# Intellectual capital and sustainable development on islands: an application to the case of Gran Canaria

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# Intellectual capital and sustainable development on islands

## An application to the case of Gran Canaria

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*Abstract*

Sustainable development is an objective for any territory, especially when the territory is a small island. To achieve the goal of development and conservation of natural resources, the ideal would be to base a good part of the island's economy on intangible assets, such as the culture or knowledge, since they neither depreciate nor erode with use. This work proposes a model designed to enable the identification and measurement of the principal intangible assets that contribute to island territories' achievement of sustainable development. In this work, the model is applied to the island of Gran Canaria (Spain).

## Introduction

Until the beginning of the 19th Century, the creation of wealth was based on the possession of lands. However, with the coming of the Industrial Revolution, all that changed and wealth was generated through a combination of capital, raw materials and work. Finally, in the 1980's, supported by the tremendous advances in the development of telecommunications and information technologies, the economy of intangibles appeared, with aspects like innovation and knowledge, the leading exponents of the creation of wealth (Bradley, 1997a; Edvinsson, 2000; Fruin, 2000; Viedma Marti, 2000).

Focusing attention on the key element of this work, namely, intellectual capital, it should be mentioned that no single definition is shared by all authors. However, one of the most used is that which defines intellectual capital as the combination of non-material or intangible assets that generate, or will generate, added value for the organization owning them (Bradley, 1997a; Edvinsson and Sullivan, 1996; Euroforum, 1998; Stewart, 1991; Unión Fenosa, 1999). Another frequently used definition considers that intellectual capital is the difference between the market value and the book value of the firm (Brooking, 1997a, 1997b; Daley, 2001; Harvey and Lusch, 1999; Lev, 2001; Nevado Peña and López Ruiz, 2002; Ordóñez de Pablos, 1999, 2003; Pasher, 1999; Petrash, 1996; Sveiby, 2000).

However, the importance of intellectual capital is not confined to companies. In fact, an increasing number of authors believe that this type of asset is of the utmost importance to territories, with Bradley (1997a, 1997b), Bontis (2002,

2004), Daley (2001), Edvinsson (2002), Edvinsson and Stenfelt (1999), Malhotra (2000) and Pasher (1999) standing out among those authors. In this respect, the interest that territories have in intellectual capital lies in the fact that, in the future, this type of resource will be one of the most important factors for social and economic development. Thus, it will be the countries that are better equipped with this type of capital that will make most progress (Daley, 2000; Edvinsson, 2002; Malhotra, 2000). Therefore, the importance of intellectual capital to any type of territory becomes even greater in small, island territories. These territories are characterized by a shortage of tangible resources and, being sensitive to their exploitation, could base their development on intangible assets and so conserve their natural resources. Thus, if the concept of intellectual capital is applied to a geographical area, it can be defined as the territory's ability to transform knowledge and intangible resources into wealth (Bradley, 1997a). Bontis (2004) considers that it includes the hidden values of individuals, firms or institutions, communities or regions that are sources to create real or potential wealth. On the same lines, Malhotra (2000) defines it as those hidden assets on which the country's growth is based, and the added value of the stakeholders living there.

Regarding the models that have been used to measure intellectual capital, many tools have appeared in recent years. Those most referred to in the literature include the Skandia navigator (Edvinsson and Malone, 1999), the intangible asset monitor (Sveiby, 2000) and the balanced scorecard (Kaplan and Norton, 1997). The model used in the case of territories was an adaptation of the Skandia navigator for countries (Edvinsson and Stenfelt, 1999). However,

and despite the proliferation of models of intellectual capital in recent years, when establishing a classification of the elements comprising this type of capital, there seems to be some consensus about dividing intellectual capital into three large components: human capital, structural capital and relational capital (Bontis, 2002; Petty and Guthrie, 2000; Ordóñez de Pablos, 2002, 2003; Roos *et al.*, 2001; Viedma Marti, 2001). That division is also applicable in the case of territories although some modifications must first be made to each of the components (Bontis, 2004). According to Bontis (2002, 2004), a country's human capital can be defined as the sum of its citizens' knowledge, education and capabilities. Structural capital comprises those intellectual assets that, unlike human capital, can be appropriated by the country, which makes it possible to perform economic transactions with them (Malhotra, 2000). Lastly, relational capital, which in the case of territories is called market capital, refers to its ability to provide competitive solutions for international customers (Bontis, 2004). In other words, it refers to the value of the commercial relationships that the country maintains with its suppliers and customers in the global market (Malhotra, 2000; Pasher, 1999).

## Proposal of the model

In light of the social debate on how to grow economically and socially without creating inequalities, damaging the environment or mortgaging the future, this work proposes a model that attempts to provide a tool that, by measuring intangible assets, contributes to small, island territories achieving sustainable development. This objective differs from that proposed by Edvinsson and Stenfelt (1999) in two significant ways. The first lies in the fact that it is applied

to a particular type of territory, small islands, where intangible asset based development would have positive results. The second is that the model should only include assets that contribute wealth and do so, or have the potential to do so, in a sustainable way. Therefore, it is necessary to clarify the concepts of *sustainable development* and *small, island territory*.

*Sustainable development*

Since the World Commission on Environment and Development commissioned the Prime Minister of Norway, Gro Harlem Brundtland to write a report, which was published under the title *Our Common Future*, much has been written about the concept of sustainable development. That report states that sustainable development is the kind of development that satisfies the needs of the present without compromising those of the future. It also states that it is not a permanent state of harmony; on the contrary, it is a dynamic, changing process where the exploitation of resources, the destination of investments, orientation of technological development and institutional changes are directed toward satisfying present and future necessities (World Commission on Environment and Development, 1987).

Sustainable development must consider the existence of a balance between social, environmental and economic aspects. However, that balance does not always occur; in fact, as Shearlock *et al*. (2000) state, the importance of each of the factors to the achievement of sustainable development is not clearly defined. On the same lines, Selman (2000) indicates that there are many definitions of sustainable development and, however, they all include

inseparable environmental, social and economic parameters. Similarly, Shearlock *et al.* (2000) maintains that sustainable development policies require the integration of those three political areas that have traditionally been separated.

However, that definition of sustainable development, which, according to Naredo (1998), is widely accepted, also has its critics. Giddings *et al.* (2002) describe it as ambiguous and political, and Giddings *et al.* (2002) and Selman (2000) maintain that it has numerous meanings that are interpreted differently depending on who is going to use it –*e.g.,* governments, company managers, ecologists, etc.

For Haughton (1999), apart from the existence of a balance between the social, environmental and economic aspects, five principles of equity must also be considered in any discussion on sustainable development. If those five principles are not taken into account individually and collectively, he argues that it is inevitable that the capability to achieve sustainable development is critically undetermined. The principles are: a) *intergenerational equity* or principle of futurity, which aims for present construction without compromising the future; b) *intra-generational equity*, which advocates social equity; c) *geographical equity*, which means that local policies are adopted to solve environmental problems at a local level but also at a global level; d) *procedural equity*, which aims to guarantee that the participatory legislative system assures fair and open treatment for all, and finally, e) *inter-species equity*, which states that the

survival of other species is taken into consideration in the same way as the survival of the human species.

Works on sustainable development should bear in mind that there are two schools of thought, the strong sustainable and the weak sustainable. The former advocates the maintenance of natural capital, which involves renouncing economic growth since the production of manufactured capital requires the use of natural capital Simon (2003). Hence, if economic and demographic growth is not halted, adjustments will automatically take place, which will put a brake on these non-sustainable tendencies (Goldsmith, 1972; Ehrlich and Ehrlich, 1993; Meadows, 1994). On the other hand, according to Simon (2003), the weak sustainable school is more optimistic since it considers that there can be some substitution between man-made capital and natural capital, in a way that development will be possible but it can not be unlimited. However, as the Brundtland report states, that limit is not fixed but depends on aspects such as the present state of technology or the existing social organization (World Commission on Environment and Development, 1987). The model proposed in this work falls within that second school of thought.

*Small, island territory*

There is no doubt that the size and isolation of territories of this type gives them certain peculiarities that do not occur in continental territories. So, according to McElroy (2000), small islands suffer a series of limitations stemming from those conditions that mean they are disadvantaged from an economic point of view (Briguglio, 1995). In this respect, one of the problems lies in the shortage of

natural resources, which leads to a high dependence on the exterior, both for exports and imports. On the same lines, the territory's restrictions mean that the internal market is very small to absorb a high internal production, while there is little possibility of substituting imports with local products (Briguglio, 1995). All this results in the governments of these territories having to be sure to identify and exploit the island's characteristics that may represent a competitive advantage (Mehmet and Tahiroglu, 2002). It should also be stressed that the manufacturers in small, island territories are not usually competitive, due to the additional cost of necessarily importing raw materials. Consequently, these territories can be considered centers of consumption of manufactured goods that have to be imported. Moreover, the territorial limitations mean that there is little business diversification (Briguglio, 1995; McElroy, 2000; United Nations General Assembly, 1998). Other aspects to be considered are the low ability to influence prices in the local and export markets, little internal competitiveness and few possibilities of taking advantage of economies of scale (Briguglio, 1995; McElroy, 2000). Other limitations stemming from insularity and distance are the high transport costs, the uncertainty about suppliers and the need to maintain high *stocks* (Briguglio, 1995; McElroy, 2000).

All island territories also have some peculiarities in common, such as the possibility of natural disasters (Armstrong, 2001; Briguglio, 1995; Debance, 1999) and the fragile natural environment. The latter means that any activity in these territories has significant repercussions on their environments (Armstrong, 2001; Briguglio, 1995).

In spite of all the above, in many cases, island economies have achieved spectacular growth rates, especially in sectors such a finance, banking and tourism; the last of those being supported by the natural attraction of many islands. However, for that growth to be maintained over time, it is essential to have a qualified work-force (Mehmet and Tahiroglu, 2002).

All of that leads us to consider that, in this type of territory, development based on intangible assets could be more sustainable that if it were based on material assets.

*Presentation of the model*

After the definitions of the above concepts, which guided the design of this model, it should be mentioned that, as Figure 1 shows, the model comprises seven categories, six for each of the types of intellectual capital identified in this work, and one that reflects the accumulation of intangible assets of the other groups. The categories are: tourism capital, economic activity capital, social capital, environmental capital, public administration capital, training and development capital and result capital. This is not the traditional division of intellectual capital. The reason for stressing categories based on functionality rather than on the nature of the assets (human, structural and relational capital) is that it was thought more suitable address the functional and organic organization that characterized public administration. This may facilitate its implementation and its identification with the objectives of that administration. Furthermore, these groups must not be seen as separate compartments; it is necessary to be conscious that there are important links between them, which is

essential for correct management. Finally, and before defining the categories, it should be explained that each category may contain sub-categories; in other words, second level categories of intellectual capital can be established. Within the groups and any existing sub-groups, the intangible assets that should be managed and suitable indicators to measure them must be identified.

Take in Figure 1

Beginning with tourism capital, this category comprises those intangible assets that are strategic to the tourism sector and includes those related to the supply as well as those related to the demand. The reason for giving tourism a separate category from other economic activities is that, as Debance (1999), Mehmet and Tahiroglu (2002) and McElroy (2000) state, it is the activity that usually has more weight in most small, island economies. In fact, tourism is the main economic activity in 70% of European islands and is responsible for 50% of GDP in one third of them (García Falcón and Medina Muñoz, 1999). Some examples of intangible assets in this category are: the quality of accommodation, the image of the destination and tourist loyalty.

Economic activity capital includes all the non-material assets that are fundamental to the other economic activities taking place in a territory (*e.g.*, agriculture, livestock, fisheries, construction, industry, commerce and services). The presence of this category in the model is justified by the economic, social and environmental impact of business activities. Some of the intangible assets

that can be included in this category are: company competitiveness, productivity, image and the workplace accident rate.

Social capital covers all those intangible assets whose development improves the social strength of the territory. We should make it clear that the term social capital defined in this way does not exactly coincide with what is understood in the works like those of Coleman (1988, 1990), Dasgupta (2000), Fine (1998), Putnam (1995) or Woolcok (2002). So this category comprises the non-material resources linked to areas such as health, housing, employment, immigration, culture, sport, women, youth, public safety, justice, etc. Each of those areas can be broken down into subcategories that permit a more structured study to be made of their respective assets. The importance of this category in the model is irrefutable, since, as Gladwin *et al.* (1995), Gobierno de Canarias (2002), Selman (2000), Shearlock *et al.* (2000) and Wilson and Buller (2001) state, it is impossible to understand sustainable development if it is not accompanied by balance and social justice. Some of the assets to be included in this category are: equality between the sexes, the integration of immigrants, quality of health and quality of jobs.

Environmental capital comprises the intangible assets whose development is a determinant in conserving the environment. In this respect, it should be borne in mind that, if this type of capital is of extreme importance in any territory, in small, islands it is essential because of the fragility typical of their environment. This category comprises intangible assets related to aspects such as water, waste, energy, rural environment and urban environment. The assets within this

category include environmental health, air quality, deterioration of the territory, the impact of producing energy, the decline in aquifers, concern for environmental health and a water-saving conscience.

Public administration capital refers to all those intangible assets that are crucial for the island's public administrations to function correctly. This category attempts to capture, through the intangible assets, the local and island administrations' ability to adapt to the citizens' needs and expectations of social, environmental and economic development, and to do so efficiently. Finally, some examples of the assets included in this category are: the efficiency and flexibility of the public institutions and the citizens' satisfaction with those institutions.

Training and development capital covers all those intangible assets that are vital both to the training and to the research and development that take place on an island. Therefore, any improvements in this block of intellectual capital will have a positive future impact, either directly or indirectly, on the other categories. The intangible assets comprising this category relate to education, research, innovation and the information society. Some examples of this type of asset are education quality, technological independence and the applicability of what is researched.

The result capital group is conceived as one synthetically comprising what occurs in the other categories. In this respect, this category comprises only one asset. This is calculated as the weighted average of the values of the different

categories, which are related both to the territory's economic competitiveness and to social and environmental aspects. Therefore, this category can be considered a measure of the sustainability of the activities performed in the territory. Moreover, it is proposed that, together with the indicator of this asset, another indicator is used to measure the generation of wealth in the territory (*e.g.*, per capita income), thus permitting a direct observation of the creation of wealth taking place on the island.

As previously mentioned, relationships exist between determined assets from the different dimensions. We now give some examples of such relationships, which are indicated by arrows in Figure 1. Thus, intangible assets in the environmental dimension, such as the impact of producing energy or the decline in aquifers, are clearly seen to be influenced by the quality of the relevant research and development, which is an asset in the subcategory university, science and technology. Furthermore, if we consider that, by their actions, governments aim to mitigate environmental problems selectively and establish economic policies that are sustainable from an ecological point of view (Shrivastava, 1995), it is reasonable to assume that there is a connection between public administration capital and environmental capital.

There is also a relationship between social capital and the environment (Pretty and Ward, 2001), with a two-way link between them. Thus factors such as culture or demographic pressure affect the environment or the deterioration of the territory, while in the opposite direction, assets like water quality or pollution

directly affect assets included in social capital –*e.g.,* the health of the population.

There is another possible relationship between training and development capital and environmental capital and social capital. There is no doubt that an educated society has a positive impact on the environment and social tolerance.

The underlying philosophy of the model, which is based on obtaining economic, social and environmental development by means of intangible assets, means that such development is obtained by minimizing the negative impacts on nature, both at a local and a global level. Thus, we believe that the proposed model is in line with the principles proposed by Haughton (1999), which have been included in the model although not all with the same depth. For each of those principles, we now list some assets included in the model, and whose existence can be used to control whether the principles are being complied with.

Thus, the assets related to *intergenerational equity* include a conscience not to generate waste, a recycling conscience, saving energy and water consumption, and environmental education, all of which fall within the environment category. These assets contribute to environmental conservation and consequently to future generations' ability to enjoy the environment. Moreover, other aspects, such as quality research and education, both within the category of training and development, and a conscience to produce ecologically, the quality and modernization of industry, within the category of economic activity, are also

determinant in the improvement of present resources and their consequent conservation

The assets related to *intra-generational equity* or social justice are found within the social category. Thus, the sub-category of community health includes intangibles such as the health of the population and health promotion, while equality of the sexes and social volunteer conscience fall within the sub-category of groups under social protection. The sub-category of housing includes accessibility and habitability of housing, while the sub-category of employment includes job stability and social peace. There is no doubt that the existence of those assets in a territory constitutes a clear sign of the existence of social equality.

Intangible assets associated with *procedural equity* are found included in various sub-categories in the model. Thus, the sub-category of employment contains assets such as good labor relations peace, job stability and adequate working conditions, while the sub-category groups under social protection contains equality of the sexes. All of those are assets that may be an indirect reflection of a fair and participatory legislation system. However, it is clear that this principle is under-represented in the model. In any case, it should be noted that to a great extent, compliance with this principle does not depend on the island authorities since the legislative competence of those authorities is limited because the island is not an independent state.

Of the categories proposed by Haughton (1999), it is perhaps the principle of *geographical equity,* together with the above principle, that is most understated in the model. The reason for that deficit lies in the fact that the territory under study covers a small surface area, which means that the capacity to influence on a global level is limited. However, assets that may be linked to this principle are taken into account. Thus, the sub-category of energy and water includes assets such as saving energy consumption, saving water and energy diversification. If those assets are in good condition, it means that energy and water are being saved and the former is being produced from renewable sources. This means that fewer pollutants are emitted into the atmosphere, which consequently helps not to increase the greenhouse effect. The sub-category of industry and construction includes the modernization of industry; an asset that contributes to a more efficient use of resources. Thus, as most of the raw materials used in the islands have to be imported; this helps to reduce the deterioration of the territories that export them.

Finally, the assets related to *interspecies principle* are predominantly found in the category of environment and include assets such as the protection and sustainable exploitation of the environment and environmental education, which fall within the rural and urban sub-category, and an ecosystem habitat conscience which is included in the category of waste and recycling. Other assets belonging to the environmental category are also indirectly related to this principle; for example, energy and water saving contributes to less pollution and consequently to less deterioration of the habitats of other species.

The intellectual capital of Gran Canaria: an application

*Antecedents*

Gran Canaria is an island forming part of the Canarian Archipelago, has a surface area of 1,560.10 square kilometers (602.36 square miles) and is almost circular, with a maximum diameter of 53.5 kilometers. Its location in the Atlantic Ocean, more than 1,000 kilometers from Continental Europe, means that, together with the other Canary Islands, it is considered an outermost region of the European Union. There are 771,333 inhabitants, a figure representing approximately 45% of the archipelago's total. As regards economic activity, in relatively few years, the island has changed from having a preeminent agricultural sector to being one of the most important tourist destinations in Spain (Hansen Machín and Domínguez Mújica, 1993).

*Application of the model*

The first step in applying the proposed model to Gran Canaria was to identify the general objective of the territory. In this respect, The Social and Economic Strategic Plan for Gran Canaria establishes it as "[...] To improve the national and international competitiveness of Gran Canaria to guarantee sustained economic growth with adequate conservation of natural resources and an improvement of the quality of life of its citizens" (Cabildo de Gran Canaria, 2001:13). Taking that objective into account, the model proposed in this work is especially suitable, since it was designed for the achievement of sustainable development by the territory and, to that end, includes economic as well as social and environmental aspects.

When establishing the categories of the model to be applied to Gran Canaria, and in order to capture a more detailed, complete picture of the island reality, most of the categories were divided into subcategories. Table I shows the final configuration of the model.

Take in Table I

Once the structure of the model had been determined, the relative weightings of each of the categories and their subcategories were fixed. This relative weighting represents the importance of each category and subcategory in achieving the objective of sustainable development. The results of that weighting are shown in Table II. It should be stressed that the relative weightings shown in that table are based on the opinions of 61 consulted experts. The weightings of the different categories were all given quite similar values, although the highest valued was the category of training and development while the least valued was public administration, which was the only category whose average value was significantly below the overall average. Another notable result is that the categories that include intangible assets related to tourism and the environment were considered more relevant to obtaining sustainable development than those associated with the social category.

It should be stressed that for the purposes of this work, an expert is considered to be an individual with a broad knowledge the relevant topic. Thus, the experts include: the University Rector and manager, professors, ecologists, business

consultants, doctors, researchers, entrepreneurs, public managers, heads of business organizations, trade union leaders, university lecturers, primary and secondary teachers, etc. The experts were chosen in such a way that there were at least three for each of the proposed subcategories. Moreover, the particular knowledge of each expert allowed as many perspectives of the topic as possible. For example, in the case of the subcategory rural and urban environment there was an ecologist, a university lecturer, a manager from the public administration and a civil servant, while the experts in the subcategory waste and recycling were a politician, an ecologist, a university lecturer and a manager of a private company responsible for waste management on the island. To be specific, and in line with the proposal of Simon (2003), the experts contributing to operationalize the term sustainability represent all the stakeholders that should be involved in that achieving sustainable development.

The heterogeneity of the informants' training and/or activity undoubtedly incurs the risk of low levels of homogeneity in the responses. However, it was decided to use that methodology rather than others, such as a survey of the resident population, because, although the contribution of a greater number of people was lost, it was possible to obtain deeper and more precise knowledge of the intangible assets that contribute, or could contribute, to the sustainable development of the island. A review of the literature was undertaken but it was not significant in determining the weights of the assets and categories.

Another problem associated to the use of experts to set the loadings in the model is that they may not be impartial and so give higher loadings to their

personal preferences. However, in selecting the experts great care was taken to ensure that business, social and environmental specialists were represented in the final selection. This balanced panel of experts and the fact that the loadings were established as the averages of all the experts mean that any possible deviances tend to self-compensate.

In order to make sure that all the experts understood and had the same notion of the meaning of sustainable development, prior to the interviews they were informed of what was understood by sustainable development for the purposes of this work. Furthermore, during the selection of experts it was ensured that they had previously participated in the preparation of the Strategic Plan for the Gran Canaria, a document setting out the principle strategies to achieve sustainable development in the territory, and that they shared the same conception of the term. A similar procedure was followed in the case of intellectual capital, so that they all had the same concept of the meaning before the interviews took place.

With regard to how the problem was presented to the experts, it should be mentioned that it was proposed that they endeavor to identify the most significant intangible assets that determine that a small island territory, specifically Gran Canaria, can achieve sustainable development. As previously mentioned, the first step was to clarify the concepts of intellectual capital and sustainable development. Then the experts were given the categories of intangible assets that were proposed in the model as a result of the review of the literature and a study of the island's organization. The next step was to ask

the experts to propose the assets that should be included in each of the subcategories in which they were experts, and the most appropriate indicators to measure them. When all the opinions had been collected, a list of all the assets and indicators proposed for each subcategory was drawn up. That list was then given to the experts, who were asked to put the assets proposed by themselves and the other experts in the same subcategory in order of the importance that they attached to them, and to evaluate their present condition on Gran Canaria. The results of this stage identified the assets and indicators that would be included in the model. The experts were then given the list of definitive assets in each subcategory and asked to evaluate each of the subcategories in the category in which they were experts. The weight of each of the subcategories was calculated from the average evaluation of the experts. Finally, the importance of each dimension to the achievement of sustainable development for Gran Canaria was established by asking all the experts for their opinions. Thus, Table III shows all the assets used in this work, together with the importance assigned to them within their categories or subcategories, while Table IV shows their present situation according to the team of experts.

Take in Table II

Take in Table III

Take in Table IV

The next step was to measure all the proposed assets by means of their respective indicators. Those measurements were calculated using secondary sources of information such as the Canarian Autonomous Government, the Gran Canaria Island Council and the Canarian Institute of Statistics.

Finally, the index of sustainability was constructed from the accumulation of the partial indexes of each category and subcategory. The value of an index calculated in that way is that it can be used to make comparisons with that for the same territory in a different period of time, or for other territories in the same period of time. In the first case, it would permit the evolution of the island's sustainability of development to be observed and, in the second, it can be used to compare it to that of another territory. In this work, the second option was chosen, with Tenerife as the second territory.

The need for systems of sustainability indicators is widely recognized and great efforts have been made in that respect (Simon, 2003). Hence, the attempt to prepare a combined indicator of sustainability, such as that proposed in this work, is nothing new and for years there has been talk about establishing an index based on economical indicators (Neumayer, 1999). However, that type of index has been criticized for attempting to reduce the social and environmental aspects to equations based on economical data. To overcome the problems created when combining measures, there have been some initiatives that have proposed the construction of frameworks of indicators that permit the links between different indicators to be shown. Two examples are the European System of Environmental Pressure Indices and the European System of

Integration of Economic and Environmental Indices constructed by The Commission of the European Communities (1996). For their part, Ekins and Simon (1999, 2001) developed a framework of indicators that shows how economic activities affect ecological functions. Although these frameworks must be seen as more complex systems than the simple combination of indicators, there is no doubt that they may be controversial. However, some of them have proved to be effective in their use by legislators (Simon, 2003).

The model proposed in this work also aims to establish a series of indexes to measure sustainable development of the island territory where it is applied. To construct the model, the values of the indicators used to measure the proposed intangible assets were loaded according their importance and then combined.

As previously mentioned, the model is structured in categories containing subcategories. Each of those categories comprises a series of assets that are measured by means of a series of indicators. The indexes are calculated in an upside-down fashion, so that the index values of the assets are calculated first, then those of the subcategories and finally those of the categories. Since not all the indicators represent the asset in the same way, the measurements are loaded according to the importance of each indicator. This form of combination is possible because each of the measured values is divided by a base value, which corresponds to the measurement values for each indicator on Gran Canaria. Thus, the value that reflects Gran Canaria in each indicator is 1, making the resulting values easy to compare. Once the index values of the assets of each subcategory had been obtained, they were combined to obtain

the value of the subcategory. Since not all the assets have the same importance within the subcategory, the sum was calculated by loading the values according to their importance within the subcategory. The next step was to combine the subcategory values, also loaded according to importance, to obtain index values for the categories. Finally, the same process was used for the categories to obtain an index total for sustainability.

Obviously, the loadings assigned to the variables and dimensions could be crucial. However, in no way does this work claim that those established for Gran Canaria are suitable for any other territory. In fact, each territory should establish the loadings most suited to its social, environmental and economic characteristics. Hence, if this work applies the same loadings to Gran Canaria and Tenerife, it is because the two islands are very similar in those three aspects. The same problem occurs in models of intellectual capital applied to firms, since an intangible asset that is vital to one firm may be irrelevant to another. That circumstance minimizes the homogeneity of results and the usefulness of making comparisons between firms, although it does not detract from the increasing importance of measuring and controlling the intangible assets that they possess.

Due to the way in which the indexes in this work are constructed, the managing authorities may be tempted to reinforce certain assets at the expense of others because that action might not affect the index. This substitution problem may lead, for example, to not reinforcing determined assets related to nature or social affairs while doing so with those linked to economic activity. However, it

should be made clear that, first, the proposed model is based on intangible assets whose reinforcement does not damage natural resources and, second, since there is a positive relationship between the different dimensions, the improvement of an asset in a particular dimension can contribute to the improvement of assets in other dimensions. Thus, if the asset ecological production awareness is improved, it leads to improvements in other intangible assets related to the environment. Moreover, the model permits minimum objectives to be established for each asset if there is a desire for no imbalances in the promotion of assets.

The problem is that, to determine those values, it would be appropriate to have performed various measurements. Moreover, excessive substitution can easily be avoided if the partial indexes, as well as the overall index, are taken into account.

To be able to interpret the results of the indexes obtained (see Tables V and VI), it must be remembered that these are the indexes for Gran Canaria in relation to those for Tenerife, with the former taking the value of 1. Thus, the distance from a value of 1 for any index must be interpreted as the difference in the situation between the two islands regarding the group of analyzed assets. Therefore, if the index is lower than 1, it indicates that, in general terms, the situation of Gran Canaria is better than that of Tenerife. Similarly, the observations about the partial indexes for each category, subcategory and asset provide more detailed information that will permit the formulation of the

actions to be taken in order to achieve the objective of sustainable development.

The results obtained indicate that the overall result included in the category "result" reflects that Tenerife is growing in a more sustained way than Gran Canaria. However, it should be stressed that the difference between the two islands is only 2.86%. In the case of the partial indexes that comprise the general index, the results for Gran Canaria show higher values for the categories of environment, public administration and training and development, especially in the case of public administration, which was 20% better than in Tenerife. However, the partial indexes for the tourism, economic activity and social categories have higher values for Tenerife, with the value for economic activity exceeding that of Gran Canaria by more than 30%. Those data reflect that Tenerife surpasses Gran Canaria in all the indexes related to business activity, except in the case of commerce and services. Therefore, it is not surprising that the indicator of the generation of wealth, in other words the value added per inhabitant is also higher in Tenerife. All that leads to the conclusion that Tenerife is growing more than Gran Canaria and, according to the index of sustainability constructed in this work, that growth is more sustainable.

Take in Table V

Take in Table VI

## Conclusions

The importance of intangible assets in organizations has been increasing in recent years. However, that phenomenon is not confined to the context of companies; it can also affect territories. That importance is, if possible, even greater in small, island territories, a type of territory characterized by its fragility, shortage of resources, little possibility of local companies to influence prices, low internal competitiveness, little business diversity, etc. In addition, territories are interested in their development being sustainable development, understood as that which satisfies present needs without compromising those of the future. The construction of the model in this work led to the design of a tool which, by measuring and evaluating intangible assets, contributes to obtaining sustainable development in small, island territories. Moreover, its application to Gran Canaria means that, using a series of indicators, the intangible assets of that island are identified, measured and evaluated, and a series of indexes were calculated. The purpose of those indexes is to reflect both the accumulated value of those intangible assets and the sustainability of development in a small, island territory.

The main practical implication of this study is for managers of public administrations of islands, who can find the answers to which intangible assets the territory must possess to achieve sustainable development, and what the present condition of those assets is. Moreover, the structure of the model means that both longitudinal and transversal comparisons can be made with other territories. Moreover, there should be no reason for those comparisons to include all the variables of the model, but they can be made with only the

variables of one part of the model (e.g. those belonging to a specific dimension, sub-dimension or group of assets). For example, the variables of the environmental dimensions may be compared with those of an island territory that represents a global reference in that aspect. Thus, we could have some values that serve as a goal for the island to achieve. In the case of this study, the comparisons were between the islands of Gran Canaria and Tenerife. Furthermore, the proposed model attempts to respond to Malhotra (2000), who stated that the leaders of national economies should aim to have reliable mechanisms available to measure knowledge resources in order to understand how those assets are related to the country's future actions. That author states that if national politicians and leaders wish to take decisions that permit their territories to increase their performance and future growth, they must have tools that facilitate the measurement of intellectual capital since this is the basis of their countries' future wellbeing. In addition, the methodology followed to implement the model could serve as a way to reflect on the importance of environmental, social and economic aspects to the achievement of a territory's sustainable development.

Another practical implication of the model is that it proposes the existence of relationships between the different categories and the assets comprising them. The existence of those associations may lead to the proposal of actions that permit more efficient improvements in the present condition of a territory's intellectual capital and consequently in the sustainability of the territory's development.

Moreover, the methodology designed in this work can be used to obtain partial results within each of the categories. For example, representatives of the business sector could use the indexes and indicators proposed for the economic activity and tourism categories to improve the contribution of that sector to the sustainable development of the island. They could also use the relationships identified between the assets of each subcategory to achieve more effective processes to accumulate intangible assets.

Finally, we should mention that the principal innovation of this model lies in the fact that it is based on intangible assets rather than on physical or financial assets, as other models are. Therefore, it is based on a type of asset that does not depreciate with use and whose use does not damage the environment.

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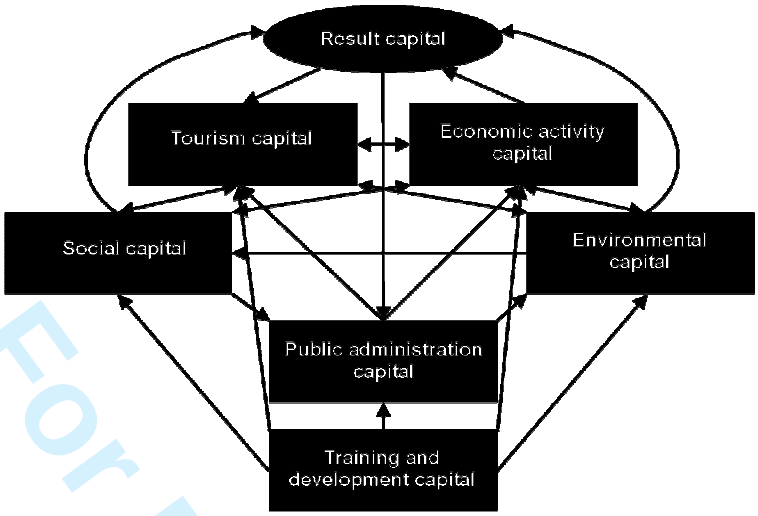
Figure 1. Model for the measurement of intellectual capital in a small, island territory



| Table I: Categories and subcategories of the model | |
|---|---|
| Category | Subcategory |
| Tourism | |
| Economic activity | • Agriculture, livestock and fisheries<br>• Industry and construction<br>• Trade and services |
| Social | • Employment<br>• Housing<br>• Population groups under social protection<br>• Population and immigration<br>• Public safety<br>• Culture and sports<br>• Community health |
| Environment | • Energy and water<br>• Waste and recycling<br>• Urban and rural environment |
| Public Administration | |
| Training and development | • Primary and secondary<br>• University, science and technology<br>• Professional and vocational training<br>• The information society |
| Result | |

| Table II: Relative importance of categories and subcategories | | | |
|---|---|---|---|
| Categories | Weighting[1] | Subcategories | Weighting[1] |
| Tourism | 18.07 | | |
| Economic activity | 15.10 | Agriculture, livestock and fisheries | 23.00 |
| | | Industry and construction | 33.67 |
| | | Trade and services | 43.33 |
| Social | 16.97 | Employment | 26.12 |
| | | Housing | 15.55 |
| | | Population groups under social protection | 10.86 |
| | | Population and immigration | 13.15 |
| | | Public safety | 6.91 |
| | | Culture and sports | 9.15 |
| | | Community health | 18.26 |
| Environment | 17.34 | Energy and water | 43.59 |
| | | Waste and recycling | 25.70 |
| | | Rural and urban environment | 30.71 |
| Public administration | 12.50 | | |
| Training and development | 20.02 | Primary and secondary education | 33.33 |
| | | University, science and technology | 25.00 |
| | | Professional and vocational training | 22.50 |
| | | The information society | 19.17 |

[1] Evaluation of relative importance on a scale of 1 to 100

| Table III: Intangible assets of Gran Canaria | | | | | |
|---|---|---|---|---|---|
| Category: tourism | | Category: economic activity | | Category: social | |
| Asset | Weighting | Subcategory: agriculture, livestock and fisheries | | Subcategory: employment | |
| Loyalty | 28 | Asset | Weighting | Asset | Weighting |
| Tourist security | 28 | Association tendency | 40 | Job security | 39 |
| Image of Gran Canaria | 22 | Institutional support | 36 | Capacity to create employment | 23 |
| Qualified staff | 22 | Ecological production awareness | 24 | Adequate working conditions | 21 |
| Category: public administration | | Subcategory: industry and construction | | Good labour relations | 17 |
| Asset | Weighting | Asset | Weighting | Subcategory: housing | |
| Efficiency | 40 | Quality | 64 | Asset | Weighting |
| Modernization | 37 | Modernization | 36 | Accessibility | 65 |
| Suitability of staff | 23 | Subcategory: trade and services | | Inhabitability | 35 |
| Category: training and development | | Asset | Weighting | Subcategory: groups under social protection | |
| Subcategory: primary and secondary education | | Qualification and training of staff | 54 | Asset | Weighting |
| Asset | Weighting | Entrepreneurship | 27 | Quality and guarantee of protection | 42 |
| Schooling – regular attendance | 46 | Quality | 19 | Public support | 25 |
| Quality of teaching | 28 | Category: environment | | Equality between the sexes | 20 |
| Absence of classroom conflicts | 26 | Subcategory: energy and water | | Social volunteer conscience | 13 |
| Subcategory: university, science and technology | | Asset | Weighting | Subcategory: population and immigration | |
| Asset | Weighting | Savings in energy consumption | 46 | Asset | Weighting |
| Teaching quality | 39 | Savings in water consumption | 34 | Absence of demographic pressure | 46 |
| Research quality | 34 | Diversification of energy | 20 | Bio-demographic balance | 27 |
| Image | 27 | Subcategory: waste and recycling | | Ability to absorb immigration | 27 |
| Subcategory: professional and vocational training | | Asset | Weighting | Subcategory: public safety | |
| Asset | Weighting | Ecosystem-habitat conscience | 50 | Asset | Weighting |
| Adequacy of training programs | 54 | Non-waste-generating conscience | 28 | Police efficiency | 36 |
| Quality of education | 46 | Recycling conscience | 22 | Police traning and turnover | 33 |
| Subcategory: the information society | | Subcategory: rural and urban | | Sense of security | 31 |
| Asset | Weighting | Asset | Weighting | Subcategory: culture and sports | |
| Basic technological training | 42 | Protection and sustainable development of environment | 68 | Asset | Weighting |
| Quality of access to information | 36 | Environmental education | 32 | Habit of practicing sports | 37 |
| Habit and confidence in using Internet | 22 | | | Habit of enjoying culture | 37 |
| Category: result | | | | Institutional support | 26 |
| Asset | Weighting | | | Subcategory: community health | |
| Sustainability | --- | | | Asset | Weighting |
| | | | | Health education | 43 |
| | | | | Promotion of health | 41 |
| | | | | Population's health | 16 |

Table IV Present situation of intangible assets of Gran Canaria

| Category: tourism | | Category: economic activity | | Category: social | |
|---|---|---|---|---|---|
| Asset | Weighting | Subcategory: agriculture, livestock and fisheries | | Subcategory: employment | |
| Loyalty | 4 | Asset | Weighting | Asset | Weighting |
| Tourist security | 2.8 | Association tendency | 3.67 | Job security | 2 |
| Image of Gran Canaria | 3.2 | Institutional support | 3.67 | Capacity to create employment | 4 |
| Qualifications of staff | 2.4 | Ecological production conscience | 2.5 | Adequate working conditions | 1.33 |
| Category: public administration | | Subcategory: industry and construction | | Good labour relations | 17 |
| Asset | Weighting | Asset | Weighting | Subcategory: housing | |
| Efficiency | 2.8 | Quality | 3.5 | Asset | Weighting |
| Modernization | 3.2 | Modernization | 3 | Accessibility | 2 |
| Suitability of staff | 3.2 | Subcategory: trade and services | | Inhabitability | 3.5 |
| Category: training and development | | Asset | Weighting | Subcategory: groups under social protection | |
| Subcategory: primary and secondary education | | Qualification and training of staff | 2.33 | Asset | Weighting |
| Asset | Weighting | Entrepreneurship | 2 | Quality and guarantee of protection | 2.67 |
| Schooling – regular attendance | 4 | Quality | 2 | Public support | 3 |
| Quality of teaching | 2.5 | Category: environment | | Equality between the sexes | 2.67 |
| Absence of classroom conflicts | 1.5 | Subcategory: energy and water | | Social volunteer conscience | 3.5 |
| Subcategory: university, science and technology | | Asset | Weighting | Subcategory: population and immigration | |
| Asset | Weighting | Savings in energy consumption | 2.33 | Asset | Weighting |
| Teaching quality | 3.67 | Savings in water consumption | 3.33 | Absence of demographic pressure | 1.33 |
| Research quality | 3.33 | Diversification of energy | 2 | Biodemographic balance | 3 |
| Image | 3.67 | Subcategory: waste and recycling | | Ability to absorb immigration | 3 |
| Subcategory: professional and vocational training | | Asset | Weighting | Subcategory: public safety | |
| Asset | Weighting | Ecosystem-habitat conscience | 4 | Asset | Weighting |
| Adequacy of training programs | 2.67 | Non-waste-generating conscience | 3 | Police efficiency | 4 |
| Quality of education | 3.33 | Recycling conscience | 4.5 | Police training and turnover | 3 |
| Subcategory: the information society | | Subcategory: rural and urban | | Sense of security | 2.67 |
| Asset | Weighting | Asset | Weighting | Subcategory: culture and sports | |
| Basic technological training | 2.33 | Protection and sustainable development of environment | 2 | Asset | Weighting |
| Quality of access to information | 2.67 | Environmental education | 2 | Habit of practicing sports | 3.33 |
| Habit and confidence in using Internet | 2.5 | | | Habit of enjoying culture | 3 |
| Category: result | | | | Institutional support | 4 |
| Asset | Weighting | | | Subcategory: community health | |
| Sustainability | --- | | | Asset | Weighting |
| | | | | Health education | 3 |
| | | | | Promotion of health | 2.33 |
| | | | | Population's health | 3.67 |

[1] The evaluation of the present situation of the assets was performed using a 5-point Likert scale, where 1 represents a very bad situation and 5 very good.

| Table V: Synthetic Indexes of Tenerife in relation to Gran Canaria | | | | | |
|---|---|---|---|---|---|
| Sustainability | Index | Categories | Index | Subcategories | Index |
| Overall index | 1,0286 | Tourism | 1.0430 | | 1.0430 |
| | | Economic activity | 1.3634 | Agriculture, livestock and fisheries | 1.4268 |
| | | | | Industry and construction | 1.9630 |
| | | | | Commerce and services | 0.8638 |
| | | Social | 1.0420 | Employment | 1.1442 |
| | | | | Housing | 0.9681 |
| | | | | Groups under social protection | 1.0846 |
| | | | | Population and immigration | 0.9458 |
| | | | | Public safety | 1.0042 |
| | | | | Culture and sports | 0.8918 |
| | | | | Community health | 1.0924 |
| | | Environment | 0.9492 | Energy and water | 0.7773 |
| | | | | Waste and recycling | 1.0517 |
| | | | | Rural and urban environment | 1.1076 |
| | | Public administration | 0.8014 | | 0.8014 |
| | | Training and development | 0.9623 | Primary and secondary education | 0.9145 |
| | | | | University, science and technology | 0.9938 |
| | | | | Professional and occupational training | 0.9554 |
| | | | | The information society | 1.0126 |

| Table VI: Index of assets of Tenerife in relation to those of Gran Canaria | | | | | |
|---|---|---|---|---|---|
| Category: tourism | | Category: economic activity | | Category: social | |
| Asset | Index | Subcategory: agriculture, livestock and fisheries | | Subcategory: employment | |
| Loyalty | 1.0002 | Asset | Index | Asset | Index |
| Tourist security | 1.1622 | Association tendency | 1.3400 | Job security | 1.0178 |
| Image of Gran Canaria | 0.9887 | Institutional support | 0.64411 | Capacity to create employment | 1.4520 |
| Qualifications of staff | 1 | Ecological production conscience | 2.7500 | Adequate working conditions | 1.1959 |
| Category: public administration | | Subcategory: industry and construction | | Good labour relations | 0.9537 |
| Asset | Index | Asset | Index | Subcategory: housing | |
| Efficiency | 0.9584 | Quality | 0.8272 | Asset | Index |
| Modernization | 0.5081 | Modernization | 3.9822 | Accessibility | 1.2222 |
| Suitability of staff | 1 | Subcategory: trade and services | | Inhabitability | 0.4961 |
| Category: training and development | | Asset | Index | Subcategory: groups under social protection | |
| Subcategory: primary and secondary education | | Qualification and training of staff | 1 | Asset | Index |
| Asset | Index | Entrepreneurship | 0.6792 | Quality and guarantee of protection | 1.0225 |
| Schooling – regular attendance | 0.9606 | Quality | 0.7391 | Public support | 1.0821 |
| Quality of teaching | 0.7595 | Category: environment | | Equality between the sexes | 1.4990 |
| Absence of classroom conflicts | 1 | Subcategory: energy and water | | Social volunteer conscience | 0.6538 |
| Subcategory: university, science and technology | | Asset | Index | Subcategory: population and immigration | |
| Asset | Index | Savings in energy consumption | 1.0553 | Asset | Index |
| Teaching quality | 1.0905 | Savings in water consumption | 0.8116 | Absence of demographic pressure | 1.2857 |
| Research quality | 0.7023 | Diversification of energy | 0.6070 | Biodemographic balance | 1.0914 |
| Image | 1.0788 | Subcategory: waste and recycling | | Ability to absorb immigration | 0.2209 |
| Subcategory: professional and vocational training | | Asset | Index | Subcategory: public safety | |
| Asset | Index | Ecosystem-habitat conscience | 1.1429 | Asset | Index |
| Adequacy of training programs | 0.9655 | Non-waste-generating conscience | 1.0163 | Police efficiency | 1.0161 |
| Quality of education | 1.0270 | Recycling conscience | 0.8897 | Police training and turnover | 1.1937 |
| Subcategory: the information society | | Subcategory: rural and urban | | Sense of security | 0.7887 |
| Asset | Index | Asset | Index | Subcategory: culture and sports | |
| Basic technological training | 1.1512 | Protection and sustainable development of environment | 1.1506 | Asset | Index |
| Quality of access to information | 0.8546 | Environmental education | 1.0163 | Habit of practicing sports | 0.7239 |
| Habit and confidence in using Internet | 1.0065 | | | Habit of enjoying culture | 1.0093 |
| Category: result | | | | Institutional support | 0.9635 |
| Asset | Index | | | Subcategory: community health | |
| Sustainability | 1.0040 | | | Asset | Index |
| | | | | Health education | 1.0576 |
| | | | | Promotion of health | 1.0105 |
| | | | | Population's health | 1.3957 |