A methodological approach for understanding an emergent Caribbean Open Data eco-system

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Abstract

The purpose of this paper is to explore a methodological approach to understand an emergent Open Data eco-system in developing countries and specifically tourism sector contexts. The main objective is to provide a basis for which Open Data initiatives can be strategically targeted to result in economic, social and environmental benefits. The existing approaches for assessing the openness of data are identified. Then, the theoretical and methodological bases using Actor Network Theory (ANT) and Social Network Analysis (SNA) are explored to understand their application to the Open Data phenomenon. Thirteen tourism industry practitioners in the public sector of five Caribbean countries were interviewed using a research instrument derived from the Open Data Research Network (ODRN) Sector-Specific Assessment Framework for Open Data. Interviews were conducted over the period February to March, 2015 and the data represented using ANT and analysed using SNA. The findings reveal an inter-connected data network across five Caribbean countries and the patterns, structure and attributes of that network can be measured to determine the key actors and influencers of an emergent Open Data eco-system.

Keywords: open data ecosystem, Caribbean tourism, Actor Network Theory, tourism open data ecosystem, Social Network Analysis

Introduction

The Open Data phenomenon is still a relatively new political, social and economic movement. As it evolves from the initial pre-occupation with publishing open government data portals, key stakeholders such as governments, citizens and multilateral agencies, are becoming increasingly interested in more analytic methods for evaluating the value potential and impact of open data initiatives.

In the Caribbean, governments have been slow to embrace the Open Data movement\(^1\). As a region where small island developing economies struggle to cope with the lingering effects of the economic recession, tight fiscal space and limited economic policy discretion, open data competes with a range of socio-economic policy demands for scarce resources and political attention. Within this context, the assessment of the readiness for open data initiatives and its potential economic impact requires greater specificity, more targeted focus and a compelling narrative.

Various frameworks and mechanisms have emerged for analyzing prospective open data contexts. The World Bank’s Open Data Readiness Assessment\(^2\) methodology (ODRA) provides a toolkit to support an economical and action-orientated assessment of the readiness to evaluate, design and implement an open data initiative. The Open Data in Developing Countries (ODDC) project developed a stakeholder mapping method using ‘Visual Understanding Environment’

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\(^1\) As at May 2015, only 2 Caribbean countries have signed up to the Open Government Partnership (Trinidad & Tobago, Dominican Republic). There is, as yet, no official Open Government Data Portal in the Caribbean

software (VUE - http://vue.tufts.edu) (ODDC, 2013) that facilitates the identification of issues, actors, important information and data sources and their interconnections.

The Open Data Census\(^3\) and the Open Data Barometer\(^4\) have become well-established global indices. The Census ranks countries and cities on the supply and degree of openness of common datasets, while the Barometer provides a more comprehensive methodology for ranking countries and regions on multiple dimensions of open data readiness, implementation and impact. These are among the more popular, established assessment mechanisms, but are predominantly descriptive in nature, supply-side oriented with the unit of analysis emphasizing the individual country, city, or agency case. Subsequent efforts have been made to consolidate common methods and frameworks for the study of open data with the development of the “Common Assessment Framework for Open Data”\(^5\).

The Caribbean Open Institute (COI) recently conducted a series of sector studies as part of a larger research initiative “Harnessing Open Data to Achieve Development Results in Latin America and the Caribbean”\(^6\), that seek to determine the institutional attributes, data sharing practices, value-opportunities, and potential enablers/constraints of an emergent Open Data ecosystem in various sectors. An Open Data ecosystem can be characterized as a network of inter-connected, interdependent actors, data sources and data exchange relationships, wherein the network attributes can enable or constrain the impact of data within that ecosystem. The use of the ecosystem metaphor to describe open data has been explained (Harrison, Pardo and Cook, 2012), but there is still a need for effective analytic mechanisms to explicate the operation of such an Open Data ecosystem.

Specific to the tourism sector, semi-structured interviews were conducted and thirteen (13) institutional stakeholders in five (5) Caribbean countries participated. Existing assessment methods were applied to the data collected, but lacked sufficient analytic precision to answer key research questions. Hence the study underscored the need and presented an opportunity to explore other approaches to analysing and understanding an emergent Open Data ecosystem in a developing country context.

This paper proposes a methodological approach for understanding an Open Data ecosystem as an actor-network within which data flows are facilitated through an enactment of actors. Knowledge is built through the receipt of data and information which can be shared through a network (McLeod and Vaughan, 2015). Data activity can be explained through a network mechanism of relationships (McNaughton, McLeod and Boxill, 2014) and thereby an Open Data ecosystem can be characterized as an actor-network where network relationships represent data supplied freely for use and re-use, and utilised for various activities, not in the least policy making. Specifically, the application of Actor Network Theory and Social Network Analysis as conceptual and methodological devices to examine an emergent tourism open data ecosystem was explored.

\(^{3}\) http://global.census.okfn.org/
\(^{4}\) http://opendatabarometer.org/\(^5\)
\(^{5}\) http://opendataresearch.org/content/2014/646/towards-common-methods-assessing-open-data-workshop-report\(^6\)
Theoretical Background

This paper explores theoretical and methodological aspects of an Open Data ecosystem. Open data are based on the availability of machine readable data with no restrictions on use and re-use. In addition, the provision of open data has been largely the responsibility of public entities that are the repositories of collected datasets. An ecosystem can be viewed as a set of inter-connected components that are built and function around the purpose of that ecosystem. Open Data ecosystems are formed through the provision of open data but the operation of that system still needs to be revealed. The ecosystem metaphor has found useful application in the Open Data field (Davies, 2011; Harrison et al., 2012; Lee, 2014). Davies (2011) combines infrastructure and ecosystem metaphors to explain the impact of open data initiatives. Lee (2014) proposes eleven elements of an Open Data ecosystem including data audit, privacy, dataset selection, data access, licensing, high-quality data, data discovery, public agency support, data user engagement, economic reuse and evaluation. While these elements can be purposefully driven towards achieving economic, social or environmental goals, the required configuration for achieving a successful ecosystem architecture can guide interventions to improve the operation of an Open Data ecosystem. It is with this view that theoretical and methodological approaches have been identified in this paper.

Data sharing is enacted by a system of actors. These actors can be framed using the lens of Actor Network Theory (ANT) (Latour, 2005). ANT provides an ontological position for this work and proposes that enactment occurs through heterogeneous relationships of human and non-human entities, including for the purpose of a data actor-network, not exhaustively as suggested by Law (2007) human beings, machines, organisations and ideas. ANT provides a theoretical frame to treat humans and non-humans as alike actors (Jóhannesson, van der Duim and Ren, 2012). An Open Data ecosystem actor-network comprises an assemblage of these actors and once actors can be identified, and their relationships, an arrangement of actors can be revealed. This arrangement is based on key ANT concepts of assembling, enacting and ordering. Within an actor-network arrangement, translation of an actor-network can be understood (Ren, Jóhannesson, and van der Duim, 2012). Translations can be viewed as the processes within the network as ‘actants’, both human and non-human become agents through their inter-relationships. Based on the works of Latour, Callon and Law, it is suggested that ‘… humans often stand powerless confronted with strong actor-networks made up of technologies, documents, habits, discourse and schemes … (Ren, Jóhannesson, and van der Duim 2012: 16) and this speaks to the potential strong agency of non-human actors.

The idea of an Open Data actor-network is largely descriptive; however this representation is enhanced with the application of Social Network Analysis (SNA), a theory and methodology that maps actors and their relationships to reveal a pattern that can influence the outcomes for those actors (Freeman, 2004). The tradition of SNA is based in sociology with mathematical foundations to represent networks in graph-theoretic terms. Modern day SNA involves the understanding of the antecedents and consequences of social relationships (Borgatti and Halgin, 2011). According to Borgatti and Halgin (2011) the ‘theory of networks’ is the antecedents of networks in terms of the selection of and opportunity for certain types of relationships and ‘network theory’ suggests that there are processes, which result in the network pattern. In its simplest form a network begins with two nodes and a tie, called a dyadic relationship. The network is formed as nodes are inter-related by certain associations, cognitions, events and activities (Borgatti, Everett and Johnson, 2013). The inter-connections form a network pattern...
and SNA provides a mechanism that can measure and reveal the consequences of a network’s pattern. Although one shortcoming of SNA is its inability to show translations that ANT suggests occur, its representation of an existing network of relationships can contribute to understanding the key influencers and the processes within the network. Nonetheless, there are opportunities to re-configure a network and determine certain outcomes.

Conjoinng Actor Network Theory and Social Network Analysis can contribute to understanding the operation of an Open Data eco-system, which can also be viewed as a socio-technical system (STS). Socio-technical systems (STSs) are comprised of social and technological elements within a system. Kling, McKim and King (2003) suggest that Socio-Technical Interaction Networks (STINs) provide a basis for which there is interaction between technology that impacts human behaviour and human behaviour influences technology. In that regard Kling et al (2003) diverge from utilizing ANT both epistemologically and methodologically and take a more conservative approach regarding non-human agency and propose a STIN model that allows for proactive determination of the actors and their interactions to model a socio-technical network. Thus, a STIN approach suggests that a model of actors and interactions can be pre-determined to achieve certain goals, but this approach limits an assessment of existing actors and interactions. A broader approach should be taken to understand STSs such as an Open Data eco-system and herein is the value of ANT. ANT has been applied to conceptualizing STSs (Heeks and Stanforth, 2007; Tinati, Halford, Carr and Pope, 2011; Tinati, Carr, Halford and Pope, 2012) and SNA has been utilized for mapping STSs to understand information flows in Open Data development (Zappia, 2011). The equality of human and non-human actors in terms of agency within ANT can add value to understanding the impacts of Open Data eco-systems (Kuk and Davies, 2011). Kuk and Davies (2011) make a distinction between human agency and material agency (material agency combined with artifacts has been referred to as materiality) to explain an assemblage of open-data complementarities. This materiality can influence the outcome of an Open Data eco-system and therefore ANT can be a theoretical lens for understanding Open Data eco-systems.

**Methodology**

*Research Location*

![Figure 1: Tourist (Stop-over) Arrivals in 2010 (Jan-Dec)](Source: Caribbean Tourism Organization (2012))
The research purpose of this paper is to outline a methodological approach for understanding a Caribbean tourism data eco-system, explain the potential influences within a tourism destination based on the use of tourism data and set out a framework for understanding the potential impacts of an open data initiative within the sector. Tourism is an important economic and social activity for the region. The first six (6) months of 2014 showed an increase in visitor arrivals of 4.3% (CTO, 2014a) and further growth is anticipated with declining oil prices. With 25.1 million tourists who spent approximately US$28.1 billion in 2013 (CTO, 2014b) the Caribbean region is largely dependent on the tourism sector. Caribbean tourism is a growth sector and with continued strong performance renewed attention is being given to the sector’s sustainability including its development and management. Five (5) countries in the region were selected for this research study and the tourist arrivals figures are shown at Figure 1. The Dominican Republic is the strongest performer with just over 4 million tourists per year. Jamaica has since 2010 surpassed the 2 million mark for tourist arrivals to the island. The other three (3) countries, Antigua and Barbuda, Barbados and Trinidad and Tobago combined account for about 50% of the number of tourists that visit Jamaica and about 25% of the number of tourists that visit the Dominican Republic.

**Data collection**

The Common Assessment Framework for Open Data (ORDN, 2014) referenced earlier, was adapted for purposes of a sector-specific study of an emergent open data ecosystem and used as the basis for developing a research instrument for data collection. This paper reports on results obtained from the data provenance/profile, data use and data impact sections of the framework. The main tourism datasets including tourism arrivals, tourism assets and tourism service providers and any other tourism datasets were assessed using the framework. In terms of data use, information regarding the primary users as well as any should be and could be users who would add value to the sector were obtained. The potential impacts were categorized based on social, environmental, political/governance, and economic/commercial dimensions and identified using the Caribbean Tourism Guiding Policy Principles for Sustainability (CTO, 2014c). The policy issues are capacity management, marketing, transportation, environment, economic linkages, and health, safety and security. The participants included the main public sector tourism organizations in five Caribbean countries, Antigua and Barbuda, Barbados, the Dominican Republic, Jamaica, and Trinidad and Tobago. Skype and telephone interviews were conducted and notes were taken during the interview. Thirteen (13) questionnaires were obtained from an initial 16 invitations, an 81.3% response rate.

**Data analysis**

The data collected was first analyzed using currently available methods of assessment. Appendix I shows the stakeholder mapping approach, which depicts the various institutional stakeholders in the tourism sector and their connectedness to the key policy issues and supporting datasets. Based on the stakeholder mapping exercise at Appendix I, the tourism datasets are inter-connected within the tourism sector data system of the countries; however there is need to re-fine the relative importance of these datasets. In addition, Appendix II depicts the relative ranking of the five (5) countries in terms of the openness of Caribbean datasets including the tourism
datasets using the Open Data Census. Both techniques provide a useful visual representation of aspects of the tourism data ecosystem, but are limited in terms of any further analytic insight.

Table 1: Attribute categories and actors framework

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<thead>
<tr>
<th>Attribute Categories</th>
<th>Actors</th>
<th>Attribute Categories</th>
<th>Actors</th>
</tr>
</thead>
</table>
| **Data Source**      | Immigration
   Ministry of Tourism
   Tourism Authority
   Hotel Association
   Central Bank | **Country** | Antigua & Barbuda
   Barbados
   Dominican Republic
   Jamaica
   Trinidad & Tobago |
| **Data Owner**       | Immigration
   Ministry of Tourism
   Tourism Authority
   Central Bank | **Primary User** | Ministry of Tourism
   Tourism Authority
   Students
   Researchers
   Planning Authority
   Government Agencies
   Businesses
   Public |
| **Data Custodian**   | Immigration
   Ministry of Tourism
   Tourism Authority
   Central Bank | **Should Be User** | Public
   Researchers
   Government Agencies
   Competing Destinations
   Businesses
   Media |
| **Data Type**        | Tourism Arrivals
   Tourism Assets
   Tourism Service Providers
   Tourism Exit Survey
   Tourism Entertainers
   Tourism Destination Studies | **Could Be User** | Researchers
   Hotel Associations
   Businesses
   Application Developers
   Overseas Offices
   Government Agencies |
| **Data Share**       | Ministries
   Teachers
   Caribbean Tourism Organization (CTO)
   Overseas Offices | **Open** | Public
   Website
   NoRestrict
   NoCost
   Excel |
| **Data Dissemination** | E-mail; Regular Mail
   Telephone
   Website
   Reports; Special Request
   Press Release
   Excel
   PDF | **Public Sector** | Ministry of Tourism
   Tourism Authority
   Central Bank
   Tax Office
   Ministry of Trade |
| **Data Restriction** | Yes Restriction
   No Restriction | **Private Sector** | Hotel and Tourism Association
   Businesses
   Airlines |
| **Data Cost**        | No Cost
   Free | **Policy Issue** | Marketing
   Economic Linkages
   Capacity Management
   Transparency
   Environment
   Transport
   Health, Safety & Security |

Source: Authors
Figure 2 Attribute categories and actors (Source: Authors)
A matrix containing attribute categories and actors (Table 1) was developed to assist with defining and categorizing the relationships among the actors. Attribute categorization is particularly important since the same actor such as a government agency can be placed in more than one category such as source, owner and custodian of data (Figure 2). An attribute category was created and defined as ‘Open’ (circled at Figure 2) and this category includes the general public, website, no restriction, no cost and Excel format. The ‘Open’ attribute category is not a data attribute but a combined construct of data demand and supply elements. The actors are not an exhaustive list but are indicative of the types of responses from the participants of this research study. Data providers and users were identified using a shortened version of their name such as Immigration (Immigra), Statistical Office (StatOff) or Central Bank (CenBank). A naming approach instead of a coding approach was taken to assist with understanding the diagram. The tourism datasets, called data type, include tourism arrivals, tourism assets, tourism service providers, exit survey, destination studies and entertainers. Tourism data content can influence the outcomes of the system in terms of its impact on tourism policy issues and therefore it was important to include policy issues within the tourism data system to understand the more important tourism policy issues in the region.

Network relational data were derived from the questionnaires placed into attribute categories and entered into an Excel spreadsheet for analysis using SNA software. The relational data were analyzed using UCINET 6 software (Borgatti, Everett and Freeman, 2002) and NetDraw (Borgatti, 2002). UCINET 6 software has been popularized for SNA and can be obtained from Analytic Technologies (http://www.analytictech.com/). The relational data were entered using a node list format with the country being the focal node and relationships were assigned to the focal node based on interview responses.

Specifically, through use of SNA as theory and methodology, the following questions about this emergent Tourism Open Data ecosystem have been examined:

1. Can the network analysis identify influential actors in the ecosystem (i.e. keystone species)?
2. Can the network analysis identify major inhibitors: i.e. structural attributes or patterns that lead to data exchange inefficiency, which could be alleviated by using open data?
3. Can network patterns highlight opportunities for a digital commons-based approach to sharing data resources / approaches across countries?
4. Does the network analysis enable us to infer the degree of data openness consistent with conventional assessment methods?
5. Are there visible, observable network patterns or structural attributes that would signify the potential of a healthy open data ecosystem?

SNA was utilized to address these questions as once the network has been mapped, certain measures can be applied to understand the importance of network actors and consequences of the network pattern. Centrality is a key measure of network position. Those actors that are more central are in an advantageous position to control network resources or the removal of the most central node can fragment the network (Borgatti, Everett and Johnson, 2013). The overall network centralization is the extent to which actors revolve around the most central actor (Everett and Borgatti, 2005) and this is important for influence throughout the network. The findings sub-section outlines influential actors, inhibitors and data sharing approaches, openness assessment and a healthy data eco-system with opportunities for open data.
Findings

Figure 3: Caribbean tourism data eco-system (Source: Authors)
Influential Actors

Table 2: Centrality values (Freeman degree centrality)

<table>
<thead>
<tr>
<th>Actors</th>
<th>InDegree</th>
<th>NrmInDeg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>16</td>
<td>22.54</td>
</tr>
<tr>
<td>TourIndus</td>
<td>15</td>
<td>21.13</td>
</tr>
<tr>
<td>StatOff</td>
<td>15</td>
<td>21.13</td>
</tr>
<tr>
<td>Immigra</td>
<td>14</td>
<td>19.72</td>
</tr>
<tr>
<td>tourast</td>
<td>13</td>
<td>18.31</td>
</tr>
<tr>
<td>tourarr</td>
<td>12</td>
<td>16.90</td>
</tr>
<tr>
<td>DRMOT</td>
<td>12</td>
<td>16.90</td>
</tr>
<tr>
<td>TTTDC</td>
<td>10</td>
<td>14.08</td>
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<tr>
<td>toursev</td>
<td>10</td>
<td>14.08</td>
</tr>
<tr>
<td>NoCost</td>
<td>10</td>
<td>14.08</td>
</tr>
<tr>
<td>Businesses</td>
<td>10</td>
<td>14.08</td>
</tr>
<tr>
<td>GovAgs</td>
<td>10</td>
<td>14.08</td>
</tr>
<tr>
<td>Website</td>
<td>9</td>
<td>12.68</td>
</tr>
<tr>
<td>NoRestr</td>
<td>9</td>
<td>12.68</td>
</tr>
<tr>
<td>CapMan</td>
<td>9</td>
<td>12.68</td>
</tr>
<tr>
<td>CenBank</td>
<td>9</td>
<td>12.68</td>
</tr>
<tr>
<td>Marketing</td>
<td>8</td>
<td>11.27</td>
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<tr>
<td>OverOff</td>
<td>7</td>
<td>9.86</td>
</tr>
<tr>
<td>ABMOT</td>
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<tr>
<td>E-mail</td>
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<tr>
<td>Environment</td>
<td>7</td>
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<tr>
<td>TaxOff</td>
<td>7</td>
<td>9.86</td>
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Source: Authors

Influential actors are central actors who can enact either positively or negatively and influence network effectiveness and outcomes. Centrality is measured as the degree to which actors were engaged with network activity. The overall network centralization in-degree is 1.346% and this is the extent to which all other actors revolve around the most in-degree central actor. A ‘Public’ actor has a degree centrality of 16 and this actor has the highest in-degree centrality value that has been normalized for comparative purposes (in this network of 72 actors, the normalized in-degree centrality is 16/71 times 100 or 22.54). The actors with high normalized in-degree centrality values are influential to the eco-system’s operation as these actors are at the core of the network and the top five include the general public, the tourism industry, the statistical offices in three Caribbean countries (Antigua & Barbuda, Barbados and Trinidad and Tobago), the various Immigration Departments and the tourism assets dataset (Table 2). The most prominent policy issues with higher in-degree centrality values are capacity management, marketing and the environment. The disseminative capacity can be determined by no cost, website, no restriction and e-mail as these nodes have higher in-degree centrality values than other disseminative nodes.
Inhibitors and Data Sharing Approaches

Data sharing relationships are engaged through a network mechanism. Inhibitors can constrain data dissemination. As a result, there is need for both a network mechanism facilitated by dissemination for there to be effective data diffusion. The composition of the network in terms of the types of actors and dissemination mechanisms can assist with clarifying any inhibitors. In this case, the network positions are indicative of several observations that can identify potential inhibitors to data sharing activities:

- User and dissemination nodes are in proximity: from visual evidence the ‘Students’ node is in proximity to the ‘E-mail’ node, and the ‘Media’ node is in proximity to the ‘Reports’ node. A breakdown of the network revealed that there was a match between the number of countries, the users and the dissemination mechanisms and hence the reason for the network positions of the nodes. For instance, both the Dominican Republic and Jamaica indicated media as users and reports as a dissemination mechanism while the other countries did not and hence the network position of the ‘Media’ node and the ‘Reports’ node.

- User groups are positioned in similar proximity within the network: a group of private sector actors, ‘Businesses’, ‘Hotels’ and ‘Tourism Industry’ is positioned similarly and this relates to a set of common users within all five countries. There is no evidence however of a common dissemination mechanism that reaches this user group and therefore it is suggested that this is an opportunity for an open data initiative.

- The public sector actors are key potential enablers or inhibitors based on the strength of ties within the countries (Appendix III). The Ministries of Tourism and various Tourism Authorities, particularly the ABMOT (Antigua and Barbuda Ministry of Tourism) DRMOT (Dominican Republic Ministry of Tourism) and TTTDC (Trinidad and Tobago Tourism Development Company) are important public sector actors in the eco-system. The dissemination policies developed within these organizations can enable or inhibit data sharing within the tourism data eco-system.

Openness Assessment and a healthy data eco-system with opportunities for open data

The tourism data network comprises 72 actors in five (5) Caribbean countries (Figures 2 and 3). In Figure 2, the attribute categories reveal dense relationships between the data providers (sources, owners and custodians) and users (prime, should be and could be users). In Figure 3, the overall network topology is circular in nature with several pendants pulling away Jamaica and Trinidad and Tobago from the other three countries, Antigua and Barbuda, Barbados and Dominican Republic. A circular network suggests that the network lacks a coordinating actor that can make a direct intervention to reach other actors in one step and this is a star network, which is most efficient (Borgatti et al, 2013). In addition, the pendants are opportunities to create convergence within the data system as those countries without these relational nodes should seek to engage these pendant entities more readily. In addition, Openness actors (Figure 3; circled), ‘Website’, ‘Public’, ‘No Cost’, ‘No Restrictions’ and ‘Excel’ are differently positioned in the network and this is evidence of a lack of coordination in the network.

The overall network seems disorganized with no clear clusters of relationships. Nonetheless, the countries that have similar kinds of relationships are closer in proximity to each other on the
network diagram as the geodesic distance (the shortest path between two nodes) is shorter. For example, Antigua and Barbuda and Barbados are similar and Jamaica is farthest. An open data initiative can create similar types of data relationships within the eco-system and therefore improve convergence. Similar observations are made with the policy issues. Policy issues that are in proximity relate to the environment and economic linkages, while marketing and capacity management issues are apart. The tourism datasets are generally not in close proximity to the policy issues except capacity management. This positioning is an indication for greater assessment of the data needs for the management of policy issues to achieve favourable outcomes within the tourism sector. While tourism sector stakeholders are engaged with providing information and utilizing the various tourism datasets through a formal arrangement for the benefit of the tourist destination, the network analysis suggests that the tourism assets and tourism service providers datasets are in closer proximity to capacity management issues and therefore some attention should be given to these datasets (Figure 3). This is an opportunity for an open data initiative that can contribute to the development of data to achieve the required policy goals.

Conclusions

Open Data initiatives provide an opportunity for the creation of an eco-system within which several data elements and users interact to achieve goals. By taking an ANT approach the inter-relationships between data and user elements converge and provide meaningful insight about the prime influencers of the data system. The key actors are the prime users, the members of the public and the tourism industry. Any open data initiative should review effective dissemination mechanisms for these user groups. In addition, important influencers in terms of tie strength are those agencies in the public sector, the Tourism Authority and the Ministry of Tourism and therefore these agencies are required to implement and set out the policy framework respectively for a healthy tourism data eco-system. The resourcing of these actors becomes important to effect changes in the tourism data landscape.

The inter-connectedness of human and non-human actors can enable or constrain network outcomes. The performance of the data within the system is enabled by its ability to diffuse and the provision of content to meet policy goals. For instance, although the arrivals dataset from the demand-side can be used for marketing purposes, information from the tourism assets and tourist exit survey can also influence marketing strategy as these assess the supply-side of the sector. The interventions needed to transform the tourism system to bring value can be linked to the materiality of the non-human actors with equal emphasis placed on the resourcing and agency of human actors. This perspective is important to understand the impact of data within the eco-system.

For developing countries, particularly those with limited resource endowments, such as the small island developing states of the Caribbean, opportunities for open data require a more targeted sector-specific approach that can maximize the benefits and returns from the allocation of scarce financial and human capital resources to such policy initiatives. This research study explores an analytic framework for understanding potential impacts of an open data initiative in the tourism sector in order to inform the targeted allocation of resources to stimulate the sector’s development. A network approach for understanding Open Data eco-systems can add value to
the field. A network can be viewed as a coordinating mechanism in which ties are bonds that create cooperation between actors or converge and create sameness of action (Borgatti and Halgin, 2011). ANT and SNA are complementary, both conceptually and methodologically for understanding an Open Data eco-system. The study is exploratory and further work will re-examine the structure of the instrumentation used for data collection, to be more specifically designed to support network analysis. There is no doubt that an open data initiative with its emphasis on data sharing will support the generation of knowledge but the suitability of the mechanisms and architectures that can support a healthy Open Data eco-system for there to be continued data sharing and utilization can be revealed through ongoing work through application of ANT and SNA approaches.

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References


Appendix I Caribbean Tourism Stakeholder Maps (five countries)

Figure A - Antigua and Barbuda Tourism Sector Stakeholder Map

Figure B - Barbados Tourism Sector Stakeholder Map
Figure C - The Dominican Republic Tourism Stakeholder Map

Figure D - Jamaica Tourism Sector Stakeholder Map

Figure E - Trinidad and Tobago Tourism Sector Stakeholder Map

Key

- **Actors**
- **Information**
- **Issues**
Appendix II Caribbean Open Data Census (five countries)

Source: Caribbeancensus.okfn.org (retrieved 05/2015)

<table>
<thead>
<tr>
<th>Country</th>
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Appendix III: Tourism Data Eco-system (the strengths shown by line thickness)