Open Data Accessibility Mechanisms for Tourism Development in South Africa

Siviwe Bala[1][0000-0003-2581-0942], Judy van Biljon and,[1][0000-0002-4646-1641]

Marlien Herselman[1,2][0000-0003-1089-3925]

[1] University of South Africa
[2] Council for Scientific and Industrial Research

64074633@mylife.unisa.ac.za

Abstract. Employment is a means of addressing the socio-economic developmental challenges of inequality and poverty. In South Africa, tourism has been identified as an important sector for creating employment and various initiatives are being investigated to support the tourism sector. Open Data has been proposed as a mechanism to promote tourism development but how that can be done has not been theorised. Applying Critical Realism as a research philosophy, this study seeks to identify potential causal mechanisms underlying open data accessibility and use towards sustainable tourism development. An exploratory qualitative case study and semi-structured interviews with 25 tourism information managers from the local government and private sector was used to collect data. Thematic Analysis was conducted in phase one of this study's qualitative analysis. The 15 themes identified were then subjected to affordance-based causal analysis in phase two of the analysis. Three mechanisms (innovation, efficiency and marketing) linked to touristic open data access and use for digital platforms development were identified. This study contributes to the limited body of open data literature in the South African tourism context. The contribution to theory building lies in the causal mechanisms proposed as underlying open data accessibility and use in tourism.

Keywords: Open Data, Critical Realism, Affordances, Socio-Economic Development, Tourism

1   Introduction

In South Africa, the tourism industry has been identified as a sector that provides better job opportunities than most other growth sectors with a 2,7% GDP contribution and employs 4,5% of the total South African workforce [1]. Therefore, the South African President announced support for destination marketing and ways to reduce bureaucratic red tape and prioritise support for developing tourism businesses [2]. Stakeholders in the tourism sector, including investors, rely on access to the relevant information that

is up-to-date for planning and decision making [3] increasing the demand for tourism related open data [4]. The World Bank Group [5] asserts that open data provides the potential for poverty reduction and employment creation while Bonina and Scrollini [6] highlight the importance of understanding and improving the provision of open data in its adoption for promoting the uptake toward solving real-world problems. Most open data studies focused more on unravelling conceptual and theoretical dimensions of open data while the empirical investigation of open data lags, especially in the African context [7]. As such Žebrytė *et al.* [8] called on researchers to conduct empirical studies that will investigate the area of access to and use of open data platforms. Despite the growing adoption and importance of open data in influencing economic growth and socio-economic development a grounded understanding of what supports the access and use of open data in the South African Tourism Sector is lacking. Against this background, the research was guided by the question: *What are the potential causal mechanisms for open data driven digital platforms developed in the South African tourism sector?*

The remainder of the paper is structured as follows; in Section 2 the review of open data literature is discussed. Section 3 presents the core concepts of critical realism and associated methodological implications. Key procedures for data collection and analysis are described in Section 4. The thematic analysis and the six stepwise-framework for identifying mechanisms were operationalised in Section 5 to present the findings. The discussion of the findings is presented and the paper concludes by discussing the contribution and key takeaways of the study in Section 6.

2 Review of Literature

In the tourism field, the focus is on open data reuse for the development of digital solutions such as Mobile Apps, APIs, Maps, Websites, Mobile Augmented Reality etc.[9]. The review in the following sub-sections covers key terminology and concepts related to open data including the stakeholders, accessibility and utilisation. Open Data (OD) relates to data and information that can be freely utilised, modified, and shared by anyone for any purpose [10]. In a report produced by The World Bank [11], typical stakeholders of open data can be grouped into six main archetypes namely; Suppliers, Aggregators, Developers, Enrichers, Enablers and ICT Sector. These stakeholder categories are described in Table 1 for a clear distinction. Governments, civil society, researchers, activists, the private sector and individuals can use open data for socio-economic and environmental gains [12].

Table 1. Open Data Stakeholder Types [11].

Stakeholders	Description
Suppliers	These are organisations that publish their data as Open Data to allow others to use and reuse it. They include not only public sector bodies but also some private sector companies.
Aggregators	These are organisations that collect and aggregate open data and, sometimes, other proprietary data. This is typically on a sectorial or geographic theme.

Developers	These are organisations and individual developers who design, build, and sell web or smartphone applications to deliver government open data to customers (normally in the personal sector) in attractive and informative ways, sometimes in competition with "official" applications.
Enrichers	These are organisations which use open data to gain new or better insights that they can deliver in services or products to their customers - often completely new services which could not exist before Open Data.
Enablers	These are organisations which provide platform and technologies that other businesses and individuals use. They are a vital part of the Open Data "eco-system" - while being revenue generating themselves, they also provide cost-effective and easy-to-access services for both data suppliers and data consumers.
ICT Sector	These are companies in the "traditional" ICT sector of hardware supply, software development and systems integration that are providing services to companies working to create data-rich services. Some are also providing enabling services.

Synthesising the transformative potential of open data Davies *et al.* [13] views open data as a "digital fuel of the 21st century", a promising resource that can support new economic activity and novel ideas. In its existence open data overlaps and sometimes cross pollinates with various other terms in the Information System domain. Fig. 1 illustrates a nexus of open data related term and conceptual linkages between them.
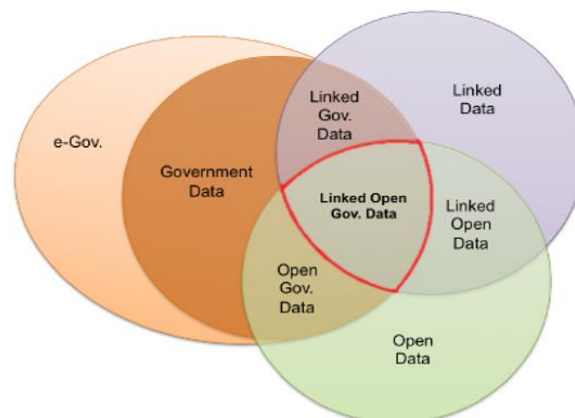

Fig. 1. Relationship Between Open, Government and Linked Data [14].

There are eight principles that should be considered by governments and public funded organisations to ensure that the data is open when it is released [15]. The principles include data being timely, easily accessible, available in different data formats, openly licensed, complete, raw as possible, machine readable, free, and non-discriminatory. For this study the researcher examined "accessibility" principle and data disclosure characteristic due to their relevance to the broader aim of this study of providing causal mechanism underlying open data accessibility in support of South African tourism development.

2.1 Open Data Accessibility

Open Data accessibility refers to the availability and access to a comprehensive content and information at a reasonable fee, obtainable through the use of internet, in an appropriate and easy to amend manner [10]. Factors such as context, manner of publishing, support provided to the users, open data tools, all these factors have an impact on how far the open data will be accessible. In the African Data Revolution report Van Belle [16] notes that in the African context open data is usually not available in most public sector organisation's online platforms. As a result, it is difficult to establish which government entity has and or is publishing open data since most information and data desired by the public ought to be derived from institutional documents in order to be accessible. Sapkota [17] maintains that a commitment to open data means making information and data resources accessible to all without discrimination; and actively engaging [users and other stakeholders] to ensure that information and data can be used in a wide range of ways. Davies *et al.* [13] argue that putting data online under open license does not equate to it being accessible and usable. With accessibility perceived as an impediment, Zuiderwijk *et al.*[18] proposed that more research should be conducted on open data accessibility in order to uncover other possible impediments that inhibit and constrain open data accessibility. Lastly but not least, the World Bank Group [5] suggested that in order to effectively open up government data, a constant interaction and collaboration between users of open data, government and ICT sectors is imperative so as to not only leave the function of opening the data to the public sector organisation alone.

2.2 Open Data Utilisation

Enormous quantities of open data are associated with the tourism industry [19]; particularly, the travel data in the form of transportation services (e.g., the bus and train schedules, bikes lanes and walkways information) needed for developing digital platforms such as mobile applications [20]. Table 2 depicts the categorisation of open tourism data and its prevalent utilisation within the tourism sector. However, in spite of tourism widely known as an industry concerned with open data, Pantano [21] underscored the limited application of open data in the tourism industry sector. This is supported by Pesonon and Lampi [19] and Hassan and Twinomurinzi [22], calling for more studies to investigate the use of open data, particularly, examining open data benefits for tourism businesses and destinations in developing countries.

Table 2. Categorisation of Open Tourism Data [19].

Open data type	Description	Where data has been used
Geographic data	GPS Location	Mobile applications, Websites
Event data	Description of events, bands playing timetable, event type	Mobile applications, Websites
Visitor statistics	Number of overnights	Mobile applications, Websites
Supply statistics	Number of businesses, types of businesses, number and	Mobile applications, Websites

	information on attractions and museums	
Survey data	Data from survey studies	Mobile applications, Websites, academic and business research
Supply information	Information on travel destinations, attractions, restaurants, and happenings	Mobile applications, Websites, academic and business research
Transit data	Timetables	Mobile applications, Websites
Governmental data	Tax distribution and collection	Mobile applications, Websites, academic and business research
All the above		Smart Tourism City, augmented reality applications, services that combine data from several sources

3　Critical Realism

Critical Realism (CR) is a new direction in the philosophy of science and social science [23], which provides an alternative to the positivist and interpretivist paradigms that have shaped our view of science and causal laws [24]. There are two critical realism enigmas asserting that i) knowledge is fallible (transitive dimension) – arguing that the knowledge about the real-world is socially constructed; and that ii) there is a real-world (intransitive dimension) – the world that exists independent of our knowledge and awareness about it [25]. Such that one of the vital tenants of critical realism is that knowledge is distinguished from existence. The central idea of critical realism is the stratification of social reality into three nested domains, namely, real, actual and empirical domain (as illustrated in Fig. 2) [26]. Critical realism literature further asserts that reality has an ontology differentiated by structures, mechanisms, and events operating in an open system [27]. In terms of practice and methodology, critical realism is not committed to the qualitative and quantitative forms of research. CR goes beyond the "what" question that the qualitative and quantitative usually describes, to the "why" and "how" questions in order to understand and explain phenomenon such as why, i.e., Information Communication Technologies lead to Development in the Information Communication Technologies for Development (ICT4D) research field and hypothesise the causal structures that might have caused the observed phenomenon or outcomes [28].

One distinguishing critical realism methodological feature is the process of retroduction. Bygstad, Munkvold and Volkoff [29] draws on Weick's description that the process of retroduction is a "thought trial" [29] employed towards identify the mechanisms underpinning empirically observed events. In his study Mungai [30], drawing from Easton [31], explains that retroduction involves tracing backwards in retrospect to identifying circumstances and setting that led to the observed events. The identified mechanism is usually a logical explanation of the contingent reality through an iterative process corroborated by the collected empirical data. According to Raduescu and Vessey [32], "causality is central to the world of scientific investigation and is generally understood to be the relationship between cause and effect, while causal mechanisms are the process or pathways through which an outcome is brought about". The explanation of

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causal powers that were activated at a given place and time is fundamental to critical realism's approach of understanding the ontology of social reality.
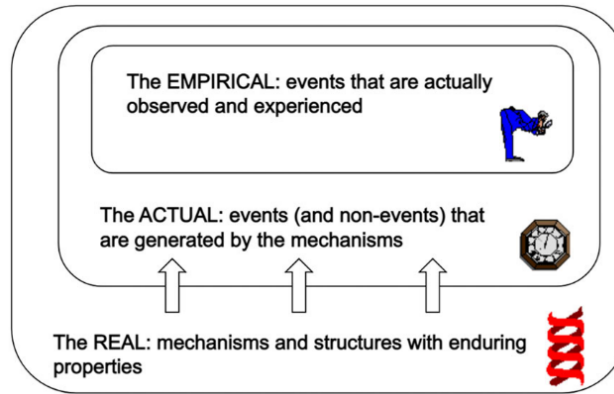

Fig. 2. Stratified Ontology of Critical Realism [26].

Critical realism's view on causality is such that mechanisms produce certain outcomes in one context and different outcomes under different context and circumstance as a result of contingent causality [27]. Critical realism's notion of causality is illustrated in Fig. 3. Mechanisms also occur as a result of an interplay between human, social and technical elements that produce contingent events. However, those events or outcomes cannot be separated to the elements that caused them [27]. Simultaneously, the results of the abstract or high-level mechanisms may arise due to the interplay of various affordances at a granular level [29].
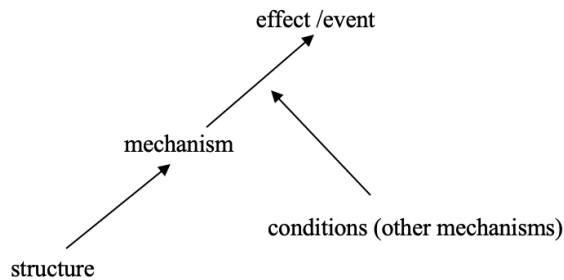

Fig. 3. Critical Realism View on Causality [33].

Critical Realism was considered appropriate for investigating this practice-based research domain of tourism information access as CR's search for causation is useful to researchers who aim to explain social events towards suggesting practical policy recommendations that could address social problems [34].This also included CR's unique features of reflexivity, pluralism and iterative retroduction, features that are not supported by interpretivism and positivism [35].

3.1 Affordances as Generative Mechanisms

The original tenant and basic assumption of Affordance theory is 'action possibility' provided by the environment [36] to an actor that is a result of the interaction between the environment and the actor. This research project adopted the affordance concept application akin to Bygstad *et al.* [29] also observed in the IS literature where affordance was used as a relational term and "the potential for behaviours associated with achieving an immediate concrete outcome" [37] emanating from interaction between an object (such as an IT artefact) and goal-oriented actor or actors [38]. The relational notion of affordance includes viewing affordances as neither exiting in the artefact nor the actor but as a result of the interaction between the two objects or structures [37]. Affordance potentialities associated with IT artefacts are methodologically easier to identify than whole mechanisms [37]. In this instance affordances are viewed as elementary units or "building blocks" of more complex mechanisms [37, 38]. This study employed affordance-based causal analysis to examine the contextual conditions and factors influencing the accessibility and utilisation of touristic open data for the development of travel and tourism mobile applications.

4 Research Methodology

An exploratory qualitative research design was employed using purposive sampling, which involves "the deliberate choice of an informant due to the qualities the informant possesses" [39]. Greater interest in reusing open data usually comes from visionaries, entrepreneurs, and small businesses who seek to make new products and services that are data-driven [5]. Therefore, the study was conducted with fifteen private sector participants from mobile application developing companies (Start-ups) that have South African tourism open data driven mobile applications on Google Play Store. The public sectors participants were eight Gauteng municipalities, including Gauteng Tourism Authority and Gauteng Department of Economic Development. Gauteng province as an economic hub with the largest Internet penetration (85.2%) was selected for this study. This cross-sectional study used semi-structured interviews for qualitative data collection where participants were asked questions about their experiences concerning accessing, using, and their interaction with tourism-related open data. The questions asked were geared towards participant thoughts, perception and experiences about tourism open data accessibility and use underpinned by Open Data in Developing Countries (ODDC) framework to inform the interview questions available in this link: https://bit.ly/3L8CnRS. The duration to complete one semi-structured interview was approximately 30 to 40 minutes each. The researcher recorded the interview sessions to ensure comments are not missed, although some notes were also taken during the interview session. In total, 25 interviews were conducted in which 15 of the interviews were with the participants from private companies while ten were with public sector participants. The researcher was granted ethical clearance with reference number – Ref #:074/SGB/2029/CSET_SOC for the purposes of this study. This study's qualitative data analysis process for identifying mechanisms began in phase one with the Thematic Analysis (TA) as advocated by Braun and Clarke [40] was conducted as a useful and

flexible method for qualitative research, followed by phase two of stepwise framework for critical realist data analysis as advocated by Bygstad *et al.* [29].

5 The Findings

5.1 Thematic Analysis

This study employed thematic analysis approach for qualitative analysis of the collected research data using Atlas.ti software package, which entailed coding, identifying and analysing patterns or themes emerging from the data and reporting on them. The thematic analysis (phase one) followed six stages as advocated by Braun and Clarke [40]. A total of 15 themes were identified and their descriptions, including summaries of raw data extracts from individual transcripts that relate to the themes, were created as part of thematic analysis, as illustrated in Table 3. The full list of themes is available in this link: https://bit.ly/3P2J2xR with theme descriptions and sample quote.

Table 3. Themes Derived from Transcribed Data.

Theme	Theme	Theme
1) Government support for open data initiatives is lacking or limited	6) Poor open data platforms formats and standards	11) Open Data utilised to provide tourist convenience and efficiency
2) Unavailability and challenges in accessing open data	7) Innovation led to open data application development	12) Open Data use required compliance with GDPR and POPI Act
3) Open data quality	8) Non-existent Open Data policies	13) Touristic open data and information easily obtainable
4) Cost and competitiveness of Open Data driven mobile app development	9) Entrepreneurship informed the use of open data for application development	14) Users engaged on published tourism data and information
5) Marketing and information provision for tourist decision making informed the development of open data driven mobile app	10) Collaboration with relevant stakeholders crucial for open data supply and publication	15) Private company collaborations crucial for open data sourcing, access and sharing

In line with CR ontology, critical realist data analysis begin with the search for 'demi-regularities' at the empirical level of reality [34]. CR searches for tendencies not laws, as predictions that suggest that 'whenever event x, then y' are not possible in the social world that consist of open system [41]. The tendencies that CR look for may be recognised from the rough trends or broken patterns in empirical data that are known as themes from phase one of thematic analysis. Critical realists call such tendencies demi-

regularities and can be identified through qualitative data coding [34]. In CR the identification of themes in the form of demi-regularities is crucial as it also represents the beginning of abduction and retroduction [34]. The themes and codes that were identified as part of thematic analysis were adopted for abstraction and retroduction in a stepwise framework for critical realist data analysis for uncovering affordances and mechanisms underlying open data accessibly and use in support of the South African tourism sector as explained in the next section. The stepwise framework was operationalised using the concept of affordances as advocated by Bygstad *et al.* [29] .

5.2   Stepwise Framework for Critical Realist Data Analysis

Step 1: Description of events and issues that constitute the phenomenon of interest. Events are basically the clustering of themes derived from the empirical evidence, so that the identification of events can be corroborated by direct observations and interview quotes from the empirical data[42]. The researcher continued with the process of identifying events until no new information on the events was discovered. The consolidation of themes that were derived from this study's phase one of thematic analysis served as events. Crucial events that were identified during data collection and analysis were: (1) the desire to innovate through open data (2) open data driven app developed for marketing and information provision to support tourist decision making (3) touristic open data used for generating income (4) open data used for user convenience and efficiency.

Step 2: Identification of key entities. The second step focused on identifying associated entities and objects of the case that characterise the phenomenon being studied and collecting data about these entities. These entities, for example, could be organisations, technology artefacts, individuals and interactions between them with emergent causal powers [29]. The combination of these entities may constitute physical or social structures that reside in the real domain. Key entities that were distinguished concerning events under analysis in this study include among others developers, suppliers, aggregators, enablers and the general ICT sector. Seven other technical, physical or social structures that were identified include: 1) Internet connection 2) Websites 3) Technical expertise 4) Smartphones, Open datasets, Open Data APIs 5) Voluntary involvement of individual innovators and entrepreneurs, tourism practitioners 6) Collaboration between companies and online user communities 7) Private funding for mobile application development (personal savings, financial support from family members, private investment, i.e. sweat equity funding). The entities may sometimes form a collection called an assemblage which consist of interconnected entities that act, enact, and interact to generate events [43] as it was observed in this study from the collaboration of various private companies who collected and shared open data among themselves for the development of mobile applications.

Step 3: Theoretical re-description (abduction). The third step of this study's critical realist data analysis was the interpretation of the empirical data using theoretical concepts called theoretical re-description or abduction. In this study, the researcher applied Affordance Theory as a relevant IS theory and lens to enhance understanding of actions and events through redescription and recontextualisation. According to Danermark,

Ekström and Karlsson [41], "abduction is to move from a conception of something to a different, possibly more developed or deeper conception of it". This abduction process is a form of inference different from induction and deductions in that the case under investigation is abstracted, described in general patterns and concepts, while conclusions are not part of the claims of given statements or ideas. For theoretical re-description and abduction, the concept of affordance was adopted towards identifying and analysing potential causal mechanisms underlying open data accessibility in support of South African tourism development.

Step 4: Retroduction: Identification of candidate mechanisms. Retroduction was the fourth step in the critical realist data analysis as a key epistemological process. This step focused on identifying underlying causal mechanisms and conditions that may have caused patterns of events under review. Retroduction is the mode of inference where the researcher postulates the continuous process by which observed events were generated [44]. In practical terms, this process was conducted iteratively and creatively by the researcher as a meta-process whose outcome was identifying mechanisms that explain what caused the observed events [31]. Through the lens of the affordance concept four candidate causal mechanisms underlying open data accessibility and use in support of South African tourism development were identified. The affordances are modelled on the structures proposed by Bygstad *et al.* [29] as described below:

The Innovation Mechanism. The innovation mechanism is based on two affordances, the *reusability* and *redistributability* affordances of open data. Fig. 4 the reusability affordance actualisation, was supported by the collaboration with user communities and understanding of user needs and requirements as an enabling condition for the use of open data.
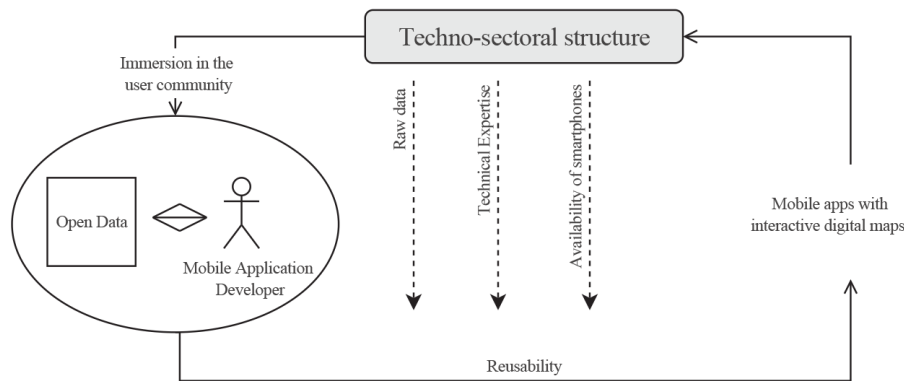

Fig. 4. Reusability Affordance.

The immediate concrete outcomes are a result of goal oriented user interacting with an artefact (i.e. open data dataset) [29]. The mobile applications with interactive digital map were identified as a concrete outcome by the mobile application developers. Participant was quoted stating the following concerning the open data reuse linked to the identified reusability affordance outcomes i.e., *"open data enabled the mobile application development with digital maps"C14.*

Davies *et al.* [13] maintains that open data enables private innovators to develop solutions for improvement of public service and build unique, new services and products with economic and social value, thus contributing to economic development and innovation. Furthermore, innovation mechanism as a source of value creation indeed supports tourism development [45]. This is through the use and application of touristic open data for the development of new and innovative digital products and services that transform tourism industry.

The Marketing Mechanism. The *boosterism (marketability)* affordance that was actualised contributed to the activation of the marketing mechanism. Boosterism is an approach on tourism initiatives such as stimulating tourism demand, planning, analysis and goal setting purely within marketing context for tourism growth [46].
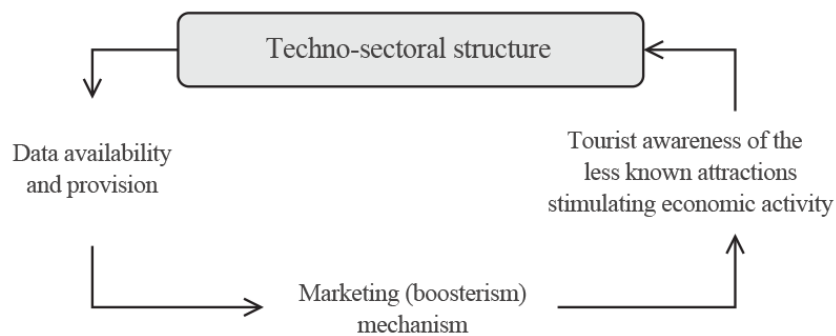

Fig. 5. Marketing Mechanism

The availability of data provided by public entities also shared by private companies among each other as data aggregators, enablers and suppliers lead to the enactment of the marketing mechanism illustrated in Fig. 5. The observed concrete outcomes from the activation of the marketing mechanism were among others the ability to draw tourist to less known tourist attractions and the increased economic activity in the tourist destinations and attractions. In tourism as a data driven industry, the marketing and management of tourism businesses and destinations depend on the collection and analysis of data such as tourist arrivals, tourism spent, bed nights etc. The effective use of this data can result into new products and business models that may lead into new employment opportunities that never existed before and increased economic activity in tourist attraction and destinations.

The Efficiency Mechanism. The *efficiency* affordance was actualised as a subset of generative mechanism through the interaction between the goal driven users and the open data datasets as an ICT artefact. A participant stated the following regarding the access and use of open data for achieving efficiency affordances: *"It was the only one[app] that was allowing people to use an app to find wildlife sightings, and it helps people to get more out of their time in South Africa"*. The actualisation of efficiency affordance as a subset of generative mechanism resulted in the enactment of the efficiency

mechanism in Fig. 6. Conradie and Choenni [47] argue that the benefits associated with open data include efficiency and effectiveness both in government and in social setting.
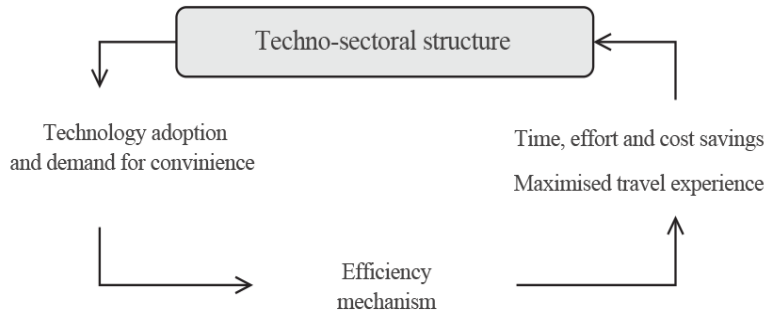

Fig. 6. The Efficiency Mechanism.

The Entrepreneurial Drive Mechanism. The entrepreneurial drive mechanism is based on the actualisation of the *earnability* affordance through the access and use of open data. Revenue and income generation from the use of open data was specified as one of the perceived goals that was indicated by this study's participants as open data users. The users of touristic open data pursued the goal of revenue generation through start-ups companies for mobile application development and as entrepreneurs. The enabling conditions for the actualisation of the earnability affordance were the opportunity to create a touristic open data driven mobile applications in order to fulfil user needs gap and space of possibilities provided by the tourism sector. The data availability, technical expertise and internet connectivity provided stimulating conditions for the earnability affordance. Two concrete outcomes were indicated by the participants namely; the revenue generation and job creation with the possibility of earning income. The touristic open data, as an ICT artefact, was engaged by goal-oriented mobile application developers to generate economic value through the activation of the entrepreneurial drive mechanism. Furthermore, Carrara *et al.*[48] confirms that even though there is a limited number of studies that measure the number of jobs created in the Open Data field of practice, there is evidence that supports causal relationship between the release of Open Data and subsequent increase in the number of jobs created by small-medium sized enterprises.

Step 5: Analysis of the set of affordances and associated mechanisms. In this step several avenues of analysis are proposed in line to this study's research questions [29]. The iterations suggested as approaches that may be explored to examine the explanatory power of the initial results are: i) Analysing the dependencies between affordances ii) Grouping affordances iii) Identifying focal affordances, and their relationships to other mechanisms iv) Abstracting affordance into height-level mechanisms. The five identified affordances (reusability, redistributability, boosterism, efficiency, and earnability) were abstracted into four mechanisms of innovation, marketing, efficiency and entrepreneurial drive. The innovation and entrepreneurial drive were combined to form one mechanism "the innovation mechanism". What enabled the combination of the two mechanisms (innovation and entrepreneurial drive) was the enabling conditions that

were relatively similar, the affordances that are of the same nature and the functional outcomes of the mechanisms were also relatively similar.

Step 6: Assessment of explanatory power. The results of this study's stepwise critical realism based methodological analysis provided three mechanisms namely innovation, efficiency and marketing. Although other mechanism could also have been at play, the three final mechanisms were identified for being consistent with the data material and feedback that was received from the study's participants.

6   Discussion and Conclusion

This study is a first step towards enhancing our understanding of open data, its use and accessibility in the South African tourism sector context. Open data as an approach in supporting the accessibility of tourism related information in South Africa has a potential for supporting socio-economic development efforts as shown by the three identified mechanisms namely; *innovation, marketing, efficiency*. Critical Realism was found appropriate as a research philosophy for guiding the non-deterministic view on causality where an exploratory case study was used to collect data for identifying potential causal mechanisms underlying open data driven digital platforms developed in the South African tourism sector. The findings provide various opportunities for further research. The literature on open data in relation to the South African context was found lacking in terms of strategies and relevant policies. Therefore, this study does not only contribute to the body of open data literature in South African context particularly in the tourism domain, but it could also be used to inform policy development on open data. The study also demonstrates theory building in ICT4D research based on the abstraction of causal mechanism-based explanations underpinned by Critical Realism philosophy and the theory of Affordances.

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