

# Extent of Application of Fourth Industrial Revolution Technologies to Enhance Tourism Sustainability: A Case of Selected Tourism Operators In Victoria Falls

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## Abstract

This study sought to analyse the extent of the application of Fourth Industrial Revolution techniques (4IR) in tourism sector of Zimbabwe using the resort town of Victoria Falls as a case study. The objective of the study was to analyse the effectiveness of the 4IR technologies on the competitiveness among tourist operators, and determine strategies that can be adopted to improve the use of 4IR technological trends. A pragmatic approach was used in the study with both quantitative and qualitative research instruments utilised through questionnaires and interviews. A total of 96 tourist respondents were used in the study, as well as 30 tour operators. The study also used probability sampling through systematic random sampling for tourists and the non-probability sampling through purposive sampling, for the groups of respondents which are in the accommodation tourism facilities, tour operators. The findings in this study clearly revealed there was a need for tourism operators in the Victoria Falls to be fully fused into more technologies that enhance tourist perceived positive experience for tourism sustainability. The findings clearly showed that pre-travel technologies used by tour operators have enhanced tourists to choose and opt for their services. However onsite technologies used by tour operators were limited according to tourists who indicated were not satisfied with the extent to which onsite technologies which were applied. The reasons behind slow adoption of 4IR technologies by most operators, emanated from managerial skills, expertise and desire to innovate. The following recommendations were suggested to improve adoption of artificial intelligence. Tourism players must look at outsourcing and hiring of software systems and infrastructure. Organisations should increase budgets for ICT training, businesses should invest in cyber security systems to protect their stakeholder's information and their confidentiality. Tourism players should invest in digital transformation and at the same time the government should come up with cyber policies that conform with global policies.

**Keywords:** Fourth Industrial Revolution, Technology, Tourism Sustainability, Strategies

## INTRODUCTION

Tourism is a rapidly expanding sector that tends to add greatly to most countries' Gross Domestic Product (GDP). United Nations World Tourism Organization stated that, tourism sector contributed around 5% of global GDP in 2012. (GDP). Both in emerging and developed countries, tourism is a major source of job growth. Tourism's steady growth has been hailed as a contributor to long-term prosperity in a number of countries. It is also a significant catalyst of globalization, catalysing foreign trade by allowing for widespread exchange of technical and market expertise.

Tourism contributes significantly to the global Gross Domestic Product and is a primary engine of economic growth in most countries. The arrival of the 4IR has ushered in massive transition in most, if not all, areas of the global economy. Technological progress has pervaded every aspect of the socioeconomic structure of every society on the planet. Sari (2018) postulates these changes have a major impact on people's everyday lives, as they replace old habits with new ones. The Fourth Industrial Revolution is ushering in a modern era of industrialization that has never been seen previously. The power and impact of emerging technologies is further enhanced by the ever-widening data communication and expanding information network (Sari, 2018). ZTA (2016) reported that Zimbabwe had a diverse variety of tourism opportunities that can help the country gain international recognition. Zimbabwe, on the other hand, is lagging behind other developing and industrialized countries in terms of technical advances.

## STATEMENT OF THE PROBLEM

In most countries around the world, tourism is a major economic trend. Innovation and advancements in communications and information technologies have revolutionized the tourism and hospitality industries. Technology has developed into a unique marketing platform for tourist destinations. Without advanced underlying technologies, the tourism industry will not be able to develop new goods and services (Osman and Canan 2019).

Zimbabwe's high industry customers are the first in the world to have access to cutting-edge technology that is constantly evolving, despite the fact that Zimbabwe is only in the early stages of becoming a fully digital economy. The globalised market has increased the demand for technologies, which is still costly due to affordability issues such as internet access and power outages, not to mention the lack of creativity in



Zimbabwe. The addition of travel and tourism to Zimbabwe's GDP (percentage of GDP) was 6.5 percent in 2019, but sustainable tourism is required for economic growth. Thus, in order to succeed in the international business warfare while also surviving in this new world under the Covid-19 period, resolutions to boost tourism in a sustainable manner with the maintenance of modern technology are needed.

## RESEARCH OBJECTIVES

The study came up with the following research objectives:

### Main research objective

To analyse the extent of the application of Fourth Industrial Revolution techniques in tourism sector of Zimbabwe using the resort town of Victoria Falls as a case study.

### SPECIFIC OBJECTIVES

1. To identify the current 4IR technologies used by tourism and hospitality operators in Victoria Falls.
2. To assess the opportunities and challenges of applying 4IR technologies by Tourism and hospitality operators of Victoria Falls.
3. To analyse the effectiveness of the 4IR technologies on the competitiveness among tourist operators in Victoria Falls
4. To determine strategies that can be adopted to improve the use of 4IR technological trends and advancements that player in the tourism sector can adopt in future.

## RESEARCH QUESTIONS

1. What are the current 4IR technologies used by tourism and hospitality operators in Victoria Falls?
2. What are the opportunities and challenges of applying 4IR technologies by Tourism and hospitality operators in Victoria Falls?
3. How effective are 4IR technologies on the competitiveness among tourist operators in Victoria Falls?
4. Which strategies that can be adopted to improve the use of 4IR technological trends and advancements that player in the tourism sector can adopt in future?

## LITERATURE REVIEW

A review of related literature was conducted and the theoretical framework underpinning the study was identified.

### McKinsey 7S Model

The McKinsey 7S model is a holistic framework to business administration that decides how the enterprise can function as a whole (Karami, 2005). The model depicts that if managers want to have a stable policy execution, they should consider the fundamental aspects of strategy, structures, style, organization, common beliefs, workers, and expertise are among the influences. Since the variables are all dependent of one another, failing to pay heed to any one of them sets the stage for failure (Peter and Waterman, 1982). The 7-S model shows that organisations can only be competitive if all of their variables are in sync (Barney, 1991). An organization's strategy is its course of action in response to changes in its external climate. The model reflects a tactical approach to organizational actions that is pre-planned, well-thought-out, and often practiced (Kaplan, 2005).

### Rogers' Diffusion of Innovations Theory

The diffusion of inventions theory proposed by Rogers was found to be the most suitable for studying the implementation of technology in organizational settings (Medlin, 2001, Parisot, 1995). Given the prevalence of technical advances in diffusion science, Rogers (2003) sometimes used the terms "technology" and "innovation" interchangeably.

### Technology-Organization-Environment framework

The Technology-Organization-Environment framework (TOE) structure developed by Tornatzky and Fleischer (1990) was found to be relevant since it included three distinct contexts that affect how a company adopts and incorporates technical innovations: technological background, corporate context, and environmental context. Internal innovations are practices and technologies that the company has embraced.

### Ecotourism

Ecotourism ensures a balance between the commercial, sociocultural, and environmental advantages of tourism production and the costs of doing so (Rasoolimanesh & Jaafar, 2017). Its focus is to improve the quality of life for citizens of the destination while also attempting to protect the environment for future generations (Edgell, 2016). The hospitality and tourism sectors have been transformed by information and communication technologies (ICTs) (Buhalis, 2015). Sustainable tourism, according to Bramwell and Lane (1993), has a broad foundation and a strong association with the concept of self-sustaining growth.

### Conceptual framework

The conceptual framework provides brief overview of objectives and its elements. Technological systems support goal achievements and results. The main aim for these enhancers' centres on improved sustainability of tourism offerings. These are measured by the extent to which these enhancers are used indirectly effecting organisational performance (customer relation management, customer satisfaction and profitability). The extent to which improved sustainability is attained entirely depends also on the external and internal influencers that contribute directly to



how much tourism players have experienced them. Political, economic, environmental, socio-cultural are non-organisational controlling factors that may indirectly affect the extent to which 4IR technologies are applied by various tourism operators. Opportunities attained also directly impact improved sustainability and so does efficiencies.

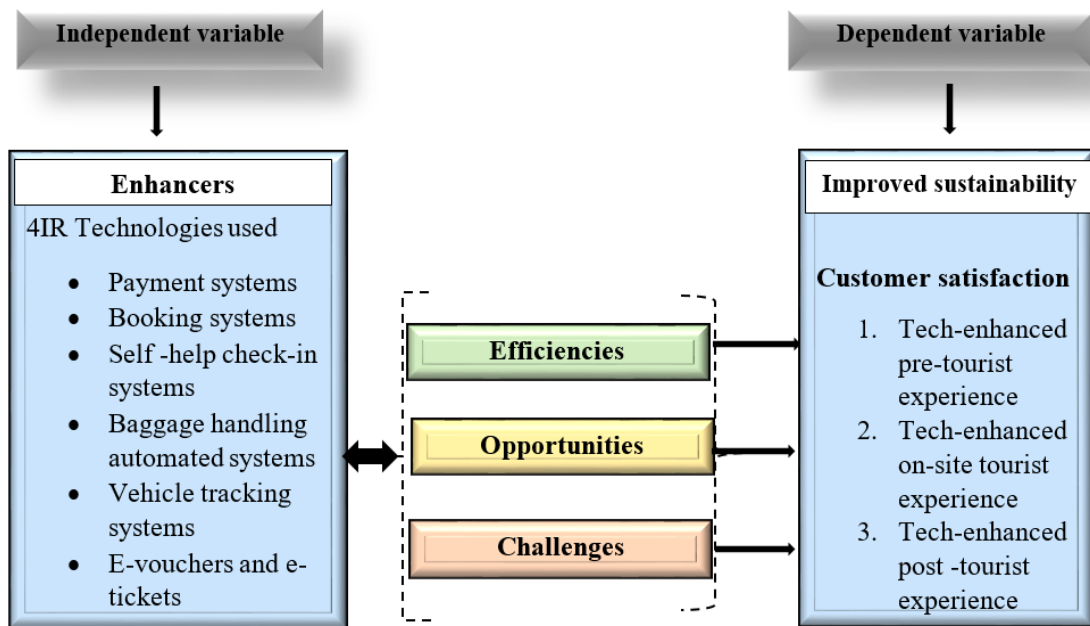


Fig 1. Conceptual framework for 4IR technologies as tourism sustainability enhancers- Researcher's own construct

## RESEARCH METHODOLOGY

The pragmatic approach was adopted the pragmatic approach. The quantitative approach has the advantage of providing quantitative precise results and being relatively quicker in data collection and analysis. On the other qualitative research is useful in exploring a limited number of cases in depth and it also helps in addressing complex phenomena in rich detail. This research approach thus ensured that data acquired helps the researcher to answer the research question as clearly as possible. Since this study intended to prove a model for the relationship between variables in the business environment, the researcher used the mixed methods approach.

### Sampling and Sampling Techniques

In the case of the study, with a large population size of tourists, the researcher used the Slovin's formula to calculate the sample size. The Slovin's formula was used to calculate the sample size (n) given the population size (N) and a margin of error (e). It is a random sampling formula to estimate sampling size.

To determine sample size for tourists:

$$\text{Slovin Formula: } n = N / (1 + Ne^2).$$

$$n = \frac{28\,333}{1 + (28333) 0.10^2}$$

Where: n = sample size

N = population size

E = margin of error \* desired

Therefore, the representative sample size from the population sample using a margin error of 10% is N= 96 for tourists. Furthermore the 10% formula was also used to calculate sample size for the hospitality and tour operators' employees. Therefore, the representative sample size from the population sample using a margin error of 10% is N= 30 for employees for tourism service providers. Since the study only considered IT managers and marketing officers, the study purposively used a representative of five (5) employees from those respective departments.

Table 1: Population and sample size for tourism service providers

Research Participants	Pre-covid Number of employees (population)	Sample size from each organisation
Kingdom hotel	126	5
Illala Hotel	62	5
Old drift lodge	10	5
Wild horizons	364	5
Vic Falls Anytime	210	5
Batoka	115	5
Total	887	30

Source: Researchers own computations



## Results presentation

**Table 2:** Reliability statistics for the analysis

Cronbach's Alpha	N of Items
.902	42

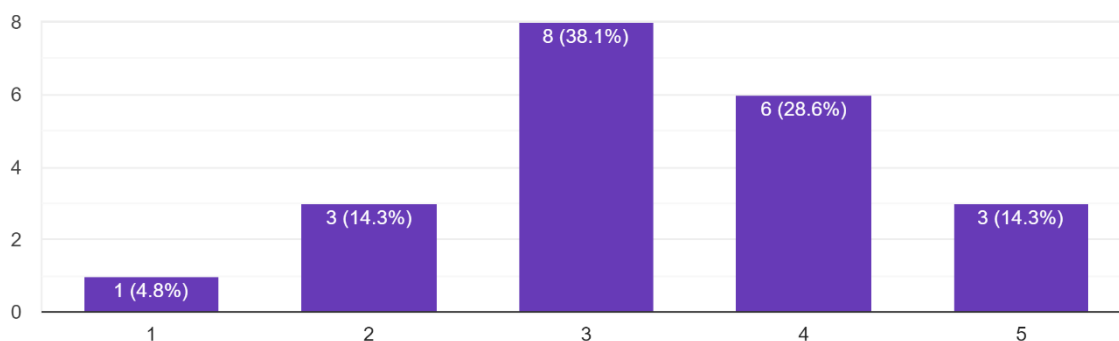
The presentation in Table 2 was on consistence of the data collection instrument, using the Cronbach's alpha coefficient. Thus, reliability is a very important factor in checking whether the data collection instrument has internal consistency. So using this test statistic of 0.70 as a threshold, the results showed that the research instrument was overall consistence with a coefficient value of 0.902, implying that the questionnaire was good for purpose.

### To identify the current 4IR technologies used by tourism and hospitality operators in Victoria Falls.

The Mckinsey 7S model states that managers need to take into account holistic approaches on strategies which will determine the company success. The study focussed on the current technologies that players in the tourism and hospitality industry make use of especially those in Victoria Falls resort to remain successful and sustainable in the tourism business. However, the researcher first established the extent to which players in the industry have adopted artificial technology.

On a scale of 1-5, rate to what extent have you adopted the use of artificial technologies in your operations?

21 responses



**Fig 1.** The extent to which Artificial Intelligence has been adopted by tour operators

The presentation in Figure 2 shows that the penetration level of artificial intelligence was minimal as indicated by 19.1% of the responses although 42.9% believed that the presence of artificial intelligence was quite significant. However only 13% have managed to penetrate into artificial technologies to a great extent. The various technologies, players in the tourism industry were expected to adopt were summarised using frequency table:

**Table 3:** Available technologies used by tour operators

Tour operators	Yes	No
Big data	65.2	34.8
Cloud computing systems	56.5	43.5
Internet of things	87.0	13.0
Geographic Information Systems [GIS]	69.6	30.4
Automation	69.6	30.4

The researcher listed down the technologies that are employed in the successful run of operations in Tourism and Hospitality. According to Table 3 the identified technologies had been adopted mostly internet (87%), followed by animation (69.6%) and geographical information system (69.6%) whilst cloud computing was least in adoption. The results above can show that tourism players have a managed to penetrate into IOT (internet Of Things) much extensively. The extent to which organisations adopt using technologies entirely depends on how much they are able to embrace and understand both internal and external technologies available.

A cross tabulation was performed based on experience to establish how it affects adoption. So according to the presentation given in Table 4, there was an insignificant ( $p\text{-value} = 0.458 > 5\%$ ) correlation between experience in the industry and the rate at which players in the tourism and hospitality industry were adopting artificial intelligence. The number of years one has been in the industry has no relation with extent to which an organisation adopts the use of fourth technologies.

**Table 4:** Correlation between experience and AI adoption

Tour operators	Value	Asymptotic Standardized Error	Approximate	Approximate Significance
Pearson's R	-.163	.250	-.757	.458
Spearman Correlation	-.163	.250	-.757	.458
N of Valid Cases	23			

So according to the presentation given in Table 5, there was a significant ( $p\text{-value} = 0.008 < 5\%$ ) correlation between managerial position and the rate at which players in the tourism and hospitality industry were adopting artificial intelligence. The significance is due to the managers' expertise in the IT innovation appreciation, and skills.

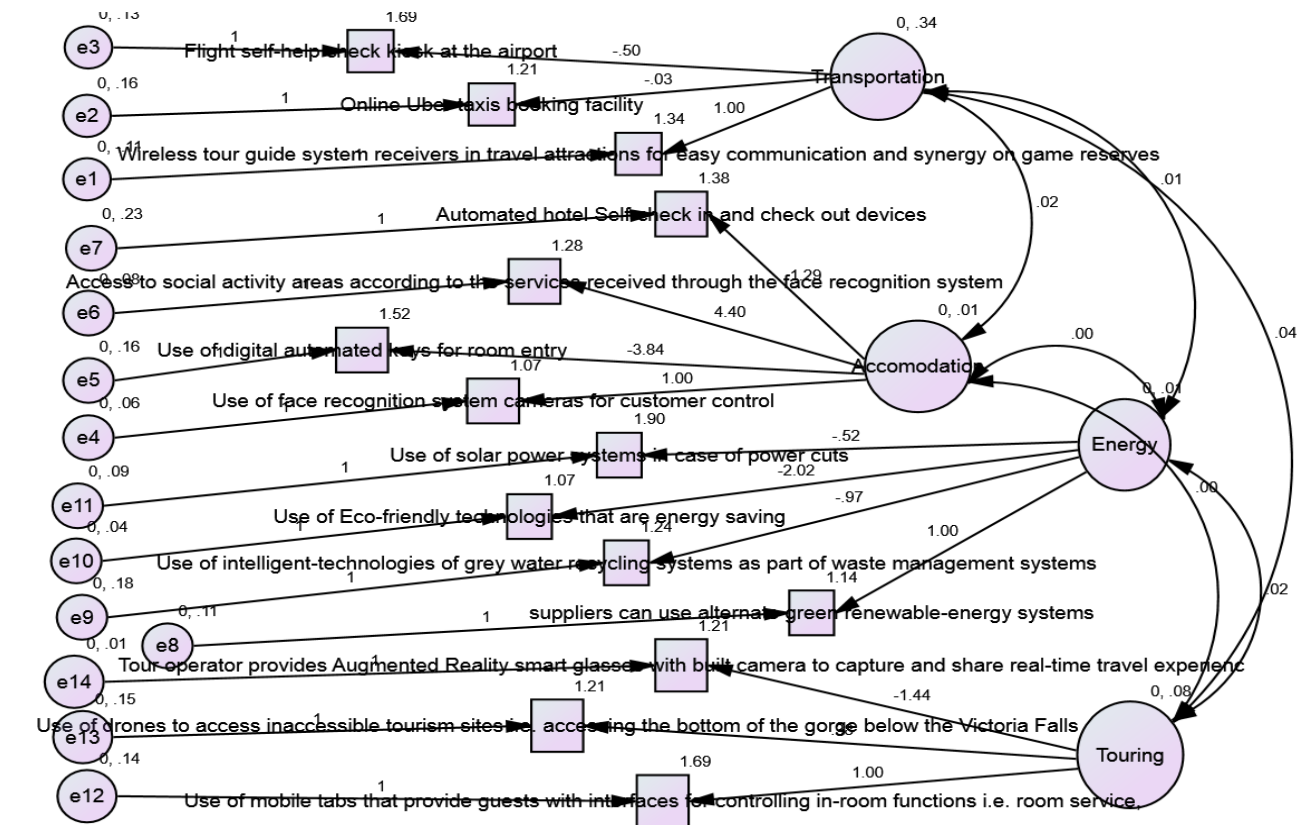


**Table 5:** Correlation between managerial position and AI adoption

Tour operators	Value	Asymptotic Standardized Error	Approximate	Approximate Significance
Pearson's R	.663	.250	.757	.008
Spearman Correlation	.663	.250	.757	.008
N of Valid Cases	23			

**Table 6:** Correlations: (Group number 1 - Default model)

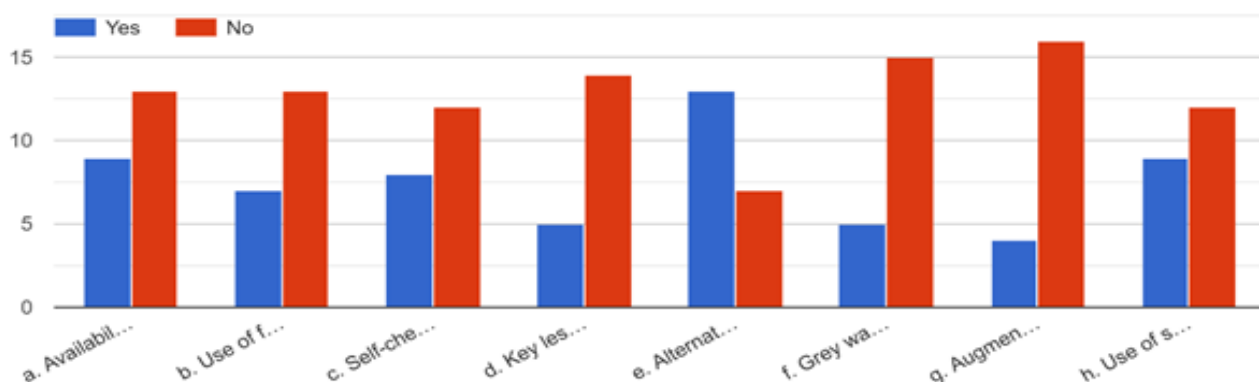
			Estimate
Transportation	<-->	Accommodation	.468
Transportation	<-->	Energy	.251
Touring	<-->	Transportation	.247
Accommodation	<-->	Energy	.508
Touring	<-->	Accommodation	.046
Touring	<-->	Energy	.939



**Fig 2.** Correlations

The relationship between various aspects of smart technologies (transportation, accommodation, energy and touring activities) was established as given on Figure 2 where energy and accommodation had a correlation of 0.508 which is very high and positive. In that same regard, energy management and touring activities produced a correlation of 0.939 which again was very high. Thus, the smart technologies applications had a correlation effect.

**How do you apply these technologies in your operating systems?**



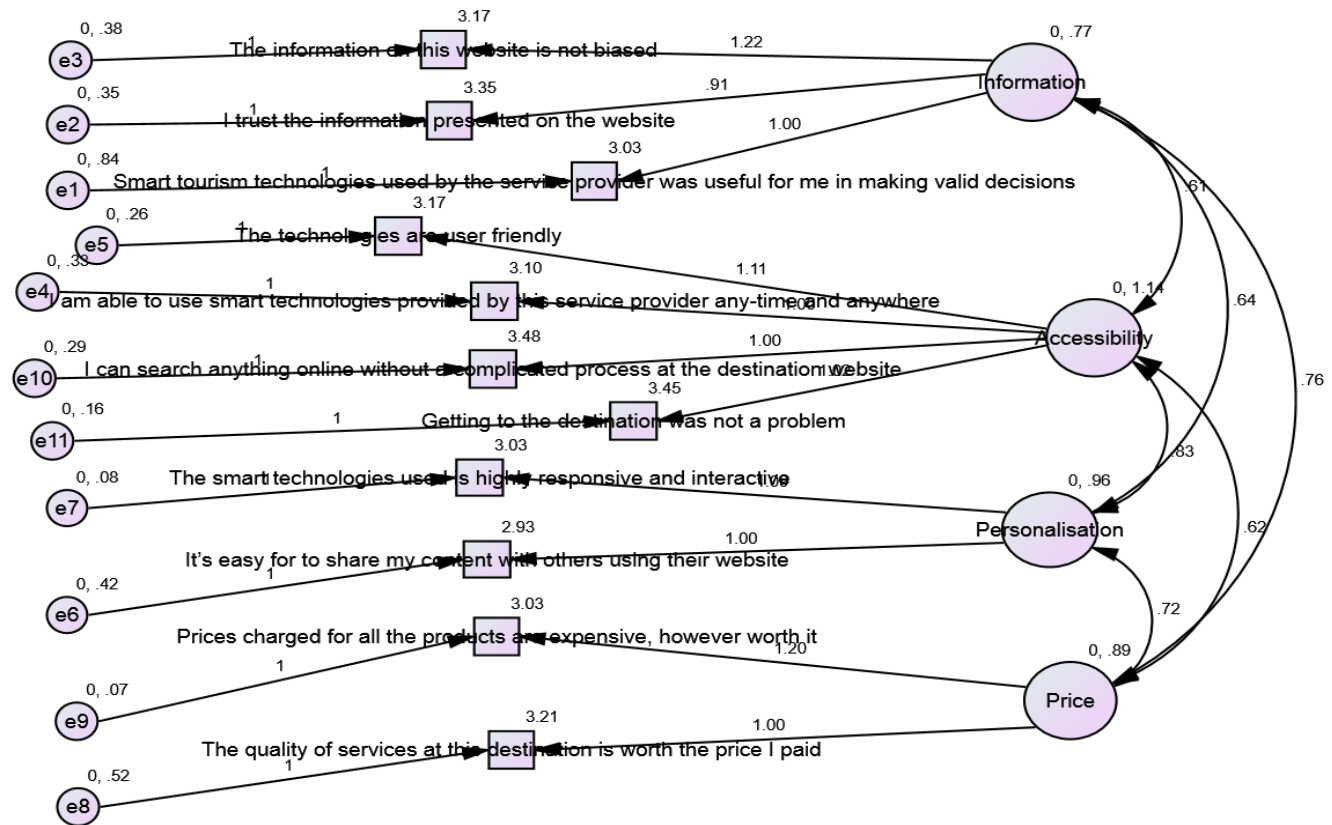
**Fig 3.** How technologies are applied in operations



Figure 3 represents how the responses were distributed according to YES or NO, and in this case, there was no equal distribution. Majority of tour operators said NO to their responses on how they applied these technologies in their operating systems.

**Table 7: Correlation on perceived tourist technology experience**

			Estimate
Information	<-->	Accessibility	.649
Information	<-->	Personalisation	.752
Price	<-->	Information	.915
Accessibility	<-->	Personalisation	.796
Price	<-->	Accessibility	.616
Price	<-->	Personalisation	.781



**Fig 4. Correlations**

The relationship between variables on perceived experience by tourists, which included prices, personalisation, accessibility and information, was also established. The highest correlation was between price and information, 0.915, whilst accessibility and personalisation had a 79.6% relationship. Thus, there was a high co-variance between perceived experiences by the tourists which was positive and the extent to which these technologies were used pre and onsite.

**HYPOTHESIS 2:**

H1: Fourth industrial technologies have a significant influence on sustainable tourism

The model below seeks to establish whether fourth industrial revolution technologies have any significant effect on the sustainability of tourism measured according to access to Information, accessibility, personalisation and price strategies and the extent to which customers are happy and satisfied about the services.

**Table 8 Correlation: Hypothesis 2**

		I was happy about the technologies used during my travel	inform	Acces	personal	Price
i was happy about the technologies used during my travel	Pearson Correlation	1	.815**	.584**	.731**	.940**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	58	56	58	58	58
Access to Information	Pearson Correlation	.815**	1	.572**	.729**	.777**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	56	56	56	56	56
Accessibility	Pearson Correlation	.584**	.572**	1	.722**	.562**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	58	56	58	58	58



		I was happy about the technologies used during my travel	inform	Acces	personal	Price
Personalisation	Pearson Correlation	.731**	.729**	.722**	1	.726**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	58	56	58	58	58
Price	Pearson Correlation	.940**	.777**	.562**	.726**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	58	56	58	58	58

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

The correlation table above had all the values less than p. value =000>0.05. Which means all the perceived technology experiences of tourist have a relationship with satisfaction.

## SUMMARY OF FINDINGS

### Current 4IR Technologies Used by Tourism and Hospitality Players in the Victoria Falls

The findings of the study showed that majority of the players in the tourism industry (transport, accommodation, recreational services) have only managed to use 4IR at minimal levels. However, a significant relationship was established between managerial position and the rate at which players in the tourism and hospitality industry were adopting artificial intelligence. The significance is due to the manager's expertise in the IT innovation appreciation, and skills. In this case the style and expertise of management used by the tour operators in adopting into artificial technologies in their business operations and managers who are fully responsible for IT innovation. Available technologies that were mentioned by included the use of big data, clouding computing systems, internet of things (IOT), Geographic Information systems (GIS) and also automation. However, it was not all operators that agreed to be using these in wider way. At the same time the data from the tourist supported this as most of them indicated it was only at pre-travel when they experienced better technologies than onsite.

#### TRANSPORTATION

The results revealed that only 69% of the tourist indicated they had access to flight self-help check kiosks at the airport, while on the other hand, 21% used online uber taxis booking facility and to mention 35% also that agreed they had access to wireless tour guide system receivers in travel attractions for easy communication and synergy. This is an indication that use of artificial technologies in the transport sector are minimal for majority of tourism operators in Victoria Falls.

#### ACCOMMODATION

The findings of the study revealed that only 52% operators in the tourism service, were using digital automated keys for room entry, which in this case should not be expected as majority or all should be having keyless automated room entry for security reasons and privacy. On the other hand, 38% had automated hotel self-check in and out devices, while also 28% had access to social activity areas according to services received through the face recognition system. Lastly, the findings showed that only 7% tour operators in the Victoria Falls used face recognition system cameras for customer recognition. Accommodation facilities have also minimally fused artificial technologies to a smaller extent.

#### ENERGY MANAGEMENT

Use of artificial technology for energy management was also revealed to be at minimal, as highest number 93% disagreed to be using eco-friendly technologies that are energy saving while 75% also disagreed, they used intelligent technologies of grey water recycling systems as part of waste management systems. On the other hand, a high number of tourists indicated some of the tour operators were also using solar power systems in case of power cuts.

#### TOURING ACTIVITIES

Less artificial technologies have been applied for recreational activities during touring activities. This is shown by 79% who revealed that tour operators did not provide them with augmented reality smart glasses to capture real time at the same time there were no drones used as some of the operators advised them the risk of security regulations by the government.

### Challenges of applying 4IR technologies by Tourism and hospitality operators of Victoria Falls

The results indicated that 74% was the majority that indicated the need to train following the introduction of each technology logistic is costly, while lack of human resources was also a problem. The cost of introducing modern technologies is cited as the second most important problem for tourism industry participants who have yet to embrace technological advancement. The findings also revealed that external challenges have greatly influenced the slow adoption into 4IR technologies. Socio-cultural, political factors have been noted by tour operators in the Victoria Falls as challenges. Over regulation and sometimes conflicting policies inhibit company growth and innovation. Liberal and democratic governments present more opportunities of economic growth and development as compared to authoritarian governments whose regulations are more stringent and tend stifle liberties. As a result, political forces can stifle or favour the companies they control.

### Effectiveness of the 4IR technologies on the competitiveness among tourist operators in Victoria Falls

With regards to 4IR technologies being effective towards the competitiveness, 70% agreed that cloud computing has made it easy to meet individual customer demands precisely. 65% also revealed that artificial intelligence has assisted in examining the movement of tourist during tours, improved collaboration among tourism and other stakeholders at large. Use of web services has identified alternatives for customers to choose their desired products. At the same time use of artificial intelligence has helped carry out tasks which the local workforce lacks and also



empowered equipped unskilled workers. Use of artificial technology has improved environmental sustainability, in the sense that use of alternative energy sources like solar power and grey water recycling technologies have helped in alternating to other energy sources instead of using the thermal power source of energy which may also cause pollution and release green-houses which cause global warming.

## CONCLUSION

From the results of the study it can be deduced that there is a need for tourism operators in the Victoria Falls to use more technologies that can enhance tourist's perceived positive experience for tourism sustainability. Majority tour operators showed that pre-travel technologies that enhance tourist to purchase their products were positively rated. Tour operators, mentioned the existence of few technologies like the big data, GIS, IOT, and cloud computing. The use of websites with interactive platforms which have allowed users to interact with friends online such that they also share their experiences, which in turn act as recommendation strategies tour operators use to attract new tourists. At the same time existence of social media platforms also has contributed to more competitive advantage for them. Realising consumer expectations is important in developing a good website.

## RECOMMENDATION

1. Since there is slow adoption of new technologies, tourism players in Victoria Falls must look at outsourcing and/ hiring of software systems and infrastructure.
2. There is for increased budgets for ICT training for employees.
3. Businesses should heavily invest in cyber security systems to protect their stakeholders' information and their confidentiality.
4. Businesses need to speed up ecommerce adoption in digitization of supply chains and expand their market access to increase profitability.
5. Tourism players in Victoria Falls, should invest in digital transformation enablers for automation, digitization and use of emerging digital technologies.
6. The government should come up with cyber policies that conform to with global policies.
7. Government should invest more on internet connectivity infrastructure.
8. The energy sector should increase power output to reduce power shortages.

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