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Information Technology and Competitive Advantage: The Effect of Electronic Data Interchange on Firm Performance in Virtual Hotel Operation in Indonesia

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Abstract. Indonesia is an archipelagic country and one of the world's destinations often visited by foreign tourists. The emergence of various types of accommodation has resulted in many hotel choices ranging from exclusive to low-cost. Therefore, this study aimed to examine the effect of electronic data interchange (EDI), information technology (IT), competitive advantage (CA), and firm performance (FP) on virtual hotel operation (VHO) in Indonesia. The respondents comprised 206 VHO managers selected by purposive sampling, while data were collected using online questionnaires. The results indicated that EDI does not significantly and positively affect FP in VHO in Indonesia. Conversely, IT and CA significantly and positively affect firm performance. This study contributed to developing a collaboration model using EDI, information technology, and competitive advantage to improve firm performance. Practically, the results could help VHO managers improve firm performance with competitive advantage acting as a full mediator.

Keywords: Electronic Data Interchange, Information Technology, Competitive Advantage, Firm Performance, Virtual Hotel Operation

1. Introduction

Indonesia is an archipelagic country with the potential to be developed into a world-class tourist destination. Following this, the development of the tourism sector has increased over the past ten years due to the higher interest in visitors or tourists from within the country and abroad. A report by the Central Statistics Agency showed that the number of domestic tourist visits had increased by 8.66%, while foreign tourists declined by 0.28% compared to last year. The tourism sector in Indonesia provides a positive side for economic rotation (Roz et al., 2020). Its development is marked by the increasingly rapid hotel industry as a fulfilment of travel accommodation. Currently, the hotel industry does not only offer accommodation using part or all of its buildings to provide commercially managed lodging services (Gunawan et al., 2019). Various hotels began to emerge, ranging from star to low-budget hotels. With the convenience of current technology and the presence of a technology-savvy generation, Indonesia is the right target for technology-based startup hoteliers known as Virtual Hotel Operation (VHO).

VHO is an online platform that works with lodging business owners while connecting their properties to potential customers. It was first recognized in Indonesia in 2015 with the concept of low-cost accommodation and currently it is the choice for travellers with a minimal budget (Avili, 2016). Several VHO have been operating for a long time in Indonesia, such as AirBnB, Airy, RedDoorz, and Oyo, which from America, Indonesia, Singapore, and India, respectively. Information technology (IT) has an important role in the performance of virtual operations. It supports fast data exchange between hotel accommodation providers and potential customers (Droge & Germain, 2000; Khallaf et al., 2017). Furthermore, internet support helps potential customers find real-time and accurate information about the hotel by adjusting their budget (Muazu & Abdulmalik, 2021).

The ease of finding VHO information has a good impact, as evidenced by the annual increase in online hotel bookings in Indonesia. In 2017, online hotel bookings reached 14.5 million users, with a penetration rate of 5.5%. This increase reached 15.7 and 16.9 million users in 2018 and 2019, with 5.9% and 6.3% penetration rates, respectively. The number is projected to increase drastically in 2020, 2021, and 2022, reaching 18 million, 18.9 million, and 19.6 million users, with penetration rates of 6.6%, 6.9%, and 7.1%, respectively (Kusumawati, 2020), becoming an advantage for VHO to compete with star hotels.

This study aimed to examine the effect of electronic data interchange (EDI), IT, and competitive advantage (CA) on firm performance (FP) in Indonesia's low-cost VHO hospitality sector. Section 2 further explains the literature and develops hypotheses based on theory and previous studies, while Section 3 presents the methodology used. Moreover, Section 4 show the data analysis results, and Section 5 discusses the theoretical implications, conclusions, and limitations.

2. Related Works

2.1. Electronic data interchange (EDI)

Business is closely related to technology, a determining factor supporting business people to achieve goals by building a network and exchanging data. EDI refers to exchanging data using a network and supporting devices. This technology has been used by thousands of companies, including in the hospitality business, to exchange documents or data with business partners or potential customers (Goksoy et al., 2012). According to Khazanchi (2002), EDI is the exchange of business transactions based on predetermined standards through a communication network that includes at least two-way relationships, such as providers and users. Rao et al. (1995) found that it was one of the firm's methods for exchanging business documents between computers in a standardized format. Furthermore, it is a system of electronically exchanging data and business information between computers, users, and business partners (Son et al., 2005).

2.2. Information technology (IT)

The IT era is important in carrying out business activities, with a real impact on economic growth (Ongus & Nyamboga, 2019). Munizu (2015) stated that this technology processes, obtains, compiles, stores, and manipulates data to produce quality information that supports firm decisions. In line with this, Abdelkader & Abed (2016) found that IT includes hardware and software-based products, as well as services to support business productivity with internet networks. It also guarantees that the information provided is relevant, accurate, and timely, facilitating strategic and useful decisions as a firm advantage (Fajar & Amri, 2022; Muazu & Abdulmalik, 2021).

2.3. Competitive advantage (CA)

Heizer & Render (2014) explained that business sustainability is achieved through CA by creating good values for customers. These values comprise competitive cost leadership, friendly customer service, and creating products that fulfil users' expectations. However, CA is a different fit from existing competitors (Ariyawardana, 2003). It is the ability obtained through a firm characteristics and resources to perform better than its competitors (Jamaludin, 2021). Furthermore, this is a basis for developing a strategy to achieve sustainable growth with low costs, differentiation, and fast response to customers (Elijah & Millicent, 2018).

2.4. Firm performance (FP)

FP is overall success in achieving predetermined strategic goals. It is the firm ability to achieve goals through the efficient and effective use of resources (Liang et al., 2010). Ma et al. (2021) stated that FP is a condition resulting from management activities. In its implementation, performance results from work obtained by carrying out profit-oriented and non-profit-oriented activities (Linda & Thabrani,

2021).

2.5. Hypothesis development

EDI provides good benefits for business actors through its various systems that help the firm improve its performance. FP is a benchmark used as a marker of success. According to Chege et al. (2020), performance is the achievement level on task implementation in a firm to realize its vision and mission. Furthermore, it is a managerial measure in assessing employee work results quantitatively and qualitatively (Masyhuri et al., 2021). Several studies showed a link between the use of EDI and FP. According to Choe (2008), good EDI improves employees' performance. Droge & Germain (2000) also found that financial performance could have a good effect when carrying out systematic and structural EDI with predetermined standards. Therefore, the following hypothesis was proposed:

H1: Electronic data interchange affects firm performance

EDI implementation could be one of the firm strategies for realizing its vision and mission and leading to success (Benjamin et al., 1990). It could be used as a strategy that differentiates one firm from another, making EDI a CA for each firm (Masudin et al., 2021). CA is obtained when firm better presents the operational business processes in producing high-quality goods and services at competitive prices (Heizer & Render, 2014; Roz, 2021). The interrelationship between EDI and CA has been shown by several studies. For instance, Goksoy et al. (2012) stated that firm had realized the benefits of EDI as a CA. Therefore, the following hypothesis was proposed:

H2: Electronic data interchange affects competitive advantage

Data exchange in business is inseparable from the role of IT, translated as processing, obtaining, compiling, storing, and repairing data to make them quality and accountable (Munizu, 2015). Studies reported a relationship between IT and the advantages possessed by firm. According to Aslizadeh (2014), technical information knowledge affects CA. Lai et al. (2006) also found a strong effect of data exchange and IT on CA in logistics firm in China. Therefore, the following hypothesis was proposed:

H3: Electronic data interchange affects information technology

A firm is considered successful based on various factors, such as its performance. FP is the success in achieving the strategic goals set through selected strategies. According to Elijah & Millicent (2018), it constitutes complex psychological, sociological, and physical interactions in achieving targets and goals agreed upon by all members. Many factors, such as IT, affect the firm success in improving the performance. The role of IT helps firm make decisions and reduce risks (Muazu & Abdulmalik, 2021). A firm takes good care of IT because it is an asset or valuable item (Khallaf et al., 2017). In line with this, Şahin & Topal (2018)

stated that using IT significantly impacts a FP in the supply chain sector. It is important to note that another factor affecting FP is CA. A competitive strategy aims to achieve sustainable results by improving FP (Lana, et al., 2016). According to Potjanajaruwit (2018), FP is achieved by implementing the right strategy based on the existing potential. This supports Ariyawardana (2003) that high FP is affected by CA in Sri Lanka. Therefore, the following hypotheses were proposed:

H4: Information technology affects firm performance

H5: Competitive advantage affects firm performance

IT is important in a firm long-term sustainability and significantly impacts performance (Choe, 2008). It facilitates a business actor to exchange data quickly and in real-time, distinguishing a managed firm from its competitors (Khallaf et al., 2017). Collaboration between IT and EDI quickly provides an advantage for firm (Bhatt et al., 2010), which could be a strategy for running the business. Studies stated that a firm could implement a good relationship between EDI to improve the work results. According to Masudin & Kamara (2018), EDI impacts firm work results, while IT also positively impacts operational performance (Fink & Neumann, 2009; J. Zhang et al., 2009). Therefore, the following hypotheses were proposed:

H6: Electronic data interchange affects firm performance mediated by competitive advantage

H7: Information technology affects firm performance mediated by competitive advantage

This study aimed to examine the direct and indirect effects of EDI, IT, and CA on FP.

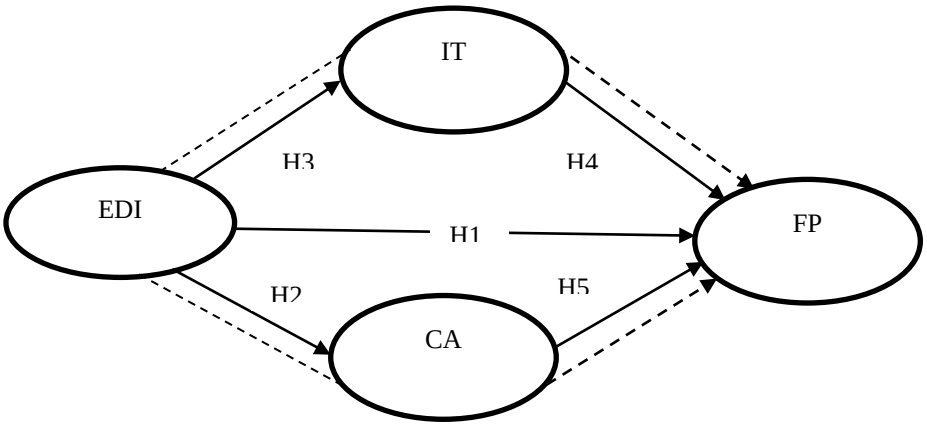

Fig. 1: Conceptual Framework

source: own

3. Method

A quantitative approach was adopted to test the hypotheses for the effect of the independent on the dependent variable. The independent variables included EDI, IT, and CA, while FP was the dependent variable. Data were collected by distributing questionnaires online using a Likert scale measurement of 1-5. The sample comprised 206 VHO managers in Indonesia determined using non-probability because the population size could not be identified clearly. EDI was measured using three indicators, including Better Communication, Quick Access to Information, and Improve Billing (Masudin et al., 2021). IT was measured using four indicators, such as IT Infrastructure, IT Technical Skill, IT Managerial Skill, and IT Business Partnership (Abdelkader & Abed, 2016). Moreover, CA was measured using four indicators, namely Price, Quality, Time to Market, and Sales Growth (Masudin et al., 2021). FP was measured using two indicators, comprising operational and financial performance (Jamaludin, 2021). The analysis used the Partial Least Squares – Structural Equation Modeling (PLS-SEM) method.

4. Findings and Discussion

Respondents' Demographics

The data collected through online questionnaires showed that 206 respondents fit the criteria of gender, age, last education, business location, business period, and income.

Table 1: Respondents' demographics

Gender	**Male**	**138**	**66.9%**
	Female	68	33.1%
Age	20 – 25 years	45	21.8%
	26 – 30 years	70	33.9%
	31 – 35 years	**85**	**41.3%**
	> 36 years	6	2.9%
Last Education	Senior High School	15	7.2%
	Diploma	29	14%
	Undergraduate	**105**	**50.9%**
	Graduate	57	27.6%
Business Location	**Java, Bali, East Nusa Tenggara, and West Nusa Tenggara**	**135**	**65.5%**
	Sumatra	25	12.1%
	Kalimantan	15	7,2%
	Sulawesi	20	9.7%
	Papua	11	5.3%

Business Period	1 – 3 years	75	36.4%
	4 – 6 years	**120**	**58.2%**
	> 7 years	11	5.3%
Income	10,000,000 – 30,000,000	18	8.7%
	40,000,000 – 60,000,000	**150**	**72.8%**
	> 70,000,000	38	8.4%

source: own

The results in Table 2 showed that respondents comprised VHO managers, who were selected using the criteria of gender, age, last education, business location and period, and net monthly income. Managers are dominated by males aged 31-35 years, meaning they are mostly adults and wise in making decisions. Meanwhile, the business location is dominated by Java, Bali, East Nusa Tenggara, and West Nusa Tenggara, with a period of 4-6 years and a monthly income of 40,000,000 - 60,000,000. This means that these provinces are the most visited regional destinations for tourism.

Construct Validity and Reliability Test

A variable is declared valid when the loading value exceeds 0.5. The test results are presented in Table 2.

Table 2: Convergent validity test results

Variable	Indicator	Outer Loading	Description
Electronic Data Interchange (EDI)	Better Communication	0.916	Valid
	Quick Access to Information	0.900	Valid
	Improve Billing	0.916	Valid
Information Technology (IT)	IT Infrastructure	0.775	Valid
	IT Technical Skill	0.776	Valid
	IT Managerial Skill	0.814	Valid
	IT Business Partnership	0.760	Valid
Competitive Advantage (CA)	Price	0.801	Valid
	Quality	0.861	Valid
	Time to Market	0.868	Valid
	Sales Growth	0.826	Valid
Firm Performance (FP)	Operational Performance	0.915	Valid
	Financial Performance	0.907	Valid

source: own

Composite Reliability

A composite reliability value exceeding 0.7 means the variable is constructively reliable. Table 3 shows the reliability measurement results.A composite reliability value exceeding 0.7 means the variable is constructively reliable. Table 3 shows the reliability measurement results.

Table 3: Composite reliability test results

Variable	*Composite Reliability*	Description
Electronic Data Interchange (EDI)	0.891	Reliable
Information Technology (IT)	0.788	Reliable
Competitive Advantage (CA)	0.860	Reliable
Firm Performance (FP)	0.795	Reliable

Source: Primary data processed, 2022

The results showed that all composite reliability values are at a value of > 0.7. This means reliability is fulfilled, and all indicators could be used as a measure.

PLS analysis

PLS testing was conducted through the Goodness of Fit model, as well as evaluating the outer and inner model results.

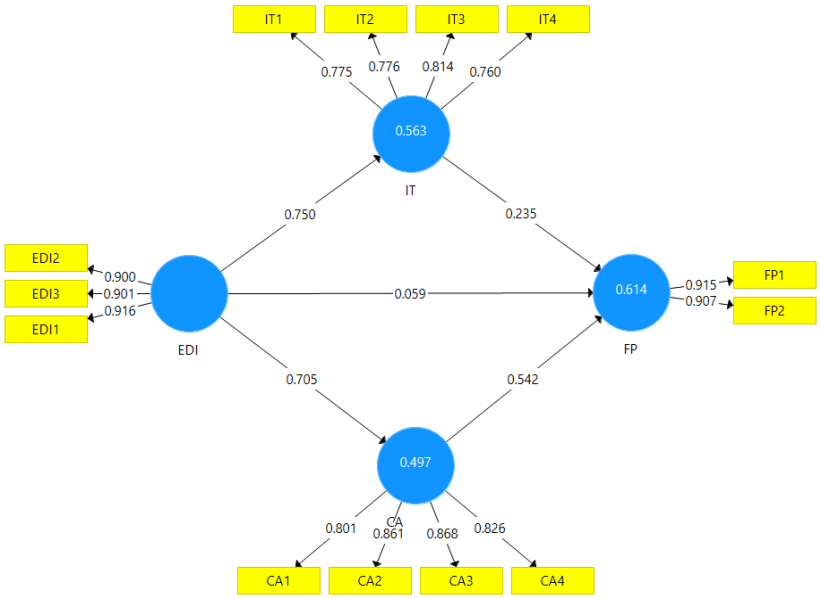

Figure 2: Results of Data Processing using SmartPLS

The Goodness of Fit Model

PLS testing was conducted through the Goodness of Fit model, as well as evaluating the outer and inner model results.

Each endogenous variable expressed by the value of R2 includes:

1. IT had a value of 0.563, indicating that 56.3% is affected by EDI.
2. CA had a value of 0.497, showing that 49.7% is affected by EDI.
3. FP had a value of 0.614, implying that 61.4% is affected by EDI, IT, and CA.

The predictive relevance value (Q2) was calculated as follows:

$Q^2 = 1 – (1 – R_1^2) (1 – R_2^2) (1 – R_3^2)$

$Q^2 = 1 – (1 – 0.563^2) (1 – 0.497^2) (1 – 0.614^2)$

$Q^2 = 1 – (1 – 0.316) (1 – 0.247) (1 – 0.376)$

$Q^2 = 1 – 0.321$

$Q^2 = 0.679$

The calculation showed a value of 0.679, meaning the model has predictive-relevance. This indicated that 67.9% of data diversity could be explained by the PLS model. Meanwhile, 32.1% is explained by other external variables that were not studied.

Outer Model

The largest outer loading showed the indicators on the dominant variable. The variable is significant when the t-test value exceeds 1.96 and the P-value is less than 0.05.

Table 4: Outer model electronic data interchange test results

Indicator	Outer Loading	T-statistics	P-value	Description
EDI1	**0.916**	**59.026**	**0.000**	**significant**
EDI2	0.900	46.815	0.000	significant
EDI3	0.901	60.437	0.000	significant

source: own

EDI variables are reflected by Better Communication (EDI1), Quick Access to Information (EDI2), and Improved Billing (EDI3). The results showed that of the three indicators, Better Communication obtained the highest score, indicating it dominated EDI.

Table 5: Outer model information technology test results

Indicator	Outer Loading	T-statistics	P-value	Description
IT1	0.775	24.455	0.000	significant
IT2	0.776	27.412	0.000	significant
IT3	**0.814**	**34.979**	**0.000**	**significant**
IT4	0.760	22.408	0.000	significant

source: own

IT variables are reflected in IT Infrastructure (IT1), IT Technical Skills (IT2), IT Managerial Skills (IT3), and IT Business Partnerships (IT4). The results showed that of the four indicators, IT Managerial Skills had the highest value, indicating it dominated IT.

Table 6: Outer model information technology test results

Indicator	Outer Loading	T-statistics	P-value	Description
CA1	0.801	31.356	0.000	significant
CA2	0.861	38.810	0.000	significant
CA3	**0.868**	**43.165**	**0.000**	**significant**
CA4	0.826	29.595	0.000	significant

source: own

The CA variable is reflected by Price (CA1), Quality (CA2), Time to Market (CA3), and Growth (CA4). The results showed that of the four indicators, Time to Market obtained the highest value, indicating it dominated CA.

Table 7: Outer model firm performance test results

Indicator	Outer Loading	T-statistics	P-value	Description
CA1	0.801	31.356	0.000	significant
CA2	0.861	38.810	0.000	significant

source: own

The FP variable is reflected by Operational Performance (FP1) and Financial Performance (FP2). The results showed that Operational Performance obtained the highest value, indicating it dominated FP.

Inner Model

The inner model was partially tested by t-test and P-value in each lane to determine the direct and indirect effects.

Direct Effect

This study tested three effects tested, as shown in Table 8.

Table 8: Direct effect test results

Direct Effect	Original sample	T-statistics	P-value	Description
Electronic Data Interchange (EDI) -> Firm Performance (FP)	0.059	0.783	0.434	Not Sig.
Electronic Data Interchange (EDI) -> Competitive Advantage (CA)	0.705	20.741	0.00	Sig.
Electronic Data Interchange (EDI) -> Information Technology (IT)	0.750	23.157	0.000	Sig.
Information Technology (IT) -> Firm Performance (FP)	0.235	2.625	0.000	Sig.
Competitive Advantage (CA) -> Firm Performance (FP)	0.542	6.616	0.000	Sig.

Source: Processed Data, 2022

Indirect Effect

The effect was measured from one variable to another through intermediaries. A P-value of > 0.05 and < 0.05 indicates not significant and significant, respectively. The calculation of the Sobel test is shown in Table 9.

Table 9: Indirect effect test results

Indirect Effect	Original Sample	T-statistics	P-value	Conclusion
Electronic Data Interchange (EDI) -> Information Technology (IT) -> Firm Performance (FP)	0.176	2.627	0.000	Sig.
Electronic Data Interchange (EDI) -> Competitive Advantage (CA) -> Firm Performance (FP)	0.382	6.417	0.00	Sig

source: own

This study built a model to measure the effect of EDI on FP mediated by IT and CA in VHO. Six of the seven hypotheses tested were accepted, while one was rejected. The results of the hypothesis 1 test showed that EDI positively but insignificantly affects FP. The findings indicated that good communication, fast information access, and billing rate information do not significantly impact FP. This support Tan et al. (2009) that EDI does not directly affect FP. Furthermore, the findings were consistent with G. P. Zhang et al. (2010) that one of the operational performance improvements is the role of EDI, though other factors are more dominant.

The second hypothesis test showed that EDI significantly and positively affects CA in VHO. The positive direction indicates that exchanging data electronically improves CA (Benjamin et al., 1990; Khazanchi, 2002). Moreover, good communication and commitment between people as a benchmark for EDI significantly impact a superior strategy (Masudin et al., 2021). Data accuracy and trust between people also make EDI positively influence CA (Riyadi, 2010). This finding supported Goksoy et al. (2012) that EDI has a great effect and potential for the sustainability of industrial excellence in Turkey.

The third hypothesis test showed that EDI positively affects IT. EDI is a method of exchanging business data or transactions electronically through the internet. It assists business people in processing a document with other parties accurately, quickly, and efficiently (Narayanan et al., 2009). Data accuracy is important in exchanging data with supporting IT (Fidel & Crespo, 2015). This finding was in line with Sekhar (2010) that EDI positively affects information management in retail companies in India. The positive relationship indicates that better EDI improves IT in VHO.

The fourth hypothesis test showed that IT affects FP in VHO. The results indicated that using IT is meaningful in improving FP (Ma et al., 2021) (Nazifa & Ramachandran, 2019). The existence of infrastructure, skills, and managerial IT increases operational performance (Chen & Zhu, 2004). These results supported Liang et al. (2010) that the ability to utilize IT positively affects the firm financial performance and other internal capabilities. Similarly, Martínez-Caro et al. (2020) and Rehman (2011) found a good relationship between IT and FP.

The fifth hypothesis test showed that CA affects FP in VHO. CA is created to surpass competitors by offering greater value or benefits to consumers (Widyanesti & Masyithah, 2018). In this case, applying something different contributes to improving FP. Strengthening prices, maintaining stable service quality, and sales growth could improve the performance (Roz, 2021). In line with this, Do & Nguyen (2020) and Elijah & Millicent (2018) found that CA is important in improving FP. Furthermore, Jamaludin (2021) showed that applying CA improves the performance.

The sixth and seventh hypotheses explain how IT and CA mediate the relationship between EDI and FP in VHO. The tests showed that CA indirectly improves FP. Therefore, good communication, fast information access, and a real-time billing process facilitate creating strategies as strengths in running a business (Benjamin et al., 1990; Riyadi, 2010). CA also fully mediates the effect of EDI on operational performance. This means that strategies such as price, quality, and timing of sales to sales growth impact EDI in improving operational performance (Masudin et al., 2021). Furthermore, CA mediates the effect of IT on FP (Fink & Neumann, 2009). The four indicators, including IT Infrastructure, IT Technical Skills, IT Managerial Skills, and IT Business Partnerships, relate perfectly to FP (Masa'deh, 2013). This finding as consistent with Bhatt et al. (2010) and Khallaf et al. (2017), which found a good relationship between IT and FP, supported by pricing strategies and product quality assurance.

5. Conclusion

The data analysis results showed that six of the seven hypotheses proposed were accepted, while one was rejected. This showed that FP increases when supported by IT and a good CA. Meanwhile, EDI did not significantly improve FP in VHO. The positive direction indicates that better IT, EDI, and CA improve operational and financial performance. The results further showed that CA fully mediates the effect of EDI and IT on FP. It is important to note that this study collected data using online forms due to the pandemic, resulting some statements are inconsistent with the existing conditions. Also, it was only conducted in the service sector, specifically hospitality, meaning the conclusions cannot be generalized to other fields.

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