



# A framework for enhancing Information Sharing and Collaboration within the Tourism Industry in Zimbabwe

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## Abstract

The research upon which this article is based aimed at developing an ICT based framework that enhances information sharing and collaboration within the tourism industry. The research showed the current information sharing methods employed by tourism service providers and consumers. It illustrated the role ICTs can play in information sharing and collaboration in the tourism sector. The Design Science Research paradigm for Information technology was employed to conduct a qualitative research study. The data for the study was collected through semi-structured interviews and was analysed using structural coding to find emerging themes. The findings of the study revealed that collaborative information sharing in Zimbabwe is minimal and mainly occurs mandatorily between government institutions and tourism providers. Issues of trust, diversified information needs, poor infrastructure and rivalry between regulators and tourism providers hamper information sharing. The study developed a framework, which when adopted can help mitigate against the issues hampering information sharing.

**Keywords:** Framework, information sharing, collaboration, tourism

## Introduction

Tourism is globally noted as being a major driver of economic and social development. According to Nathan Associates Inc. (2013), tourism generates foreign earnings, creates incomes, stimulates domestic consumption and creates employment especially for low and semi-skilled workers particularly benefiting women and the youth. The industry is able to accomplish this due to its diffuse and fragmented nature which encompass many components, stages and decision-making processes in the creation and delivery of the tourism product (Bramwell and Lane, 2003). Regardless of the fragmentation, there is extensive dependence on each other among tourism businesses, government and residents of the local community (Karambakuwa et al, 2011). These businesses need each other to optimise benefits of the tourism activity thus are interested in the development of the industry. The government is interested in tourism development as well as it drives economic development. Bramwell and Lane (2003) advocate for collaboration among a number of tourism stakeholders, in relation to a common issue or 'problem domain' in order to achieve significant tourism development. Collaboration has been recognised as an important determinant of the success and competitiveness of a tourism destination (Rodolfo, 2010). As Tazim and Donald (1995) noted, collaboration can also lead to the exchange of information, goals and resources.

The tourism industry has been acknowledged to be very information intensive. The information has been labeled as the life blood of travel industry where today's consumers



are very demanding, requiring flexible, specialised, accessible, interactive products as well as communication with suppliers (Buhalis, 1998). This has facilitated ICT to become an integral part of tourism operation. This is because ICT “encompasses all technologies that enable the handling of information and facilitate different forms of communication among human actors, between human beings and electronic systems, and among electronic systems” (Hamelink, 1997, as cited in Tsokota and von Solms 2013). In the tourism supply chain, not only is the exchange of information very crucial, but the information must be able to flow quickly and accurately between the client, intermediaries and each of the tourism suppliers involved in servicing the client’s needs (Nwakanma et al, 2014). Thus by harnessing the power of ICT, information in tourism can be managed more effectively and transported globally almost instantly.

Achievements in ICT have given scope for the development of a wide range of new tools and services that facilitate global interaction between players around the world (Buhalis, 2008). These new tools include the internet, mobile devices and social media and have facilitated smart tourism. An example is the existence of virtual communities for sharing information through smart tourism. As Buhalis (2008) predicted, ICT is providing the “infrastructure” for the entire industry and is overtaking all mechanistic aspects of tourism transactions. On the other hand, achieving collaboration among the key tourism stakeholders is a well-known problem that has proved a challenging task requiring the development of new mechanisms and processes for incorporating the diverse elements of the tourism system (Tazim and Donald, 1995). This is despite the fact that destination organizations generally see it as part of their role to enhance collaborative partnerships (Tremblay and Wegner, 2009). A study by Tremblay and Wegner (2009) showed that organisations are interested and desire to collaborate and saw the benefits collaboration will bring to their businesses and the tourism sector as a whole.

Globally, markets have increased their levels of focus on domestic tourism in order to develop their tourism industry and Zimbabwe has recently joined the band wagon (Mtomba, 2015). This has been facilitated further by the poor performance in the tourism industry where for instance in 2013 Zimbabwe had 2% growth in tourist arrivals below the global average of 5% (Zimbabwe Tourism Authority, 2014). The World Travel and Tourism Council (2016) showed that Zimbabwe's tourism industry is not creating any new employment stagnantly contributing 3.1 % of total employment in the years 2014 and 2015 and still forecast to remain that way. Since 2000, the majority of literature agrees that tourism development is continuously fluctuating (Chingarande, 2014; Zhou, 2013; Muzvidziwa 2013; Ndlovu and Heath 2013).

Others even attest that tourism development is declining (Mupfiga 2015; Mirimi et al, 2014; Nyahunzvi 2014). Even though the research by Taru and Gukurume (2013) in Masvingo, showed that local communities and individuals have benefited through "economic synergies" between the industries and local communities, these "synergies" have not been effected countrywide due to uneven tourism developments (Zhou, 2013). The majority of local communities are marginalised and play a peripheral role in the tourism sector matrix (Chiutsi and Mudzengi, 2012; Manwa 2003; Zhou, 2013; Nyahunzvi 2014). Nathan Associates Inc. (2013) listed a number of growth constraining challenges the Zimbabwe tourism industry is facing and among them was limited ICT usage and lack of inter-governmental policy formulation ultimately negatively impacting the tourism sector. Mutsena and Kabote, (2015) echoed the need for a synchronised policy development approach that ensures a safe environment to do business and participate in domestic tourism. Moreover, the local tourist, who is crucial for tourism development, lacks information on the products and services available (Ministry of Tourism and Hospitality Industry, 2012) yet as shown earlier, information is the lifeblood of travel industry. Without information, a tourist may not travel even if they can afford it and this is a huge challenge (Nyambura, 2014).



## Study Objectives

This study sought to address the problem of constrained growth and development in the tourism industry in Zimbabwe which is caused by the lack of collaboration among tourism providers and which is affecting information availability and ease of access to information within the tourism industry in Zimbabwe, thus disadvantaging the local tourism stakeholders. The paper aims to demonstrate the current information sharing methods employed by tourism providers and consumers, and to illustrate the role ICTs can play in information sharing and collaboration within domestic tourism. To accomplish this, the research developed an ICT based framework that enhances information sharing and collaboration within the tourism industry.

## Literature on information sharing and collaboration

The information sharing theory in tourism has not received much attention. In tourism literature therefore, information sharing has been discussed in passing and is not viewed as as a critical domain. However, tourism information needs differ greatly due to the multiplicity of stakeholders in tourism (Manente, 2009). The tourism stakeholders are made up of tourism organisations, governments, local residents/communities, tourists and environment (Buhalis and Amaranggana, 2015). The stakeholders have an enormous need for and a growing request for information. This need is caused by i) information not being available, outdated or insufficient; ii) difficulty in information access (the right information or to have knowledge of its availability); iii) information retrieval costs are frequently too high making it inaccessible; iv) the information is inadequate to the role and needs of the stakeholders (Manente, 2009). Tourists' today are increasingly longing for information pertaining to their environment (Mupfiga, 2015, Carvalho, Cunha, and Morais, 2010). A tourist's information needs include unified information of destination (Peace, Rowe and Cooper, 2005); real time support during tourism consumption (Carvalho, Cunha, and Morais, 2010); and sharing experiences with other tourists easily (Mupfiga, 2015, Amadeus, 2012). Tourists need assurance of the information's availability post visit for peer review. In this study, identification of tourism information needs is crucial to determine the information to be shared and produced. A 2012 study by Amadeus IT Group foresaw an era of 'collaborative travel' consisting of information sharing in order to transform travel and tourism and the tourism experience (Amadeus, 2012). The study suggested a world of collaboration where service users become partners rather than customers through i) working more with data ii) working more with others and iii) helping people learn from others.

Collaboration among tourism stakeholders however is not a new phenomenon in tourism literature. It is acknowledged that not much can be accomplished in tourism without multiple firms working collaboratively with one another to serve the consumer (Crotts, Buhalis and March, 2000). Collaborative effort is centred on different problem domains; policy making (Bramwell and Sharman, 1999; Hall, 1999); destination marketing; tourism planning (Bramwell and Lane, 2003; Ladkin and Bertramini 2002); and information sharing. Organisations engage information sharing strategies to gain direct access to all relevant information for their business operations (Li, 2010) and to formulate total tourism product for the consumer (Buhalis, 1998) resulting in a more efficient flow of goods and services. While organisations may be willing to collaborate, literature shows that it is not always easy and organisations are not always willing to share information. Factors such as relationship investment, shared vision and communication influence inter-organizational information sharing (Egberink, 2015). These factors help create trust and stimulate partnering organisations to collaborate to share information.



However Tengberg (2013) stated that companies are more willing to share information when these four concerns are addressed: legal and privacy concerns; technical concerns; knowledge gains and strategic concerns. An organisation needs to be assured that the inter-organisational information sharing strategy will give it a much needed competitive advantage and that it is technically viable. Cresswell et al (2013) identified trust and candor, high levels of individual and organizational commitment and the right mix of participants as crucial aspects. While there may not be a universal list of key success factors for inter organisational networks, scholars and practitioners recognize the need to breach boundaries between agencies, professions, sectors, governments, and even nations (Cresswell et al, 2013; Fan, 2013; Amadeus, 2012). A redesign of the various business processes is needed to eliminate organizational boundaries and to facilitate data exchange (Fan, 2013; Buhalis, 1998). Once the boundaries have been ignored, organisations in a collaborative network need to exert rigorous communication and commitment (Ramayah, Lee and Chyaw, 2011; Khuong 2013) to keep the network functional.

Organisations in collaborative networks tend to form different kinds of inter organisational relationships (Crofts, Buhalis and March, 2000). Tengberg (2013) identified five different structures of relationships among firms involved in sharing information. These structures are: i) No collaboration: An organisation uses its own data and does not share with anyone; ii) Direct sharing: Organisations form direct alliances with others and share data between themselves; iii) Joint collaboration: Organisations form a separate unit for sharing information with its own repository. One of these organisations will be responsible for managing the information sharing, iv) Third party aggregator: Unlike joint collaboration the information sharing unit is managed by an independent party; and v) Personal data wallets: An organisation collects data individually from various units then controls the degree of sharing and with whom to share the data.

### **Tourism, ICT and Information Sharing**

ICT is an enabler of development in every sector of society and the economy (Microsoft, 2004) and a major contributor to competitiveness and competitive advantage (Buhalis, 1998). However it can only be part of the solutions in solving the challenges facing the international development community (Microsoft, 2004; Pease, Rowe, and Cooper, 2005) as it is unable to accomplish this single handed (Buhalis, 1998). This research takes into cognisance this fact, and the framework proposed here comes in as one of the pieces to address Zimbabwe's tourism situation. ICT qualifies in this quest because of its key attributes, namely: knowledge management; efficiency; networks; and multipurpose (Microsoft, 2004). This means that ICT is appropriate for sharing information through inter organisation networks and is versatile enough to be applied according to specific needs. However the form and nature of ICT infrastructure is crucial for successful implementation (William, 2009) especially when the organisations have different ICT configurations. The size and complexity of the network can cause serious technological challenges as they grow (Creswell et al, 2013). At the same time, the technical infrastructure must encourage free exchange and enforce risk mitigation controls (McKinsey Quarterly, 2013).

Businesses in a collaborative network as facilitated by innovations in ICT have been called virtual organisations (Fan, 2013; IOM, 2012). Pease, Rowe and Cooper (2005) defined a virtual organisation as "a network of independent tourism sector competitors linked by ICT to share skills, costs, assets and broaden access to markets". Virtual organisations are strategically engaged in coopetition (simultaneous cooperation and competition between businesses). Virtual organisations are built upon the developments of the internet. Online platforms that match demand and supply are acting as intermediaries between peers who



are involved in sharing (Juul, 2015). One such platform is a collaborative information sharing platform. IACA (2014) defined an information sharing platform as "a centralized computer system that allows authenticated users to collect, manage and share structured and unstructured data sets from a variety of sources " When well designed, information sharing platforms serve as "one stop shops" for users (IACA 2014; Pease, Rowe and Cooper, 2005) who are the members of the collaborative network. IACA (2014) further explains that by deploying an information sharing platform, organisations can share a wide variety of content (pictures, videos, illustrations, geospatial content and links to internal and external websites) can be shared and discovered over an information-sharing platform. The platform can be integrated with existing systems allowing access to external data sources through exceptional connectivity often established over a secured socket layer (SSL) or through a virtual private network (VPN). Moreover, an information sharing platform leverages communication facilities across board making them good channels for communication. That way, members can work together towards a common goal by focusing on their respective collaborative activities for different. Lastly, information sharing platforms allow for automated content discovery which reduces information overload and ensures information is communicated to the right person, at the right place, at the right time basing on a user's context.

However, while the internet conveniently enables information sharing, it poses its own risks. The recent sophisticated, targeted cyber-attacks on governments and businesses call for information sharing platforms to incorporate security features that safeguard against such attacks Microsoft (2015). Recent studies in the strategic adoption of ICT in tourism are more centered on the use of the internet, social media and mobile technologies (Buhalis, 1998; Carvalho et al 2010). Buhalis (1998) proposed the multi-dimensional framework for strategic adoption of ICT in tourism. He mentioned different applications that support inter-organisational functions for horizontal, vertical and diagonal integration. However as innovations in ICT continue to improve, systems integration technologies have also changed. New business concepts such as smart tourism are being adopted which have provided tourism organisations with marketing platforms through persuasive power of word of mouth. Moreover, using social media analytics tools, organizations can transform massive volumes of social media data into useful business insights (IBM, 2013). Carvalho et al (2010) proposed a framework that is aimed at meeting the tourist's information needs. This framework targets mobile devices by integrating multiple mechanisms so as to continuously serve the tourist regardless his circumstances, Carvalho et al (2010). Fundamental technologies such as data, devices, screens and sensors are implemented to enable applications at different stages of the travel experience (Amadeus, 2012).

Nevertheless, collaboration around ICT is becoming the rule in tourism. Collaborative networks among businesses have become one of the workarounds towards destination promotion and enhancement of regional economic development (Pease, Rowe and Cooper, 2005). By forming inter organisational ICT enabled networks, tourists can be granted a concerted and unified tourism experience. Pease Rowe and Cooper (2005) argue that multiple websites are failing to provide a unified view of the destination to the tourist since each website individually represent the numerous autonomous suppliers making up a tourism destination. As Buhalis (1998) suggested, destination managers need new ways to serve the tourists' demands. Literature shows that destination management organisations (DMO) have implemented destination management systems (DMS) with the intention to provide complete and up to date information on a particular destination making it competitive (Rowe, 1992). TDN (2007) citing Pollock (2001) defined a DMS as 'the IT infrastructure used by a destination organisation for the collection, storage, manipulation and distribution of information in all its forms, and for the transaction of reservations and other commercial activities'. However a significant number of DMSs have been known to be unsuccessful as they failed to gain the support and commitment of stakeholders (TDN, 2007). Buhalis (1998)

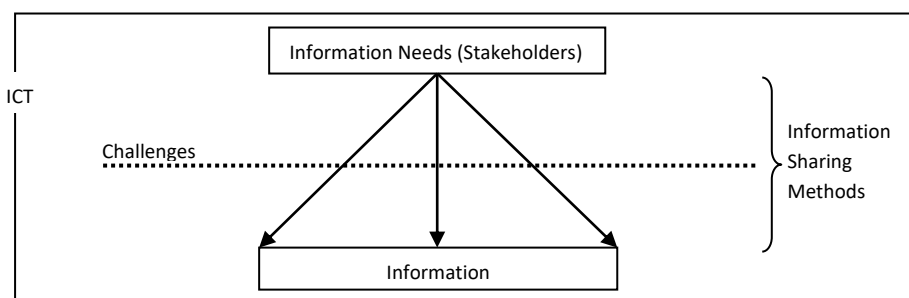
suggested for the full utilisation of the entire range of ICTs available. Rodolfo (2010) on the other hand, believe that closer partnership and cooperation (collaboration) throughout the tourism industry is essential for the success of such a system.

The factors elaborated on earlier on (Egberink, 2015; Tengberg, 2013; Ramayah, Lee and Chyaw, 2011) need to be considered for a collaborative system to be successful. Thus by collaborating and information sharing the information's value is optimised in service provision and responding to problems (IOM, 2012) with more efficient flow of goods and services. This call for collaboration to enhance tourism development has been echoed in Zimbabwe. Muzvidziwa (2013) advocates for the tourism stakeholders (governments, communities and tourists) to give more commitment and coordination to their activities. In support of this view, Mirimi et al (2014) and Kabote and Motsena (2015) argue that it is crucial for the different players in the tourism sector to collaborate through incorporating stakeholder perspectives so they can competitively contribute to tourism development. Marunda, Marunda and Munyanyiwa (2014) call for electronically empowering tourism communities by availing computers and connectivity to them since tourism and hospitality developments are largely dependent on the use of ICT. Tsokota et al (2014) further expound that simple acquisition of ICT assets does not automatically generate business value. ICTs are tools of business which need to be applied for the correct task. Tsokota et al (2014) then suggested several elements for the strategic use of ICT in Zimbabwe tourism sector.

One of these elements was an integrated interactive portal for the tourism sector in Zimbabwe which would interface with databases of related companies and allow virtual tours, videos, online bookings and payments. This idea is very applicable in the wake of fast growing ICT adoption rate by large internationally recognised hotels (Mupfiga, 2015) and massive investments by both the private sector and government in the tourism and ICT sectors (Tsokota et al, 2014).

### Conceptual Framework

From the discussion above, three main concepts have emerged. From these a conceptual framework that will guide field research on information sharing and collaboration in Zimbabwe has been built. The first concept is the fact that for information to be shared there has to be need for it among the different tourism stakeholders. Due to diversity in the tourism sector, the information needed is different. Consequently in sharing information, there exist different types of relationships/collaborations as well as the methods of sharing the information. The second concept is the use of ICT for information sharing. Different industries have applied ICT in this domain. As innovations in ICT continue to revolutionalise tourism business process, the different technologies have a role to play. The last concept highlights the prevalence of challenges in information sharing and collaboration. On one hand lies the fact that the success of a collaborative network depends on a number of factors. On the other hand, the use of ICT for sharing information poses its own risks to the network (Microsoft, 2015). Figure 1 below illustrates this scenario.



**Figure 1.** Tourism information sharing and collaboration conceptual framework Source: own compilation



## **Research Methodology**

A qualitative research guided by the design science research paradigm as applied in Information Systems research was employed. According to Hervner et al (2004), in the design-science paradigm, knowledge and understanding of a problem domain and its solution are achieved in the building and application of the designed artefact. This is accomplished by bringing people organisations and technology together. Field research was carried out through in depth semi-structured interviews. Non probability purposive sampling strategy was used in the study to collect data. The target population that was suitable for selection in the study were government institutions and associations (private) directly involved in tourism in Zimbabwe in Harare. The government institutions involved were regulatory authorities and tourism providers. Private tourism associations were appropriate as they were central and key to collaborative activities among their tourism members. These organisations were purposefully chosen to allow for complete representation across the business variations in tourism industry. That way the study was able to select information rich cases for intensive study resulting in in-depth understanding of the phenomena pertaining to the current collaborative information sharing activities in Zimbabwe. The sample size was small consisting of six participants each from their own organisation who are well informed about ICT and tourism in Zimbabwe. The sample size was determined by the saturation level which in this case was six. It was possible to reach saturation at six since participants were from representative organisations that is regulatory authorities and associations. The participants were ICT managers (2), association chairpersons (2) and marketing managers (2).

The respondents were chosen basing on their expertise in tourism and/or expertise in ICT and also on being at managerial level. The participants were knowledgeable in collaborative activities that occur in Zimbabwe's tourism sector.

## **Data Collection**

Primary data was collected through semi-structured interviews while secondary data was collected through an extensive literature review. A literature review is a presentation of a logically argued case founded on a comprehensive understanding of the current state of knowledge about a topic of study Machi and McEvoy (2012). A basic literature review was conducted in order to summarise and evaluate the existing knowledge on this study's topic. From the knowledge, the researchers were able to draft questions necessary to address the research problem of the study.

Interviews were conducted to give the researchers opinions and views of respondents about information sharing and collaboration in tourism. A general interview guide was designed to help in conducting semi-structured interviews. The questions were categorised according to the conceptual framework formulated from the literature review. The strategy of inquiry employed was grounded theory. Face to face interviews were conducted at the respondents' work places for the initial interviews and telephone interviews were conducted for following up on more issues which needed more elaboration. Face to face interviews lasted between 45 to 60 minutes. The interviews were recorded through note taking and voice recording with the full consent of the participants.

## **Data Analysis**

Data analysis involved segmenting and taking data apart as well as putting it back together with the intent of making sense out of it (Creswell, 2014). Raw data was composed of brief notes collected by the researcher during the interview process. Structural coding and



thematic analysis were used for data analysis as described by Saldana (2009). This process commenced from data collection (grounded theory) through to the actual analysis (structural coding). As suggested by Saldana (2009), codes were applied to segments of data that related to specific research questions. This constituted First Cycle Coding (FCC) process.

The Second Cycle Coding (SCC) process was conducted through thematic analysis because of the flexibility and the ability to be applied to any coded data that characterise thematic analysis (Stenius et al, 2004). This involved searching for themes, reviewing the themes and defining and naming the themes as suggested by Braun and Clarke (2006) in their 6 phases of conducting thematic analysis. No quantitative follow up was made since the number of participants was very minimal. The initial framework developed was presented to an expert reviewer from the academic community. The reviewer evaluated it for relevance and applicability in the problem domain and context and gave feedback. The reviewer's comments were incorporated in the refinement of the framework.

## Results

The results will be presented in descriptive, narrative form which is the most common employed means of presenting qualitative data (Creswell, 2014) in qualitative researches. The results shall also be presented in a structure corresponding to the research questions (Stenius et al, 2004). The major research question that the interviews sought to answer was to ascertain the current information sharing initiatives occurring among tourism stakeholders. The question was further divided into three major categories as deduced from the conceptual framework. These categories are: i) Tourism stakeholders' information needs ii) Current methods of sharing information iii) Ways of improving information sharing.

### Tourism stakeholder information requirements

Through structural coding, the FCC process produced memo code composing of nine different labels pertaining to tourism stakeholders' information needs. These labels are: Operational Information, Supply Chain Information, Executive Information, General Information, Trust Concerns, Information Utilisation Concerns, Benefit Concerns, Mandatory Collaboration and Voluntary Collaboration. Further analysis conducted during the SCC process, thematic analysis, constituted recoding the FCC data. The nine labels were grouped into three major themes. These major themes were used to identify the aspects of Zimbabwe tourism stakeholders' information needs. These are: i) Information Types which incorporate Operational Information, Supply chain information, Executive/Managerial Information and General Information; ii) Information Sharing Concerns which incorporate Trust Concerns, Information Utilisation Concerns and Benefit concerns; and iii) Collaboration Types which are Mandatory and Voluntary Collaboration. These themes have been tabulated below together with their corresponding FCC labels (Table 1).

**Table 1: Three Aspects of Tourism Information Sharing**

Information Types	Information Sharing Concerns	Collaboration Types
<ul style="list-style-type: none"> <li>• Operational Information</li> <li>• Supply Chain Information</li> <li>• Executive Information</li> <li>• General Information</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of Trust</li> <li>• Information Utilisation</li> <li>• Benefit Concerns</li> <li>• Lack of incentives</li> <li>• Lack of data utilisation</li> <li>• Lack of cooperation</li> </ul>	<ul style="list-style-type: none"> <li>• Mandatory Collaboration</li> <li>• Voluntary Collaboration</li> </ul>

Finally, triangulation demonstrated the relevance of the data and themes developed.



**Mandatory Collaboration:** Data analysis revealed that mandatory collaboration is a critical element of collaboration among Zimbabwe's tourism stakeholders which significantly impacted the aspects around information sharing. Participants from the different types of tourism organisations revealed that information was being shared as a mandate outside which no information sharing was carried out. As one participant stated, organisations are mandated to provide information about their customers. The concept of mandatory

collaboration is further strengthened in that stakeholders need incentives and to derive benefits from the information sharing initiative in order to participate. Two participants from opposing tourism organisations did note that organisations were willing to share information if they could see the benefit according to them. One of the participants, in the discussion about information sharing within their association's organisations, he stated that there was no need as each organisation was self-reliant.

**Trust Concerns:** In analyzing the data associated with information sharing among tourism providers in Zimbabwe, trust concerns continue to appear. Tourism providers were concerned that competitors could use information obtained to out compete their peers. On the other hand, orchestrators were concerned about getting "misrepresented information" which was manipulated to best suite the tourism provider, for instance, to get charged lower rates. This shows that the concept of trust concerns in tourism information sharing and collaboration is very significant.

### Current information sharing methods

With respect to the current methods in which Zimbabwe tourism stakeholders are sharing information, the FCC process produced memo code composing of six different labels. The labels are: Manual Sharing, Interactive/Social Sharing, ICT based sharing, Data Misrepresentation, Inconvenience and Maintenance costs. Further analysis of the labels conducted during the SCC process, produced two major themes that identify the aspects of Zimbabwe tourism stakeholders' collaborative information sharing methods. These are; i) Information Sharing Methods which include Manual Sharing, Interactive/Social Sharing, ICT based sharing and ii) Challenges in sharing information which include Data Misrepresentation, Inconvenience and Maintenance costs. These themes have been tabulated below together with their corresponding FCC labels (Table 2).

**Table 2: Two Aspects of Tourism Information Sharing Methods**

Information Sharing Method	Information Sharing Challenges
<ul style="list-style-type: none"> <li>• Manual Sharing</li> <li>• Interactive/Social Sharing</li> <li>• ICT based sharing</li> </ul>	<ul style="list-style-type: none"> <li>• Data Misrepresentation</li> <li>• Inconvenience</li> <li>• Maintenance costs.</li> </ul>

Again, through triangulation the relevance of the data and themes developed could be demonstrated.

**Inconvenience:** Data analysis revealed that some data sharing methods are proving inconvenient for their purpose. This theme manifested in the way all participants felt the need to make changes in the way information was being shared. Participants stated that websites "lacked functionality" and were not interactive thus prohibiting feedback from tourists and other stakeholders. Another participant noted that social media were too diverse and fragmented thus inconveniently not providing full information. This shows that convenience is an important aspect of information sharing methods for all stakeholders involved.

**Interactive/Social Sharing:** From the data analysis, it could be seen that interaction among stakeholders is an important element in collaborative information sharing methods. Through functions organised by the orchestrator, tourism stakeholders get to meet and share information. One participant in the discussion on ways of improving the current sharing methods stated that more workshops, conferences, seminars and fairs are needed to market the destination. The participant felt that it is in such functions that stakeholders get to know more of developments in local tourism. Another participant felt that more of such functions can help to brand the nation as a good destination. Interactive sharing, thus, is significant in the discussion of key aspects of tourism information sharing methods.

### Ways of improving information sharing

The FCC process produced eight different labels with regards to ways of improving information sharing and collaboration in Zimbabwe. These labels are: System Integration, Statistics, Data Analytics, more interactive websites, proactive and reactive measures, logistics, infrastructure, online information sharing platform. These labels makeup the potential remedies for overcoming challenges and/or improving collaborative information sharing among tourism stakeholders in Zimbabwe. Further analysis conducted during the SCC process grouped the eight labels into two major themes. These major themes were used to identify the aspects that constitute better or improved collaborative information sharing in Zimbabwe's tourism sector. These are Technology Based Initiatives incorporating System Integration, Statistics, Data Analytics, more interactive websites and online information sharing platform and Micro Level Initiatives incorporating proactive and reactive measures, logistics and infrastructure. These themes have been tabulated below together with their corresponding FCC labels (Table 3).

**Table 3: Two Initiatives for improving tourism information sharing**

<b>Technology Based Initiatives</b>	<b>Micro Level Initiatives</b>
<ul style="list-style-type: none"> <li>• System integration</li> <li>• Statistics</li> <li>• Data analytics</li> <li>• More-interactive websites</li> <li>• Online information sharing platform</li> </ul>	<ul style="list-style-type: none"> <li>• Proactive and reactive measures</li> <li>• Logistics</li> <li>• Infrastructure</li> </ul>

Again, the relevance of the data and themes developed could be demonstrated through triangulation.

**Technology Based Initiatives:** From the Data analysis, it was discovered that technology has a crucial contribution in the enhancement of tourism collaborative information sharing. All participants felt that more adoption of ICT within tourism would greatly help market destinations. One participant felt that there was need for change of attitude towards ICT through applying "more commitment to good IT". The significance of this theme is further strengthened by ongoing implementation of new web based information sharing systems by two organisations from which participants were selected. The participants were excited about the development as they believed this would make huge change in the way information is shared.

### Challenges posed in tourism information sharing

In order to deduce the overall challenges being faced by tourism stakeholders in information sharing another coding process level was applied (third-level coding). Further thematic analysis was carried out on a hierarchical code list derived from the raw data. The code list was made of all codes from the first level coding phase. The third-level coding process resulted in six themes.



**1) Inadequate information sharing:** The labels categorised under this theme are those initially categorised under the theme information types (Operational Information, Supply Chain Information, Executive Information and General Information) and those under the theme information sharing methods (Manual Sharing, Interactive/Social Sharing and ICT based sharing) as well as the label Inconvenience. The researchers found that these labels represented the gaps that exist between the types of information needed and the means employed for sharing the information.

**2) Fragmented information sharing:** The labels categorised under this theme are those initially categorised under the theme information sharing methods (Manual Sharing, Interactive/Social Sharing and ICT based sharing) and the challenges experienced in collaboration (Inconvenience and Maintenance costs.). These labels constitute some of the information sharing experiences encountered by tourism stakeholders.

**3) Rivalry between regulators and operators:** This theme sufficed from the information sharing concerns (Lack of Trust, Benefit Concerns, Lack of incentives and Lack of cooperation) and Data Misrepresentation. The labels under this theme depict tensions that exist among tourism stakeholders.

**4) Mistrust Between Regulators and Providers:** The labels categorised under this theme are those initially categorised under information sharing concerns (Lack of trust, lack of data utilisation). The theme was appropriate for these labels as they all entail perception issues from the perspective of the participant.

**5) Poor infrastructure:** The labels categorised under this theme are those initially categorised under micro level initiatives (poor infrastructure, transport logistics). These first cycle codes entail aspects that hinder overall tourism performance and ultimately collaboration.

**Triangulation.** The process of triangulation was employed to prove corroboration in the data analysis. The researcher would code and recode the initial raw data. After this, the researcher would examine ways in which new labels affected the data analysis. In the first-cycle coding, several codes/labels were dropped while new ones were adopted. In the second cycle, the codes were fitted within seven meta codes that is themes according to the researcher's interpretations. In the third cycle the researcher recoded the second level themes in accordance with the research problem statement. Some labels were amalgamated while others were maintained.

## **Findings and discussion**

The findings shall be discussed according to the themes and the responses obtained from the participants. These themes are i) Inadequate information sharing ii) Fragmented Information iii) Rivalry between Regulators and Operators iv) Mistrust in data sharing and v) Poor infrastructure. Participants shall be referred to according to the labels ascribed in the data presentation section. The participants are tourism providers associations (two participants, A1 and A2), government institutions (two participants, G1 and G2) and destination managers (D1 and D2).

### **Inadequate information sharing**

In tourism collaborative information sharing, issues of inadequate information sharing were discovered resulting from fragmented nature of information. The participants experienced these issues differently according to their own information needs. The researcher found that



operational, supply chain, executive and general information are the types of information that tourism stakeholders may require among themselves. Where information is shared, it is mandatory sharing. Table 4 below shows these results according to participants.

**Table 4: Inadequate Information sharing**

Participant	Comment
G1	We do share information with tourism providers. These are lease holders and tour operators. The operators are mandated to provide information about their takings. This information is provided as hard copies. Recently they can be provided through email.
A1	No, we do not share any information among ourselves. We do not want to give away information to competitors. Also we do not see the benefit for sharing information. Perhaps incentives would help.
D1	We get information from the ZTA who are responsible for the marketing of Zimbabwe as a destination. This information is about the providers' details and grades. The information is provided through hard copies.
D2	Information is available over the website. However it is difficult to keep the website updated such that information may be stale and irrelevant to current events.

From the above it can be noted that the current information sharing is not sufficient to meet all the needs of the stakeholders. There is no information sharing except for when it is mandated by regulation. There is need to mitigate on the issues raised in order to enhance information sharing. Thus information sharing is critical for framework being proposed for enhancing information sharing.

### **Fragmented information**

The current information sharing methods are proving inconvenient for the enhancement of information sharing due to the fragmented nature of the information needed and the sharing methods available. Websites lack functionality and interactivity such that tourists fail to provide feedback. Use of social media is staging financial cost implications as these are fragmented and require significant time commitment. Manual methods of sharing information are inconvenient as well since data can be misrepresented. The table below (table 5) shows the participants' opinions regarding the information sharing methods.

**Table 5: Fragmented Information sharing**

Participant	Comment
G1	There is the problem of information misrepresentation where operators alter figures or provide incorrect customer information. They do this so that they can get cheaper rates.
A2	Systems are implemented on different platforms. Integration tends to introduce additional costs whose funds are not always available
D1, A1	Websites are inconvenient as they lack functionality for interaction such as feedback from tourists.
G2	Data may be provided as Excel Sheets by email but still need to be captured in the system. This is very inconvenient

The discussion shows dissatisfaction in the current sharing methods employed. Addressing these issues can greatly influence information sharing in the positive. As such methods of information sharing shall be part of the framework being built by the study.

### **Inter regulator-operator rivalry**

Results from the research showed hostility between regulators and operators. While the factors contributing to such rivalry are irrelevant to the purpose of this study, the rivalry is certainly apparent. Issues of misrepresentation of data, lack of cooperation and the need for perceived benefits or incentives to share data are clear signs of the hostility. Information exchanged in the prevalence of such hostility is exposed to manipulation. As a result it can be noted that data integrity is highly compromised in mandatory collaboration types.



**Table 6: Rivalry between regulators and operators**

Participant	Comment
G1	Information can be misrepresented by altering figures or changing customers' demographic information such as nationality. This is done to get cheaper tariffs.
A1	If there were incentives provided, it would be worthy while to get involved.

Rivalry between stakeholders is a significant inhibitor of information sharing. When information can be manipulated and altered, data integrity is compromised. This further inhibits information sharing. This factor is therefore significant in the proposed framework for information sharing and collaboration.

### **Mistrust in data sharing**

It was noticed that the diversified tourism stakeholders do not trust each other in sharing information. Fear of competition, and lack of derived benefit from the sharing initiative constituted the trust concerns. To further explain, the need for incentives to participate in information sharing revealed the lack of trust was imminent.

**Table 7: Mistrust in sharing data**

Participant	Comment
A1	Competitors may take the information and use it for their benefit.
A2	The information is redundant. No statistics are provided and no data analytics are done. Therefore it is not necessary to participate.

Trust is critical for sharing information that may be sensitive. As trust is critical for sharing information, it is of paramount importance to address issues of trust in the framework. There is need to clearly show benefits that can be derived from information sharing so that stakeholders can opt for the idea. This theme then qualifies as a factor for the framework for information sharing.

### **Poor infrastructure**

From the research it emerged that while there may be willingness to engage in information sharing, there were other critical issues that needed to be addressed. These are infrastructure issues raised by participants that pertain to accessibility of tourism facility not information. The issues under this theme are infrastructure and transport logistics. Participants felt these issues were critical since they can prohibit a destination from being attractive.

**Table 8: Poor Infrastructure**

Participant	Comment
G2	Tourists may find it difficult to access our facilities due to poor infrastructure
A1	There are serious logistics issues. No matter how easily information about a destination can be found, it is of no use if the destination is inaccessible.

As seen from the literature review, whole tourism development can be achieved through an amalgam of solutions among them, ICT based solutions. It is imperative for this study to consider such initiatives as they may indirectly be inhibiting information sharing. Infrastructure and logistics do contribute to the lack of collaborative information sharing. It may seem futile to focus on sharing information while the tourism facilities are inaccessible. Therefore such factors need to be incorporated in the framework.

## Information sharing and collaboration challenges and the proposed solutions

While this study is taking an ICT based approach to solving the problem of lack of availability of information, it takes into cognisance that ICT alone does not provide solutions to a problem. ICT is a tool for accomplishing a task. Thus the proposed solutions are of two types; technical (ICT based) and micro level (central government). Table 9 below lists the solutions against the identified challenges.

**Table 9: Proposed solutions for overcoming collaboration challenges**

Challenge	Proposed Solution(s)	
	Technical Initiatives	Micro Level Initiatives
Fragmented Information	Online Platform Systems Integration Business Analytics	
Rivalry Among stakeholders	Systems Integration	Policy formulation for tourism mandatory information sharing and collaboration
Mistrust among stakeholders	Data Security (Data encryption, SSL)	ICT Policy for sharing data
Poor Infrastructure	ICT Infrastructure (networking and mobile and data communications)	Transport logistics Infrastructure

## Factors for framework development

The themes discussed in the findings constitute the seven factors for the development of the proposed framework. These factors are critical for enhancing information sharing and collaboration in Zimbabwe. Detailed explanation of the factors shall be given in the next chapter. The factors are:

- **Inadequate information sharing:** The current information sharing is inadequate to meet the diversified information needs
- **Fragmented sharing methods:** Information sharing methods are inconvenient due to their fragmented nature. They are ineffective, requiring significant time and financial resources.
- **Rivalry between regulators and operators:** Data integrity is highly exposed and vulnerable when being shared in the presence of hostility between regulators and operators.
- **Mistrust among collaborators and providers:** The decision to participate in information sharing is propelled by the level of trust among participants.
- **Poor infrastructure:** Accessibility of information and attractions depends on the underlying infrastructure that has been set up.
- **Technological initiatives:** ICT based initiatives for the enhancement of information sharing
- **Micro level initiatives:** Central government solicited initiatives for the enhancement of information sharing.

## Framework Overview

According to Hevner et al. (2004), design science research in information systems must produce an artifact which is applicable in the appropriate environment. The artifact of this study is the proposed framework for enhancing information sharing and collaboration in Zimbabwe. This artefact is developed from the findings of the study and also borrowing concepts from cyber-security information sharing frameworks. It is intended to be applied in the tourism sector at any level for which collaboration is practical. The factors for the

framework listed in section 4 deduced from the research constitute the components that make up the framework. The components are ; rivalry between regulators and operators; mistrust between collaborators and operators; poor infrastructure; fragmented information needs; inadequate information needs, technological initiatives for mitigating challenges and micro level initiatives. The components have been categorised according to the impact they have on information sharing since they are interlinked with the causality effect. The categories are Information Sharing Challenges, effects of the challenges, mitigating

initiatives and the desired result. This implies that the challenges of rivalry between regulators and operators, mistrust between collaborators and operators, poor infrastructure and fragmented information needs are all contributing to inadequate information sharing. Ultimately, the application of ICT and or Micro Level initiatives improves collaboration thus enhancing information sharing. The categories and their subsequent components are: i) Information sharing challenges ii) Effects of challenges on information sharing and iii) Initiatives for mitigating the challenges.

### Information sharing challenges

- **Fragmented information needs:** Tourism stakeholders (government, government institutions and tourism providers) have diversified information needs among themselves. As the study revealed, there is need for operational, executive, supply chain management and general information depending on the organization needing the information. The ultimate goal for all the stakeholders is the intention to give the tourist quality service and convenience during consumption of the tourism service. This can help to meet the tourists' need for a unified view of destination as well as providing a tourism experience as a whole package. Tourism stakeholders have turned to any available means for meeting their information needs which offer them minimum cost. It was seen that the traditional ways of sharing information through printed copies and social interactions through workshops, seminars and expos are quite dominant. ICT related methods have been limited to websites and social media due to the low costs of setting up. However the methods are failing to provide the convenience and effectiveness that they are intended to produce due to their fragmented nature. Information is scattered across platforms. They are ineffective, requiring significant time and financial resources to maintain. This can be noticed by outdated websites and lack of responses or delayed responses on enquiries by tourists and other stakeholders. In such a scenario, the motive to participate in collaborative information sharing is low even though the need to may be acknowledged by the stakeholders. An integrated online information sharing platform can alleviate the frustrations arising from diversification of information needs and information sharing methods. The system can be integrated with operators' own systems to provide real time information sharing. Stakeholders can provide information into the platform directly. When made accessible to the public, views, reviews and comments can be added for interactivity.
- **Rivalry between regulators and operators:** The study established that relations between regulators and operators are not conducive for information sharing. Operators are seeking to minimise operational costs and are looking at ways to evade any tariffs and taxes due from them. On the other hand, the government seeks to retain income from the operators for the services that they are providing. For the operators to comply, it was discovered, the government has resorted to mandatory sharing through regulations. Mandatory collaborative information sharing however is not producing satisfactory results. Data integrity is highly compromised when information is being shared in the presence of hostility between regulators and operators. By employing data security protocols such as SSL and data encryption, data shared through system integration can be guaranteed to be unhampered with.



- **Mistrust among Collaborators and Providers:** Trust is an essential part of sharing especially information that may be sensitive. While collaborators may decide to engage information sharing, this is held suspiciously by the providers who would be the sources of information. Daily business operations can be analysed to produce statistics for tourism planning and development. Through data analytics, forecasting and trend analysis can greatly contribute to tourism development. However, it was discovered providers are not willing to share information with the orchestrators or even among themselves. They are concerned that the information may be used by competitors to gain competitive advantage over them. Moreover, low confidence with the orchestrator's ability to utilise the information effectively is demotivating the operators to participate. On the other hand collaborators do not trust providers and argue that they are not cooperative. It is only when benefits start to accrue that they get involved. Since the decision to participate in information sharing is propelled by the level of trust among participants, it can be noted that the lack of adequate information sharing is also emanating from this issue. For trust to develop, it is imperative for the government to be consistent with policy and implementation. Policy formulation must involve extensive stakeholder involvement. It becomes easier for the operators to buy in the government initiatives that are introduced.
- **Poor Infrastructure:** Accessibility of information and attractions depends on the underlying infrastructure that has been set up. Operators in Zimbabwe bemoan collapsed infrastructure and inefficient transport and logistics. Information sharing initiatives tend to be in vain in such a scenario when tourism sites and facilities are not accessible. ICT infrastructure is also crucial to complement any systems integration and online platforms that can be developed for sharing information. A poor ICT infrastructure may result in the information sharing platforms not being utilized at all. Infrastructure is of crucial importance. The government can form private-public initiatives for the development infrastructure.

### Effects of challenges in information sharing

- **Inadequate information sharing:** Due to the challenges mentioned above, the current information sharing is inadequate to meet the diversified information needs. It is only occurring mandatorily.
- **Orchestrators:** Collaboration orchestrators such as the government cannot provide unified information about the Zimbabwe destination. Socially interactive activities such as seminars, expos and conferences do make a difference but due to the costs of participation, not all key players are involved. Small to medium tourism enterprises and majority of local stakeholders get left behind. General information about these players needs to be made public and accessible to every potential tourist and bring growth in the sector.
- **Operators and providers:** These stakeholders need to give the tourist a whole product experience. The supply chain needs to be fully interlinked to allow for seamless flow of information between related providers of tourism experience. For instance transport, accommodation, communication, payment and attraction providers can be interlinked for the tourist information to flow through the chain seamlessly. By doing so, the tourism operators would have to engage mutually beneficial co-opetition as described in the literature review.

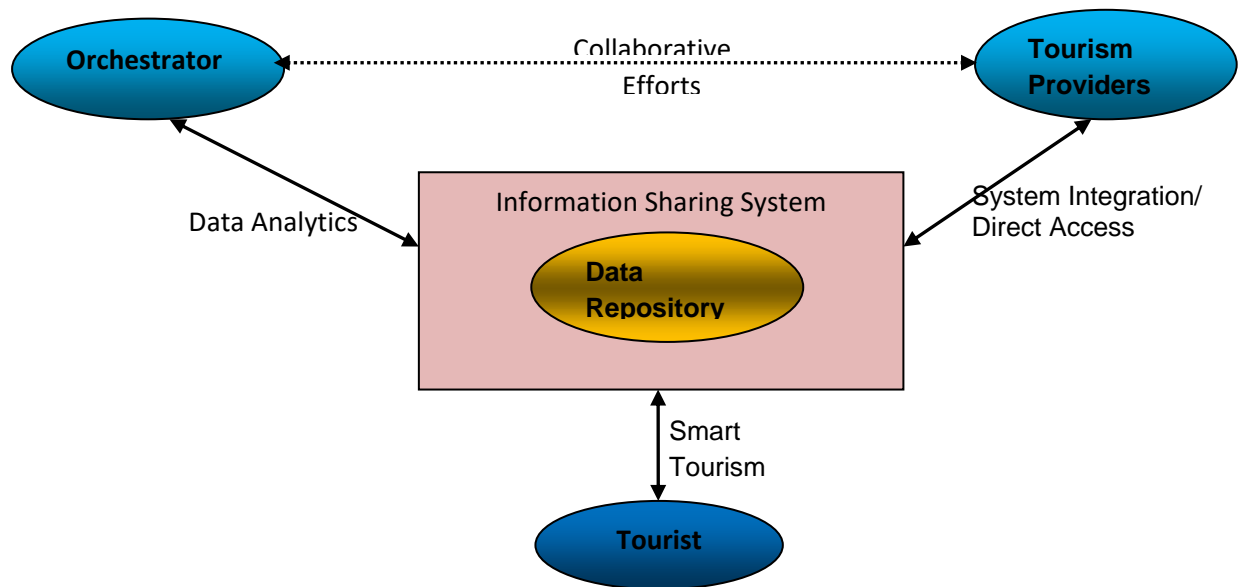




**Regulators:** Government institutions that are custodians of tourism facilities such as national parks and museums require operational information from operators and providers. Information provided is highly compromised with substantial financial and statistical implications. Inaccurate information implies inaccurate statistics which consequently results in poor planning.

### Initiatives to mitigate challenges

- **Technological Initiatives:** ICT can play a significant role in changing the current information sharing in Zimbabwe tourism sector. It is a tool constantly evolving through continuous innovations. For full benefit, all ICT available needs to be adopted and applied. Application of ICT needs to be carried by using the right ICT for the task at hand in order to be effective. If ICT is not applied correctly, it may not yield the expected result resulting in frustration and lost time and finances.
- **Online Information Sharing Platform (OISP):** An information sharing platform as described in the literature review is critical in a collaborative network for sharing platform. Due to the internet, OISP can help reduce time required for sharing information. When made public, the system is accessible by anyone from anywhere across the globe. All tourism stakeholders including tourists are able to obtain unified general information about destinations. Moreover, it is easy to provide reviews and comments about any tourism experience through additional functionality that is usually not available on websites. Social media and websites can be incorporated as well by providing links to the websites and external portals such as Facebook, twitter, whatsapp, hangouts and others. Consequently this implies the OISP needs to be fully accessible across the diversity of communication devices to make information easily accessible.
- An OISP provides great convenience in managing information as all information is available at one source. This is practical especially when all the information is stored in one central repository. Tourism providers can have access to the repository through systems integration or they can feed data through the interface. Figure 2 provides a diagrammed illustration of this.
- With data in one central repository, it is easy for destination promoters or orchestrators to provide accurate and timely executive information such as statistics and trend analysis figures. This information can be extracted through data analytics tools.



**Figure 2:** Collaborative Information Sharing Platform for tourism

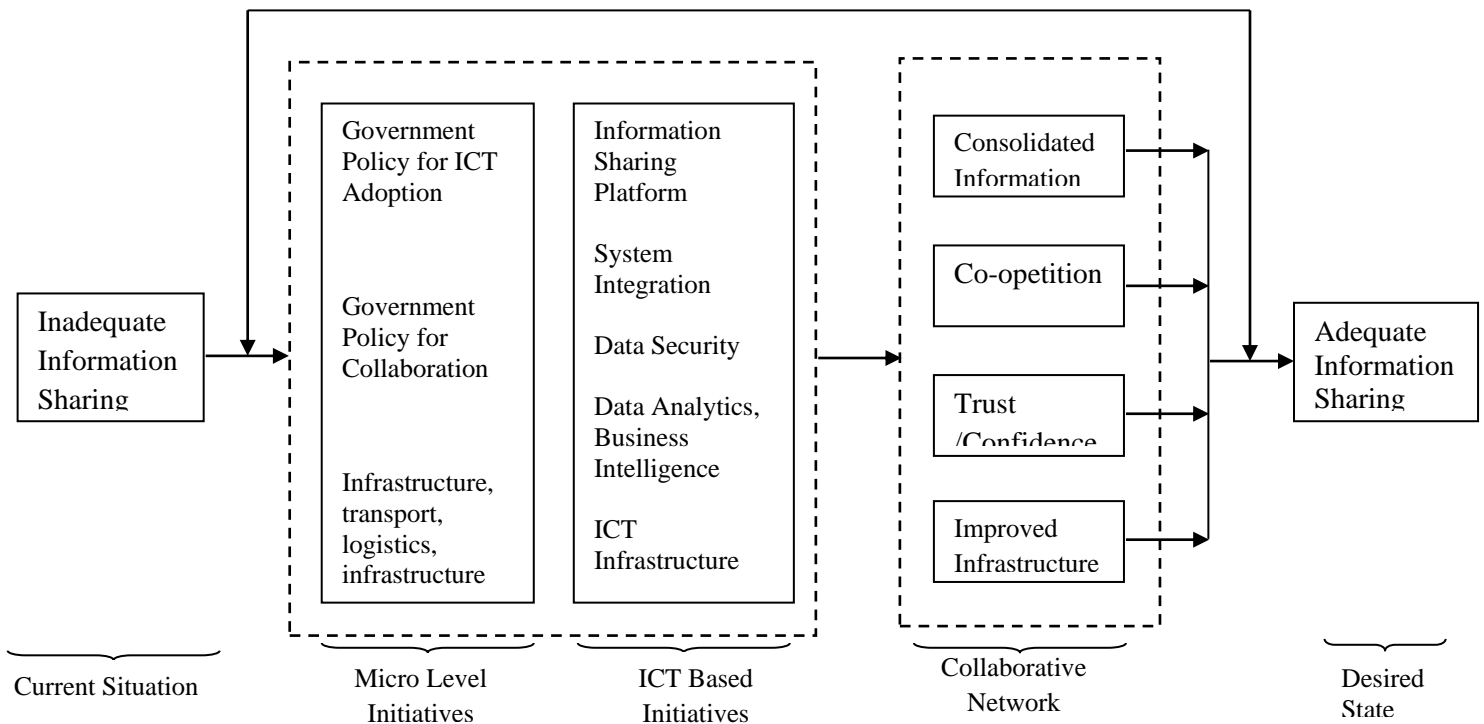
Source: Own Compilation

- **Systems Integration:** Direct information sharing between stakeholders can be greatly facilitated through systems integration. This applies for between regulators and operators as well as among operators themselves and allows data to be transferred in near real time across tourism organisations. Through technologies such as web services and Electronic Data Interchange (EDI), human interference is greatly reduced thus countering issues of data manipulation for misrepresentation. These technologies are platform independent so systems integration is relatively easy to implement and to maintain. Another importance of systems integration is the ability to provide tourism as a whole product in the tourism supply chain. When related organisations are integrated, tourists need not to provide their details for every service they consume. This improves the quality of service and efficiency of systems.
- **Data integrity and security.** Sharing data electronically especially over the internet has become very prone to manipulation. In order to establish trust reliable data security mechanisms need to be applied to systems integration and the OISP. Data transmitted needs to be encrypted and should be transmitted over secured protocols such as Secure Socket Layer (SSL). It is difficult for external intruders to break through systems and steal data for malicious intentions.
- **ICT Infrastructure:** Effective ICT relies on an efficient ICT infrastructure as its backbone. There is need for data communications to be reliable and stable across the nation for a collaborative network to be successful. This is imperative as information needs to be accessible anytime from anywhere. The current ICT infrastructure in Zimbabwe while improving, needs to be vitalised. Private public partnerships can help in ensuring this is accomplished.
- **Micro Level Initiatives:** These are central government solicited initiatives for the enhancement of information sharing. They include infrastructure establishment, policy formulation for collaboration with stakeholder consultation, consistency in policy implementation and ICT policy formulation. The central government needs to reestablish accessibility to tourism sites by reestablishing infrastructure such as roads, airlines. There is also need to promote infrastructure sharing given economic challenges that persist in the nation. It is also imperative for government to formulate tourism and ICT policies that govern issues of sharing data.

- This should be accomplished through extensive stakeholder consultations. Stakeholder involvement is crucial for collaborations. It helps establish policy ownership and willingness to participate.

### Proposed framework to enhance information sharing and collaboration in tourism

After taking into consideration the comments from reviewer, the final framework is presented in Figure 3 below. The current situation of inadequate information sharing can be applied micro level and ICT based initiatives to transform it to a more functional collaborative information sharing network. In this network can be seen collaboration, trust, co-opetition and improved infrastructure. This produces more adequate information sharing. Continued application of the micro level and ICT initiatives will continue to improve the information sharing in tourism. Braces at the bottom label the components that are above.



**Figure 3:** ICT Based framework for enhancing information sharing and collaboration

The discussion and presentation of the framework, forms the answer to the major research question. The study sought to establish how ICT can be used to enhance information sharing and collaboration. The key factors identified during analysis have been used to provide the answer. In the next section is a presentation of the evaluation step towards the proposed framework.

### Conclusion

ICT is a versatile tool available and applicable in any situation to solve problems. In tourism the tool has become an integral part of the industry. It has been applied in different tourism domains with significant and revolutionary improvements in operations and service delivery in the industry. In the information sharing and collaboration domain, ICT's potential is vast. Tourism thrives on efficient flow of information. Collaborative sharing of tourism information



greatly enhances destination performance and attractiveness by increasing its visibility both locally and internationally. By harnessing the power of ICT, Zimbabwe's tourism sector can gain enormous vitality through collaborative information sharing. ICT makes it easy and almost effortless to coordinate collaborative activities through virtual organisations. Data centres or repositories become central to every stakeholder's information needs. It is imperative however to introduce and implement policies that make the environment conducive for the ICT tool to operate effectively. As the study showed, it is not easy to form organisational collaborations. There is need for tourism policies that ensure collaborations in critical domains such as sharing of information. Once the benefits of collaborating and sharing information begin to materialize, participation improves ultimately leading to development of the tourism industry. The study then developed a framework which aims at enhancing information sharing and collaboration in tourism in Zimbabwe. The framework helps to improve appreciation of ICT in tourism and enhance its adoption particularly in countries such as Zimbabwe with low ICT adoption rate.

### **Recommendations**

This study recommends the adoption of the proposed framework by all tourism stakeholders in Zimbabwe. The framework offers strategies for resolving the lack of availability of tourism information by advocating for more information sharing and providing for ways of accessing information. Through online platforms, systems integration, mobile devices and social media the framework can help to make the tourism experience seamlessly convenient and worth it. Through data analytics and convenience of sharing data, the framework can help inspire operators and providers to collaborate. To implement the framework, it is recommended that destination promoters assume the role of orchestrator and facilitate collaborative information sharing. To make the orchestrator effective, government needs to formulate policies that govern tourism collaborations especially granting the orchestrator power to effect collaborations. The orchestrator then needs to consultatively design a public OISP that will help increase visibility of tourism facilities and their information.

Tourism providers and operators need to adopt ICT for tourism supply chain and integrate them in order to improve service for the tourist. Improved service helps encourage more business. Finally the study recommends that the central government improves road network, ICT infrastructure and transport logistics to enable tourism facilities to be accessible. Information availability is insignificant if the service cannot be enjoyed. The government can consultatively formulate policies that encourage ICT adoption, information sharing and collaboration among tourism providers and stakeholders. One such policy is infrastructure sharing.

### **Proposed future research initiatives**

Future work can start by broadening the target population to include tourism providers in other regions of the country. This could help to provide more challenges being faced by tourism providers in sharing information collaboratively. After this the future work in this study can then involve quantitative methods of research to deal with scientifically proven variables raised from the factors for the framework.

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