


INCREASING TECHNOLOGY-BASED DRIVER'S PRODUCTIVITY UNDER COVID-19 PANDEMIC IN VIETNAM: THE SIGNIFICANT CONTRIBUTION OF CONSUMER BEHAVIOR

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ARTICLE INFO	<u>ABSTRACT</u>
<p>Article history:</p> <p>Received 08 August 2022</p> <p>Accepted 10 November 2022</p> <p>Keywords:</p> <p>Driver's Productivity; Driver's Behavior; Customer Behavior; Ride-Hailing Service; Vietnam; COVID-19 pandemic.</p> <div data-bbox="172 1131 478 1377" style="text-align: center;">  </div>	<p>Purpose: Ride-hailing service, after the emergence in Hanoi – capital of Vietnam in 2014, has experienced major development and gradually enhanced the inner-city travelling of citizens. This study aims at investigating technology-based driver productivity perception and identifying several important influencing factors during the period of COVID-19 pandemic</p> <p>Design/methodology/approach: The samples of 370 technology-based drivers have been surveyed to collect significant data about factors impacting on worker productivity in Vietnam ride-hailing service. SPSS 26 software is conducted with two types of analyses, including descriptive analysis and statistical analysis</p> <p>Findings: The findings indicate that social distances, service waste and customer behaviors possess significant impacts on worker productivity in Vietnam ride-hailing services. Several special concerned factors have been identified to raise driver's awareness of productivity improvement in ride-hailing service.</p> <p>Research, Practical and Social implication: Major implications can be suggested for improving driver productivity during and after COVID-19 pandemic, especially in term of reducing service waste and increasing customer behavior towards ride-hailing services.</p> <p>Originality/value: Basing on research findings, the study becomes significant contribution to further papers as well as service managers to enhance technological driver productivity during COVID-19 pandemic.</p> <p>Doi: https://doi.org/10.26668/businessreview/2022.v7i4.e617</p>

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AUMENTAR A PRODUTIVIDADE DO MOTORISTA BASEADO EM TECNOLOGIA SOB A PANDEMIA COVID-19 NO VIETNÃ: A CONTRIBUIÇÃO SIGNIFICATIVA DO COMPORTAMENTO DO CONSUMIDOR

RESUMO

Objetivo: O serviço de transporte de passageiros, após o surgimento em Hanói - capital do Vietnã em 2014, experimentou um grande desenvolvimento e melhorou gradualmente as viagens dos cidadãos pelo interior da cidade. Este estudo visa investigar a percepção da produtividade dos motoristas baseada na tecnologia e identificar vários fatores de influência importantes durante o período da pandemia da COVID-19

Design/metodologia/abordagem: As amostras de 370 motoristas baseados em tecnologia foram pesquisadas para coletar dados significativos sobre fatores que afetam a produtividade dos trabalhadores no serviço de transporte de veículos no Vietnã. O software SPSS 26 é conduzido com dois tipos de análises, incluindo análise descritiva e análise estatística

Conclusões: As constatações indicam que as distâncias sociais, o desperdício de serviços e o comportamento dos clientes têm impactos significativos na produtividade dos trabalhadores no Vietnã. Vários fatores especiais preocupantes foram identificados para aumentar a conscientização dos motoristas sobre a melhoria da produtividade nos serviços de transporte de carga e descarga.

Pesquisa, prática e implicação social: Principais implicações podem ser sugeridas para melhorar a produtividade dos motoristas durante e após a pandemia de COVID-19, especialmente em termos de redução do desperdício de serviços e aumento do comportamento do cliente em relação aos serviços de transporte de carga e descarga.

Originalidade/valor: Com base nos resultados da pesquisa, o estudo se torna uma contribuição significativa para outros trabalhos, bem como para os gerentes de serviços para aumentar a produtividade dos motoristas tecnológicos durante a pandemia da COVID-19.

Palavras-chave: Produtividade do Motorista, Comportamento do Motorista, Comportamento do Cliente, Serviço de Transporte, Vietnã, Pandemia da COVID-19.

AUMENTO DE LA PRODUCTIVIDAD DE LOS CONDUCTORES CON TECNOLOGÍA BAJO LA PANDEMIA DE COVID-19 EN VIETNAM: LA IMPORTANTE CONTRIBUCIÓN DEL COMPORTAMIENTO DEL CONSUMIDOR

RESUMEN

Objetivo: El servicio de transporte por carretera, después de la aparición en Hanoi - capital de Vietnam en 2014, ha experimentado un gran desarrollo y ha mejorado gradualmente los viajes de los ciudadanos en el centro de la ciudad. Este estudio tiene como objetivo investigar la percepción de la productividad de los conductores basada en la tecnología e identificar varios factores importantes que influyen durante el período de la pandemia COVID-19

Diseño/metodología/enfoque: Se ha encuestado a una muestra de 370 conductores de base tecnológica para recopilar datos significativos sobre los factores que influyen en la productividad de los trabajadores del servicio de transporte colectivo de Vietnam. Se realiza el software SPSS 26 con dos tipos de análisis, que incluyen el análisis descriptivo y el análisis estadístico

Resultados: Los resultados indican que las distancias sociales, los residuos del servicio y los comportamientos de los clientes tienen un impacto significativo en la productividad de los trabajadores de los servicios de transporte colectivo de Vietnam. Se han identificado varios factores de interés especial para concienciar a los conductores de la mejora de la productividad en el servicio de transporte por carretera.

Investigación, implicación práctica y social: Se pueden sugerir importantes implicaciones para la mejora de la productividad de los conductores durante y después de la pandemia de COVID-19, especialmente en lo que respecta a la reducción de los residuos del servicio y al aumento del comportamiento de los clientes hacia los servicios de transporte por carretera.

Originalidad/valor: Basándose en los resultados de la investigación, el estudio se convierte en una contribución significativa para otros trabajos, así como para los gestores de servicios, para mejorar la productividad de los conductores tecnológicos durante la pandemia de COVID-19.

Palabras clave: Productividad de Los Conductores, Comportamiento de Los Conductores, Comportamiento de Los Clientes, Servicio de Transporte Colectivo, Vietnam, Pandemia Covid-19.

INTRODUCTION

Industrial 4.0 has been radically changing the business since advancement in technology brings about better chance of development. The transportation of freight and customer in international mega-cities is following the trend with the emergence of Uber – a technology-based mobile application in 2009. Users can place orders in the application and this would automatically send the orders to available drivers. Then the transportation is ready to be handled and the journey could be tracked on customer's phone. The fast-responding, time-saving, cost-lowering and reliable features make the technology-based transportation become more popular (He and Shen, 2015; Tirachini, 2019; Assegaf et al., 2020). Statistics indicated that in 2020, the market for ride-hailing service has been developed dramatically. Grab – the dominant enterprises in online transportation accounts for 75% market share, has provided 146 million rides in 2019 and this figure continued to grow at 70% in 2020 (ABI Research, 2020). As projected, by the end of 2021, the market for ride-sharing in Vietnam may witness an escalating increase and exceed more than 6.7 million users (Nguyen et al., 2019). In 5-year time, the market would reach 4 billion USD (ABI research, 2020).

The potential development of ride-hailing service in Vietnam emphasized on the importance of technology-based drivers who are considered to be the co-partners of Grab. Drivers complete the rides with higher quality, higher customer satisfaction and would contribute significantly to the prosperity of the enterprises. Noor (2019) concluded that the ride-hailing users' loyalty can be affected by: readiness, comfort, safety, service price, reliability and most importantly, the quality of drivers and brand images. Moreover, Ackaradejruangsri (2015) considered the shortage of time for waiting as the essential features in online transportation. Burhanuddin (2018) also highlighted the impact of drivers in creating customer satisfaction as the drivers enhance the ride, operations and service reliability. Overall, it is generally accepted that the quality of driver contributes considerably to the success of the business. More importantly, in 2020, the emergence of COVID-19 has lowered the development of economic sectors (ADB, 2021). The fourth wave of infections began from May 2021 has remarkably increasing the patients to 100,000 until the end of July. Therefore, it is projected that the economy would be facing more negative movement.

Labor productivity, conceptualized as the measurement of economic efficiency showing the level of effectively economic inputs are converted into output, according to US Bureau of Labor (2021), can be the important factor in enhancing labor quality, especially in the period of COVID-19 pandemic. In service sector, improvement of labor productivity should be supportive in creating customer satisfaction (Anitsal and Schumann, 2007; Böckerman and

Ilmakunnas, 2010). In ride-hailing, higher labor productivity may increase the numbers of products (drives) without raising the numbers of workers (drivers). Generally, the national labor productivity in transportation sector reached 88.8 million VND/person in 2018 – relatively low compared to service sector and general economy level (Vietnam Productivity report, 2019). Therefore, investigating on driver's productivity not only provides insights about the efficiency and effectiveness of technology applications in the market but also contributes to the establishment of sharing economy in Vietnam.

Consequently, this study aims at gaining the perception of drivers in several Vietnam online transportation enterprises about labor productivity and the determinants of labor productivity. A survey has been conducted with sample size of 370 technology-based drivers. The remainder of this paper provides the literature review and analytical framework, which are followed by the data collection, descriptive analysis and hypothesis testing. The last two sections present the important findings, limitations of this study and final conclusion.

LITERATURE REVIEW

Labor productivity in service sector

Labor productivity can be considered as an important economic indicator for different industry and it represents the competitive capacity of companies (ILO, 2020). In service sector, labor productivity is difficult to be precisely measured (Samargandi, 2018), however, it can be defined as the ratio between level of outputs and the labor cost/number of labor/ time cost by labor (Freeman, 2008). Therefore, labor productivity may reflection how efficiency and effectiveness of labor utilizing in corporate level (US Bureau of Labor, 2021).

In the competitive business market, labor productivity becomes essential advantage for companies to pursuit because higher labor productivity means better outputs with the same quantity of labor-based input (Damanhour and Rana, 2017). Therefore, improvement in labor productivity may be beneficial for companies. Service sector may be labor-intensive and dependent on the quality of labor for raising efficiency (Biege et al., 2013). Moreover, customer satisfaction is also under influence of labor productivity improvement (Goel et al., 2017). A workforce which is not only productive but is also aware about reducing the other energy costs like energy costs and fuel costs is a source of sustained competitive advantage and this may highlight the importance of labor productivity in service sector. Besides, labor cost would contribute considerably to the overall performance assessment of business (Freeman, 2008). Higher labor productivity, as abovementioned, can lower the labor cost by generating more revenue with the same quantity of employees and also cover the increasing cost. Therefore, it

would produce lower cost structure for companies which assists the development of competitive advantage (Goel et al.,2017).

Conclusively, labor productivity can be regarded as an important factor in service business. It is not only contributing to the efficiency but also promote the quality enhancement in operations.

Labor productivity improvement

Actually, there is a shortage of researches about labor productivity in ride-hailing service which can be referred as driver productivity due to the newly-emerged sector has not been highly emphasized as an independent industry.

Therefore, this study implements investigations on the overall labor productivity improvement which can possibly be effective in ride-hailing service. Several scholars indicated that the level of labor productivity is significantly impacted by organizational management (Cox et al., 2003; Thomas et al., 2003; Shehata and El-Gohary, 2012; Naoum, 2015). Technologies and innovations seem to be the modern determinants of labor productivity improvement; however, the baseline would be drawn to management practices applied in corporate level. According to Thomas et al. (2002), productive level in an organization can be reduced considerably by effective managing procedures. Therefore, this factor contributes to the optimum performance establishment of the companies. Moreover, quality control, project completion, workforce cost reduction can be regarded as important practices for labor productivity improvement (Koch and McGrath, 1996; Cox et al., 2003; Shehata and El-Gohary, 2012; Ghodrati et al., 2018). Beside organizational management, employee satisfaction can be considered to be a major determinant of labor productivity. Human resource planning is identified as the starting point of organizational operations (Koch and McGrath, 1996). Achieving the qualified labor opens the gate for effective human resource management which centers in increasing employee or labor satisfaction. Academically, employee satisfaction provides opportunities for raising labor productivity by engaging the full commitment and high-performed working from organizational workforce (Cho and Erdem, 2006; Belay et al., 2014; Gaisina et al., 2015).

Nevertheless, the two abovementioned determinants can be traditional ones. The modern approaches may cover several different influencing factors. Lean management should be the trending innovation started from manufacturing service and has spread to service sector currently. Not similar to manufacturing, service sector would consider reducing operational wastes as the beginning stage in lean adoption (Andrés-López et al., 2015). Wastages or service

wastes are identified to be the zero-valued creation procedures occurring in the service operations and needs to be reduced or eliminated (Arfmann and Barbe, 2014). Li et al. (2011) divided service waste into 3 dimensions: (1) Service design – mismatch of service with customer needs, (2) Service ability - not fully-used capacity and (3) Service process – low working efficiency. And the driver productivity, related to the study, is mainly clarified under the 3 dimensions. Service waste reduction or elimination can contribute significantly to the labor productivity enhancement process within organizations (Thomas et al., 2002; Arfmann and Barbe, 2014; Ketoeva et al., 2019).

Last but not least, customer behavior should be thoroughly considered in providing higher labor productivity. Sibley et al. (1992) stated that business firms had placed remarkable attention on competitors and internal operations for achieving better performance which omitted the importance of customers – the buying force in the market. However, customer satisfaction can be the source of labor productivity improvement by creating financial success. Ford and Heaton (2001) proposed the idea that customers should be treated as the “quasi-employees” of the firms. The service users can actively participate in the organizational operations in terms of quality-agents, consultants, guest supervision which would increase the service provider's productivity, especially in labor productivity (lower cost, higher efficiency) (Anitsal and Schumann, 2007). More importantly, customers contribute to the process of creating value added to the service conceptualized as the value an organization adds to resources in the process of transforming them into a product or service and is therefore able to charge a premium for it (Simpao, 2018). Therefore, this brings about better labor productivity in terms of higher earnings for firms. Importantly, social distance plays critical part in influencing on labour productivity during COVID-19 pandemic, especially in modern services like ride-hailing. Due to the fourth wave of novel coronavirus disease outbreak, several social distance policies and lockdown campaigns would be imposed on Hanoi. During the lockdown, people must stay at home and only go out if very necessary. Non-essential businesses and public transportation would be suspended from operation (Ministry of Industry and Trade, 2021). Notably, people are restricted in lockdown area and cannot go to work as usual. In addition, several people might get job loss due to economic decline. On one hand, social distancing avoids the direct contacts among people and reduce the potential cross-transmission of coronavirus among people (Sun and Zhai, 2020). On the other hands, social distance is not suitable on the longer term because this policy disrupts both economic and social context (Voko and Pitter, 2020). As a result, social distance - an emerging policy in the flow of COVID-19 epidemic might bring significant impact on labour productivity.

In conclusion, labor productivity improvement should be achieved via several important determinants. With the fact that there is a shortage of researches about labor productivity in ride-hailing service, the mentioned influencing factors should be applied in Ruch and Hershauer (1974) framework which is described in the following section.

Ride-hailing service

Transportation is considered to be one of the most essential services in life. Traditionally, there are several modes of transport such as air, rail, water, road, ... Together with the development of technology, electronic device has become one of the significant things in shifting traditional transportation to online transportation (Burhanuddin et al., 2018). At present, one of the most popular online transports is ride-hailing service. In particular, a ride-hailing service or an e-hailing service is a service that matches passengers with private drivers via websites and mobile applications by utilizing a location sharing system (Ubaidillah et al., 2019).

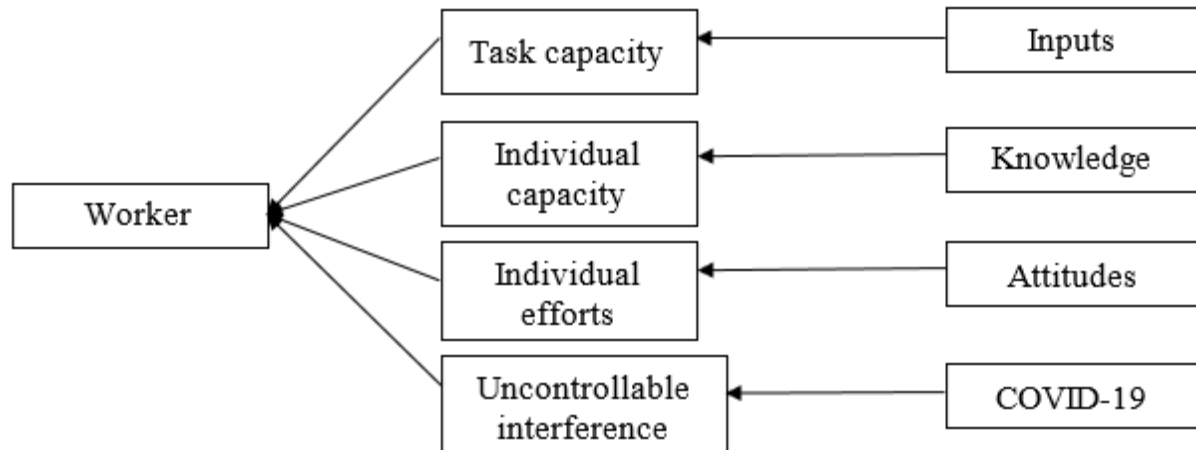
As such, in this millennial, online transportation business plays a critical part in modern life due to its simplicity and helpfulness. In this system, rides are readily available and come to the right customers at the right time (Burhanuddin et al., 2018). Besides, the presence of ride-hailing service helps drivers to approach customers easier and utilize their free time (Burhanuddin et al., 2018). Consequently, through ride-hailing service, everyone is able to fully utilize their resources through the act of sharing, renting, subscribing or donating (Hawapi et al., 2017).

ANALYTICAL FRAMEWORK

Research model

In this study, the conceptual framework is originated from the worker productivity model of Ruch and Hershauer (1974). This model has been upgraded gradually and still been adopted by modern researchers. As stated, the labor productivity is under impact by 4 pillars, namely: (1) Task capacity – inputs; (2) Individual capacity – knowledge and skills, (3) Individual efforts – attitudes and (4) Uncontrollable interference.

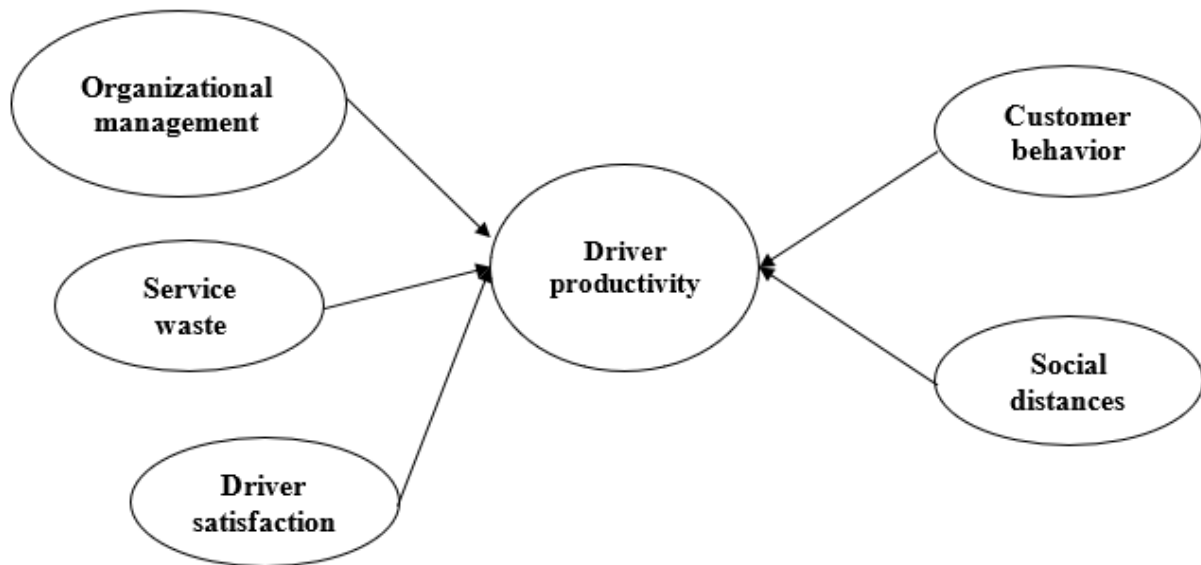
Figure 1. Worker productivity model by Ruch and Hershauer (1974)



The worker productivity has been utilized and updated in light of the researches from Aral et al. (2012) and Diwas (2020) with large modifications. In this study, the authors refer the 4 pillars for 6 different dimensions.

Firstly, the task capacity can be investigated through inputs for driver productivity. This study includes organizational management as important input for task capacity. Management from the enterprise involves planning and organizing function (Alrowahi and Tariq, 2020) which allocates the works for drivers. Moreover, customers are considered to be vital part of driver productivity as the buyer side makes the orders and their decision would directly affect the driver's activities (Almunawar et al., 2020). Service waste can be included in individual capacity as the abilities of drivers may help them avoid wastage and increase productivity. Besides, driver satisfaction can represent the attitude of the drivers and would be another determinant of driver productivity. Last but not least, the authors consider the effect of COVID-19 pandemic on driver productivity in ride-hailing service via the variable "Social distances" – refers to the period that Hanoi is in quarantine period and this would be the "uncontrollable interference" as COVID-19 suddenly emerged in Vietnam. The proposed research model is depicted as follows:

Figure 2. Proposed research model



Hypotheses statement

Organizational management (OM): OM can be defined as the process of planning, organization, leading and controlling the works. The drivers are considered to be the human capital of technology-based transportation; therefore, the OM should have impact on their productivity. Damanhoury and Rana (2017) indicated that work environment, training, incentives, employee's satisfaction, work environment which are also included in management practices in companies, contribute to the process of increasing labor productivity. OM in ride-hailing service may relate to the supervising policies that enterprises place on the drivers which may impact on the driver wages, compensation and working effort (Nastiti, 2016). Generally, OM should be the influencing factors of driver productivity in ride-hailing service.

H1: OM has significant impact on technology-based driver's productivity under COVID-19 pandemic in Vietnam

Service waste (SW): SW refers to the wasted time and efforts that drivers may encounter in their working days. Scholars have indicated that drivers have difficulties in pursuing their works due to problems in big cities such as traffic congestions (Agarwal et al., 2019) and due to the technology, there may arise the technical problems as system failure or connection loss (Fielbaum and Tirachini, 2020). Therefore, the challenges would lengthen the service time for drivers to complete the orders. This would be considered as waste in business and eliminating the waste can possibly increase the driver productivity.

H2: SW has significant impact on technology-based driver's productivity under COVID-19 pandemic in Vietnam

Customer behavior (CB): Customers are increasingly important in business activities, especially on technology-based application. Due to the interactive feature, customers can have feedbacks and complaints about service quality (Lee et al., 2017). Consequently, drivers may face difficulties in satisfying customers and this would be a major cause of decreasing the productivity. Moreover, in ride-hailing services, customers begin the ride and have the right to cancel the orders. Or in other words, customers of ride-hailing services are in superior position and their decision would directly affect the driver's activities (Almunawar et al., 2020). Generally, CB should positively or negatively impact driver productivity.

H3: CB has significant impact on technology-based driver's productivity under COVID-19 pandemic in Vietnam

Driver satisfaction (DS): Employee satisfaction would possibly increase the performance of the organization (Belorgey et al., 2006). Similar to the philosophy, driver satisfaction may have strong impact on the quality of ride-hailing service and particularly, provides influence on driver productivity (Böckerman and Ilmakunnas, 2010). Fielbaum and Tirachini (2020) established scoreboard for driver satisfaction and confirmed the relationship between high-scored drivers and the increase in their productivity. Therefore, DS should be included in the research model.

H4: DS has significant impact on technology-based driver's productivity under COVID-19 pandemic in Vietnam

Social distances (SD): Social distance is a situational variable. As COVID-19 pandemic spread out, countries have to implement lockdowns periods when people are required to stay at home. Ride-hailing travel was significantly reduced during the pandemic (Du and Rakha, 2020). Inversely, the freight shipping process may be reliant on ride-hailing service in the lockdown periods or customers should switch their intention to ride-hailing service during the COVID-19 pandemic, which would uptake the driver productivity in case of large demands and lower supply (smaller numbers of drivers) (Dzisi et al., 2021). SD can represent the impact of COVID-19 pandemic on the driver productivity

H5: SD has significant impact on technology-based driver's productivity under COVID-19 pandemic in Vietnam

METHODOLOGY

Sampling and Data Collection

With a view to investigating the relationship between contributing factors and driver productivity in the COVID-19 pandemic, a questionnaire is proposed to collect opinions and

behaviour of target technology-based drivers towards this matter. The target population is Vietnamese technology-based drivers, especially in Hanoi. Due to the impact of epidemic time, the sample is chosen basing on convenient sampling through online survey questionnaire, which is launching through online platforms. Importantly, it must be compliant with the balance of age, gender and income in order to ensure the reliability of sample size. As consequence, a total of 392 technology-based drivers has joined this survey from March to Jun 2021. Finally, 370 usable respondents are retained for research measurement. This number of respondents are valid enough for quantitative analysis because it is over 5 times higher than number of item scale (Hair et al., 2013).

Research measurement

To measure driver productivity, five scales are constructed from the worker productivity model of Ruch and Hershauer (1974), which are (1) Organizational management, (2) Service waste, (3) Driver Satisfaction, (4) Customer behaviour, (5) Social distance. Five scales of this study are composed to ask about the extent respondent agree with given statements by a five-point Likert scale from Strong Disagree (1) to Strongly Agree (5). The final question items of technology-based driver include 38 items. In general, the first questionnaire section are about significant factors having influence on technology-based driver productivity in the COVID-19, while the second section refers to driver's demographic information. Valid data is analyzed through the following tests: Descriptive analysis, Reliability test, Exploratory Factor analysis, Multiple regression analysis.

RESEARCH RESULTS

Demographic analysis

The statistical results described in table 1 show:

- In regards to respondents, 79% of them are male and belongs to the group of 20-29 years old (35%), which is understandable because in Asian country like Vietnam, male is likely to work as technology-based drivers and the age of 20-29 is easier to work in technology field.
- In term of experiences, it is quite balanced among the percentage of 4 groups of technology-based drivers. A third of them works in this field from 1 to 2 years, while the number of under 1-year drivers and about 2–3-year drivers are around 25%. Besides, around 20% of respondents works as technology-based drivers over 3 years.

- Regards to personal income (per month), half of drivers can earn 200 USD – 500 USD, followed by over 500 USD and then under 200 USD.

Table 1 - Overall respondent’s demographic

	Frequency	Percent %		Frequency	Percent %
Gender			Income (per month)		
Female	60	16%	Under 200 USD	37	10%
Male	292	79%	200 USD – 500 USD	203	55%
Prefer not to say	18	5%	Over 500 USD	130	35%
Age			Experience		
20 – 29	129	35%	Under 1 year	92	25%
30 – 39	104	28%	About 1 to 2 years	112	30%
40 - 49	82	22%	About 2 to 3 years	91	25%
Over 49	55	15%	Over 3 years	75	20%

Descriptive analysis and Reliability test

According to the result of reliability test, it is recognized that the mean for most constructs of framework is from 3.5 to 4.3, which shows the high compliance of technology-based drivers with these statements. Especially, almost items of “social distance” factor have high mean value, in which item SD2 (*Social distance campaigns affect customer readiness to book service*), SD5 (*Drivers are restricted in lockdown area and cannot go to work*) have mean value of 4.52 and 4.56 respectively. Moreover, the mean value of item CB5 (*Drivers have received outer ride-hailing application orders from customers*) is 4.25 and item SW7 (*The ride-hailing application assigns drivers are far away from customers*) is 4.17, as such, the productivity of driver is mostly impacted by customer behaviour, service waste and social distance (appendix).

Besides, all items have high Cronbach’s alpha (over 0.7) and high coefficient of item-to- total correlation (0.5 – 0.8), which suggest the high correlating of these items and confirm the consistency of the measurement variables (appendix). With these results, these factors of this study are mostly reliable and suitable for next analyses.

Exploratory factor analysis

Table 2 - KMO and Bartlett’s Test Result

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.920
Bartlett's Test of Sphericity	Approx. Chi-Square	4730,305
	df	129
	Sig.	,000

In general, the KMO measure of 0.920 being higher than the minimum level of 0.5 is considered as marvellous statistics (table 2). Moreover, the significance of Bartlett's test of Sphericity is 0.000. As a result, the dataset is appropriate for factor analysis.

In term of exploratory factor analysis, the ideal factor loading is 0.35 because this test has 370 samples (Hair et al., 2013). After running initial step of factor analysis with the use of varimax rotation, 38 items are summarized to six underlying factors. However, item OE3 and OR5 had cross factor loading below 0.35 meaning that these variables are removed from the scale. When running final factor analysis, 32 items are stayed in 6 underlying factors and all items are strongly loaded in particular factors, meeting the requirements of convergent and discriminant validity (Cohen et al., 1992).

Table 3 - Rotated Component Matrix for final step

	Component					
	1	2	3	4	5	6
OM1		.706				
OM2		.763				
OM3		.785				
OM4		.674				
OM5		.737				
OM7		.697				
SW1				.718		
SW2				.724		
SW7				.737		
SW6				.721		
SW7				.692		
SW8				.661		
DS2			.742			
DS3			.787			
DS4			.806			
DS5			.792			
DS6			.789			
CB1						.762
CB2						.725
CB3						.558
CB5						.581
CB6						.596
SD1	.748					
SD2	.651					
SD3	.736					
SD4	.725					
SD5	.706					
DP1					.732	
DP3					.693	
DP4					.709	
DP5					.690	
DP6					.683	

Multiple regression analysis

Pearson Correlations

Table 4 - Pearson Correlation among independent and dependent variables

		OM	SW	DS	CB	SD	DP
DP	Pearson	0.515	-0.551	0.598	0.680	-0.488	1
	Sig	0.000	0.000	0.000	0.000	0.000	0.000

Note: Correlation is all significant at the 0.01 level (2-tailed)

The Pearson Correlation result of this paper indicates that organizational management, driver satisfaction and customer behaviour are positively correlated to worker productivity in Vietnamese ride-hailing services. By contrast, service waste and social distance have negative correlation to worker productivity in Vietnamese ride-hailing services. Particularly, the value of all correlation is smaller than 0.8; thus, there is no multicollinearity among the independent variables (Gujarati, 2004).

Regression model

Table 5 - Regression model result of model 1

	Standardized Coefficient Beta	Sig.	VIF
Organizational Management	.157	.079	2.319
Service waste	-.419	.000	1.653
Driver satisfaction	.300	.082	1.926
Customer behaviour	.307	.002	1.629
Social Distance	-.392	.000	1.730
R	.750		
R Square	.662		
Adjusted R Square	.658		
Model Significance	.000		

Overall, the R value is 0.750 revealing a high degree of correlation. The value of adjusted R square is 0.658, hence, it can be concluded that driver productivity in Vietnam ride-hailing during the COVID-19 pandemic can be explained by 60.5% of organizational management, service waste, customer behaviour, driver satisfaction, and social distance. In addition, with the significant value is 0.000 (lower than 0.05), this model is meaningful enough in predicting the outcome variables.

Regards to independent factors, the coefficient of *service waste*, *customer behaviour* and *social distance* are significant at p-values lower than 0.05, at 0.000, 0.002, and 0.000 respectively. Furthermore, values of the standardized coefficient of three abovementioned factors are -0.419, 0.307 and -0.392 respectively. In other words, the p-values of *organizational*

management and *driver satisfaction* are all over than 0.05, meaning that these factors have no significant impact on Vietnamese technology-based drivers during COVID-19 pandemic.

As discussed above, it can be concluded that **Hypothesis 2, Hypothesis 3 and Hypothesis 5** and are **supported**; while Hypothesis 1 and Hypothesis 4 are rejected. Consequently, the findings confirm the literature that, improvements in customer behaviour can be positively beneficial, while a reduction in service waste and social distance can be positively beneficial to technology-based driver productivity during the COVID-19 pandemic. The ratio of each independent factors is shown in table 6.

FINDINGS AND DISCUSSIONS

Table 6 - The order of influence level

Factor	Beta	The influence percentage	The order of influence level
Service waste (SW)	-0.419	37.48	1
Social Distance (SD)	-0.392	35.06	2
Customer behaviour (CB)	0.307	27.46	3

Firstly, social distance does affect the driver productivity. This would be in-line with the idea that COVID-19 worsens the economic conditions and brings about negative impact for technology-based drivers. Or in the words, labor productivity in general and driver productivity in particular can be decreased due to lockdown campaigns. Chebly et al. (2020) considered the level of productive of labor after the COVID-19 pandemic as the nature of many works has been radically changed by social distancing campaigns. “Offline to online” should be a striking trend, however, switching the working conditions would result in decrease in labor productivity (Bairoliya and Imrohorglu, 2020; Radulescu, 2020). However, the driver productivity is inversely impacted by COVID-19 lockdowns, meaning that the perception of technology-based drivers is at high level of precaution for the deadly pandemic. Besides, SD reduced the number of traffics and number of food stores (takeaway shipping), therefore, the demands would be lower and consequently, driver productivity followed the downward movement.

More interestingly, service waste (SW) plays an important part in determining driver productivity. According to the theory of lean management, there are 8 types of waste (Pieńkowski, 2014), however, in this study, SW refers to human-related service waste, particularly Motions, Human factors, Extra-processing and defects. López-Ortega and Saloma-Velazquez (2002) identified personal factors as an influencing determinant of labor productivity and this is in the center of improvement process. Therefore, from the driver’s

perspective, if they manage their service operations and complete without mistakes, they would possibly increase the productivity. More particularly, Bekr (2016) indicated that there are 5 labor-related waste that reduce labor productivity, namely: (1) Lack of skilled labor, (2) Lack of labor in the market, (3) Work overtime, (4) Tool shortage, (5) Labor absenteeism. Whereas the labor absenteeism significantly influences the productivity due to lack of hours working (lower input and poorer output). Overall, eliminating SW would be considered as an effective strategy in improving labor productivity or driver productivity (Clark et al., 2014; Kadarova and Demecko, 2016).

It is common knowledge that customer participation to the service operations is gradually developing (Mustak et al., 2013). The third finding of this study highlights the importance of the service buyer in this process. Customer behavior contributes significantly to the level of productive that the driver become in service delivering. With regards to the technology advancements, the ride-hailing application is able to get feedbacks from customers. Therefore, it would accept the threat from "word-of-mouth" representing customer-to-customer reviews and customer-to-business interactions which would considerably impact the customer behavior of re-purchasing service (Anitsal and Schumann, 2007; Merlo et al., 2014; Wijaya et al., 2019). The increase/ decrease of customer quantity should directly influence the driver productivity. Therefore, CB can be regarded as an essential determinant of technology-based driver productivity in ride-hailing service.

Last but not least, to understand thoroughly about driver productivity, the two least-impacted factors, namely: Organizational management (OM) and driver satisfaction (DS) would be mentioned despite the low coefficients. For OM, drivers and ride-hailing enterprises are considered to be "co-partners" and the enterprises only charges the drivers fee on every ride they made. Therefore, it could not create management style or restrictions on drivers' activities and in the driver's perception, their productivity may not be affected by OM. And for DS, the majority of drivers (above 90%) answered "satisfied" when being asked about their idea about the ride-hailing enterprises. Therefore, driver's perception tends to be towards satisfaction and this makes the low coefficient value.

According to the above findings, major implications can be suggested for improving driver productivity during and after COVID-19 pandemic. It is once more revealed that lockdown campaigns due to epidemic prevention has significant impact on technological-based drivers as well as other professions. Not only the driver productivity but also their health, risk of getting infected or stores closure can be affected by lockdown campaigns. Consequently, the drivers should carefully consider their working in epidemic period. Moreover, service waste is

interestingly found to be one major hindrance of driver productivity. These wastes originate from uncorrected procedures or technological mismatch in drivers and enterprises. Therefore, it is high time that ride-hailing enterprises should systemize their labor force with qualifications, certificates or trainings in technology and service waste management to enhance the driver productivity. Once the productivity has been gained, the operation efficiency would be directly increased. More strikingly, customer behavior can be the source for troublesome issues due to the fact that ride-hailing users are subjected to be interactive and active so that their behavior should be spreading widely if they are not satisfied by the delivered service. The consequences of this can be lower demands, lower sale revenue, smaller number of rides ... Especially in the time of COVID-19 pandemic, customer behavior should be considered with higher care because users are requiring higher quality of ride-hailing service (higher safety, higher reliability ...).

Conclusively, driver productivity is remarkably impacted by lockdown campaigns, service waste and customer behaviors in the time of COVID-19 pandemic. Organizational management and driver satisfaction provide slight effects; however, the two determinants should not be ignored in the process of improving technology-based driver productivity.

LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

Limitations and recommendations

Due to the author's efforts, there are several limitations affecting the research results. Firstly, this study was conducted in the first half of 2021 and it was sometimes stopped because of COVID-19 impact in Hanoi. The prolonged research time may lead to changes in driver's perception. Moreover, the research for driver productivity only considers the drivers monthly working for one ride-hailing enterprise. In reality, drivers can be active in participating in more than one enterprise, however, they are confidential about this sharing. Last but not least, as the participants require anonymous answers, therefore, different ride-hailing enterprise may not be counted in this study. Drivers of Grab, Be, Fast Go, My Go ... are not sorted out.

In further studies, it is suggested that the researchers may base on the limitations for conducting more thorough studies, especially in the clarifications of ride-hailing enterprises. The findings would be focus on the different in driver productivity of these enterprise. Besides, driver productivity can be compared to traditional transportation (motorbike for rent) in Vietnam in order to witness development trend.

Conclusions

This study considers the driver productivity in ride-hailing service with inner-city route and empirical results taken from Hanoi capital of Vietnam. During epidemic period, there have been major changes in the activities and the technology-based drivers are not exceptional. The main consideration is the driver productivity which measures how efficient they operate under COVID-19 pandemic and the findings identify: social distance, service waste and customer behaviors have significant influence on the driver productivity. On the other hand, organizational management and driver satisfaction affects the driver productivity at a modest level. These findings would contribute directly to the recovery strategies for ride-hailing service after the COVID-19 pandemic and the new normal stage of the economy should be established. Via enhancing driver productivity, the operations of ride-hailing service can be improvised, improved and targeted at higher level of performance.

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Appendix: Descriptive and reliability analysis of research samples

No	Factors and criteria	Mean	Cronbach's Alpha	Corrected Items – Total correlation
Organizational Management - OM		3.50	0.724	
OM1	Ride-hailing enterprise provides support for improving driver productivity	3.60	0.709	0.627
OM2	The activities of ride-hailing are carefully planned and organized by the enterprise	3.63	0.753	0.607
OM3	The enterprise has strong voice in controlling ride-hailing activities	3.90	0.679	0.634
OM4	The ride-hailing enterprise has strong commitment to driver productivity improvement	3.82	0.613	0.537
OM5	The enterprise documents are presented with clear consideration and systematically applied	3.19	0.601	0.635
OM6	The enterprise has thorough check-up for driver's conditions at registration	2.98	0.697	0.548
OM7	The enterprise has strictly managed driver's activities	3.37	0.642	0.668
Service Waste - SW		3.92	0.892	
SW1	Drivers have usually exceeded projected delivering time for customers	4.01	0.801	0.729
SW2	Drivers needs a longer time than expected to move to pick up spots	3.90	0.807	0.706
SW3	There are more drivers than demanded at certain time	3.92	0.821	0.629
SW4	Drivers need too many steps for task approvals	3.73	0.815	0.709
SW5	Drivers need to wait for customers for a longer time than expected	4.13	0.857	0.657
SW6	There are numerous technological failures in the ride-hailing application results in customer loss	3.69	0.746	0.782
SW7	The ride-hailing application assigns drivers are far away from customers	4.17	0.846	0.786
SW8	The ride-hailing application directs the longer route for drivers to follow	3.87	0.739	0.790
Driver Satisfaction - DS		3.72	0.828	
DS1	Drivers feel satisfied about the overall ride-hailing profession	3.62	0.790	0.596
DS2	Drivers feel satisfied about monthly compensation	3.69	0.771	0.519
DS3	Drivers feel satisfied about the ride-hailing enterprise insurance policies	3.37	0.726	0.512

DS4	The rate of percentage among drivers is remained at high value annually	3.98	0.806	0.653
DS5	Drivers are supported by changes in technology application	4.19	0.773	0.641
DS6	Drivers are willing to pursuit the job for a long time	3.52	0.723	0.654
Customer Behaviour - CB		3.8	0.743	
CB1	Drivers have more than 4-star rated profile	4.01	0.680	0.658
CB2	Drivers receive less than 1 complain per day by customers	3.74	0.731	0.634
CB3	Drivers have more than 1 ride tip per day by customers	3.65	0.703	0.656
CB4	Drivers are not penalized by ride-hailing enterprise for mis-delivery	3.03	0.718	0.682
CB5	Drivers have received outer ride-hailing application orders from customers	4.23	0.735	0.531
CB6	Drivers' percept that customer participation is important in ride-hailing service	4.14	0.740	0.538
Social Distance - SD		4.37	0.705	
SD1	Social distance campaigns are applied too often recently	4.07	0.701	0.525
SD2	Social distance campaigns reduce the number of orders per day	4.34	0.623	0.505
SD3	Social distance campaigns make moving inner city more difficult	4.37	0.653	0.601
SD4	Social distance campaigns affect customer readiness to book service	4.52	0.689	0.583
SD5	Drivers are restricted in lockdown area and cannot go to work	4.56	0.618	0.591
Driver Productivity - DP		4.17	0.813	
DP1	Driver productivity improvement is important	4.29	0.792	0.609
DP3	The number of customers gets larger annually	4.32	0.773	0.603
DP4	The number of drivers gets larger annually	4.30	0.729	0.649
DP5	Time for completing orders is reduced gradually	3.86	0.720	0.594
DP6	Drivers find it easy to use ride-hailing application	4.17	0.718	0.529
DP7	Driver's earnings increase annually	4.12	0.712	0.521