How time value affects the performance of road freight transport operators in Zimbabwe

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Abstract: *Purpose:* The primary purpose of this paper is to investigate whether the Road Freight Transport Sector in Zimbabwe considers the value of time in their operations and how this affects their competitiveness. *Methodology:* This quantitative study involves a survey of 384 randomly selected companies from a population of 1256 registered road freight companies in Zimbabwe. The data collected was analyzed using SPSS. *Results:* The study found that all the registered companies that participated in the research confirmed that the value of time phenomenon was alien to their business practices as they worked on assumptions. They also indicated a loss of business due to customer complaints. *Theoretical Contribution:* This paper contributes to the field by highlighting the importance of considering the value of time in business operations, particularly in the road freight transport sector. It provides empirical evidence supporting the theory that the value of time can significantly impact a firm's competitiveness. *Practical Implications:* The findings of this study have practical implications for companies in the road freight transport sector. The study recommends policy formulation for companies emphasizing standard operating procedures and good time management to enhance competitiveness. This could lead to improved customer satisfaction and business success.

Keywords: competitiveness, value of time, road freight transport, sustainability

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1. Introduction

An overall agreement in logistics literature is that the value of time positively influences competitiveness (Chi, King-lok, Steven, 2012; Song, Ki-Jae, & Yeo, Gitae, 2017). Furthermore, literature has substantiated that competitiveness in the road freight sector is determined by on-time delivery (Kim et al., 2015; Abas & Imam, 2016; LeMahieu et al., 2017). The existing literature further suggests that the value of time is a combination of delivery time, transportation time, and travel time (Izadi et al., 2020; Duan, 2019; Kocatepe et al., 2019; Goenaga et al., 2018; Keya, 2019). Therefore, firms in the road freight sector should ensure they deliver the consignments to their customers on time to enhance organizational competitiveness (Khanchitpol, 2014).

Many studies have been conducted on how travel time, delivery time, and reliability influence firm competitiveness (Maio et al., 2018; Leonov et al., 2016; Laaziz et al., 2019). Several authors, notably Fowkes et al. (2004) and Lyman and Bertini (2008) have emphasized the importance of reliable travel time in freight transport planning and operations. Khalili et al. (2022) asserted that trip reliability positively impacts the competitiveness of firms in the road freight industry. Additionally, Ramdhani, Mnyamana and Karodia (2017) indicated that firms should strive to meet delivery schedules to improve profitability and customer satisfaction. Song et al. (2017) found that time value leads to firm competitiveness. Carlan et al. (2019) echoed similar understandings and claimed that the value of time positively impacts competitiveness. In line with the literature review, the study thus sought to establish if the concept of the value of time in the road freight transport sector was known and applied for organizational competitiveness.

2. Literature review

The value of time in freight transportation typically refers to a monetary value that decision makers (e.g., carriers and shippers) are willing to pay to decrease the transportation time when moving cargo from its origin to its destination. Knowledge of this value enables policymakers to conduct cost-benefit analyses of infrastructure projects and service improvements and forecast traffic demand (de Jong, 2008; Feo et al., 2011). Compared with its counterpart for passenger transportation, the VOT of freight transportation has received far less research attention because of the large number of decision-makers, complicated negotiation processes, and limited data. Until now, except for Hensher et al. (2007), freight choice modelling typically assumed a single individual or enterprise as the sole decision maker (Zhang and Zhu, 2019). Transport costs include not only monetary costs but also time costs. The time cost is not directly measurable, so this paper concerns the method to estimate its value from available information. The development of transport technologies improves the productivity of the transport industry, largely due to the reduction of transport time through an increase in speed. Reduction of transport time has a great benefit on the economy: transport firms (carriers) save labour and capital costs; manufacturing firms (shippers) increase the value of their products; consumers enjoy fast delivery (e.g., increasing availability of fresh foods produced in distant locations). In the longer term, these benefits would be enhanced by modifying the ways of organizing economic activities, changes in the location of firms, reorganization of the supply chain network, introducing more elaborate logistics (e.g., just-in-time system), etc. Previous studies have used four main approaches to measure the value of time (standard deviation, spread, share of delayed shipments, and average delay) but without reaching a common conclusion on which method to use. Similarly, previous studies also differ in what to measure, as delivery, transport, and travel times have been used.

Moreover, VOTs in freight transportation present more heterogeneity, not only because of the diversity of applied definitions of time (Zamparini & Reggiani, 2007a) and the applied calculation methods of VOTs (Rich et al., 2008; Shires and de Jong, 2009) but also because of inherent heterogeneities in freight transportation (e.g., mainly differing shipment sizes and shipment values). Regarding definitions, delivery, transportation, and travel time are commonly used (Massiani, 2003). To date, many studies have explored a considerable number of factors that influence VOTs in specific situations. These studies reported that socioeconomic variables (Zamparini & Reggiani, 2007a), decision-maker types (Shinghal & Fowkes, 2002; Zhang et al., 2018), freight modes (de Jong et al., 2001, 2004; de Jong et al., 2014), transportation distance (Bergkvist & Westin, 2001; Masiero & Hensher, 2012), cargo categories (Winston, 1981a; Shinghal & Fowkes, 2002; de Jong et al., 2004; Rich et al.,

2008), and cargo value (Jovicic, 1998) all affect VOTs. More detail, a 1% increase in GDP per capita (GDPPC) has been reported to imply a 0.68% increase in VOT (Zamparini & Reggiani, 2007a). Moreover, different VOTs apply to exporters, freight forwarders, transporters, and manufacturing factories (Shinghal & Fowkes, 2002).

Due to the differences in cargo characteristics and decision-makers requirements, shipments with diverse VOTs are commonly transported via different modes. Among the four freight modes (air, road, rail, and water), shipments transported by air have the highest VOT, while shipments transported by water have the lowest VOT (de Jong et al., 2004). Meers et al. (2017) suggested that transportation needs to be completed on time to be efficient, highlighting the importance of time for shorter distances. This conclusion has been confirmed from an empirical perspective (Maggi & Rudel, 2005; Rotaris et al., 2012). Few studies focused on freight VOT and typically assume a larger variation in the elasticities of freight VOTs than passenger VOT studies (Rich et al., 2008). Relevant literature reviews addressing freight VOT are less common than those addressing passenger transportation, and only a limited number of studies conducted such an analysis for freight transportation, including de Jong (2000, 2008), Zamparini and Reggiani (2007a), Feo et al. (2011b), and Binsuwadan et al. (2019). More recently, literature reviews have focused more on the willingness to pay for time reliability in freight transportation (Shams et al., 2017b). Zamparini and Reggiani (2007a) conducted pioneering work (the only contribution) on the quantitative study of VOTs in freight transportation.

2.1. Travel time

Travel time is an essential input to cost-benefit analysis, particularly when comparing time savings with other costs and benefits of a project. Traffic forecasting is another area in which travel time is used as an input (De Jong, 2008). In freight and passenger transport, travel time is associated with maximising utility for firms and passengers or workers. This maximisation problem is based on microeconomic theory and is typically implemented using willingness-to-pay surveys and behavioural models to measure the travel time for people and commodities (Zamparini & Reggiani, 2016). Travel time is a key benefit of most freight and passenger transport improvements. In cost-benefit analyses, time savings account for about 80% of the monetary benefit of projects in total in the United Kingdom (Mackie 2001). The freight transport time savings in European countries represent a vital part of this percentage, approximately a third of the time benefits (Massiani, 2003). The development of just-in-time logistics efficiency critically depends on reliable deliveries (Mackelprang & Nair, 2010), partly explaining this attention.

2.2. Transport time

This involves the real duration of transport, which tends to be easily understood since it is commonly a proportional function of distance. Geographical constraints such as weather or technical limitations (e.g., operational speed) directly impact transport time. Transport time on roadways is technically limited to legal speed limits. The limitation of maritime and air concerns fuel economy and design speed. Although rail can accommodate a variety of speeds, schedules impose limited variations.

2.3. Frequency

In road freight, frequency involves the number of departures for a specific time range. The higher the frequency, the better the level of service. However, a high frequency ties up larger vehicles and the risk of lower asset utilization. Distance is also a factor for lower frequency since transport demand tends to decline accordingly. Combining long-distance travel and high frequency is an expensive undertaking for transport providers as more vehicles must be assigned to a specific route, as in the case of maritime container shipping.

2.4. Delivery time

In logistics, delivery time entails delivering goods to business customers at the right time. Transport operators need to sync orders with delivery schedules to ensure on-time delivery. The idea

is to minimize the storage problem and maximize productivity. In addition, it requires close coordination between the players, efficient planning, and just-in-time logistics techniques to ensure that the right products are delivered to the right place at the right time. It can be useful, particularly for businesses that operate in fast-moving or highly competitive markets, where the ability to respond quickly to customer demand can be a key advantage. As effective as Just-in-Time delivery is, it can be difficult to coordinate large shipments efficiently, especially when dealing with shipments that vary in size and destination. Competitiveness in the globalized environment highlights the importance of becoming more efficient in implementing operational and administrative processes in companies to improve customer service levels, lead time, and the quality of products or services and optimize resources (Rodriguez et al., 2015).

3. Research methodology

A positivist philosophy guided the study to spot patterns and make logical deductions. Positivism is based on measurement, control, and systematic observation (Pruzan, 2016; Leavy, 2017). The researchers' main objective was to establish the influence of transport costs on firms' competitiveness in Zimbabwe's road freight sector. This was a case study of 1256 registered road freight companies in Zimbabwe, with Harare as the central hub for their operations. The quantitative research strategy helped researchers analyze data formally and systematically (Creswell, 2007). To obtain a deep understanding of current reality, researchers constructed a model or prototype depicting the requirements, activities, parameters, costs, and organizational processes desirable for the success of the transport costing philosophy in the road freight transport sector (Ralph & Wand 2009:109; Creswell, 2014). The study adopted a cross-sectional survey design because it allowed researchers to use large samples; hence the study's sample size was 384, large enough for a cross-sectional survey to be employed.

Additionally, the cross-sectional design allowed for a large amount of data to be collected once over a short period, giving room for measuring relationships grounded on the study's hypotheses (Creswell, 2014; De Vaus, 2012). The sample size was randomly determined from a population of 1256 registered road freight companies in Zimbabwe. The sample size for this study was determined using the formulae proposed by Krejcie and Morgan (1970);

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

Where:
x^2 = the table value of chi-square for one degree of freedom at the desired confidence level (3.841);
N = the population size.
P = the population proportion (assumed to be 0.50 since this would be the maximum sample size), and
d = the degree of accuracy expressed as a proportion (0.05)

Conferring to Krejcie and Morgan's (1970) formula, the sample size for this study was 384 households at a 95% confidence level. The sample size obtained was consistent with the principle that the sample should be at least 200 to meet the requirements of Maximum Likelihood Estimation (Hair, Ringle, & Sarstedt, 2013). Additionally, the sample size of 384 was also justified following the recommendations by Field (2005) that a minimum sample size of 200 is required to allow statistical analyses such as factor extraction, which was performed in this study. Furthermore, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was done, and the sample was found to be statistically significant for each of the constructs under investigation in the study (Field (2005). Data were analyzed using SPSS, and results were presented in tabular form. All research ethics were complied with.

4. Results and discussions

Table 1 below summarizes the descriptive analysis of the responses for operational costs. There are 6 items that were used to measure the value of time.

Table 1: Descriptive statistics for the value of time

Codes	Items	Mean	Std. Deviation
VOT1	The company does not conduct regular repair and maintenance on its fleet	3.98	1.059
VOT2	The company has an inexperienced and trained workforce	4.26	.781
VOT3	The company does not have a proper route schedule that reduces transportation time	4.10	.906
VOT4	The company profits from delivering all consignments on time	3.94	.965
VOT5	The company has poor customer relationship management which often leads to poor customer satisfaction	4.00	.797
VOT6	The company has a poor risk management mechanism which has increased transportation time	4.28	.782
Averages		**4.09**	**0.881**

Source: Survey data (2022)

Results in Table 1 above showed that the mean responses ranged between 3.98, SD = 1.059 (item VOT1) and 4.28, SD = 0.881 (item VOT6). The mean score was calculated and averaged (overall mean = 4.09; SD = 0.881) to agree out of a possible score of 5 (strongly agree). This implied that firms in the road freight sector agreed that they did not consider the value of time in the costing management practices during the period under study.

The objective of the study was to determine if road freight transport operators and their employees incorporated the value of time in their strategy formulation for organizational competitiveness. Thus, it was hypothesised that,

H1: The value of time has a positive effect on firm competitiveness.

Table 2: Hypothesis test results for the value of time variable

Hypotheses	Hypothesized Relationship	SRW	CR	Remark
H1	Value of time → competitiveness.	0.292	15.174***	Supported

Notes: SRW standardized regression weight, CR critical ratio, ** significant at $p < 0.05$, *** significant at $p < 0.001$

Table 2 above indicated that H_1 was statistically supported. These findings imply sufficient statistical support for direct relationships between the value of time and firm competitiveness (COM). This suggested that the various components of the value of time contributed to company reputation, market share, profitability levels, and customer satisfaction.

The study findings indicated that the value of time positively influenced firm competitiveness. This implied that travel time and reliability influence company's reputation, profitability, customer satisfaction, and market share. Several empirical studies have reached similar findings (Chi, King-lok, Steven, 2012; Song, Ki-Jae, & Yeo, Gitae, 2017) that the value of time positively impacts firm competitiveness. This consolidates the position of this study, which is consistent with a majority of empirical studies, attaining conclusive results as more studies report similar findings. A sizeable number of scholars have publicized that the competitiveness of firms in the road freight sector is determined by on-time delivery (Kim et al., 2015; Abas & Imam, 2016; LeMahieu et al., 2017). Khanchitpol (2014) posits that to ensure growth and survival, firms in the road freight sector should ensure that they deliver the consignments to their customers on time. In like manner, Ramdhani, Mnyamana, and Karodia (2017) indicated that firms should strive to meet delivery schedules to improve profitability and customer satisfaction.

5. Conclusion

This research has investigated the consideration of time value in the Road Freight Transport Sector operations in Zimbabwe and its impact on their competitiveness. The main findings can be summarized as follows:
- All the registered companies that participated in the research confirmed that the value of time phenomenon was alien to their business practices.
- These companies indicated a loss of business due to customer complaints.

These findings have significant implications in the broader context of the field. They highlight the importance of considering the value of time in business operations, particularly in the road freight transport sector. This research contributes to the existing literature by providing empirical evidence supporting the theory that the value of time can significantly impact a firm's competitiveness.

The research addressed the question of whether the Road Freight Transport Sector in Zimbabwe considers the value of time in their operations and how this affects their competitiveness. It was found that these companies did not consider the value of time, leading to a loss of business.

One limitation of the study is that it only focused on registered companies in Zimbabwe. Future research could expand the scope to include unregistered companies or companies in other countries to provide a more comprehensive understanding.

In conclusion, this research underscores the importance of considering the value of time in business operations. It provides valuable insights for companies in Zimbabwe's Road Freight Transport Sector to enhance their competitiveness and for researchers to explore this topic further. The findings leave a lasting impression on the reader and effectively communicate the main takeaways of the research.

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Conflicts of interest

The authors declare no conflict of interest.

Data availability

Some or all data and models that support the findings of this study are available from the corresponding author upon reasonable request.

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