI in taxi services for ridesharing.

First is the security affordance, which provides background information including pictures of rides, riders, and drivers before and after any transaction between the rider and the drivers as both of them are strangers in the ride. This aspect of ridesharing is unique in Ghana’s taxi industry that encourages most riders to travel at anytime and to anywhere concerning their personal security with strange drivers without fear. The security affordance is opened to both riders and drivers immediately a rider books a ride and accepts by a driver on the ridesharing platform. Most riders, however, make the details of the travel transactions to their relatives for any security reason in case of any travel challenge. Thus, the ridesharing companies by default
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keep track of all activities in their database between riders and drivers, which can be used as a reference in case something goes wrong (Billhardt et al. 2019).

The second is the automatic billing affordance. This involves affordable transportation on the distance covered with an agreed price for both riders and drivers, which is lower than the taxi services. Though ridesharing access involves additional network cost from mobile network telecommunication service providers but the riders and drivers see it is affordable. What every rider wants in the transportation industry is an affordable transportation option and this is what DI in taxi services provides (Stiglic et al. 2018).

Finally, is the ubiquitous service affordance, which provides wider coverage service 24/7 than the taxi services especially in most business centers where taxis are not allowed to operate. Thus, digital technology affords both riders and drivers to enjoy anytime and anywhere service in the cities where the Internet is available without restriction like the taxi services (Lee et al. in press; Wang et al. 2017). In addition, rides for ridesharing are everywhere and not identical like the taxis which can easily be identified from entering taxi restricted areas.

Upon all these technology affordances, there is also technological constraint from poor Internet connectivity, which constrains them to achieve their goals (Leonardi 2011b). This constraint normally affects them to achieve their online stability for ridesharing in Ghana.

Conclusion

This study investigated how DI in taxi services for ridesharing creates affordances and constraints for riders and drivers in a developing country context of Ghana. The authors focused on Uru ridesharing in Ghana as a case study. The study used affordance theory to understand how digital technology affords and constrains riders and drivers the opportunities to create service change in the taxi industry. The findings show three reasons that motivate riders and drivers to use ridesharing. These are security affordance, automatic billing affordance, and ubiquitous service affordance. The security affordance provides background information including pictures of cars, riders, and drivers before and after any transaction.

Automatic billing affordance involves affordable transportation for riders on the distance covered with an agreed price. The ubiquitous service affordance provides wider coverage service 24/7 than the taxi services especially in most business centers in the cities where taxis are not allowed. However, the findings show poor Internet connectivity as the technological constraint that affects the ridesharing. The study has shown that ridesharing is attracting most digital technology enthusiasts in Ghana by increasing Uru ridesharing as taxi services decrease. The authors recommend future studies to examine the nature of digital innovation in other services and the use of different theory for digital innovation in taxi services.

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