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Grouping the Americas and Asia-Pacific Countries based on Their ICT Readiness, Prioritization of Travel & Tourism and Tourist Service Infrastructures

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Abstract

Travel and tourism competitiveness is a multi-pillars construct, each originating from measurement attempts. Involvement of governments, technology and tourism infrastructures are viewed as factors able to improve tourism competitiveness. This paper identifies principal components from these pillars for the Asia-Pacific and Americas considered most improved regions by the World Economic Forum (WEF). Five principal components were identified but three components were the most appropriate solution. A cluster analysis divided the countries into four groups offering a classification of the set. With their position presented in a scatter plot, countries can identify and select the best recommendations to their case depending on the group they belong to. Based on the cluster analysis results, it is seen that groups likes the Underachievers and Critical improvements would definitely need to improve their ICT level, while the Average Performers could as well benefit from technology improvements, although at a lesser degree. Specific examples discussed give better indications and recommendations to the countries as they can draw example from the explained cases to either adopt or adapt relevant strategies that would help their economy or avoid making similar mistakes.

Keywords: tourism competitiveness, ICT, tourism infrastructures, PCA, cluster analysis

1. Introduction

Advancements in technology and the needs for a better lifestyle have created a very competitive environment at a large scale for firms, companies, enterprises, businesses, countries, territories, industries and individuals in general. The same applies to the travel and tourism industry that has registered major changes due to many factors including technology development. Gooroochurn and Sugiyarto (2005), in a study regarding indicators in the travel and tourism industry, noted that tourism competitiveness is a combination of eight main indicators: price, technology, environment, social development, human resources, openness, infrastructure and the human tourism indicator. They further found that technology and the social factor greatly affect the industry's competitiveness. On one side, Aramendia-Muneta and Ollo-Lopez (2013) noted that internet and communication technologies (ICTs) offer new opportunities by creating gains in competitive advantage as well as improving productivity or developing new businesses or facilitating new ways of management (Buhalis, 1998, 2003; Gruescu, Nanu, & Pirvu, 2009; Ion & Andreea, 2008; Irvine & Anderson, 2008; Shanker & May, 2008). Harvey (2010), on another side, highlighted the different aspects of society being part of a whole social system when it comes to political economy. This indicates how governments, by seeing tourism as a tool and contributor can impact their country's development, given that the broad social theory of political economy is addressing how politics impacts choices in society (Bramwell, 2011). The role of government is fundamental in tourism planning and development, therefore government intervention is channeled through formal institutions such as ministries (Nunkoo, 2015; Wang & Bramwell, 2012). Governments make decisions for the economy as a whole, and this includes the physical development of infrastructures, and even the decision to promote infrastructural projects.

Jovanovic and Ilic (2016) noted that tourism development depends on the modernization of infrastructures, which points at governments making the decision to intensify investment in infrastructures as an important driver of tourism sector's improvement. Some authors also link tourists satisfaction to tourism infrastructures (Blazeska, Strezoski, & Klimoska, 2018).

Tourism is a notion of numerous facets and it has become a key sector in the world's economy (Aramendia-Muneta & Ollo-Lopez, 2013). In fact, its importance is constantly increasing. For the last couple of years, a 4% yearly growth rate has been registered in the tourism industry and this led to a 300 million more people who traveled internationally between 2008 and 2016 (UNWTO, 2016). Travel and tourism industry substantially contribute a lot more to GDP, employment and exports compared to other key sectors (WTTC, 2012). In 2016, its contribution to global GDP was up to 10.2% and growth trends and prospects largely exceed that of other key sectors (Crotti & Misrahi, 2015, 2017). The World Travel and Tourism Council (WTTC) noted that tourism is a masterpiece of developing countries' development scheme as the industry's importance resulted in the National Tourism Organizations (NTOs) spending over US$ 4 billion yearly between 2008 and 2012 on marketing and promotional efforts. Governments from all over the world should therefore consider leaning towards policies to boost the development of the sector, allowing their respective countries to reap a wider set of benefits in the overall economy (WTTC, 2012).

The rapid development of ICTs will not fade in the near future, and the impacts on all sectors might only grow stronger. Over the years, the travel and tourism industry has felt the impacts of the rapid technology related changes in many different ways; authors and researchers have had opposed views on whether these impacts were positive or negative considering the benefits might often be intangible. Rather than dwelling on either positive or negative views, it is important to clarify that these changes brought opportunities along the way as well as various challenges. Ukpabi and Karjaluoto (2017) pointed out ICT revolutionized how tourism services are accessed and consumed due to the reason that highly innovative ICTs supply consumers with different channels to use tourism services.

Infrastructures remain one important tool to prepare for and attract tourists while technology contributes to improve tourists' convenience and facilitate self-travelers along their journey exploring new places/locations. The readiness in ICTs has therefore become a determinant factor to tourism competitiveness as it allows, among other things, an increase in market share and makes way for the development of new businesses. At the same time, the government sets the tone, makes tourism related policies, invest in public infrastructures and, by its decisions, attracts private investments likely to impact tourism competitiveness so that society is better off. These three pillars, namely ICT Readiness, Prioritization of Travel and Tourism (PoTT), and Tourist Service Infrastructure (TSI) seem to penetrate each other and their inter-penetration suggests a rationale so as to understand the reason studying these three indicators makes sense. Many of the countries in the Americas and the Asia-Pacific regions need to improve their ICT to cope with the countries having a well-developed ICT network. On the other hand, some countries would want to steer away from over-reliance on ICTs and protect their environment given environmental protection is nowadays a major concern due to the rapid degradation of natural resources. There, we have added another reason to the importance of the present study.

A study on ICT in the travel and tourism industry can be quite overwhelming, independently of which aspect of ICT would be the focus of the study. Extensive amount of research has been conducted on ICTs in tourism and there is still room for more considering technology is continuously moving towards greater achievements. The same applies to a study on the role of society and government in tourism knowing that a great deal of research has been conducted on the relationship between the social aspect and tourism. The importance of infrastructures for the tourism industry is undeniable and has been extensively discussed in the literature. However, the present research's contribution comes from the combination of these three important constructs to better understand their implication and importance in the competitiveness of the two regions, the Asia-Pacific and Americas, identified by the WEF as the two most improved regions.

This paper intends to conduct an interdependence study in order to identify the principal components related to ICT Readiness, PoTT or TSI and understand their importance in tourism competitiveness through principal component analysis. Leaning on the WEF competitiveness index's dataset, the study later classifies the countries from the two most improved regions based on common significant factors/components identified. What precedes allows a better idea of the countries' position in relation to their attributes, which will help identifying and suggest where to concentrate development efforts and will eventually be useful in designing the appropriate development strategy. Through the use of correlation, principal component and cluster analyses, this paper demonstrated how the countries can be grouped into similar clusters based on their ICT readiness, PoTT and TSI.

The remainder of this paper follows the present structure: next section overviews relevant literature related to each pillar as well as eyeing on the TTCI's framework. Methodological details are discussed in the subsequent section where we specify the techniques used. The results and discussion section presents the different statistical results and related discussions. It also highlights the contribution of the study, followed by the conclusion section which points towards avenues for further research related to the topic.

2. ICT Readiness, Prioritization of Travel and Tourism and Tourist Service Infrastructure: Roles in Travel and Tourism

This section discusses the role and importance of ICT Readiness, PoTT by governments and TSI in the travel and tourism sector. It also provides an overview of the travel and tourism competitiveness index (TTCI).

2.1 Travel and Tourism Competitiveness Index Overview

Tourism researchers have been particularly interested in measurements of competitiveness in relation to travel destinations and the body of literature is filled with studies related to tourism destination competitiveness as noted by Pulido-Fernández and Rodríguez-Diaz (2016). The WEF was the first institution dedicating an entire biennially report to travel and tourism competitiveness starting from 2007 but different ways have been suggested since then to measure tourism destination competitiveness (Croes, 2011; Croes & Kubickova, 2013; Gooroochurn & Sugiyarto, 2005; Leung & Baloglu, 2013). It is important to highlight that the framework developed by the WEF was based on a study by Gooroochurn and Sugiyarto (2005) where they identified key competitiveness indicators in the travel and tourism industry. The Travel and Tourism Competitiveness Report (TTCR) features the TTCI, and the index is seen as a comprehensive strategic tool which makes it easy to visualize the different weaknesses and strengths of economies in relation to the development of the tourism industry. This makes it therefore possible for governments, institutions or the different shareholders involved to cooperate in order to improve overall tourism competitiveness and, eventually, uplift the overall economy.

The new framework of the TTCI is a construct of 4 sub-indexes (the previous one was made of 3 sub-indexes instead of 4), 14 pillars and 90 individual indicators distributed among the pillars (Crotti & Misrahi, 2015, 2017). The pillars are organized as follows: business environment, safety and security, health and hygiene, human resources and labor market and ICT readiness (Enabling Environment); prioritization of travel and tourism, international openness, price competitiveness and environmental sustainability (T&T policy and Enabling Conditions); air transport infrastructure, ground and port infrastructure and tourist service infrastructure (Infrastructure); natural resources, cultural resources and business travel (Natural and Cultural Resources). However, this study focuses on three specific pillars which are ICT Readiness, PoTT, and TSI as can be seen in the summary presented in Table 1. ICT Readiness is made of 8 individual indicators which are: ICT use for biz-to-biz transactions, internet use for biz-to-consumer transactions, internet users (% pop.), fixed-broadband internet subscriptions (/100 pop.), mobile-cellular telephone subscriptions (/100 pop.), mobile broadband subscriptions (/100 pop.), mobile network coverage (% pop.) and quality of electricity supply. The social factor, namely PoTT which also represent the government's efforts towards tourism, is constituted of six individual indicators: government prioritization of travel and tourism industry, travel and tourism government expenditure (% government budget), effectiveness of marketing and branding to attract tourists, comprehensiveness of annual travel and tourism data (0–120 best), timeliness of providing monthly/quarterly travel and tourism data (0–21 best) and country brand strategy rating (1–10 best). The pillar TSI is made of four individual indicators: hotel rooms (number/100 pop), quality of tourism infrastructure, presence of major car rental companies and automated teller machines (number/thousand adult pop) (Crotti & Misrahi, 2017).

Table 1. Constructs and indicators

Pillars (Constructs)	Indicators
ICT Readiness	1) ICT use for biz-to-biz transactions (ICT1); 2) Internet use for biz-to-consumer transactions (ICT2); 3) Internet users (ICT3); 4) Fixed-broadband internet subscriptions (ICT4); 5) Mobile-cellular telephone subscriptions (ICT5); 6) Mobile broadband subscriptions (ICT6); 7) Mobile network coverage (ICT7); Quality of electricity supply (ICT8)
PoTT	1) Government prioritization of travel and tourism (PoTT1); 2) Travel and tourism government expenditure (PoTT2); 3) Effectiveness of marketing and branding to attract tourists (PoTT3); 4) Comprehensiveness of annual travel and tourism data (PoTT4); 5) Timeliness of providing monthly/quarterly travel and tourism data (PoTT5); 6) Country brand strategy rating (PoTT6)
TSI	1) Hotel rooms (TSI1); 2) quality of tourism infrastructure (TSI2); 3) Presence of major car rental companies (TSI3); 4) Automated teller machines (TSI4)

The usefulness of the TTCI has been proven and, as a result, it is the most used tourism competitiveness index (Pulido-Fernández & Rodríguez-Diaz, 2016). Many researchers admitted that the tool is undeniably essential to help tourism destinations make the most appropriate decisions with regards to the competition they are facing. Croes and Kubickova (2013) noted that a parallel between a destination's performance and that of its competitors is important in the way that it allows to determine how competitive is said destination. However, for some researchers, the index is far from perfection; and, as a result, has received numerous criticisms focusing on the arbitrary weighting of variables, some countries are considered competitive with low valued indicators, and so forth (Pulido-Fernández & Rodríguez-Diaz, 2016). TTCI might not be perfect due to methodological issues pointed out by various researchers, but it is helpful in providing researchers with a source of data as well as in reflecting countries' achievements in tourism compared to other destinations constituting direct or indirect competition. It also offers insights about a country's effort in their adoption of ICTs, the commitment of governments in supporting the tourism industry or the state of tourism infrastructures in a country. All the criticism only suggests there is room for improvements rather than a complete discard. Improvements of the index would turn it into a more powerful competitiveness measurement tool than it has ever been, proving itself to be reliable as well as strong and trustworthy.

2.2 ICT Readiness: The Technology Factor in Tourism

As mentioned earlier, the importance of ICT in tourism is well discussed in the literature. Thus, highlighting major changes that have taken place, opportunities or challenges that have surfaced due to the wide adoption of ICTs is deemed useful in order to put the present study into context. As early as the 1950s, ICTs were already applied to tourism. The technological changes went from the adoption of the Computer Reservation System (CRS) in airlines all the way to the development of the internet (Ma et al., 2003). The internet's appearance is among the major technology developments that brought significant changes in the structure of the tourism industry considering the amount of information available online consumers can access at any given time. Buhalis and Law (2008) reported that the real effects of ICTs that we are experiencing since the year 2000 are the results of the emphasis on technology witnessed over the previous two decades, making room for the emergence of new businesses, services and tools and making it easier for all stakeholders worldwide to interact. Many researchers believe that ICTs play a pivotal and major role in tourism competitiveness (Aramendia-Muneta & Ollo-Lopez, 2013; Bojnec & Kribel, 2004; Buhalis & Kaldis, 2008; Buhalis & O'Connor, 2005), but it is hardly an unanimous perception given some doubted that ICTs really impact tourism competitiveness (Mihalic, 2007) or even doubted the existence of a relationship between the adoption of ICTs and tourism competitiveness' improvements (Dos Santos et al., 1993).

With the apparition of the internet came the extensive use of social media platforms. Social media is considered to be all internet-based applications carrying consumer-generated content created by consumers from their own relevant experience and shared or stored online for easy access by other consumers (Chung & Koo, 2015; Xiang & Gretzel, 2010). Social media provides a platform where consumers can interact and search for services, share ideas, thoughts, experiences, perspectives, information (Chan & Guillet, 2011; Chung & Koo, 2015; Sigala et al., 2012). Before the use of social media, tourists had limited access to information through travel magazines, newspapers and books which have been replaced in recent years by internet websites, blogs or simply posts and/or comments from other consumers providing insights or recommendations (Chung & Koo, 2015).

2.3 Prioritization of Travel and Tourism: Governments Implication in Tourism

The implication of government in tourism development and planning has drawn interest of the scientific community for as long as one can remember and it has been well documented that local governments are the most important authority in establishing tourism development policies (Bouquet & Winter, 1987; Madrigal, 1995; Pearce, 1989). However, Bramwell (2011) insisted on the importance of a broad social theory such as "political economy" to better understand governments' role in tourism development. Governments are considered the key players in tourism development and planning (Wang & Bramwell, 2012) because much of the responsibility to manage and develop tourism is on local governments (Elliott, 1997; Nunkoo, 2015; Ruhanen, 2013). Considering the proximity to various aspects of tourism and the well-oriented knowledge of communities entitled to local governments, their constant involvement in tourism seems justified (Aronsson, 2000). Tourism policy decisions are of the domain of governments and, as a result, they are more often than not held accountable for such (Bramwell, 2011). The governments are expected to create tourism policies determining the level of benefits and costs of tourism for local communities (Citrin, 1974).

Elliott (1997) reported that the implementation of tourism policy essentially depends on the broader political, economic and social environment. But, it is important to understand that policy implementation is the process

where policy ideas and plans are translated into practice (Dredge and Jenkins, 2007). The different perspectives of researchers who studied policy implementation suggested three approaches in identifying the influence of diverse variables in the process: 1) the top-down, 2) the bottom-up and 3) the synthesis approach. The latter originated from identified weaknesses of the first two. As suggested by numerous researchers through the guidance of the synthesis approach, four factors are identified: 1) the macro-environment, 2) the institutional arrangements, 3) inter-organizational relations and co-ordination, and 4) the interest groups. Wang and Ap (2013) highlighted that the macro-environment (which is the economic and social environment) influences the roles that government would take in tourism development.

2.4 Tourist Service Infrastructure

It is often unclear what can be named tourist infrastructures considering that most infrastructures are likely to be used by tourists upon their arrival. Opinions differ in the literature when it comes to number and type of components of tourism infrastructure, but it is defined as the supply chain of transport, social and environment infrastructure collaborating to create an attractive tourism destination (Tourism & Transport Forum, 2012; Jovanovic & Ilic, 2016). However, commitment by governments to develop their tourism industry might lead to them investing and building good public infrastructures. Jovanovic and Ilic (2016) referred to tourism infrastructures as the physical elements designed and erected to cater for visitors and noted that they are the basis of tourism development. Abdullah, Razak and Jafaar (2014) also noted that public infrastructures are important for economic growth and might constitute one of the main factors to influence an increase in number of tourists. Panasiuk (2007), while analyzing tourism infrastructure as a determinant of regional development, highlighted that tourism infrastructure can be seen as basically the following elements: 1) typically touristic infrastructures (accomodation facilities, other facilities for arrivals servicing, tourist information and trails), 2) paratourist infrastructures (transportation facilities, local facilities, trade and service facilities), 3) elements which can not be unequivocally classified, their function and results serving the purpose for which they had been built (gastronomy, accompanying facilities such as sport and leisure, culture, entertainment). The WEF while capturing the overall availability and quality of infrastructures of each country's economy, separately defined TSIs as the availability of certain services that are crucial to tourists (Crotti & Misrahi, 2015, 2017). For example, tourists are most likely going to use hotel rooms considering that they are in an area where they probably have never been before or know nobody, most of the time they rely on car rental companies when public transportation services are neither convenient nor appropriate. Therefore, these services are usually directed towards visiting tourists. A lack of such infrastructures: accommodations, road infrastructures, etc., will prove to be a barrier for successfully improving the sector/the industry.

3. Data and Methodology

The present study is based on data presented by the WEF in the 2017 TTCR, and it features two regions listed as the most improved between the last two reports: namely the Asia-Pacific and Americas. The Asia-Pacific region, with 22 listed countries, is the most improved region ahead of the Americas with 23 listed countries. However, in the present study, we counted out one Asia-Pacific country (Bhutan) considering that it does not have any government budget dedicated to tourism, which makes it a special case that would need to be discussed on its own. Therefore, 44 countries were taken into consideration for the present study instead of 45.

ICT Readiness, PoTT and TSI are the three pillars used in the present study, each with 8, 6 and 4 individual indicators respectively. The WEF, while creating the framework, designed the index as a formative model. Edwards and Bagozzi (2000), in their study regarding the nature and direction of relationships between constructs and measures, suggested that Principal Component Analysis (PCA), a well-known interdependence technique (Hair, Black, Babin, & Anderson, 2014) is among the most suitable tools to be used with direct formative models. Therefore, PCA was selected and conducted as a dimension reduction analysis technique which yielded three suitable principal components. Following that step, the countries were divided into different groups via a Cluster Analysis based on the first two principal components. However, a matter of clarity in the figures to be presented suggested 2D graphs instead of 3D which would lack clarity and visibility due to the number of countries to fit in the graphs. Data were analyzed using statistical software SPSS (Statistical Package for Social Sciences) 22.0 and STATISTICA 13.

4. Results and Discussions

This section discusses the structure identified within the sample, the principal components extracted as well as the results of the Cluster Analysis conducted. It also interprets the results of the various analyses.

4.1 Principal Components Analysis

It is important to highlight that PCA depends upon the fact that at least some of the variables in the data set are inter correlated (Daultrey, 1976). If none of the variables are correlated to any other, there is no point in performing a principal components analysis.

4.1.1 Correlation Analysis

The preliminary correlation analysis of the original data has shown a fairly strong relationship between the 18 combined items of ICT Readiness, PoTT and TSI; therefore, for further analysis, we can consider the attributes or items that characterize each one of them. The correlations results are later presented in Table 1.

4.1.2 Identification of the Principal Components

PCA is a technique based on mathematical principles to transform numerous eventually correlated variables into a smaller number of variables named principal components (Richardson, 2009). Being a common technique used in the description of forms of variations in a multidimensional dataset, PCA is also one of the simplest and most reliable ways to proceed with while reducing dimension (Penkova, 2017). Thus, there are as many or less principal components than the original number of variables. Penkova (2017) emphasized that the transformation occurs in a way that the first principal component has the largest possible variance and each subsequent component, respectively, has the highest variance possible under the constraint that it is orthogonal to the preceding component.

The 8 items of ICT Readiness, the 6 items of PoTT and the 4 items of TSI were submitted to PCA in order to reduce their dimensionality. The mean and standard deviation of each of the 18 items are presented in Table 1. However, Table 2 presents the association between the 18 variables and thus, the amount to which they co-vary. As mentioned earlier, as least some of the variables need to be correlated otherwise performing PCA would be pointless.

4.1.3 Contribution of the Variables to the Factors

The existence of correlations within the data set being noted, we then proceeded to run the analysis. It is reported that determining the number of principal components is one of the greatest challenges that comes along with the use of PCA. Table 3 and Figure 1 show the results of the selected principal components based on eigenvalues as well as scree plot and also feature the communalities allowing identification of the contributing variables to each factor. Although 5 principal components are identified based on the Kaiser's rule and the scree plot, the decision to retain 3 factors is made considering that the first three factors explained over 65% of variance and the 11.837 cumulative eigenvalue of the first three components is significantly greater than the average value. From Table 2, it can be seen that the first component has the following attributes: ICT for business to business transactions, Internet for business to consumer transactions, the percentage of internet users, fixed-broadband internet subscriptions, mobile broadband subscriptions, quality of the supplied electricity, effectiveness of marketing and branding, hotel rooms and quality of tourism infrastructures. Component 2 has the following attributes: government's prioritization of travel and tourism, the percentage of travel and tourism from the government's budget and the automated teller machines. The third component is characterized by the attributes: comprehensiveness of annual travel and tourism data, country brand strategy rating and presence of major car rental.

Table 2. Basic descriptive statistics and correlations

Variables	Mean	SD	ICT1	ICT2	ICT3	ICT4	ICT5	ICT6	ICT7	ICT8	PoTT1	PoTT2	PoTT3	PoTT4	PoTT5	PoTT6	TSI1	TSI2	TSI3	TSI4
ICT1	4.770	0.645	1.000																	
ICT2	4.666	0.742	0.897	1.000																
ICT3	51.475	24.003	0.897	0.647	1.000															
ICT4	12.880	11.513	0.641	0.701	0.895	1.000														
ICT5	118.230	31.779	0.425	0.394	0.414	0.372	1.000													
ICT6	56.907	36.308	0.715	0.745	0.780	0.772	0.487	1.000												
ICT7	97.420	4.123	0.433	0.258	0.337	0.353	0.152	0.288	1.000											
ICT8	4.766	1.357	0.810	0.708	0.649	0.722	0.436	0.603	0.505	1.000										
PoTT1	4.870	0.971	0.653	0.474	0.376	0.442	0.332	0.493	0.406	0.512	1.000									
PoTT2	5.120	4.340	0.094	-0.053	0.038	0.010	-0.014	0.055	0.200	-0.062	0.401	1.000								
PoTT3	4.480	1.018	0.703	0.557	0.445	0.457	0.337	0.515	0.451	0.623	0.909	0.323	1.000							
PoTT4	65.227	21.441	0.227	0.249	0.286	0.209	0.214	0.214	0.195	0.163	0.276	0.063	0.359	1.000						
PoTT5	18.295	4.166	0.549	0.469	0.214	0.245	0.300	0.285	0.152	0.367	0.588	0.114	0.579	0.320	1.000					
PoTT6	76.327	8.356	0.056	0.168	0.249	0.271	0.196	0.191	-0.234	0.020	0.001	-0.069	-0.025	0.253	0.095	1.000				
TSI1	0.602	0.506	0.568	0.694	0.655	0.750	0.141	0.640	0.221	0.540	0.226	-0.144	0.256	0.163	0.215	0.151	1.000			
TSI2	4.689	0.922	0.193	0.140	0.345	0.205	0.205	0.249	0.311	0.269	0.156	0.085	0.306	0.459	0.230	0.224	0.229	1.000		
TSI3	5.901	1.890	0.750	0.637	0.475	0.479	0.334	0.531	0.366	0.600	0.825	0.403	0.903	0.319	0.537	0.047	0.349	0.356	1.000	
TSI4	62.005	59.401	0.583	0.490	0.665	0.633	0.308	0.604	0.344	0.605	0.602	0.349	0.628	0.228	0.191	0.113	0.330	0.313	0.641	1.000

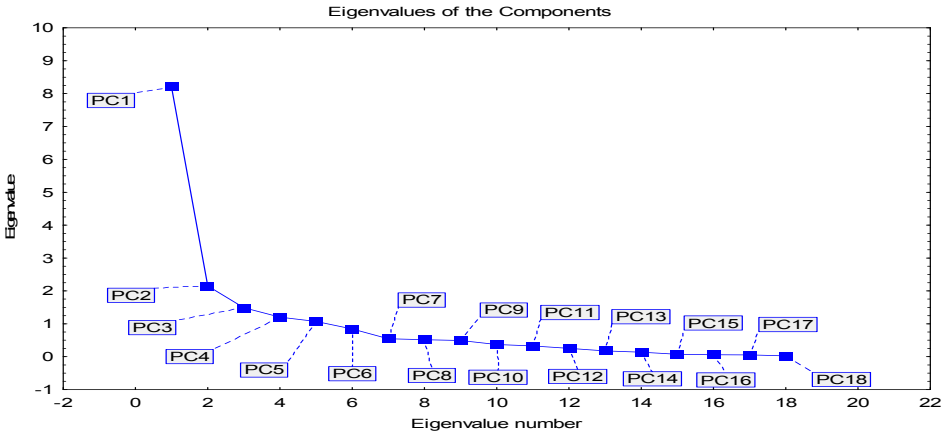

Figure 1. Scree plot

Table 3. Eigenvalues and Communalities per Component

Components	1	2	3	4	5
Eigenvalues	8.193	2.153	1.491	1.207	1.070
% of Total Variance	45.516	11.961	8.282	6.703	5.944
Cumul. Eigenvalues	8.193	10.346	11.837	13.043	14.113
Cumulative %	45.516	57.477	65.759	72.462	78.406
ICT use for biz-biz transactions - ICT1	0.808	0.808	0.847	0.889	0.894
Internet use for biz to consumer transactions - ICT2	0.692	0.759	0.776	0.852	0.853
Internet users (%) - ICT3	0.641	0.786	0.788	0.854	0.868
Fixed-broadband internet subscriptions (/100 pop) - ICT4	0.671	0.840	0.847	0.872	0.891
Mobile cellular telephone subscription (/100 pop) - ICT5	0.258	0.267	0.306	0.355	0.357
Mobile broadband subscription (/100 pop) - ICT6	0.666	0.753	0.756	0.757	0.783
Mobile network coverage (% pop) - ICT7	0.243	0.302	0.349	0.556	0.769
Quality of supply electricity - ICT8	0.680	0.698	0.747	0.747	0.790
Government prioritization of T&T - PoTT1	0.567	0.828	0.832	0.855	0.871
% T&T of Gvt budget - PoTT2	0.035	0.452	0.452	0.558	0.788
Effectiveness of marketing & branding - PoTT3	0.661	0.887	0.887	0.897	0.898
Comprehensiveness of annual T&T data - PoTT4	0.148	0.162	0.602	0.605	0.683
Timeliness of providing T&T data - PoTT5	0.295	0.389	0.424	0.737	0.773
Country brand strategy rating - PoTT6	0.027	0.157	0.599	0.614	0.771
Hotel rooms - TSI1	0.564	0.576	0.577	0.689	0.787
Quality of tourism infrastructures - TSI2	0.684	0.849	0.850	0.856	0.863
Presence of major car rental - TSI3	0.153	0.157	0.509	0.658	0.775
Automated Teller Machine - TSI4	0.401	0.675	0.688	0.691	0.701

In PCA, it is indicated from Hotteling's approach that the first component explains the most variation, the second component explains the second most and so forth (Bro & Smilde, 2014). The first principal component corresponds to the optimal solution and the following components extracted are orthogonal to the first one as well as being the next best directions for approximating the original data. Considering that, we have three orthogonal components, we can project the countries in 2 dimensional plots presented in Figures 2 and 3.

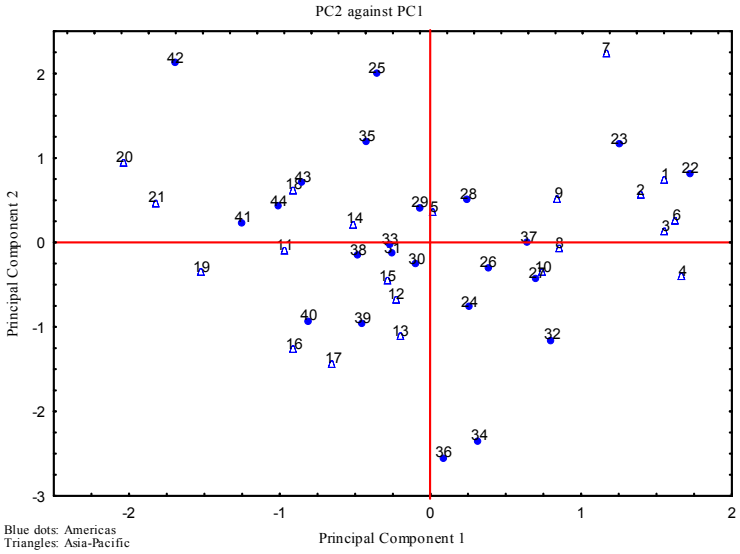

Figure 2. Projections onto PC1 and PC2 (Note 1)

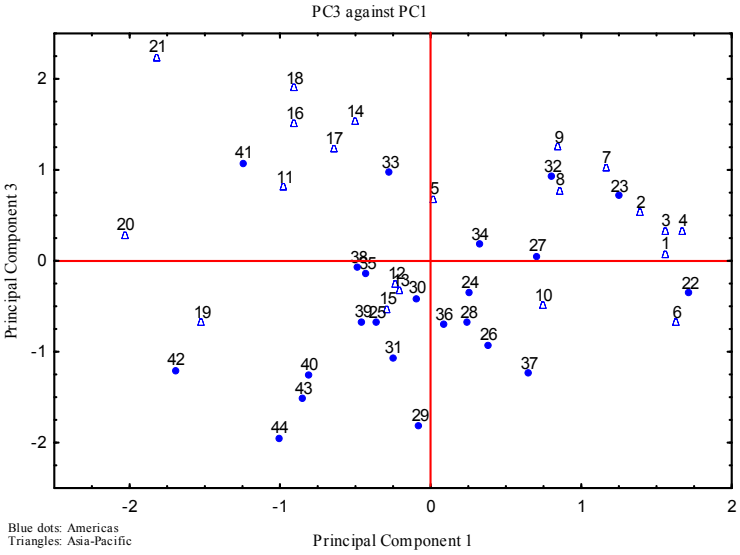

Figure 3. Projections onto PC1 and PC3

In the previous graphs, we can observe the formation of four potential clusters. Countries with a high overall achievement are located on the right side of PC1's axis which included 5 Asian countries (Japan 1, Australia 2, Hong Kong SAR 3, Singapore 4, New Zealand 6 and Korea 7) and 2 countries from the Americas (United States 22 and Canada 23). Countries with a poor overall achievement are located at the left end of PC1 and this category includes 3 Asian countries (Nepal 19, Pakistan 20 and Bangladesh 21) and two countries from the Americas (Bolivia 41 and Venezuela 42). Around the middle of PC1's axis, an additional two potential groups could be identified: those with an overall achievement above average and those with and overall achievement below average. Countries from the Americas are mostly located within these two potential groups.

4.1.4 Components' Physical Meaning

Not all the time a positive value means good and negative value means bad. In the present case, a positive value of the second component means that countries display better achievements in ICT Readiness whereas a negative value means a deeper government involvement through PoTT and a better TSI. How is that possible? All the 18 items analyzed constitute the overall achievement and they exclusively fall in the positive portion along the first component which indicates that any negative value recorded in the first principal component would translate into a negative overall achievement. However, this is not the case along the second component where the number of

items is equally divided between positive and negative portions of the axis. A closer look shows that the items of ICT readiness, except ICT7, are on the positive part of PC2, including PoTT6 and TSI4. It is fair to consider a positive PC2 being related to a good ICT Readiness performance. It is also understandable that the negative portion of PC2 does not mean a negative achievement in that component but rather embraces a different meaning explained in Figure 4 that follows.

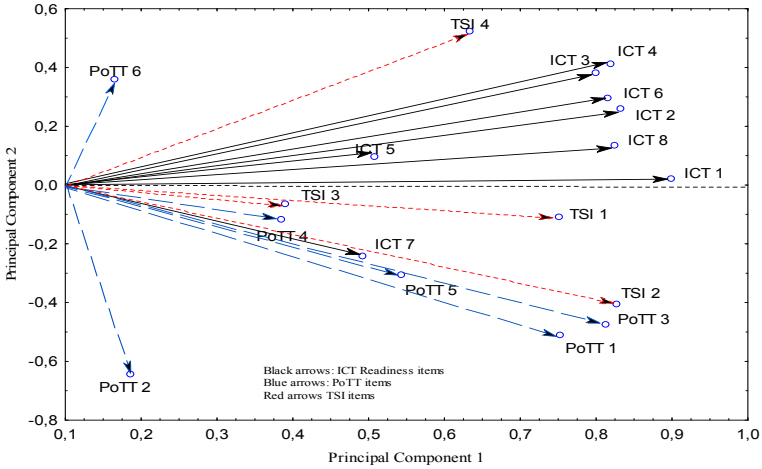

Figure 4. Physical meaning along the components

A negative PC2 value means that any country placed on that part of the axis has a better performance in items such as TSI1-3, PoTT 1-5 and ICT7. Therefore, it is safe to assert that a negative PC2 value indicates that said country would not perform so well in ICT readiness whereas it performs a lot better when it comes to PoTT and TSI.

4.2 Clusters Formation

As a tool to discover and identify associations and structure within data and typology development, cluster analysis is used to find insights into the data with division of the dataset into smaller groups. In the present situation, countries pertaining to a cluster are more similar to each other than countries in the other clusters. Using the factor scores for each case (country) generated during the PCA process, the cluster analysis was conducted via the *k*-means method based on the first and second principal component. It is reported that the most difficult task in a *k*-means clustering method is the identification of the number of clusters to be considered as well as the attribution of a name to each one of them (Penkova, 2017). The orientation and objectives of the study suggested the ideal solution of four distinct clusters. The first two components are used in the cluster analysis because PC1 and PC2 displayed eigenvalues significantly higher than the other principal components (including component 3), and using three components did not provide a satisfying solution.

As shown in Table 3 and Figure 4, four clusters emerged from the cluster analysis conducted and cluster 1 included countries with a very good overall achievement as well as a good achievement when it comes to ICT readiness. It is necessary to remember that the first principal component constitutes the overall achievement. Therefore, countries in cluster 1 named *Undisputed Leaders* can rely on their ICT level as well as their country brand strategy to continue improving their overall performance when it comes to ICT readiness, PoTT and TSI.

Table 4. Cluster coordinates and members

Cluster (Members)	I (n1=9)	II (n2=16)	III (n3=8)	IV (n4=11)
Coordinates of center				
PC1	1.426	0.108	-0.222	-1.163
PC2	0.659	-0.142	-1.477	0.742
Characteristics of Clusters	Very good PC1	Fair PC1	PC1 below average	Very low PC1
	Good ICT	PC2 below average	Low PC2	Good PC2
Cluster Name	Undisputed Leaders	Average Performers	Underachievers	Critical Improvements

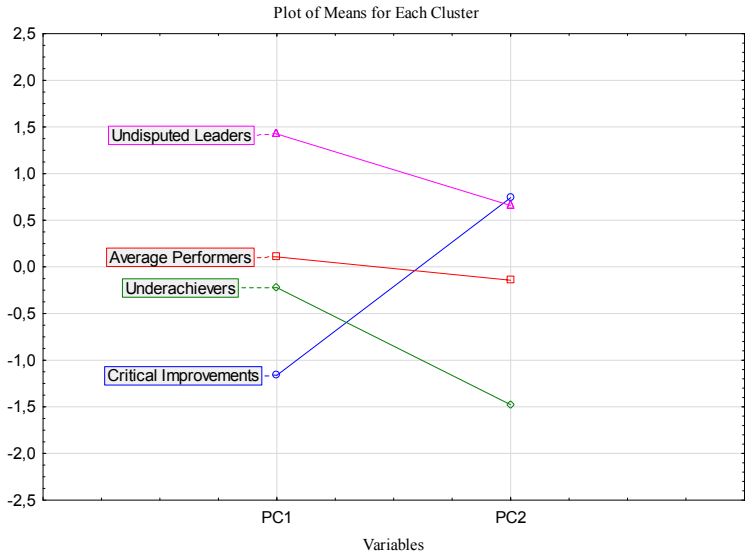

Figure 5. Means of each cluster

The second cluster, *Average Performers,* included countries with an overall achievement above average coupled with a below average performance in PC2. That below average performance in the second component suggests governments are overly involved in their tourism industry, and seeing a country such as China in that group makes even more sense. Countries pertaining to this cluster can benchmark the Overall Leaders by increasing their ICT readiness which might lead to a better overall performance. The third cluster is named *Underachievers* considering that it regroups countries with an average overall performance right below the mean value and a very low performance in the items constituting ICT readiness. Therefore, countries pertaining to this group would need serious ICT improvements. The fourth cluster with a very low overall achievement but still has an ICT readiness above average. Countries in this group are tagged with the name *Critical Improvements* because of the poor overall achievement. There would be a need for better support from governments and betterments of tourism related infrastructures in order to attract more tourists and yield a better overall performance.

Table 5. Cluster members

Undisputed Leaders(n=9)	Average Performers (n=16)	Underachievers (n=8)	Critical Improvements 4 (n=11)
Japan, Australia, Hong Kong SAR, Singapore, New Zealand, Korea Rep., Taiwan,	China, Malaysia, Taiwan, Thailand, Indonesia, Vietnam, Philippines,	Sri Lanka, Lao PDR, Cambodia,	India, Mongolia, Nepal, Pakistan, Bangladesh,
United States, Canada.	Mexico, Panama, Costa Rica, Chile, Argentina, Peru, Ecuador, Colombia, Uruguay, Guatemala.	Barbados, Jamaica, Dominican Republic, Honduras, Nicaragua.	Brazil, Trinidad & Tobago, Bolivia, Venezuela, El Salvador, Paraguay.

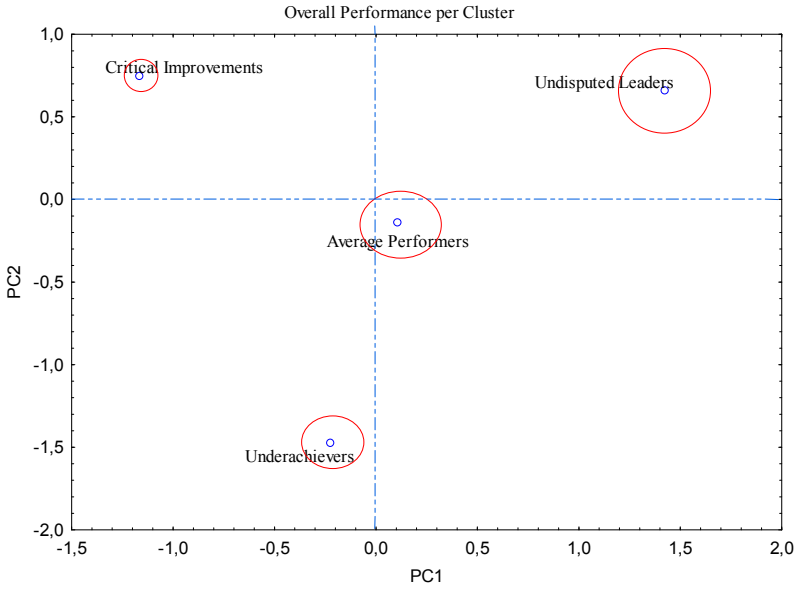

Figure 6. Distribution of overall performance per cluster

As seen in the previous table, the *Undisputed Leaders* group has more Asia-Pacific countries which is in line with the fact that it is the most improved region when it comes to tourism competitiveness. However, there might be some valuable explanations pointed out by the WEF: many countries of that region have world class tourist infrastructures and are among the most ICT ready at a global scale which helps them attract more tourists (Crotti & Misrahi, 2017). Moreover, their governments understand the challenges and opportunities and invest to support to the industry. There is a whole different dynamic in the Americas where countries in the region mostly rely on rich natural resources and good tourist service infrastructure (in the form of hospitality) to appeal to tourists. It is true that governments in the region are focusing on the strategic role tourism plays in their economic development, however certain difficulties are real challenges facing those economies considering that, excluding the United States, Canada and a few Central American countries, infrastructures are underdeveloped and many resources are not valued as they could be (Crotti & Misrahi, 2017).

4.3 Grouping Examples and Strategies Insights

The previous overall performance scatter featuring the first and second principal components displays the cluster centers and, the location on the graph would suggest the element or component that countries would need to emphasize on. A few examples are considered in order to provide better recommendations.

Tourism has been important in Nepal's economy contributing at increasing employment (6.4%), investment (2.7%) and visitors export (22.9%) in the year 2014 (Carter & Bedard, 2001; Shrestha & Jeong, 2016). As mentioned and discussed earlier, ICT impacts the tourism industry in various ways through the amount of information rendered available to consumers. Shrestha and Jeong (2016) referred to the application of ICT as the most important aspect for a successful tourism economy considering correct and timely information is what the industry relies on. However, studies have revealed that Nepal, although having a high potential for tourism development, is facing various problems and challenges including the poor ICT development and the lack of a strategic plan aiming at tourism development. Among other tasks, if Nepal wants to improve its tourism competitiveness, there is a need for the Government and private sector to be more involved in a proper management of tourist service infrastructures while dealing with the problem of availability and completeness of information. The problems are rooted in all sectors and a well-designed public-private partnership could be a sound starting point to address some of the problems and yield appropriate solutions (Shrestha & Jeong, 2016).

Venezuela is a socialist country with vast oil resources facing an unprecedented crisis where inflation is reaching unbelievable heights causing social and economic instability. In fact, it is the country with the highest inflation rate. Many researchers, when trying to explain slow or negative growth in resource-rich countries, refer to the resource curse. Venezuela faces the various attributes of the resource curse including an unstable economy, corruption and so forth. Kott (2012) discussed the negative side of over-reliance on a single commodity for a majority of a nation's export as an especially precarious prospect. When the price of the commodity falls, any

country relying on a unique commodity as export product will experience considerable economic hardship. A clear example is when the price of oil went from $140/barrel to $40/barrel between 2008 and 2009, Venezuela experienced a -3.2% GDP growth rate largely attributable to the severe decrease in export revenues ($93.5 to $57.6 billion). Such situations created an unprecedented political instability and financial crisis. Along with political and economic instability, misguided policies have contributed to push away tourists and other key players of the economy such as investors, airline companies, etc (Kott, 2012). Venezuela is a suitable example that illustrates how government policies excessive control can negatively impact tourism competitiveness. As a result of the crisis originating from mysterious nationalization of industries, severe regulatory restrictions and little private sector growth etc., the country witnessed local debts rise, unprecedented inflation, exchange rate distortions, consumer good shortages and the flight of foreign direct investment.

China, given its position in the scatter previously presented, belongs to the Average Performers. China has a relatively good ICT as can be seen in Figure 2 and 3, however continued interference or strong involvement in the industry by the government in the past has always been a concern when it comes to tourism competitiveness and development. This situation would require improvements if China would want to increase its tourism competitiveness. This highlights the existence of individual differences between countries within a cluster. The early 1980s witnessed the revolutionary development of ICTs while China was already one of the major international tourism destinations (CNTA, 2001; He et al., 2001; Lew & Yu, 1995; Ma et al., 2003). Ma et al. (2003) noted however the strong government control and intervention in the sector that takes away the power and motive from individual companies to search for ways to gain competitive advantage. Unless individual companies can reduce costs or increase operational efficiency on their own, there might hardly be a significant improvement of tourism competitiveness.

In a study regarding the sustainability of tourism in Bhutan, Dorji (2001) pointed out how the industry is managed in the country as it is controlled from the start. The policy of "high value - low volume tourism" has been adopted in an effort to prevent tourism related pollution, protect culture, tradition and environment. Within the scheme of protective tourism, the Department of Tourism sets minimum daily tariffs without limitations on the number of tourists allowed to visit. However, capacity constraints of tourism infrastructures are the main limitation to the volume of tourists. One of the many traits of Bhutan's tourism is its pronounced seasonality; there are two main tourist seasons when the weather is at its best: march/april and october/november (Dorji, 2001). The exclusion of Bhutan from the analyses is due to the fact that no government budget is directed towards tourism. Until the early 90s, the government's tourism policy was implemented by a quasi-autonomous and self-financing body: the Bhutan Tourism Corporation (BTC) which operated all services for tourists as they came as BTC's guests. Privatisation occurred from october 1991 as the government encouraged private sector participation and, the result was no other than a major increase in the number of licensed tour operators in the country (Dorji, 2001).

The cluster analysis conducted in this paper suggested four different groups that were named Undisputed Leaders, Average Performers, Underachievers and Critical Improvements. The average overall achievements of countries belonging to the Overall Leaders group could be further indication of how important ICT is to tourism competitiveness as a whole.

This study is in line with the findings of Gooroochurn and Sugiyarto (2005) on social and technology indicators being the most important to travel and tourism competitiveness. It also supports the idea that tourism infrastructures are vital to the growth of the industry. However, it highlights that technology is more important than the government's effort to support the industry, which is contrary to the weight found in Gooroochurn and Sugiyarto's 2005 study where the social factor was considered more important. As the penetration of technology goes deeper in the industry with time, its importance increases as well given tourism industry now relies heavily on timely information which can only be provided through the use of information and communication technologies. Tourism is an information intensive industry, and technological progresses are literally reshaping the structure of the industry (Xiang & Gretzel, 2010).

This study contributes to the body of literature by conducting a regional study of the Asia-Pacific and the Americas based on the 18 items of ICT readiness, PoTT and TSI. A few specific cases are presented and discussed.

5. Conclusion

The present study focused on identifying the principal components related to ICT readiness, PoTT and TSI and later grouped the countries from the two most improved regions, the Americas and Asia-Pacific, into different clusters based on the first two principal components identified. The cluster analysis would allow constituting

classes with individual countries pertaining to a group having almost identical characteristics. Therefore, this research highlighted some of the determinants of tourism competitiveness that can be used to classify the countries of the sample under study. From the results of the study, it clearly appears that the good level of technology is the determining factor that really boosted the *Undisputed Leaders* group. One clear indication this fact brings is the importance of technologies in tourism. The tourism industry fully embraced technology developments and this has revolutionized the industry. Aramendia-Muneta and Ollo-Lopez (2013) discussed how the new information and communication technologies created new business opportunities in the tourism sector and fully embracing technology developments could eventually help countries pertaining to the other groups to improve their tourism competitiveness. ICTs are even considered for their positive impact on competitiveness in the tourism industry (Bojnec & Kribel, 2004; Buhalis & Kaldis, 2008). As a result, a number of countries from the sample under study could make the decision to improve their ICT level provided they would certainly benefit from the many economic returns they would probably reap from that decision. However, a balanced development would be important to maintain the competitive advantage. Often times, the lack of appropriate infrastructures to handle tourism activities could be disappointing for the local communities.

This study relied on secondary data provided by the WEF to proceed with the analyses; however, this situation may not be good enough to make generalizations that travel through time for the betterment of communities and tourists. This study therefore can be extended or re-conducted through the use of primary data and not relying on the TTCI that has, rightfully so, received many criticisms related to its methodological conception. Moreover, this study focused on two specific regions considered as the two most improved from the last two reposts. However, this study could be also extended so that more people could participate and provide useful insights and recommendations.

Throughout the literature, mention is made of how fast technology has evolved, changing how services are provided to and accessed by consumers. The regular tourist no longer has limited access to information as it was in the past due to a convenient and time saving online dimension that offers rapidity in information gathering. Future research will stir in the direction of identifying and designing an indicator or a system of indicators that can better capture the online dimension of tourism. If technology developments have deeply impacted and contributed to tourism competitiveness, it is safe to assert that the online dimension will make said contribution greater as time goes by, considering tourism relies on timely information only provided through the use of technology. But, government efforts will have to grow consequently as ICT further develops so as to secure and protect users' information and they will also have to make sure there are appropriate infrastructures that tourists will definitely need.

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Note 1

1-Japan 2-Australia 3-Hong Kong 4-Singapore 5-China 6-New Zealand 7-Korea Rep. 8-Malaysia 9-Taiwan 10-Thailand 11-India 12-Indonesia 13-Sri Lanka 14-Vietnam 15-Philippines 16-Lao PDR 17-Cambodia 18-Mongolia 19-Nepal 20-Pakistan 21-Bangladesh 22-United States 23-Canada 24-Mexico 25-Brazil 26-Panama 27-Costa Rica 28-Chile 29-Argentina 30-Peru 31-Ecuador 32-Barbados 33-Colombia 34-Jamaica 35-Trinidad & Tobago 36-Dominican Rep. 37-Uruguay 38-Guatemala 39-Honduras 40-Nicaragua 41-Bolivia 42-Venezuela 43-El Salvador 44-Paraguay