

Public Perception on the Performance of Bus Services During Different Phases of Movement Control Order (MCO)

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Abstract: Covid-19 pandemic that has been started since December 2019 affects the ridership of public bus transportation due to fear of contamination. Hence, this research was conducted to measure the public perception on bus service performance before and during pandemic within bus passengers at Johor. In order to assess bus passengers' perception, online questionnaire survey was conducted with sample size of 102. The findings were analyzed by descriptive statistics, Spearman's correlation analysis and paired sample t test as well as ranking method. Based on the paired sample t test, the five utmost challenges faced by bus passengers are bus arrival late than schedule, unpleasant cleanliness of bus interior, seats and windows, risky travel in bus, longer average waiting time at bus stop and insecure condition of bus stop and bus. The most crucial challenge was determined to be the bus arrival later than schedule which was determined using a ranking method.

Keywords: Covid-19, Public Transportation, Bus Passengers' Perception, Bus Performance

1. Introduction

A case of novel coronavirus pneumonia (Covid-19) was reported in Wuhan, China on 1 December 2019 and consequently a public health emergency of international concern was provoked. The World Health Organization (WHO) classified Covid-19 as a pandemic on 11 March 2020 [1]. Malaysia's Prime Minister Muhyiddin Yassin made a televised speech on 16 March 2020 to declare a Movement Control Order (MCO) for Malaysia as a prevention measure in reaction to the country's Covid-19 pandemic. Since then, six phases of Movement Control Order were experienced by Malaysia with all the stringent steps suggested by the World Health Organization (WHO) to effectively contain the outbreak [2]. Bus services act as a dominant public transport mode in most developing countries. For instance, the most available public transit in Malaysia, especially Johor Bahru is bus services [3]. Covid-19 has significantly altered the situation of public transit system and its benefits. The use of bus services has been restricted or prohibited in accordance with restrictions on human mobility because it has been identified that bus services can be a vector for transmission of infection in densely populated areas [4].

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In India, the third week of March is considered as the transition phase of Covid-19 outbreak and during this period, pandemic fear started influencing the daily travel behavior of bus passengers, either directly or psychologically [5]. Service quality and service performance is related to a series of attributes describing the Public Transport (PT) service. In order to design appropriate transport strategies, operating companies should monitor the perceptions of passengers about the bus service every year or with a 6-month frequency. These perceptions are usually measured by customer satisfaction surveys and the data collected are used for developing indices providing useful information about the global quality of service and its evolution along the time [6].

Hence, this study was conducted in aim of measuring the perception of bus passengers before and during pandemic and also to identify challenges faced by bus passengers during Movement Control Order (MCO) to adapt changes in bus services operation. The study was focused mainly on general public in selected case study location. So, this research can provide data on bus passenger's impression and expectation on upcoming stages of recovery period of this pandemic.

2. Perception of passengers on public transportation

The transportation service was initiated in order to provide more advantage for people of urban and rural areas to move. Hence, the level of service quality in the public transports determined by the ability of service to meet requirements and desire through people perception [7]. As it is commonly understood that the real service efficiency of the transit system should be considered from the point of view of transit riders, it is important to examine the expectations of bus passengers regarding service performance and to understand the role of these perceptions in their travel decisions in designing market-oriented strategies that make busses more appealing to passengers [8]. Passenger satisfaction from the point of view of transport may result in a decision of expectations prior to travel and experience followed by travel. Service quality is viewed as a significant determinant of customer demand to define the value service quality to customers' satisfaction [9].

Service quality is an assessment of how well the level of service offered relates to the needs of the consumer, whereas the quality of service rendered by an agency is consistent with the expectations of the customer [10]. Aspects such as intangibility, heterogeneity and inseparability belong to service quality. This term can also be described as level and direction of difference between user perceptions and expectations [11]. Bus market share has steadily declined, to increase the bus ridership it is important to explore the impact of perceptions of bus service performance on mode choice preference [12]. First is tangible dimension like cleanliness or comfortableness of physical facilities in public transportation. Next is reliability dimension such as punctuality or frequencies. One of the factors that affect transit comfort and convenience is reliability. Reliability depends on the pace and the punctuality of public transit comes on time and is able to fulfill the perception standards of the commuter [9].

3. Methods

The method used for data collection is through a quantitative method which is an online questionnaire and through google form [13]. The survey form comprises 3 sections where section B and C is to evaluate perception based on 5-point Likert scale. The sample size used for this research was 102 based on Slovin's sample size formula [14].

3.1 Reliability test (Pilot study)

The reliability is based on the idea that individual items or sets of items must produce consistent results with the overall questionnaire as per stated in statistical terms. The reliability is much more accurate if the coefficient is found to be equal to or greater than 0.70, the internal consistency based on the value of Cronbach's alpha. The reliability of the questionnaire is based on Cronbach Alpha value, where higher value means the better quality of the items used. This questionnaire was first distributed

to a few respondents to conduct the pilot study. All items used in the survey form were found to have Cronbach Alpha value more than 0.70.

3.2 Descriptive statistics

The descriptive statistics will be used to analyze the section A of questionnaire where it provides basic information about variables in a dataset and features potential relationship between variables. This will represent the respondent profile in the form of frequency, mean and standard deviation. The respondent profile can be identified based on socioeconomic characteristics and trip characteristics. Socio-economic characteristics are gender, age, employment, monthly household income and education level. Trip characteristics are trip purpose on weekdays as well as weekend and frequency of taking the bus in a week.

3.3 Spearman correlation analysis

Spearman correlation is a nonparametric test that is used to measure the degree of association between two variables. The Spearman rank correlation test does not carry any assumptions about the distribution of the data and is the appropriate correlation analysis when the variables are measured on a scale that is at least ordinal [15]. The strength and direction of monotonic association between two variables can be determined by using Spearman's correlation analysis method.

3.4 Paired sample t Test & Ranking method

Data collected from the survey will be analyzed using the Paired sample t Test to obtain the challenges faced by respondents in adapting the bus service system by comparing their perception before Covid-19 and during Covid-19. The challenges then ranked according to the mean score comparison to identify the most crucial challenge faced by bus passengers.

4. Results and Discussion

The results and discussion section presents data and analysis of the study. The questionnaire distributed to respondents after conducting pilot study. The data collected was analyzed using SPSS software and the analysis was done based on the purpose of answering objectives of research. Respondent profile discussed was based on the frequency and percentage of all demographic characteristics.

4.1 Frequency analysis

Frequency analysis was conducted to ascertain if the gathered data in this research was normally distributed and to show which item was the most contributing factor for this research purpose by getting the number of occurrences of each response chosen by respondents. This analysis was done by comparing the grouped variables with one another that falls under two main situations which is before Covid-19 and during Covid-19. The results interpreted are based on Likert scale and mean of the scale range which starts from 1 (strongly disagree) to 5 (strongly agree). Table 4.1 shows the frequency analysis for tangibility.

Based on the frequency obtained for scale of strongly agree, the number of responses for TG1 (before Covid-19) is 19 which is low than TG1 (during Covid-19) with response value of 24. This means that bus condition was found out to be in good condition during MCO rather than before pandemic. For the next item, which is TG2 (before Covid-19), 63 respondents strongly agree for the statement while, for TG2 (during Covid-19) only 20 respondents strongly agree for the statement. This indicates that the bus crowd was declined in numbers during MCO due to fear of pandemic. The items TG3 (before Covid-19) and TG3 (during Covid-19) are observed to have almost similar responses which are 14 and 16, respectively. This means that the interior cleanliness of bus was more concerned to keep the virus spread in control. The frequency tables are interpreted with mean score. The frequency of three items under tangibility dimension was illustrated in bar chart shown in Figure 4.1.

Table 4.1: Frequency Analysis for Tangibility

Tangibility		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Before Covid-19	Bus condition (TG1)	2	13	32	36	19
	Bus crowd (TG2)	1	2	10	26	63
	Interior bus cleanliness (TG3)	4	20	30	34	14
During Covid-19	Bus condition (TG1)	1	5	16	56	24
	Bus crowd (TG2)	19	27	16	20	20
	Interior bus cleanliness (TG3)	2	9	29	46	16

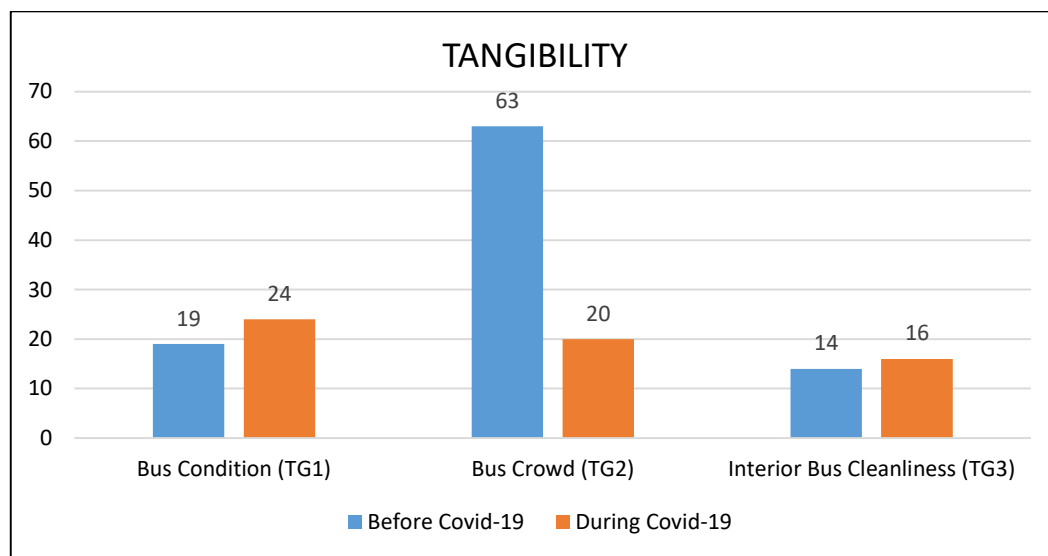


Figure 4.1: Frequency Analysis of Tangibility

4.2 Spearman’s correlation analysis

Spearman’s correlation coefficient is used to identify and test the strength of a relationship between two sets of data. This analysis will assess how well the relationship between two variables can be described using monotonic function. If there are no repeated data values, a perfect Spearman correlation of +1 or -1 occurs when each of the variables is a perfect monotonic function of the other. Table 4.18 shows the strength of relationship according to the value of correlation coefficient (r) [15].

Table 4.2: Interpretation table of Spearman Rank-Order Correlation Coefficient

Spearman, (r_s)	Strength of Correlation
≥ 0.70	Very strong relationship
0.40 – 0.69	Strong relationship
0.30 – 0.39	Moderate relationship
0.20 – 0.29	Weak relationship
0.01 – 0.19	No / negligible relationship

This analysis been conducted to identify whether the socio-economic characteristics have impact on trip characteristics of respondents. The socio-economic characteristics are gender, age, employment, monthly household income and education level. The trip characteristics are main trip purpose on weekdays, main trip purpose on weekends and frequency of taking bus in a week. These two demographic factors been correlated to identify the monotonic relationship between them.

The first factor been correlated with trip characteristics is gender. It shows that the gender has no significant effect in trip purpose of respondents on weekdays or weekends and frequency of taking bus in a week. The next socio-economic factor is age. Age is also having no relationship with the trip characteristics. Next is, the employment factor. It was identified that employment factor has significant relationship with main trip purpose of respondents on both weekdays and weekends. Since the correlation value is positive, it can be concluded that the students are using the bus service more frequently on both weekdays and weekends compared to other type of employment groups listed. This is because the correlation increases across the employment groups listed from employed to students. Besides, the relationship strength for main trip purpose on weekdays is moderately strong while the relationship strength for main trip purpose on weekends is weak based on the Table 4.18.

Following factor that been correlated with trip characteristics is monthly household income. It has been identified that there is a significant relationship between monthly household income and main trip purpose on both weekdays and weekends. Moreover, the correlation has been produced with negative value because as the monthly household income increases, the main trip purpose on both weekdays and weekends declines in value. This describes that the bus passengers are mostly with income below than RM 1000 and with no income as well. The relationship strength for main trip purpose on weekdays is moderately strong while the relationship strength for main trip purpose on weekends is strong relationship. Next factor is education level, and it has significant relationship with frequency of taking bus in a week with weak strength of relationship and negative correlation value. This describes that the bus passengers are mostly educated from or pursuing study at primary school. Meanwhile, the trip purpose has no significant relationship between education level.

Table 4.3: Correlation between socio-economic characteristics and trip characteristics of respondents

Spearman Correlation	Main trip purpose on weekdays		Main trip purpose on weekends		Frequency of taking bus in a week	
	r_s	P	r_s	P	r_s	P
Gender	0.157	0.114	0.039	0.697	0.159	0.111
Age	0.057	0.567	-0.115	0.250	0.057	0.571
Employment	0.342**	0.000	0.280**	0.004	-0.149	0.136
Monthly household income	-0.376**	0.000	-0.405**	0.000	0.086	0.392
Education level	-0.086	0.392	0.062	0.538	-0.267**	0.007

**** Correlation is significant at the 0.01 level(2-tailed)**

4.3 Paired samples t-Test

The identification of challenge faced by bus passengers during covid-19 was assessed based on the section B and section C of questionnaire. This analysis is based on comparing the mean score value obtained for each item observed before covid-19 and during covid-19 to identify the challenges faced by bus passengers to adapt the new norm of bus services. The items observed are divided into five constructs which are tangibility, reliability, responsiveness, assurance, and empathy.

There are 3 items in tangibility and reliability dimensions separately for before and during pandemic conditions. While for responsiveness, assurance and empathy dimensions, there are 2 items for both before and during pandemic conditions. All the items have been paired using SPSS software to analyse the paired differences value of mean and 95% confidence interval of the differences for mean values. The significance of the mean difference in both variables was also monitored and the hypothesis was created to draw conclusions on the significance value obtained. The significance level been used to draw the conclusion is 0.005. The results of analysis been tabulated in the Table 4.20 below.

Hypothesis:

Null hypothesis, H0: The scores before Covid-19 and During Covid-19 are significantly same.

Alternate hypothesis, H1: The scores before Covid-19 and During Covid-19 are significantly different.

Table 4.4: Result of Paired sample t Test

Variables	Pair	Items	Mean	95% Confidence Interval of the Difference		Sig. (2-tailed)
				Lower	Upper	
Tangibility	1	Bus condition before Covid-19 - Bus condition during Covid-19	-0.39	-0.60	-0.19	0.000
	2	Bus crowd before Covid-19 - Bus crowd during Covid-19	1.50	1.17	1.83	0.000
	3	Interior bus cleanliness before Covid-19 - Interior bus cleanliness during Covid-19	-0.30	-0.52	-0.09	0.006
Reliability	4	Average waiting time before Covid-19 - Average waiting time during Covid-19	-0.50	-0.78	-0.22	0.008
	5	Bus service information before Covid-19 - Bus service information during Covid-19	-0.54	-0.81	-0.27	0.000
	6	Bus arrival before Covid-19 - Bus arrival during Covid-19	0.42	0.19	0.66	0.010
Responsiveness	7	Real time information before Covid-19 - Real time information during Covid-19	-0.75	-1.00	-0.51	0.000

	8	Bus driver's behavior before Covid-19 - Bus driver's behavior during Covid-19	-0.63	-0.86	-0.40	0.000
Assurance	9	Safe travel before Covid-19 - Safe travel during Covid-19	0.15	-0.10	0.39	0.239
	10	Safe bus stop before Covid-19 - Safe bus stop during Covid-19	0.12	-0.12	0.35	0.326
Empathy	11	Easy ticket purchasing before Covid-19 –Easy ticket purchasing during Covid-19	-0.08	-0.29	0.13	0.460
	12	Travel cost affordable before Covid-19 - Travel cost affordable during Covid-19	-0.15	-0.36	0.07	0.177

Based on the results obtained, the statements with negative scores during covid-19 been chosen to identify the challenges based on significance level. The negative score statement chosen based on the dominating responses within strongly agree and disagree for each statement. The statements with negative scores are cleanliness of bus interior, seats and windows are satisfying, average waiting time at bus stop is less than 10 minutes, the bus will arrive late than schedule, it feels safe to travel in bus, and the bus stop and bus conditions are safe. The significance level for these statements is recorded. The significance value for first statement, interior bus cleanliness is 0.006 which shows that the null hypothesis is rejected and there is significant different between scores before and during covid-19.

Next statement is average waiting time at bus stop is less than 10 minutes where it has significance value of 0.008. This shows that there is significant different between scores before and during covid-19. Following statement is the bus will arrive late than schedule with significance value of 0.010 which explains that there is significant different between scores before and during covid-19. Next statement with negative score is it feels safe to travel in bus with significance value of 0.239 which shows that there is significant different between scores before and during covid-19. Following statement is the bus stop and bus conditions are safe with significance value of 0.326 which shows that there is significant different between scores before and during covid-19.

4.4 Ranking method

Hence, it can be concluded that there are five utmost challenges faced by bus passengers during covid-19 based on the paired samples t test. The mean score of these five statements before and during covid-19 has been compared to identify the most crucial challenge. Means score (M.S) obtained is based on strongly agree and disagree scale. The comparison of mean scores been tabulated in Table 4.21. Those challenges been ranked to identify the most crucial challenge and the ranking of the challenges is shown in Table 4.22. Based on the ranking, it can be seen that the most crucial challenge faced by bus passengers is under reliability construct which is bus arrival late than schedule.

Table 4.5: Mean score comparison

Statements	M.S Before Covid-19	M.S During Covid-19
Cleanliness of bus interior, seats and windows are satisfying	3.64	3.33
Average waiting time at bus stop is less than 10 minutes	2.75	3.25
The bus will arrive late than schedule	3.27	3.70
It feels safe to travel in bus	3.45	3.30
The bus stop and bus conditions are safe	3.33	3.22

Table 4.6: Five challenges faced by bus passengers during Covid-19

No	Challenges faced by bus passengers during Covid-19	Ranking
1.	The bus will arrive late than schedule	1
2.	Cleanliness of bus interior, seats and windows are unsatisfying	2
3.	It feels unsafe to travel in bus	3
4.	Average waiting time at bus stop is more than 10 minutes	4
5.	The bus stop and bus conditions are not safe	5

5. Conclusion

In sum, the purpose of this research was found to be achieved as the perception of bus passengers before and during Covid-19 was measured using descriptive statistics. The bus service attributes divided into five variables such as tangibility, reliability, responsiveness, assurance, and empathy. The overall score for each variable was obtained by averaging the response to the appropriate items. The means of all the computed items are above 3.00. This is an indication that many of the respondents agreed with the items' statements based on each variable and considered those items as major contributor to evaluate bus service performance. Based on the paired sample t test, five utmost challenges faced by bus passengers during Covid-19 was identified which are bus arrival late than schedule, unpleasant cleanliness of bus interior, seats and windows, risky travel in bus, longer average waiting time at bus stop and insecure condition of bus stop and bus. Subsequently, ranking method used to find the most crucial challenge within these five challenges. It was determined that the most crucial challenge is the bus arrival later than schedule. This study has been able to achieve its objectives, yet it still has weakness that need to be improved due to the problems that arise during the course of this study. Thus, to improve the strength of further study of this chapter suggested to increase the number of questionnaires distributed to other states as well to increase the size of sample. This will further strengthen data obtained. Furthermore, focus on more open-ended answers regarding the bus service performance to identify more factors that effecting their perception towards bus service. Besides, the scope of study should be expanded to other transport users as well to identify their perception on bus service performance.

References

- [1] World Health Organization, “Malaysia: Strong preparedness and leadership for a successful COVID-19 response,” www.who.int, Aug. 2020.
<https://www.who.int/publications/m/item/malaysia-strong-preparedness-and-leadership-for-a-successful-covid-19-response>.
- [2] Z. Li, S. Zhang, X. Liu, M. Kozak, and J. Wen, “Seeing the invisible hand: Underlying effects of COVID-19 on tourists’ behavioral patterns,” *Journal of Destination Marketing & Management*, vol. 18, p. 100502, Dec. 2020, doi: 10.1016/j.jdmm.2020.100502.
- [3] A. Minhans, S. Shahid, and S. A. Hassan, “Assessment of Bus Service-Quality using Passengers’ Perceptions,” *Jurnal Teknologi*, vol. 73, no. 4, 2015, Accessed: Jan. 16, 2021.
[Online]. Available: https://www.academia.edu/20908108/Assessment_of_Bus_Service_Quality_using_Passengers_Perceptions.
- [4] A. Gutiérrez, D. Miravet, and A. Domènech, “COVID-19 and urban public transport services: emerging challenges and research agenda,” *Cities & Health*, pp. 1–4, Aug. 2020, doi: 10.1080/23748834.2020.1804291.
- [5] J. De Vos, “The effect of COVID-19 and subsequent social distancing on travel behavior,” *Transportation Research Interdisciplinary Perspectives*, vol. 5, no. , p. 100121, Apr. 2020, doi: 10.1016/j.trip.2020.100121.
- [6] A. Aloi et al., “Effects of the COVID-19 Lockdown on Urban Mobility: Empirical Evidence from the City of Santander (Spain),” *Sustainability*, vol. 12, no. 9, p. 3870, May 2020, doi: 10.3390/su12093870.
- [7] Z. Zakaria, Z. H. Hussin, M. F. A. Batau, and Z. Zakaria, “Service Quality of Malaysian Public Transports: A Case Study in Malaysia,” *Cross-Cultural Communication*, vol. 6, no. 2, pp. 84–92, Jun. 2010, doi: 10.3968/j.ccc.1923670020100602.010.
- [8] X. Hu, L. Zhao, and W. Wang, “Impact of perceptions of bus service performance on mode choice preference,” *Advances in Mechanical Engineering*, vol. 7, no. 3, p. 168781401557382, Mar. 2015, doi: 10.1177/1687814015573826.
- [9] Md. Ariful. Islam, Md. Mehrab. Hasan, P. Das, and F. Rahman, “Assessing Bus Service Quality Based on Public Perception: A Case Study in Chittagong City,” in *4th International Conference on Civil Engineering for Sustainable Development*, Feb. 2018, vol. 1, no. , p. 5169. [10] G. Veruggio, “The EURON roboethics roadmap,” in *Proc. Humanoids ’06: 6th IEEE-RAS Int. Conf. Humanoid Robots*, 2006, pp. 612–617, doi: 10.1109/ICHR.2006.321337. (Example for conference paper or proceedings with doi number)
- [10] W.-T. Lai and C.-F. Chen, “Behavioral intentions of public transit passengers—The roles of service quality, perceived value, satisfaction and involvement,” *Transport Policy*, vol. 18, no. 2, pp. 318–325, Mar. 2011, doi: 10.1016/j.tranpol.2010.09.003.
- [11] Z. Ponrahono¹, S. Bachok², M. Osman³, M. Ibrahim, amp; Muhammad, and F. Abdullah, “Public Bus Level of Service Performance in Peninsular Malaysia:

- Correlation Analyses on Level of Service (LOS) And Passengers' Satisfaction Level," *Journal of the Malaysian Institute of Planners*, vol. 15, no. 1, 2017, [Online]. Available: <https://www.planningmalaysia.org/index.php/pmj/article/download/238/218>.
- [12] X. Hu, L. Zhao, and W. Wang, "Impact of perceptions of bus service performance on mode choice preference," *Advances in Mechanical Engineering*, vol. 7, no. 3, p. 168781401557382, Mar. 2015, doi: 10.1177/1687814015573826.
- [13] Mahmoud, M., & Hine, J. (2016). Measuring the influence of bus service quality on the perception of users. *Transportation Planning and Technology*, 39(3), 284–299. <https://doi.org/10.1080/03081060.2016.1142224>
- [14] Stephanie Glen, "Slovin's Formula: What is it and When do I use it?," *Statistics How To*, May 14, 2012. <https://www.statisticshowto.com/how-to-use-slovins-formula/>.
- [15] Statstutor, "Spearman's correlation,," Accessed: Jun. 15, 2021. [Online]. Available: <https://www.statstutor.ac.uk/resources/uploaded/spearmans.pdf>.
- [16] L. Leclezio, A. Jansen, V. H. Whittemore, and P. J. de Vries, "Pilot Validation of the Tuberous Sclerosis-Associated Neuropsychiatric Disorders (TAND) Checklist," *Pediatric Neurology*, vol. 52, no. 1, pp. 16–24, Jan. 2015, doi: 10.1016/j.pediatrneurol.2014.10.006.
- [17] M. I. M. Hamzah, F. Juraimi, and A. N. Mansor, "Malaysian Principals' Technology Leadership Practices and Curriculum Management," *Creative Education*, vol. 07, no. 07, pp. 922–930, 2016, doi: 10.4236/ce.2016.77096.