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Letter from the Managing Editor

Josep Maria Altarriba

Managing Editor

hdbresearch@pmp.es

In the article that opens this new issue of *Harvard Deusto Business Research*, Professor Francisco Sagasti reviews the emergence of modern management sciences and the idea of development in the period following World War II, sharing some ideas about the nature of planning and strategic management that arose in later years. Likewise, he examines some of the challenges we face in the 21st century and reflects on how to approach a renewal of strategic planning and management. He proposes a paradoxical focus to face the challenges organizations will experience over the next few decades, drawing the conclusion that joint efforts to review the management science experience in developing countries can provide new ideas and ways of dealing with future problems and complex conditions.

Next, the work by Cristina Crespo Soler, Arturo Giner Fillol, Yenny Naranjo Tuesta and Vicente Ripoll Feliu presents a content analysis of the intelligibility of the environmental information that is reported in the annual accounts of the main Port Authorities in Spain. Their article analyzes the environmental aspects that are presented in the annual accounts, concluding that the Port Authorities of Castellón, Gijón and Valencia provide the most details of their environmental activities and actions in their annual reports. They believe that the Port Authorities must improve their communications strategies in their annual reports in order to reflect their environmental actions in the immediate socioeconomic environment in connection with other sources of information, such as sustainability reports.

In the third article, Nuria Puente Domínguez considers how to effectively design product pages on an e-commerce website. She investigates the relationship that exists between the level of complexity of product pages and the number of unique purchases made in order to determine the most effective e-commerce merchandising strategies and techniques to help businesses in the food-based mass market sector to make the right strategic decisions that would let them increase their e-commerce sales. The results of their research allow us to conclude the importance of the visual aspects of product web pages.

In the following work, Alberto Díaz de Junguitu González de Durana, Iñaki Heras Saizarbitoria and Olivier Boiral reflect on the importance that environmental issues are taking on in the present day. In spite of the media repercussion of certain protests around the world against climate change or scandals related to the failure to comply with environmental regulations in the automotive sector, the environment has constantly remained a subsidiary topic for economists until recent times, when the ecological crisis has grown to proportions that are truly alarming for humanity. Their article intends to show some of the main features of the environmental presence in economic science, in an attempt to reveal the path that could lead to the reconciliation of the two.

The article by professors Pablo Coto-Millán and Javier Gundelfinger Casar provides an original theoretical model for air transport companies in the United States air travel market. In it, the theoretical model of competition among airlines is empirically tested by estimating two equations of demand and price fixing. Finally, the article presents results that might be useful to airlines and public authorities, since it analyzes the effect of the existence or absence of competitive transportation alternatives on air transport, and how distance, occupancy and the number of frequencies on each route influence costs.

In the article that closes this issue, Alicia Paola Partida Hernández focuses on the crucial role that culture plays in the sustainable and economic development of cities. In spite of the fact that there are every day more cities that recognize its importance and include it in their development plans, the matter considered is how to measure its impact. This article thus presents an alternative proposal to the UNESCO Culture for Development Indicators (CDIS) for assessment, made up by twenty-seven indicators organized into seven categories. The model is applied to the cities of Stockholm, Bilbao and the Guadalajara Metropolitan Area, which were selected for their public policies, as well as the cultural and creative projects that have been implemented in these areas in recent decades. The results indicate that the cities which consider culture in a cross-cutting manner achieve greater sustainable development.

Finally, as always, I would like to thank the authors for their effort and the inestimable collaboration and professionalism of the members of the editorial committee and the reviewers, as well as the warm reception by the readers of *Harvard Deusto Business Research*. Thank you very much to everyone. ☺

Renewing Strategic Planning and Management: A Paradoxical Approach¹

Francisco Sagasti

Professor, Pacífico Business School, Universidad del Pacífico and senior researcher emeritus, FORO Nacional Internacional, Lima. Peru. ORCID: [0000-0003-2629-7351](https://orcid.org/0000-0003-2629-7351)

f.sagastih@up.edu.pe

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Abstract

This paper reviews briefly the rise of modern management sciences and of the idea of development in the post-World War II period, shares some thoughts on the nature of strategic planning and management that emerged in subsequent years, examines a few of the challenges of the twenty-first century, and ends with some reflections with a suggestion on how to approach the renewal of strategic planning and management. It proposes a paradoxical approach to confront the challenges that organizations in all types of countries will face in the coming decades, highlighting that developing regions have had to cope with the instabilities and difficulties that rich countries are now also facing. It concludes that joint efforts to review the management science experience of developing countries may provide new insights and ways of dealing with future wicked problems and complex conditions, and with a plea for management schools to prepare professionals who are at ease with inconsistencies, contradictions and paradoxes.

Key words

Strategy, planning, paradox, wicked problems, developing countries, opportunism, incrementalism.

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The idea of progress morphed into that of development, aiming at achieving everywhere the material standards of living of affluent countries

1. Introduction

This paper reviews briefly the rise of modern management science and of the idea of development in the post-World War II period, shares some thoughts on the nature of strategic planning and management that emerged in subsequent years, examines a few of the challenges of the twenty-first century, and concludes with a suggestion on how to approach the renewal of strategic planning and management.

It is appropriate to begin with a note of caution, quoting a critical historian of management science: *“Despite the fact that management, perhaps more than any other field, is littered with claims of ‘revolutionary new theories’, most of these, when placed up against earlier management theories, seem incremental at best and obviously the same view with a snappy new title at worst”* (Cummings, 2002, p. 3). This paper offers just a rearrangement and updating of time-tried concepts, re-viewing them from the perspective of a long-time international practitioner of strategic planning and management.

The methodological approach adopted stems from Schon’s conception of the “reflective practitioner”, a professional who continuously reviews his past actions to extract lessons of experience that afford a certain degree of generalization (Schon, 1983), and also from Merton’s “middle range” theories that lie between broad universally applicable conceptual statements and intellectual constructs focused on specific issues derived from empirical evidence (Merton, 1968). In light of the experience with international organizations, government agencies and private corporations, both in developing and developed countries, this approach allows to infer some guidelines for renewing strategic planning and management practices, and for preparing future management professionals.

2. Progress, development and management

The idea of individual and collective progress can be traced to a conception of continuous, linear and indefinite human advance that emerged in the Middle Ages and the Renaissance, was enshrined during the Scientific Revolution and the Enlightenment, and found practical expression in the Industrial Revolution (Bury, 1955; Nisbet, 1980). It was eclipsed during the “age of catastrophe” of the first decades of the twentieth century (Hobsbawm, 1994), to rise once again in the post-World War II period. Claiming universal validity, progress morphed into the concept of “development,” which aimed at achieving everywhere the material standards of living of affluent countries. Development was seen as the result of explicit and deliberate interventions by all sectors of society, usually under the guidance of the state, to improve efficiency and productivity, diversify the provision of goods and services, extend healthy life spans, and increase satisfaction and happiness. In short, development, the latest incarnation of the idea of progress, had to be planned and managed (Bezanson & Sagasti, 2005).

Although it has its origins in the nineteenth century, management science received a major boost in the post-World War II period. Successful wartime operations by the allied forces, together with the effective mobilization of science to support them and with the effectiveness of the Marshall Plan in reconstructing war-torn economies, inspired and informed the adaptation of wartime planning and management tools by the public and private sectors in peacetime.

The emerging concept of development was soon hijacked by the Cold War. Two alternative paths were charted: capitalist market economy and multiparty democracy in the West, and socialist central planning and single party politics in the East. Each offered its own visions for

Developing countries faced a broader range of choices about institutions, context, vision, and not only decisions on activities and resources

the future, ways of engaging with the world, and institutional arrangements for advancing towards development; each provided a distinct framework within which to define what goods and services to produce, in what amounts, how to distribute them, and how to allocate financial, human, physical and technical resources (Hughes, 2016). Yet, both roads to development sought to employ advances in the management sciences, either for decisions made in a distributed way through a network of enterprises linked by market relations, or in a centralized manner by government agencies using command and control procedures.

As visions, context and institutions were clearly determined for the main protagonists of the Cold War and their close allies, their management of deliberate development interventions focused on decisions about activities and resources. In contrast, while navigating the post-World War II context, developing countries faced pressures to choose between the alternative Western and Eastern visions of development; were buffeted by strong political winds in shifting and complex geopolitical settings; and most of them lacked the stability of economic, social and political institutions of the leading industrialized nations.

As a result, for planning and management efforts in developing regions to modestly successful, it was not enough to focus on decisions about goods and services, and on resource allocation, –deliberate interventions had to deal also with institutions, context and vision. Whether explicitly or implicitly, developing countries faced a broader range of intervention choices that comprised decisions about institution building, contextual engagement and vision formulation. Therefore, government, private and civil society organizations in developing countries had a head start in dealing with these three sets of thorny issues.

3. Anticipatory and actual decision-making

A distinguishing trait of the human species is the capacity to consciously anticipate the consequences of action, and of modifying behavior in order to achieve preferred outcomes. This implies identifying desired future states; taking decisions in advance to approach them in situations that have not yet occurred but are envisaged to happen; and then transforming those anticipatory decisions into actual ones as time passes, while continuously revising and updating the anticipatory decisions that lie ahead.

Following Ackoff (1970), *planning* can be defined as anticipatory decision-making; *management* could be defined as the process of continuously transforming anticipatory into actual decisions. As hinted above, anticipatory and actual decisions fall into five main categories: *resources*, *activities*, *institutions*, *context* and *vision*. The interrelations between these five categories of decisions can be summarized stating that *resources* are allocated to *activities* through *institutions* taking into account the *context* in order to approach the *vision* (Sagasti, 1973a, 1973b).

In the first decades after World War II management science emphasized methods for optimizing resource allocation and priority setting. Mathematical programming, operations research, systems analysis, statistical techniques, simulation models, queuing theories, planning and programming budgeting systems, program evaluation and review techniques, and critical path methods were among the many tools developed for these purposes (Gupta & Cozzolino, 1975).²

Gradually, at the turn of the century, greater attention began to be paid to institutional issues, including organizational redesign, administrative processes, regulation systems, incentive

² For a broad overview of the evolution of management thinking and practice during the twentieth century, see Kiechel (2012).

**The turbulent
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actions**

structures; to organizational environments, including stakeholder analysis, competitive positioning, market research (Miller & Rice, 1967; Perlmutter, 1965); to business models, strategy and innovation, and creating shared value (McGrath, 2010; Teece, 2010; Porter & Kramer, 2011); and to the creation of visions, including scenario building, foresight exercises, futures research, idealized designs and desirable futures (Ramírez, Churchhouse, Palermo & Hoffman, 2018; Ackoff, Magidson, & Addison, 2006; Ackoff, 1981; Kothari, 1974; Linstone & Simmonds, 1977; Polak, 1971).

The expansion of the repertoire of approaches and methods to encompass institutional, context and vision anticipatory and actual decision-making was accompanied by debates about how to conduct strategic planning and management. Clashes emerged as muddling through, disjointed incrementalism and stepwise decision making were pitted against radical, visionary and comprehensive approaches; deliberate and purposeful strategies were opposed to emergent and opportunistic ones; global reach and ambition were contrasted with local positioning and limited aims. Arguments about the ascent and decline of strategic planning appeared in scholarly management journals during the last decades of the twentieth century (Mintzberg, 1994a, 1994b; Mintzberg & Waters, 1985), and Mintzberg, Ahlstrand and Lampel (1998) offered a comprehensive road map of ten strategic planning schools of thought, highlighting their key dimensions, advantages and limitations.

4. A changed global context

The turbulent global context of the twenty-first century demands another reassessment of the ways of confronting new situations, and of anticipating the consequences of decisions and actions. As happened in the post-World War II period, it is again necessary to reinterpret what is meant by progress and development, and to renew planning and management approaches.

This is a stormy period of history, a time of epochal transformation involving changes in a host of interrelated security, economic, financial, social, demographic, environmental, cultural, governance and human interaction domains. A global but fractured world order puts all of us in contact with one another, but simultaneously maintains and creates deep fissures between us. It transmits and magnifies disruptions of all types, even though the weaker and vulnerable parts of the world are more severely affected by their reverberations (Sagasti, 1989, 2013; Sagasti & Alcalde, 1999).

At the root of all of these changes there are extraordinary and accelerated scientific and technological advances, which are now profoundly altering the human condition and its future prospects. Humanity is experiencing fundamental shifts in the ideas about physical, mental and virtual reality; the origin and fate of the universe, and its place in it; and the nature of time as a background for the unfolding of cosmic and earthly events. In addition, it has to consider the enormous impact of human actions on the increasingly fragile biophysical ecosystems that support life; the newly acquired capacity to consciously alter the direction of biological evolution; the impact of artificial intelligence and its challenge to the uniqueness of human reason; the new possibilities offered by nanotechnology, biotechnology and new energy technologies; and the ways in which information and communication technologies have altered the ways human beings interact in the age of information overload and big data.

These shifts create complex, interdependent, time-lagged, conflict ridden, value laden, ambiguous, uncertain problems and conditions that are difficult to formulate, hard to comprehend, and that have no clear-cut solution or straightforward way out (Table 1). The extraordinary state of affairs that our species confronts in the twenty-first century could open

“Wicked problems” defy logical and dialectic habits of thought, demand unconventional thinking and require responses of unprecedented creativity and scale

Table 1

Twenty-first century civilizational challenges

“I think the odds are no better than fifty-fifty that our present civilization on Earth will survive to the end of the present century” (Rees, 2003, p. 8).

“Humankind finds itself on a non-sustainable course – a course that, unless it is changed, will lead to catastrophes of awesome consequences” (Martin, 2006, p. 3).

“We’re not ... going to get back the planet we used to have, ... Now we must try to figure out how to survive what’s coming at us” (McKibben, 2010, p. 16).

“This is the first moment in the history of our planet when any species, by its own voluntary actions, has become a danger to itself” (Joy, 2000).

“The juggernaut of technology-based capitalism will not be stopped. ... But the direction can be changed by mandate of a generally-shared long-term environmental ethic. The choice is clear: the juggernaut will very soon either chew up what remains of the living world, or it will be redirected to save it” (Wilson, 2002, p. 156).

“The unintended dynamics of technical civilization ... drifts willy-nilly and with exponential acceleration ... the credible extrapolations are frightening and the calculable time spans shrink at a frenzied pace ... averting the disaster ... will hurt an endless number of interests” (Jonas, 1984, p. 202).

“In the early twenty-first century, the train of progress is again pulling out of the station ... the last train ever to leave the station called Homo Sapiens. Those who miss this train will never get a second chance. ... those who ride the train of progress will acquire divine abilities of creation and destruction, while those left behind will face extinction” (Harari, 2017).

“The current civilization has become dysfunctional ... Unless unforeseen changes take place, we will disappear, just as has happened with other species in the long history of life” (Herrera, 1981, p. 55).”

enormous possibilities for humanity; yet, their unforeseen and undesirable consequences are also threatening our hard-won civilizational achievements.

The “wicked problems” associated with the opportunities and challenges that are now emerging at all levels of society require responses of unprecedented creativity and scale. These wicked problems defy logical and dialectic habits of thought, demand unconventional thinking, require the capacity to simultaneously view problems and conditions from different points of view, and test the willingness to explore less trodden paths to confront them; furthermore, they are not solved once and for all, but “*only re-solved —over and over again.*” (Rittel & Webber, 1974; Rosenhead, 1989, pp. 10-11).

5. Twenty-first century management challenges: a paradoxical approach

Confronting the dauntingly wicked problems of the twenty-first century requires new management mindsets. Two decades ago, Drucker (1999) outlined several challenges managers in our century were to confront. Examining management practices at that time, he identified emerging leadership, information, knowledge, productivity and behavioral demands, forcefully stating they required new approaches to strategic planning and management. Current business

Twenty-first century management challenges require transcending trade-offs and demand a paradoxical mindset

environments, characterized by growing uncertainty, increasing complexity and chaotic behaviors, together with the implications of demographic shifts, swiftly changing work conditions, the rise of big data and artificial intelligence, climate change threats and heightened competition pressures, have made the challenges identified by Drucker much more pressing.

Arguing that new realities posed new imperatives, Hamel (2009) summarized twenty-five “management grand challenges” identified by a group of more than thirty scholars and business leaders. Ranging from “reconstruct management’s philosophical foundations” to “empower the renegades and disarm the reactionaries,” these challenges pointed out the need for “transcending trade-offs,” and for efforts “to overcome the limits of today’s management practices without losing the benefits they confer ... Organizations must become a lot more adaptable, innovative, and inspiring without getting any less focused, disciplined, or performance oriented.”

Transcending trade-offs demands a paradoxical mindset. “*The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function,*” wrote Francis Scott Fitzgerald eighty years ago (Fitzgerald, 1936). We now need first-rate intelligence, more than ever, to face the planning and management challenges of the difficult decades ahead.

It would be wise to adopt paradoxical modes of thought to transcend some enduring dichotomies: incremental versus radical, emergent versus deliberate, and global versus local approaches to anticipatory and actual decision-making. Paradoxical thinking goes beyond logical deduction and dialectic synthesis; it fully embraces ambiguity and contradiction while maintaining the capacity for purposeful intervention.³ When deriving guidelines for anticipatory and actual decision-making, paradoxical thinking would use both aspects of these opposite stances, shifting rapidly from one to the other ever so fast that they would seem superimposed and simultaneous. It may be useful resorting to the analogy of the once supposedly incompatible wave and particle theories of light: different experiments confirm one or the other, but both are empirically proven, fruitful and inherent to the nature of light.

Therefore, strategic planning and management could benefit significantly by the adoption of at least three paradoxical stances:

- **Radical incrementalism.** Radical because “*although daring in thinking is no guarantee of daring in practice, mental timidity in constructing an ideal is certainly a criterion of mental timidity in practice*” (Kropotkin, 1970, p. 46). Bold leaps and bounds of imagination are required to anticipate future situations, opportunities and dangers, and to derive their consequences and implications for action now. Incremental, because when dealing with complex problems and conditions “*limits on human intellectual capacities and on available information set definite limits to man’s capacity to be comprehensive*” (Lindblom, 1959, p. 84).

Although information technology advances are helping to collect and process huge amounts of data, and artificial intelligence algorithms are leveraging human understanding, these limits now arise because of the complexity, trickiness and deviousness of wicked problems and conditions, which overrun human interpretative capabilities and require constantly updated mindsets. Embracing both the radical and the incremental at the same time implies being able to adaptively chart sequences of viable anticipatory decisions that would lead from the present situation to envisioned ideal futures.

³ Along similar lines, Stephen Cummings has argued: “Confronted with a multiple, chaotic reality, the individual ... must be just as multiple, mobile and polyvalent. He must keep his intelligence sufficiently wily and supple. His gait ‘askew’ so that he can be ready to make use of his truths and the truths of others (Cummings, 2002, p. 30)”

Strategic opportunism requires flexibility, resourcefulness, quick reactions, rapid adjustments and entrepreneurial spirit

- **Strategic opportunism.**⁴ Strategic because strategy is rational and systematic, deductive and deliberate, coherent and directed, and because it charts courses of action with well-defined anticipatory decisions for advancing towards desired futures (Porter, 1996). Opportunistic because it is impossible to completely predict and anticipate the future, to comprehensively account for the unintended consequences of decisions and actions, and to map every possible contingency (Sull, 2014).

Flexibility, resourcefulness, quick reactions, rapid adjustments and entrepreneurial spirit are required to avoid dangers and seize opportunities. This implies keeping a certain amount of unused financial, human, physical and other resources that could be rapidly mobilized, taking anticipatory rational decisions on the appropriate level of slack and adopting different viewpoints to elucidate, as much as possible, the unknown unknowns that create opportunities and dangers.

- **Focused contextualism.** Focused because the transformation of anticipatory into actual decisions is made in the “here and now,” concentrating on specific issues, considering local circumstances, at particular moments in time and with immediate effects. Contextual because short-term decisions have momentous medium and long-term consequences; and because it is impossible to view organizations in isolation, they are open systems continuously buffeted by environmental disturbances, respond to external stimuli and internalize their impact, and also react to internal pressures and externalize their effects (Emery & Trist, 1965; Sagasti, 1970).

This implies gathering real time intelligence on the main agents in the task and contextual environments, monitoring their evolution to continuously assess their influence and impact over time, as well as constantly examining the internal situation to detect fault lines, pressure points and other stress markers that could be relieved by judicious interactions with the environment.⁵ Moreover, as local organizations operate in an increasingly global context, the anticipatory and actual decisions they take should both project *globalized localisms* outwards, and absorb *localized globalisms* inwards (Santos, 1995).⁶

There are many other contradictions that could be embraced in a paradoxical approach to strategic planning and management, such as *grounded idealism*, which involves aiming at unattainable but approachable ends, attributes, or qualities, while at the same time being pragmatic and moored by down to earth practical concerns;⁷ and *deferred immediatism*, which consciously manages the temporal dimension by rapidly shifting between long, medium and short-term perspectives, and by continuously reviewing the timing of anticipatory decisions and their transformation into actual decisions. As Mintzberg et al. (1998, p. 367) have emphasized:

“Can anyone possibly imagine strategy making in any serious organization without mental and social aspects, without the demands of the environment, the energy of leadership, and the forces of organization, without tradeoffs between the incremental and the revolutionary? And

⁴ For additional material on strategic opportunism see Isenberg (1987).

⁵ These paradoxical approaches can be viewed as attempts to comply with Ashby’s “Law of Requisite Variety,” that states that the variety of a control system must match the variety of the underlying system it aims to control. See (Ashby, 1956; Beer, 1981).

⁶ Latour (2018, p. 92) has similarly argued that charting a path out of our current civilizational predicament requires embracing “two complementary movements that modernization has made contradictory: *attaching oneself* to the soil on the one hand, and *becoming attached to the world* on the other.” (his emphasis).

⁷ As Ackoff and Emery put it: “Ideal pursuit can provide cohesiveness and continuity to extended and unpredictable processes, to life and history. Thus the formulation and pursuit of ideals is a means by which man puts meaning and significance into his life and into the history of which he is a part (Ackoff & Emery, 1972).”

The planning and management experience of numerous organizations in developing countries could offer valuable lessons for planners and managers everywhere

can any strategy process be realistically pursued as purely deliberate or purely emergent? To deny learning is as silly as to deny control.”

The general idea is that the wicked problems and conditions that we are facing at all levels of society require the nimble minds described by F. Scott Fitzgerald, and even following the advice Alice received from the White Queen to believe “six impossible things before breakfast” (Caroll, 1999).

6. Concluding remarks

It is appropriate to conclude with some remarks on the potential contributions of the management sciences in developing countries, where managers and policy makers have had to deal for decades with the full range of resource, activity, institutional, context and vision anticipatory and actual decisions. Unfortunately, most management science theoreticians and practitioners did not realize this; like Molière’s Monsieur Jordan, who had been talking in prose all his life without noticing it (Molière, 2007, p. 237), we went about coping with institutional instability, contextual turbulence and blurred visions, as well as making decisions activities and resources, without reflecting on what it meant, without capitalizing on the experience and knowledge acquired in the process.

Noses were kept to the grindstone and sights were only occasionally to appreciate what we were doing from a wider perspective.⁸ Worse still, when facing difficult and complex planning and management conditions and problems, developing country planners and managers often resorted to approaches and methods developed elsewhere, in quite different contexts, and shoehorned them to situations they were not designed for. Yet, if reflected upon, generalized and transmitted properly, the experience of numerous public agencies, private firms and civil society organizations in developing countries could offer valuable lessons for planners and managers everywhere.⁹

There is a need to jointly rethink the management sciences, strategic planning and management, anticipatory and actual decision-making. Whether living in rich or poor countries, we all face the consequences of global geopolitical shifts, security challenges, climate change disruptions, demographic transitions, cultural and religious unrest, employment and livelihood transformations, economic and social instabilities, scientific advances and technological innovations. It is necessary to mobilize planning and management knowledge and experience, which has been acquired and accumulated in both developed and developing countries for a long time. This could be done by looking back to move forward, employing research approaches such as those suggested by Bigné, which involve “multidisciplinary-based groups, blurred and mixed frontiers of disciplines, knowledge dissemination”, and move forwards the frontiers of research in management sciences (Bigné, 2016, p. 90).

Many developing regions, and Latin America in particular, have an extraordinary diversity of diversities, —ecological, biological, energy, water, forests, soils, fisheries, forestry, minerals, ethnic, cultural, linguistic— which confers resilience; and have embarked in collective learning processes that, with some glaring exceptions, value peaceful conflict resolution and economic stability. In addition, Latin America has a long history dealing with inconsistencies, contradictions and paradoxes, but has managed to maintain a reasonable degree of coherence

⁸ For some early reflections on management sciences in developing countries see Sagasti (1972, 1974) and Sagasti and Mitroff (1973).

⁹ For some previous efforts at this see: Sachs (1964), Valqui Vidal (1973), Valadares Tavares (1979), Bandyopadhyay and Varde (1980); De Senna Figueredo and De Oliveira Marinho (1984); Jaiswal (1985); Dedijer (1985); Ali (1990).

Latin America has a long history dealing with inconsistencies, contradictions and paradoxes, but has managed to prosper

that allowed it to prosper. If capitalized upon and further developed, the lessons of history may help to successfully confront the daunting challenges of the twenty-first century and to take advantage of the opportunities it offers.

One of the main objectives of graduate management schools in the coming years should be *to prepare professionals for the private, public, civil society and academic sectors to be at ease with inconsistencies, contradictions and paradoxes*; the capacity to do this will be crucial in coping with disruption in the coming decades. The ability to deal with paradoxes goes well beyond logical analysis and dialectic synthesis skills, which although necessary are not sufficient to cope with the challenges of the twenty-first century. When anticipating responses to the changing information environment three decades ago, in addition to analysts I thought we needed *synthesists* to deal with the avalanche of information that could be glimpsed in the horizon (Sagasti, 1983). This avalanche has now become a deluge, with an onslaught of data, images, sounds, news, views, evidence, opinions and alternative facts pounding our senses and minds. Beyond analysis and synthesis capabilities, in the overwhelming information environment of today, we must embrace paradox and acquire the capacity to think in contradictory ways; in short, we need *paradoxists*.

Business employers have realized that new sets of abilities, skills and competences are necessary for success in the complex environments of the future. A recent Financial Times survey reported that some of the qualities they miss in their business school recruits are “big picture thinking,” the capacity “to solve complicated problems,” and “the ability to deal with ambiguity” (Moules & Nilsson, 2017). We must prepare the kind of planners and managers my late friend and mentor Eric Trist described so well:

“We need flexible, resourceful, resilient people who can tolerate a lot of surprise and ambiguity emotionally while continuing to work on complex issues intellectually (Trist, 1976).”

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The environmental information report in the annual accounts: An analysis of the main ports in Spain

Cristina Crespo Soler

Principal Investigator-Instructor. Vice Dean of Participation, Volunteerism and Equality. Accounting Department - College of Economics, University of Valencia. Member of AICOGestión. Spain. ORCID: [0000-0003-0704-4578](https://orcid.org/0000-0003-0704-4578)

Arturo Giner Fillol

Economic-Financial Director of the Valencia Port Authority. Professor in different Master's programs at the University of Valencia. Spain. ORCID: [0000-0002-2507-276X](https://orcid.org/0000-0002-2507-276X)

Yenny Naranjo Tuesta

Doctoral student in Corporate Accounting and Finance at the University of Valencia. Member of AICOGestión. Spain. ORCID: [0000-0001-9301-373X](https://orcid.org/0000-0001-9301-373X)

Vicente Ripoll Feliu

Principal Investigator-Instructor. Accounting Department - College of Economics, University of Valencia. President of AICOGestión. Spain. ORCID: [0000-0003-2436-1559](https://orcid.org/0000-0003-2436-1559)

cristina.crespo@uv.es, aginer@valenciaport.com, yennyna@alumni.uv.es, vicente.Ripoll@uv.es

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Abstract

The aim of this work is to present the content analysis on the intelligibility of the environmental information that is reported in the annual accounts of the main Port Authorities in Spain. The annual accounts are related to documents that contain primarily financial information, and thus meet the needs of users (especially external users) in the decision-making process; in this sense, the work analyzes the environmental aspects presented in them. The data analyzed lead us to conclude that the Port Authorities of Castellón, Gijón and Valencia are the ones that provide the most information about their activities and environmental actions in their annual reports; however, with regard to the clarity of the information reported, the Port Authority of Cartagena is the clearest in conveying the message, while the information presented by the Port Authorities of Castellón and Huelva is less explicit. It is thus recommendable for the Port Authorities to improve their communication strategies in their annual reports, in order to demonstrate their environmental actions in the immediate socioeconomic environment, referring to other sources of information, such as sustainability reports.

Key words

Port Authorities, annual accounts, environmental impact, information intelligibility.

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The annual accounts should state aspects related to environmental management on both the balance sheet and in the profit and loss accounts

1. Introduction

Due to increasing social interest in aspects related to the environmental actions taken by companies, this becomes a key factor when it comes to decision-making. The International Maritime Organization (IMO) has established mechanisms so that companies in this sector can focus on minimizing the impact of the greenhouse gases, according to the provisions signed by the countries in the Kyoto Protocol and others, such as the Paris COP-21¹. The European Sea Ports Organisation (ESPO) established the Environmental Code of Conduct in 2003, which intends to improve the information in the areas of environmental management and policies, integrating the ports into the community.

In the environmental-financial relationship on environmental matters, the annual accounts must state in both the Balance and the Profits and Loss Accounts those aspects that are derived from environmental management (Crespo, Giner, Ripoll & Crespo, 2005). This way, developments in port management are evidenced in terms of the environmental impact and the repercussion that this has, not only for society, but also internally, on corporate endeavors (Crespo, Giner, Morales, Pontet & Ripoll, 2007). Although they are topics of general interest, the research along this line is still in the very early stages, and from the perspective of accounting and port management, it is still quite scarce.

In order to contribute to the academic and professional discussion that exists on these topics, this study intends to analyze the clarity of the information on environmental matters that is reported by the Spanish Port Authorities in their annual accounts. This means that the type and intelligibility of the environmental information will be shown as revealed by the ports in the financial information they provide to different users. To do this, a textual and content analysis is carried on the annual reports published by the main Port Authorities in Spain.

Following this introduction, we present the description of the ports from an environmental perspective, focusing on the main Port Authorities in Spain. Next we reveal the importance of disseminating the financial information and its relation to environmental issues. Then we present a textual and content analysis that is carried on the annual reports published by the main Port Authorities in Spain. Finally, the conclusions recommend that the Port Authorities need to do more than simply include environmental information in the annual accounts. This information must be intelligible to all members of the interested audience, which is currently not the case, as the reports are presented in a very technical language that makes them difficult to understand.

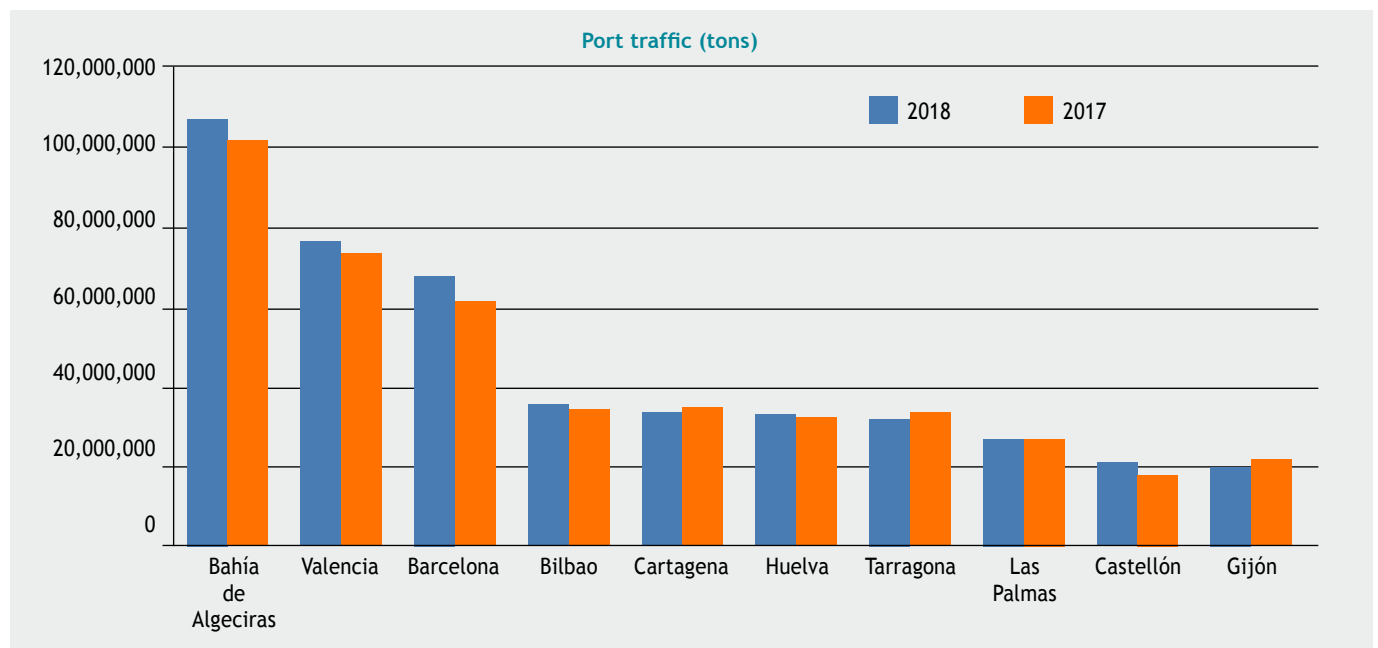
2. The Port Authorities and their environmental vision

Spain is considered to be geographically one of the countries in the European Union with the most coast and as a logistically important space in southern Europe. For this reason, the port systems play a vitally important role in the country's economy. The State Ports Authority (2018) states that the activity of the Spanish port system accounts for nearly 20% of the GDP in the transport sector, contributing 1.1% of the GDP in Spain. The port system generates direct employment for more than 35,000 people and indirectly for another 110,000, and is economically representative and important in different studies (Puertos del Estado, 2018). The port system is made up of 28 Port Authorities (hereinafter, PA), the control and coordination of which is under the State Ports Authority (controlled by the Ministry of Public Works).

¹ Conference 21 of the parties to the United Nations Framework Convention on Climate Change.

In the port system, the PAs of Bahía de Algeciras, Valencia, Barcelona, Bilbao and Las Palmas stand out for being among the 125 most important ports in the world, through which around 12 million containers passed in 2017. Altogether, these PA moved nearly 86% of the entire port system operated by Spain (Spanish Ports, 2018). Other important PAs, as shown in Figure 1, are those of Huelva, Gijón, Tarragona, Cartagena and Castellón, which have an influence on the total traffic in Spain.

Figure 1
Total Spanish port traffic



Source: Spanish Ports Statistical Report (2018)

The IMO and PAs, in this case, recognize that their activities are generating an environmental impact and are not isolated from the environmental problem the world is currently experiencing. In particular, their operations can produce greenhouse gases, and it is necessary to incorporate environmental aspects in economic and financial reports, listing in the annual accounts the actions and measures taken by the organizations in terms of the environment. These practices generate competitive, sustainable markets that promote not only a culture of accountability, but also allows them to be visible in their environment (Merk, 2013).

Aware of the environmental problem, in 2008, 55 of the world's largest ports voluntarily signed the World Port Climate Declaration (WPCD) and joined the International Port Association, which is committed to the long-term work of implementing measures through the World Port Climate Initiative (WPCI) (Fenton, 2017), which is being gradually adopted by different PA. Bahía de Algeciras, Barcelona, Gijón, Valencia and Vigo have incorporated this measure, which indicates that the main Spanish PA are increasingly more interested in taking actions that contribute to reducing greenhouse gases. This is reflected in the establishment of environmental policies, structuring of management and control systems with environmental components, obtaining environmental certifications and the physical changes and changes in structure made by ports in terms of their facilities, among other measures.

The port systems play a vitally important role for the country's economy

These actions and investments that the different ports are developing in favor of the environment must be exposed and disseminated in the community, using different channels to do so. Accordingly, since the annual accounts are the main source of information consulted to help external users make decisions based on economic-financial aspects, the information reported on environmental matters takes on fundamental importance (Crespo et al., 2007).

3. Importance of disseminating information in the annual accounts

The Consolidated Text of the State Ports and Merchant Marine Act approved by Legislative Decree 2/2011, of 5 September establishes that the PA are public entities with legal personality and their own assets independent of those belonging to the State, with full capacity to take action in the pursuit of their purposes, acting subject to private legal regulations; in addition, they are governed by Law 39/2015, of 1 October, on the Common Administrative Procedure of the Public Administrations and the General Budgetary Act and supplementally by Law 40/2015, of 1 October, on the Legal Regime in the Public Sector.

In Spain, the port regulations articulate aspects of the General Accounting Plan, the resolutions of the Institute of Accounting and Account Audits, and in accordance with port legislation, regulations and instructions established by the State Ports Authority. The PAs that make up the Spanish port system must publish their annual accounts in the Official Spanish State Gazette (BOE)² in order to promote transparency of information and aspects related to accountability, made mandatory in Spain by Law 47 of 26 November 2003³.

The annual accounts report the financial statements, the annual report and the audit report, and although the law generically establishes that environmental information must be presented in them, each PA voluntarily presents the aspects it considers relevant in this area. In the environmental-financial section, Crespo et al. (2005) indicate that the annual accounts should set out the property, rights and obligations associated with environmental protection on the balance sheet, and the income and expenses derived from environmental management in the profit and loss account. In this sense, the accounts must take into account in the environmental aspects information on: income, subsidies, operating expenses and extraordinary expenses, projects and works that generate an environmental impact, repercussions, tangible and intangible fixed assets, provisions, contingencies, obligations and environmental fiscal repercussions that are developed and managed by the ports (Crespo et al., 2007).

Since it is one of the reports commonly consulted by external users, it is important for the environmental information⁴ reported by the PAs in their annual accounts to be clear and comprehensible to all types of users. In spite of the fact that the legal dicta are very generic in terms of the presentation of said information, there is increasing evidence of a real culture of

² With the aim of disseminating different information about their organizations on the digital platform to the interested audience, it is necessary to wait for a resolution to be issued by the Ministry of Public Works. This process is more bureaucratic, and therefore the reports are not up to date, which makes it more difficult to obtain them.

³ It should be mentioned that after the work completed, corresponding to the year 2017, Law 11 of 2018 was issued, which modifies the code of Commerce, the consolidated text of the Corporations Law, approved by Royal Legislative Decree 1/2010, of 2 July, and Law 22/2015, of 20 July, on Accounts Auditing, with regard to non-financial information and diversity. But given the legal structure of the Port Authorities, only some concepts of the code of commerce and the accounts auditing act are applicable in terms of their public aspects.

⁴ Based on Law 11 of 2018, this aspect is contemplated in the following manner: "The consolidated annual accounts must include the balance sheet, the profit and loss account, a statement that reflects the changes in the net assets for the year, a cash flow statement and the annual report in a consolidated manner. These documents form a single unit. The consolidated annual accounts are joined by the consolidated management report, which will include, as appropriate, the non-financial information statement," with the most comprehensive and relevant information on environmental matters being published.

It is important for the environmental information reported by the PAs in their annual accounts to be clear and comprehensible to all types of users

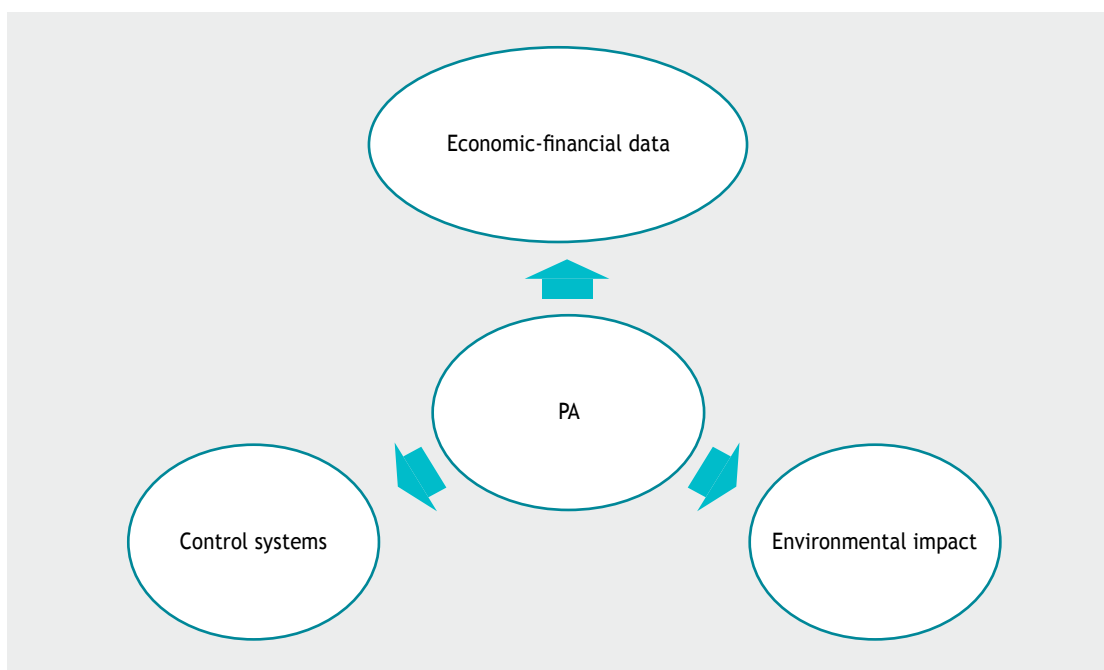
supplying information and of including environmental topics in these reports, which has been strengthened in recent years by regulations and external pressures (Chirino, Hernández & Ledezma, 2014). This is seen in greater detail in the data that each PA supplies in economic terms on their environmental management in their different reports.

4. Analysis of the annual accounts

The annual accounts of the ten main PAs (mentioned in section three) were selected based on their importance in terms of freight traffic in Spain and for being leaders in southern Europe. The aim is to analyze the contents and text of the environmentally-related information in this economic and financial report, primarily in an effort to understand what type of data are reported by the PAs and what financial aspects are the most visible, as well as the clarity of their publication.

As observed in Figure 2, the data used are of an economic and financial nature, considering the annual accounts of the PAs, along with the annual reports and audit report published in the Official Spanish State Gazette in 2017, corresponding to the 2016 financial year.

Figure 2
Area of analysis of the annual accounts



Source: Authors' own work

The “environmental information” section is analyzed to disaggregate the type of data reported, to determine whether aspects related to the environmental impact of the Port Authority’s activities are reported. Using the works by Crespo et al. (2005, 2007) as a base, the following aspects were mainly reviewed, which are considered to be the variables of the study:

- Environmental information: In this item, it is indicated whether the section is included in their annual accounts.

The environmental information revealed depends on the internalization and importance of this aspect for each Port Authority

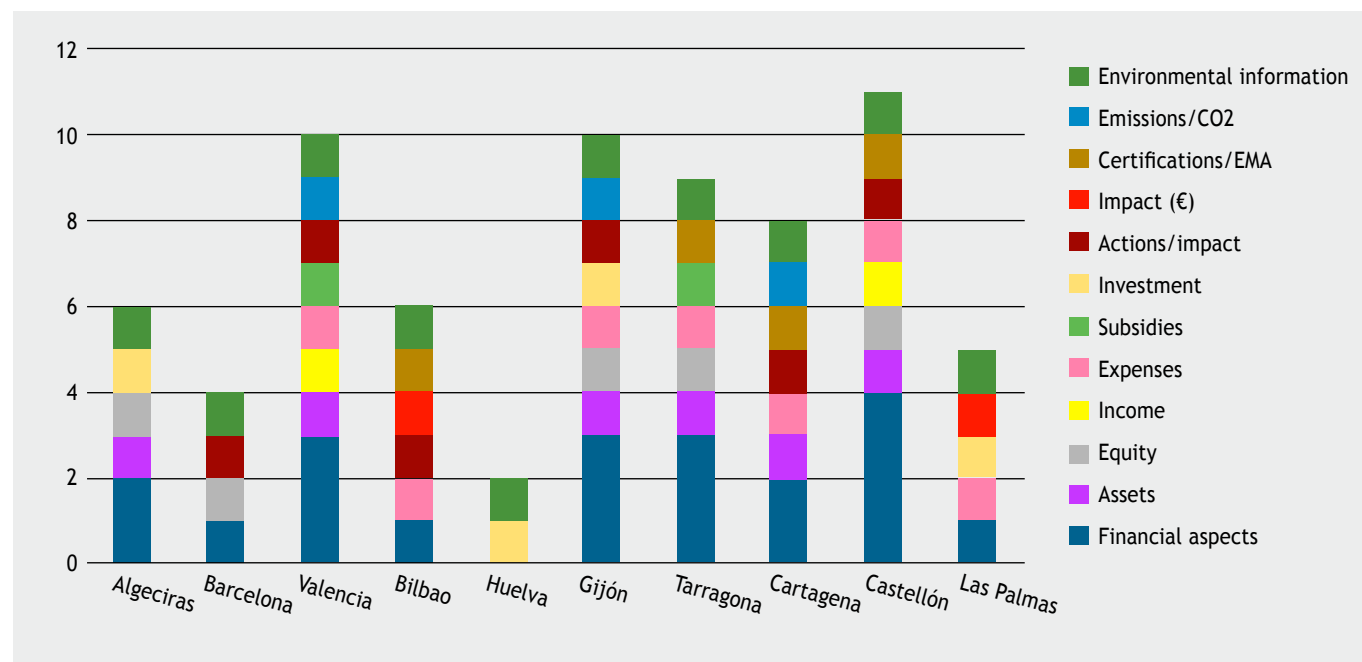
- Emissions/CO2: It is indicated whether they express in their annual accounts information on greenhouse gases, particularly aspects related to information on CO2.
- Certifications/EMA: It is reviewed whether it is stated in the annual accounts that they have incorporated some type of environmental certification or environmental management systems.
- Impact (€): It is reviewed whether they express the environmental repercussion that they generate in economic terms.
- Actions/impact: It was analyzed whether they mention (in non-economic terms) their environmental actions and management performed or that they plan to perform in order to minimize the environmental impact.
- Investment: It was primarily reviewed whether investments in environmental areas existed and were explained.
- Subsidies: It was examined whether having environmentally-related subsidies was mentioned in the annual accounts.
- Financial aspects, expenses, income, equity and assets: It was reviewed whether there were any tables, figures or economic details of the environmental management in these line items on the Balance Sheet and the Profit and Loss Accounts.

4.1. Content analysis

The content analysis (Andréu, 2002; Porta & Silva, 2003), through the previously mentioned categories, makes it possible to conduct a qualitative review of the environmental information presented in the annual accounts of the PAs. In this regard, it is important to stress that all the accounts analyzed publish environmental information, although their content differs. Used as a reference for the study were the annual accounts corresponding to the year 2016, which were published in 2017.

Figure 3

Environmental information provided by the PAs



Source: Authors' own work

The texts that use a more technical language (with a higher index) are those corresponding to the PAs of Algeciras and Tarragona

As observed in Figure 3, among the categories analyzed in the reports, the PAs of Castellón, Gijón and Valencia are the ones that publish the most data related to the environment. It should be noted that the Port Authority of Valencia presents information related to environmental assets, income and expenses, and also states the subsidies received in relation to environmental matters and actions taken to minimize their environmental impact, specifically referring to the carbon footprint. The Port Authority of Gijón also presents financial data, such as environmental assets, equity and expenses, and specifies the investments made to reduce emissions and their impact on the environment. The Port Authority of Castellón, in addition to the financial environmental information it publishes, specifies the certificates, such as ISO 14001 and the environmental management systems implemented, which help perform better in terms of the environment.

It is observed that the Port Authority of Huelva is the one that provides the least description of its environmental activities in its annual accounts report, offering data mainly linked to investments made or to be made, without providing any details or reporting on the economic effects of the environmental management it performs. The PAs of Barcelona, Bilbao and Las Palmas report economic figures related to their environmental impact, i.e., they do not merely present financial data, rather they also specify an environmental investment-impact figure, thus quantifying financial aspects of their environmental activities.

4.2. Textual analysis

The textual analysis is one of the ways of analyzing the content, and it has been applied in studies in different disciplines, with accounting and finance being an emerging area of study (Loughran & McDonald, 2016). In this case, we are going to review one of its aspects, legibility, in an attempt to measure the reader's capacity to understand the message that the companies wish to express, using the Gunning-Fog index or fog index as it is known in Spanish (Marco González & Salim Mattar, 2013). In our study, we apply this measure to the environmental information published in the annual accounts of the PAs to determine their level of comprehensibility.

Our aim is to link the linguistic characteristics of the annual report to the related information on the environmental matters of the PAs, this being one of our contributions. In order to measure the legibility of the annual accounts, as demonstrated by the Gunning-Fog index, two measures⁵ were used, namely:

$$M1 \text{ index} = 0.4 \times \left[\left(\frac{\text{Total words}}{\text{Total lines of information}} \right) + 100 \left(\frac{\text{Whole words}}{\text{Total words}} \right) \right]$$

$$\text{Fog index} = 0.4 \times \left[\left(\frac{\text{Total words}}{\text{Total phrases (sentences)}} \right) + 100 \left(\frac{\text{Whole words}}{\text{Total words}} \right) \right]$$

During the first reading, the fog index equation calculated the number of years of education that are necessary to understand the text. In other words, if we have a fog index value of 15, it implies that the reader needs 15 years of education, which is to say a university degree, in order

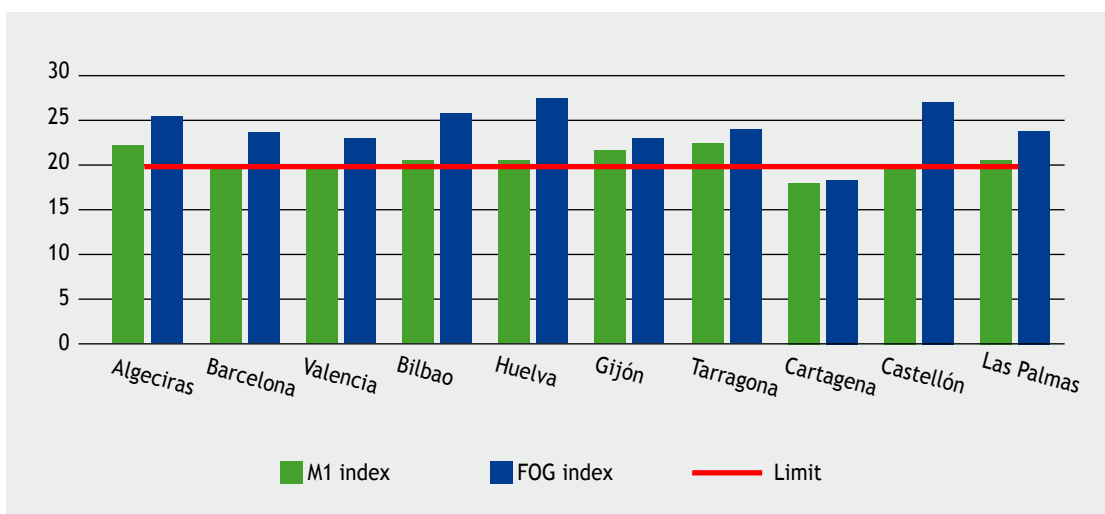
⁵ The index is a function of two variables: average sentence length (in words) and complex words (the number of words with more than three syllables).

Only the Port Authority of Cartagena has data that are reasonably legible

to understand the text during the first reading. Therefore, a text is considered “good”, in terms of the index, if it is less than 15; a text is average if it is between 15 and 20, and is illegible if the index is greater than 20.

As observed in Figure 4, we established the index according to both methods of calculation. The M1 index is related to the number of words per phrase, the number of lines per phrase and whole words. According to this measure, none of the texts is considered to be a “good text”; they are at a medium level of understanding, in other words, they require an average of 20 years of study in order to understand the information contained in them. The texts that use a more technical level of language (with a higher index) are from the PAs of Algeciras and Tarragona. Although it is one of the PAs supplying details in environmental terms, this information is not very comprehensible, since the reader would need approximately 23 years of study and to be familiar with technical language in order to understand it. According to this measure, the best index was obtained by the Port Authority of Cartagena, with a report comprehensibility score of 18.10. Of the three PAs that publish the best environmental information in their annual reports (see Figure 3), the comprehensibility of the reports by the Port Authority of Castellón and Valencia is on the limit that indicates illegibility (19.9 and 20.2). This is a wake-up call, since in spite of being the ones offering the most environmental data, they are not sufficiently clear when transmitting it in their annual reports.

Figure 4
Legibility of the annual reports



Source: Authors' own work

Another measure used to determine the comprehensibility of the environmental information has been the fog index, which measures the number of words as compared to the total number of sentences (Guninng-Fog, 2018). In this case, only the Port Authority of Cartagena has data that are marginally legible. The Port Authorities of Huelva and Castellón have the highest index (27.6 and 27.1, respectively), which leads us to say that said environmental information has a high degree of linguistic complexity. This aspect should be improved so that this information can be relevant and comprehensible in the decision-making process and understood by external users.

The environmental activity that is presented in the annual financial report by the Port Authorities is becoming increasingly more concise

5. Conclusions and final recommendations

The economic and financial focus of the annual accounts influences the information that is supplied and the concepts that are transmitted, endorsed and legitimated. The regulations on the type of data and the details that are published are very generic, so there is a variety of non-uniform possibilities in drafting the report. The environmental information revealed depends on the internalization and the importance of this aspect for each Port Authority, in other words, the level of detail of the environmental information is different in each port organization, and in some PAs, such as Huelva, it is minimal.

Some Port Authorities, especially those that go further in the dissemination required by regulation, that is, those that have internalized environmental management and its dissemination, include in their annual accounts information on their actions and activities performed, specifying the economic-financial data resulting from these acts. Even though it is not the subject of our study, it should be acknowledged that when searching for the data published by the PAs studied, a culture of dissemination was revealed, but with differences at a discursive level in the preparation and dissemination of this information. The advances made so far have made it possible to propose moving onto other scenarios in dissemination, where the appropriateness and projection of the environmental dissemination are debated, along with the possibilities of integrating the reports and audits presented by the organizations.

Based on the authors' own experience, an evolution is evident in the publication of environmental information in the annual accounts. This factor is associated with the establishment and execution of the Social Corporate Responsibility Report (also known as the Sustainability Report or the Environmental Report) by the PAs. As a result, the environmental activity in the annual financial report presented by the Port Authorities is becoming increasingly more concise. However, the annual accounts must make it possible to integrate the data with other types of reports, in order for it to be more complete, concise and to better connect the reports that are written and released. This connection could better situate the information and concentrate efforts, thus preventing the duplication of data and making progress toward their comprehensiveness. One example of this is displaying in the environmental note in the annual accounts the link to the environmental report. This is only done by the PAs of Castellón and Valencia, which in turn are important authorities in our study, since they issue a high volume of quality information on an economic, financial and environmental level.

The information presented on environmental matters uses a technical language of an economic-financial nature, and in particular, the fog index shows that a specialized audience is required that knows this type of language in order to understand what is disseminated. But this does not mean that it is not a good report. When audit institutions like the General Intervention Board of the State Administration (IGAE, according to its initials in Spanish) audit the annual accounts, they can include a proviso or paragraph emphasizing this matter, but this has not been observed in any part of the analyzed reports. Users of this information may be directing their attention to other environmental reports and not necessarily to the annual accounts to obtain information on the environmental management of the PAs, which is yet another reason to establish criteria for integrating the reports issued by the institutions.

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Case study analyzing the relationship between the degree of complexity of a product page on an e-commerce website and the number of unique purchases associated with it

Nuria Puente Domínguez

Director of the Master's Program in Digital Marketing. Isabel I University. Burgos, Spain. ORCID: [0000-0003-0483-2691](https://orcid.org/0000-0003-0483-2691)

nuria.puente.dominguez@ui1.es

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Abstract

How are effective product pages designed for an e-commerce website? In the current economic context, Spanish companies must be able to justify all their investments. Therefore, so that they can compete effectively and obtain competitive advantages, they must know which elements generate value for the organization. This research analyzes the relationship between the degree of complexity of the product web pages and the number of unique purchases associated with them. The objective is to determine the most effective e-commerce merchandising strategies and techniques to help the companies in the food sector make the right strategic decisions, allowing them to increase the sales of their e-commerce websites. A case study research technique is used, the results of which conclude the importance of the visual aspects of the product web pages.

Key words

E-commerce merchandising, product page, case study, e-food.

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There is no doubt that sooner or later, mass market e-commerce will be consolidated in Spain

1. Introduction

Unlike what happens in other sectors and in other countries within the same sector, the definitive launch of mass-market e-commerce has yet to occur in Spain. However, the high growth rates of recent years indicate that this sector “can only grow; another matter is the pace, but no one questions whether sooner or later mass-market e-commerce will establish itself in Spain” (Delgado, 2016). These were the resounding words of Alfonso Delgado, New Business Manager at Nielsen in late 2016.

Online purchases represent 3.7% of sales in the mass-market sector around the world, but only 1% in the Spanish market. This is explained by the fact that the Spanish market is one of the least developed markets in terms of attraction and level of commitment by online shoppers. Only 14.4% of all households purchase products of this type over the Internet, as opposed to the 20% who make online purchases worldwide. Furthermore, the amount spent by Spanish families on the Internet accounts for barely 6% of their total mass market budget, while in the United Kingdom, where the most loyal online consumers are found, this figure is 20% (Kantar Worldpanel, 2014).

In recent years, it has proven especially complicated to promote winning formulas in a scenario clearly marked by weakening consumption, where even the mass market sector, which has always shown an enviable capacity for resilience, has experienced decreasing sales. More than ever, the new times require high levels of training and valuable information about consumers, markets and the main trends, as well as a large dose of innovation. Thus, it is important to commit to innovation, but from a multidisciplinary model that takes into account not only the novelty of the product, but also the service, the shopping experience and communication with the customer, among other aspects (Benlloch & Álvarez, 2014).

Given the current economic situation in which Spanish companies perform their activity, where there is an imperative need to justify each and every euro invested, companies must have accurate knowledge of the elements that ultimately generate value for the organization, in order to compete more effectively and obtain competitive advantages. Along these lines, the present research intends to shed light on the main factors to consider when prioritizing the application of certain e-commerce merchandising strategies, with the ultimate aim of assisting companies in the food-based mass market sector in making the right strategic decisions that would enable them to increase their e-commerce sales.

2. Theoretical framework

With an unchanging volume and market value and an inflationary context, the interests of consumers and the industry appear to be situated on the price axis, in spite of the fact that it is known that the focus on this variable prevents healthy market growth over the medium term. However, when faced with a situation like the present one, with a saturated market dominated by the demand, in which only one of four consumers demands exclusively price (Kantar Worldpanel, 2012), it is more logical to look for new domains than to engage in a price war (Andrés, 2010). Furthermore, the homogeneity of products and price specifications, customer preference for a product, brand or establishment owe to a large extent to the generation of greater value through the creation of new and better utilities for consumers in association with purchasing processes (De Juan, 2005).

Online Spanish shoppers increasingly perceive fewer real differences among products and appear less loyal to brands, among other reasons, because they can obtain comprehensive

The Spanish market is one of the least developed markets in terms of attraction and level of commitment by online shoppers

information on the products over the Internet, which allows for more intelligent purchases (Kotler & Keller, 2006). They want to shop online, but sometimes the brands do not make it easy for them, and therefore they are willing to reward those that help them by paying a premium (41%) or with their loyalty and prescription (Siegel & Gale, 2013).

As might be expected, in this new medium, it is even more necessary to intensively develop marketing strategies capable of persuading shoppers and influencing their purchasing decisions in order to increase sales, since in online purchases, users find themselves alone at the point of sale. There is no physical seller and the sensory experience is inevitably more reduced than in the offline environment, since the two-dimensional nature of the screen offers a limited amount of space in which to present the information. It is therefore necessary to promote e-commerce merchandising strategies, i.e., “psychological sales techniques that act on the mind of the shopper with the objective that he or she can satisfy the needs that led him or her to the point of sale, reminding about certain forgotten needs, as well as perceiving other new needs” (Escrivá & Clar, 2005).

In general, consumers use key factors in the selection of the point of sale, such as differences in products and prices, for example. However, when these are minimal between the different establishments, consumers need more discriminating criteria, and thus matters related to the point of sale become particularly relevant (Reinares & Calvo, 1999). This is true to the point that some authors have gone so far as to suggest that weather conditions may even be more influential than other marketing elements not found at the point of sale, and even have a greater influence on an individual's purchasing decisions than the product itself (Kotler, 1973-1974). A good atmosphere encourages customers to stay in the establishment and promotes visits to different sections, thus increasing the sales volume (Reinares & Calvo, 1999).

The influence of the factors defining the physical shopping environment on the emotional states and shopping behaviors of individuals is a fact that has been well established in the literature (Babin, Darden & Griffin, 1994; Baker, Parasuraman, Grewal & Voss, 2002; Baker, Grewal & Parasuraman, 1994; Belk, 1975; Bitner, 1992; D'Astous, 2000; Díez de Castro & Navarro, 2003; Donovan, Rossiter, Marcolyn & Nesdale, 1994; Donovan & Rossiter, 1982; Mehrabian & Russell, 1974; Sherman, Mathur & Smith, 1997; Sierra, Alíer & Falces, 2000; Spies, Hesse & Loesch, 1997; Turley & Milliman, 2000; Zorrilla, 2002). However, far less research has been done on the nature and effectiveness of web environments (Dailey, 2004; Eroglu, Machleit & Davis, 2001; Gómez & Lorenzo, 2006; Koernig, 2003; O'Cass & Fenech, 2003; Pascua, Román & Fernández, 2013; Puente, 2016; Yoh, Damhorst, Sapp & Laczniak, 2003), which is why this research is considered essential.

2.1. E-commerce in the food-based mass market sector

In a context in which the typology of the commercial formats has multiplied, competition has gotten tougher and therefore there are more shopping alternatives available to customers, expanded even further by Information and Communication Technology (ICT), retailers have made - and continue to make - efforts to win over consumers (Zorrilla, 2002). This has favored the search for new ideas to gain customer loyalty, given that formulas based on traditional marketing have become less effective, due to the very dynamism of the sector (Zorrilla, 2002).

In recent decades, the Internet has become a new shopping channel chosen by more and more customers. However, purchasing mass market products online is still a slowly growing phenomenon, since the items found in a supermarket are more difficult to market through this

More than ever, the new times require high levels of training and valuable information about consumers, markets and the main trends, as well as a large dose of innovation

channel (Müller-Lankenau, Wehmeyer & Klein, 2005; Raijas & Tuunainen, 2001) because they are tangible products with a variable potential for differentiation, unrepresentative and frequently purchased (Peterson, Sridhar & Bronnenberg, 1997). Furthermore, even though the shopping cart usually includes several items, the extra cost for home shipping can be relatively high for many customers as compared to the volume of the purchase.

On the other hand, a large part of the reluctance when it comes to buying mass market products over the Internet is related to the inability to have sensory experiences with the products, such as seeing how spongy the muffins are, the color and appearance of the cold-cuts or the flavor of the cheese, among other aspects; this is especially crucial for perishable products (Arce & Cebollada, 2011). Customers often have a series of habits acquired in their offline shopping experiences that are not available in online shopping, such as examining the products (especially food) through a small sample before purchasing them (Müller-Lankenau et al., 2005). What's more, many supermarket products are perishable, and therefore they have problems with expiration dates that do not affect other items, such as books, for example (Raijas & Tuunainen, 2001).

In spite of all of the above, e-commerce is not a niche market, rather a new commercial model that benefits all the mass market agents by giving them added value: for consumers, it is quick, easy and always available; for distributors, it generates loyalty and additional business to the offline channel; and for manufacturers, it captures a high-quality shopper (Roger, 2014).

It should also be said that not everything is difficult when it comes to marketing mass market products over the Internet. Since many customers do not like the conventional shopping framework for this type of products, their purchase through an online channel can be perceived as a very attractive alternative (Müller-Lankenau et al., 2005). 59% of men (as opposed to 36% of women) state that their partner is the one who does "the shopping" (Ideup, 2012), but when they women are asked, the answer is clear: it is not a pleasant experience. 68.4% of the women state they have less than two hours per day for themselves, a very valuable amount of time that 57.6% avoid dedicating to this chore. In fact, if they had more free time, mass market shopping is the task to which they would dedicate the second least amount of time (76.3%), behind only housework (82.5%) (Womenalia & Alice, 2012).

3. Proposed hypotheses

On the Internet, the absence of physical and time-related barriers makes e-commerce websites the main means of communication between the company and its customers, thus making their design just as important as in any physical point of sale. Along this line, focusing the research on a specific part of e-commerce, the following hypothesis is considered:

H. The more complex a product page is, the greater its number of unique purchases is.

A good product page must be able to satisfy all possible buyers, regardless of the amount of information needed to reduce the perceived psychological risk. To eliminate this, it is necessary to design the product pages in such a way that they can provide the information they need to make buying decisions with confidence, according to the different phases through which they

Customer preferences for a product, brand or establishment are largely due to the generation of greater value

pass. It would be ideal for them to be designed in layers, first showing the key points, but also presenting specifications and general details of the products.

- **Notice:** this is the first step in the entire shopping process (and it can be the only one in the case of impulse buying). This is the first contact the user has with the product, so the page must include the product name, some pictures, its price and availability and a button to add it to the shopping cart. It is important for the price to be shown from the outset, since it is one of the first pieces of information that any shopper wants to know, as it provides some clues as to the value of the product, whether it is within their budget and whether they are shopping in the right segment. It is also a key component for comparing products. Not showing prices to users goes against their needs and creates a hostile shopping environment. As far as pictures go, a priority is for them to be clear and to provide added value for the user (providing different views of the same image or adding rotation functions, for example), since customers look at them even when they are buying products that it is not important to see and they have already read the complete description. Furthermore, it is recommended that users be able to zoom in on the photographs in order to see the products close up (Nielsen & Loranger, 2007; Nielsen & Pernice, 2010).
- **Interest:** once the product has captured the attention of the user, it is quite likely that the customers feel that it meets their expectations, but they are still not sure, so they will try to expand on the initial information. In this case, the web page must include a description of the product and its features, as well as secondary images and videos. Precise descriptions with appropriate images help customers make confident buying decisions, but they need to be detailed enough to help differentiate the product. It is recommended to facilitate the purchasing decision as much as possible, enabling customers to narrow down their options. To do this, it is best to provide support in the form of comparative tables, since these are usually the most effective method for communicating differences between similar items (Koyani, Bailer & Nall, 2004; Nielsen & Loranger, 2007). Once inside the e-commerce site, the factor with the most affect on the purchase decision is the website design, to the extent that 92.6% of all users state that the visual aspects are the greatest factors of influence. Product pages with pictures and videos have better results, as users take barely 90 seconds to evaluate them, and on the Internet it is not possible to maintain contact with the product, so the best way to evaluate its quality is through them. Offering several different views of an item and alternative illustrations increases sales by 58%. However, at the same time, it is important for these to match reality, since if they do not, negative after-sales behaviors would occur (Vouchercloud, 2013). With regard to videos, 57% of the customers said they had more confidence in buying a product after watching a video about it, although only 31% decide to buy it after having seen it. 52% state that they are willing to spend more time on e-commerce sites that use product videos and 45% are more likely to return to them (Vouchercloud, 2013). However, it must be kept in mind that users get bored easily with videos of “talking heads,” and they tend to look away, although they often keep listening to the audio if they are interested in the topic (Nielsen & Pernice, 2010).
- **Decision:** this last level is not necessary for all users. It includes evaluations, recommendations of alternative products, comments and videos created by other shoppers and information from the social networks. Likewise, awards and recognitions of product quality are also a good way to increase the credibility of the organization and build bonds of trust (Nielsen & Loranger, 2007).

Therefore, the more complex a product page is, the greater the number of its unique purchases will be.

The weather conditions can actually be more influential than other marketing elements that are not present at the point of sale

4. Empirical study

Since the end of the 20th century, the use of case studies as an applied methodology has been increasingly more accepted as an instrument of scientific research in the area of business administration, since Business Economics, as a social science, and Strategic Management, as a specific scientific discipline within this science, require research methodologies that are capable of reflecting all the complexity of the business phenomena they analyze (Villarreal & Landeta, 2010). Along these lines, it is considered that this technique is useful for research, because it allows the direct measurement of the conduct of the people involved in the phenomenon being studied, without the need for them to verbalize their engagement, which prevents any variations between the reality of their actions and their perception of them, which is especially important in the area of e-commerce.

The methodological design used for this technique is that proposed by Villarreal and Landeta (2010), based on the study of authors like Eisenhardt, Yin, Maxwell, Rialp, Shaw and Fong, among others:

- Research questions and objectives: with the ultimate purpose of helping companies in the food-based mass market sector to make the right strategic decisions that would enable them to increase their e-commerce sales, this research intends to find out whether or not there is any relationship between the degree of complexity of a product web page and the number of unique purchases associated with its.
- Conceptual context, perspectives and theoretical models: the existing literature so far on which this research is supported includes authors such as Koyani et al. (2004), Nielsen and Loranger (2007) and Nielsen and Pernice (2010).
- Selection of the unit of analysis and the cases: using as a reference the research by Cascales (2015), Cristóbal and Marimon (2001) and Marimon and Cristóbal (2012), we opted for a non-probabilistic convenience sample and chose the online greengrocer ComeFruta.es. Within this food-based mass market sector of e-commerce, the core of the study is the product web pages for the 30 top-selling products (as it is understood that these are the ones with the best e-commerce merchandising actions associated with them) during 2016 (by analyzing a full year, we prevent any possible problems related to seasonality and high product rotation) and their number of unique purchases. Since what we want to analyze is the complexity of the web pages, special attention is given to items such as photographs (quantity and quality), text descriptions, videos and the existence of related content.
- Research methods and resources: to grant greater reliability and validity to the research, an action plan is developed that standardizes the evidence collection process through the creation of a data collection protocol that includes the definition and operationalization of the variables analyzed (Table 1).
- Field phase: before proceeding to collect these data, it is necessary to define the sources of evidence that are going to be used, which in this case are:
 - Google Analytics: for a comprehensive study of the website, relating the techniques implemented with the results obtained, a processional discipline belonging to the realm of business intelligence is used: web analytics. In this case, the tool Google Analytics is used to determine which are the 30 best-selling products for 2016 and the number of unique purchases for each. It should be clarified that to ensure the confidentiality of the

Table 1
Definition and operationalization of research variables

Variable	Definition	Type of variable
Number of photographs	Number of photographs (of the product) that there are on the product web page.	Discrete quantitative
Quality of the photographs	In order to capture the attention (and eye) of the user, the photographs must be real and easy to interpret, provide added value (for example, showing different views of the product), have high color contrast (with a light-colored background, if possible) and high quality (that permits zooming in for a close-up view of the product).	Dichotomous nominal qualitative (high/low)
Descriptions	The textual descriptions of the product existing on its web page can be one of two types: • Simple: containing the basic product information (content, weight, ingredients). • Complex: in addition to the basic product information, they contain information about the product and its nutritional properties, the place of origin, the producer, the best time for consumption, culinary and product conservation recommendations, as well as other types of information of value related to the product.	Dichotomous nominal qualitative (simple/complex)
Videos	Existence of videos (related to the product) on the product web page.	Dichotomous nominal qualitative (yes/no)
Extra content related to the product	Existence of links on the product web page to blog articles where content of value is provided in relation to the product, such as information about its nutritional properties and effect on health, culinary recommendations and recipes, for example.	Dichotomous nominal qualitative (yes/no)
Degree of complexity of the product web page	This variable integrates all the elements that make up the product web page. For its operationalization, four levels are considered, although in reality, the first level corresponds to e-commerce without any product web pages. • Null: if the product does not have its own web page with the minimal elements listed in the following paragraph. • Low: this is the minimal level of complexity, and its objective is to get the attention of the user with regard to a certain product. The web pages of this type must include the name of the product, a picture, its price and a button to add it to the shopping cart. • Medium: once the user's attention has been captured, it is appropriate to generate interest, showing that the product in question meets their expectations. To do this, the pages of this type must include everything from the previous level, plus a good description of the product and its characteristics. It is also recommendable for there to be more than one picture of the product and, if possible, a video. • High: this is the maximum level of complexity and its function is to convince the most indecisive customers to buy the product they are seeing. To do this, the web pages of this type must include the same elements as the previous levels, plus evaluations and recommendations for alternative products, comments and videos generated by other buyers and information from the social media. Culinary recommendations and additional information related to the product will also be considered. Since not all the web pages might have all the elements of each level of complexity, it is understood that a level is attained when it has at least two of the three elements that it consists of. Likewise, when a page does not reach the intermediate level, but it does meet the qualifications for the upper level, it is understood that the complexity of the web page is medium.	Ordinal qualitative (null, low, medium, high).
Unique purchases	Number of times that a certain product has formed part of a transaction.	Discrete quantitative

If more free time is available, shopping for mass market products is the activity to which customers would dedicate the second least amount of time

company's data, an index is elaborated in which the largest number of unique purchases is equal to 100 and the rest are calculated accordingly.

- Direct observation: once the best-selling products are determined, the next step is to analyze the complexity of their web pages. To do this, direct observation of them is used, taking into account the key indicators taken from the literature and set out in the data collection protocol.
- Recording and classification of data: after the data collection phase, the data are recorded and classified in a table that organizes, integrates and synthesizes the information obtained.
- Individual analysis of each case to link the data collected to the hypotheses proposed; and a global analysis to test the theoretical hypotheses that led to conducting the study with the evidence available, ultimately accepting, reformulating or rejecting them.
- Drafting of a final report with the general conclusions of the study and their implications.

5. Results

Each element of the product web page was analyzed independently, with the following results:

- Quantity and quality of the photographs: as shown in Table 2, upon analyzing the average number of unique purchases of the best-selling products according to the number of photographs found on their web page, using as a reference the mean number of unique purchases per page for the entire sample (22.87), it can be concluded that providing more than one photograph is positive in terms of sales (25.89 vs. 17.6 purchases/page). However, the added value (represented as the ratio of purchases/page) that two or three pictures generate does not significantly improve as the number of photographs increases.

Table 2

Classification of the product pages analyzed according to the number of photographs

No. photos	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
1	11	194	28.28%	17.6
2	9	211	30.76%	23.4
3	4	66	9.62%	47.3
4	3	142	20.70%	16.5
5	1	21	3.06%	21
6	1	37	5.39%	37
7	1	15	2.19%	15
	N=30	N=686	100%	22.87

In terms of the use of high- or low-quality images on the product pages, the result is, as shown in Table 3, that products with high-quality images have more unique purchases (23.26 vs. 21.57), although the difference in size of the two groups should be stressed.

Companies in the food-based mass market sector need help to make the right strategic decisions that would allow them to increase their e-commerce sales

Table 3

Classification of the product pages analyzed according to the quality of the photographs

Quality	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
Low	7	151	22%	21.57
High	23	535	78%	23.26
	N=30	N=686	100%	22.87

- Complexity of the descriptions: upon analyzing the number of unique purchases in terms of the type of descriptions found on the web pages (Table 4), it can be seen, as shown in Figure 4, that the full descriptions are slightly higher (53.5%), although in all reality, the mean number of unique purchases per page is lower, which leads us to think that the descriptions do not have a positive influence on the number of purchases.

Table 4

Classification of the product pages analyzed according to their description

Description	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
Simple	13	319	46.5%	24.54
Complete	17	367	53.5%	21.59
	N=30	N=686	100%	22.87

- Use of videos: 88% of the unique purchases of the best-selling products are for products that do not include videos on their web pages. However, of the 30 pages analyzed, only 10% have a video of the product (an unboxing), so the sample analyzed is considered to be too small to draw any conclusions (Table 5).

Table 5

Classification of the product pages analyzed according to the use of videos

Videos	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
No	27	604	88%	24.54
Yes	3	82	12%	21.59
	N=30	N=686	100%	22.87

- Existence of extra content on the product web page: as seen in Table 6, most of the pages analyzed (73.3%) do include extra content of value and it is precisely these pages that achieve 71.3% of the unique purchases in the sample analyzed.

Table 6

Classification of the product pages analyzed according to the existence of extra content

Extra content	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
No	8	197	28.7%	24.63
Yes	22	489	71.3%	22.23
	N=30	N=686	100%	22.87

The main conclusion drawn from the case study is that in the context of online supermarkets, visual information plays a more important role than textual information

- Complexity of the product web page: even though food products typically involve a low degree of engagement (which entails a routine purchasing decision in which habit proves decisive), the web pages analyzed have a medium or high level of complexity. In addition to getting the user's attention with basic product information, they attempt to generate interest and even desire by expanding upon this information with additional content, provided by both the company and by customers. In accordance with the data in Table 7, the pages with a high level of complexity (73.3% of those analyzed) are the ones that achieved most of the unique purchases (83.5%).

Table 7

Classification of the product pages analyzed according to their level of complexity

Complexity	No. pages	Unique purchases		Unique purchases/page ($\bar{X}$)
Mean	8	113	16.5%	14.13
High	22	573	83.5%	26.05
	N=30	N=686	100%	22.87

6. Conclusions

Even though the level of engagement of users with mass market products is usually low (which means that the purchasing decisions are routine), it is necessary to remember that the penetration of online mass market purchases is low as compared to other sectors and countries, which indicates that there are still several entry barriers. Among them, worth mentioning is the intangible nature of the medium, which is a very important barrier, taking into account the specific needs (in terms of temperature and expiration dates, for example) associated with some products. The perceived risk in these cases is high, which pushes users to reduce it by searching for quality information. From a generic perspective, the combination of accurate descriptions and appropriate images helps differentiate the product and as a result, make confident purchasing decisions.

However, in line with the literature, the main conclusion drawn from the case study is that in the context of online supermarkets, visual information plays a more important role than textual information.

Both the number and quality of the photographs included on the product web page has a positive influence on the number of unique purchases. Including more than one photograph is effective for sales, but it is not recommendable to add more than three, since doing so does not significantly increase purchases, so it is likely that the cost for the merchant is greater than the benefit obtained. Likewise, the higher the quality of the images, the greater the number of unique purchases.

Just the opposite, neither the expanded product descriptions nor links on the web page to extra content of value (detailed information about the nutritional properties of the product, the place of origin, the producer, the best time for consumption, culinary recommendations and/or advice on product conservation) have a positive influence on the number of unique purchases.

In essence, it can be stated that the more complex product web pages are associated with a larger number of unique purchases, which allows us to accept the hypothesis proposed in this research study.

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Economics and environment: An impossible reconciliation?¹

Alberto Díaz de Junguitu González de Durana

Tenured Professor. Department of Applied Economics I. Faculty of Business and Economics. University of the Basque Country/Euskal Herriko Unibertsitatea (UPV/EHU). Donostia/San Sebastián. Spain. ORCID: [0000-0002-2372-2108](https://orcid.org/0000-0002-2372-2108).

Iñaki Heras Saizarbitoria

University Professor. Department of Management. Faculty of Business and Economics. University of the Basque Country/Euskal Herriko Unibertsitatea (UPV/EHU). Donostia/San Sebastián. Spain. ORCID: [0000-0002-9337-1374](https://orcid.org/0000-0002-9337-1374).

Olivier Boiral

University Professor. Department of Management. Faculty of Business Administration. Université Laval. Québec. Canada. ORCID: [0000-0002-9722-7644](https://orcid.org/0000-0002-9722-7644).

alberto.dj@ehu.eus, iheras@ehu.eus, Olivier.Boiral@mng.ulaval.ca

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Abstract

It should be noted that, until now, the relationship between economics and the environment has never figured as one of mankind's primary or principal concerns. It presently does. The recent worldwide student mobilization for climate action, the Climate Change Congress in Paris (December 2015) and the so-called *dieselgate* scandals, involving companies in the automobile sector not complying with regulatory environmental norms (which also began in 2015), among many other events, provide evidence that this relationship is presently of central concern to questions regarding the future of mankind.

Nevertheless, we should remind ourselves of the fact that, despite being a recurrent theme in the media, the environment continued to be treated by economists as a subsidiary issue until, in relatively recent times, the effects of the global environmental crisis grew to proportions that meant it became a serious concern for the future of mankind.

The aim of this paper is to trace the historical relationship between the environment and economics. In all reality, the focus is more modest: we aim to illustrate the principal traces of the presence of the environment in economic science in an attempt to exhibit a path which might lead to the reconciliation of the one (the environment) with the other (economics).

Key words

Economics, Environment; Environmental economics; Ecological economics.

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Economics emerged as a scientific discipline with the scientific revolution of the 18th century

1. Background

The meaning of economics as we know it today first appears in the 18th century, in spite of the fact that there had long been speculation about the nature and morality of the economic process (Barber, 1982). According to Losee (1987), it should be indicated that all civilizations have worked toward attaining truths, however in ancient times, it seems that only Greeks were capable of directly examining nature, applying the force of reason. Possessed by an insatiable curiosity and a critical, secular attitude, they forged a conception of the universe that has dominated all of western thought. In this manner, Greek thinkers assimilated, along with many other elements that made up their cultural, scientific and religious reality, a vision of the world that dated back to eras long before them, in which the *whole* explains the *parts*: the *organicism* or *holistic* vision. This perspective conceives the world as a grand biological entity: *Mother Earth* (Granet, 2010). The break away from this focus occurs with the discussion of the nature and origin of wealth during the 16th-18th centuries; this is a discussion that has shaped economic science (Naredo, 2015).

It was the *physiocrats* who shifted the center of economic interest away from the acquisition of riches towards their production. Accepting the fact that the earth is the only source of wealth, they believed that man could, however, have a significant effect on its generation. Seeing the multiple interrelationships that exist among the representatives of the mineral, plant and animal kingdoms, and considering as Linnaeus does that everything created is useful, the physiocratic school of thought tries to reconcile the *private economy* with the *natural economy*, with the aim of achieving the enrichment of both (Quesnay, 1991). This holistic vision would later be abandoned, favoring the break between the economic and ecological realms.

In spite of the precedents that exist, it is not until the culmination of the scientific revolution in the 18th century that economics emerges as a scientific discipline. The accomplishments earned by physics led scientists and intellectuals to consider it as an example to be followed. The *new* science prompted the study of the world and of life, including mankind, with an analysis perspective that was strongly mechanistic (Crombie, 1985). The fathers of the social sciences did not escape this emerging paradigm, and so the world of economics that was structured during the 17th-19th centuries reflected the Newtonian principles of *atomism* and mechanics, with the basic notion of dynamic balance. Once the economic system was implemented, it would be seen to be governed by inertia, just like the universe, as emphasized by Naredo (2015). These intellectuals had confidence in the capacity of science to solve any problem, with reason, technique and work as tools.

The emerging economy, like other branches of knowledge, was affected by the process, which led to blindly believing in the unlimited capacity of science to solve any problem (present, future and even until then unknown), with reason, science, technique and work as the tools to achieve it. In turn, economic science itself would effectively collaborate to expand said belief, providing a conceptual apparatus that magnifies the productive and utilitarian achievements of the industrial society and covering up the destruction and servitude derived from it (Naredo, 2015). With regard to the role and responsibility of economics in shaping the modern world, economist Joan Robinson indicates that, among the many ideas and sentiments that form an ideology, those related to economic life always play a very important role, and economics “has always been part the vehicle of the dominant ideology in each era, and part scientific research method” (Robinson, 1966, p. 7).

At this point, we consider it relevant to include in this brief description of the context in which economic science came about another element that is crucial for understanding the

Adam Smith proposed that labor, not nature, is the quintessential factor of production

impact derived from economic activities on the environment: the emergence of the modern state during the Renaissance, accompanied by the emergence of puritanical morals. Both circumstances contributed factors of both an institutional and an ideological nature that made a radical change possible in how production and the accumulation of property and wealth were considered. Until the Renaissance, material security was compensation for moral conduct. As the Old Regimen is wiped out, the individualistic ideology of success ensures people's needs. Only one more new ingredient was needed to complete the breeding ground for the nascent economy: the value of labor.

2. Smith and classic analysis

Adam Smith (1723-1790) is recognized as the father of economic science, in a large part due to his work *The Wealth of Nations*. Smith identifies the exchange with utilitarian egotism and the pursuit of profit, and thus it would follow, according to the author, that all men are merchants and humanity as a whole is a true commercial society (Smith, 1994). Furthermore, he states that work is the measure of the exchange value, which is the only meaning of the concept of value that he considers to be of economic interest. Smith's work marks a turning point in the relevance given up to that point to nature as explaining production and growth, shifting it from this point on to labor.

Smith also contributed to implementing the abstract idea of the free market, a framework in which the different parts and elements of the economic system would relate to one another. In this system, the profit motive would occupy the role of universal gravitation in the physical world, ousting the interest in the crucial values of things, still present with the physiocrats, in favor of pecuniary values.

Along the exact same lines, Thomas R. Malthus (1766-1834) understands wealth as "the material things necessary, useful or agreeable to man, which have required some portion of human exertion to appropriate or produce" (Malthus, 2008, p. 43), thus establishing the definition on which economic science is based. A logical consequence of this is that all wealth must necessarily be useful, but not everything useful constitutes wealth, for example, natural assets.

Malthus was concerned about the existence of an inherent trend, in his opinion, by human beings to reproduce without any limitations, as he clearly expresses at the start of his famous work, *An Essay on the Principle of Population*: "The principal object of the present essay is to examine the effects of one great cause [...]. The cause to which I allude, is the constant tendency in all animated life to increase beyond the nourishment prepared for it" (Malthus, 1998, p. 7).

The problem of the scale of the economic process has remained until recent times on the sidelines of economic analysis. As Fernando Tudela indicates in the prologue of one of the Spanish editions of said work, vindicating the importance of Malthus' work: "There is a feature in Malthus' original work that did not escape the sagacity of Keynes: the emphasis on the concepts of scale, limit and threshold as pertinent for the theoretical construction of the political economy. Neoclassical economic theory focused its efforts on the mechanisms used to allocate resources" (Malthus, 1998, pp. XXXIII-XXXIV). If economics has traditionally focused most of its attention on problems of allocation and distribution, the consideration of scale as one of the fundamental problems of economic analysis constitutes precisely the main new aspect of the ecological focus. It could be said that Malthus and Ricardo opened up the first relevant intellectual debate on the limits of growth.

Malthus was concerned about the matter of scale, because of the tendency by man to reproduce without any limits

A contemporary of Malthus, David Ricardo (1772-1823) maintained that natural qualities do not add value to commodities. Thus, the price of products is obtained from the calibration between offer and demand: for the first time, scarcity appears as the determinant of value (Ricardo, 1973). The physiocratic remnants that remained in Smith's work have disappeared in that of Ricardo, who insisted that production depends exclusively on the work and technology that have been applied, coinciding in this aspect with other authors of his time, such as Marx.

Economics emerged in a cultural and social context in which the material pursuit of an individual was justified under the presumption that, once the material needs were met, people would have the conditions to pursue moral improvements, although in the words of Polanyi (1947), set out in his excellent booklet entitled "Our Obsolete Market Mentality," the step taken for the emergence of economic science was dramatic: "Labor and land were made into commodities, that is, they were treated as if produced for sale. [...] The true scope of such a step can be gauged if we remember that *labor* is only another name for *man*, and *land* for *nature*. The commodity fiction handed over the fate of man and nature to the play of an automaton running in its own grooves and governed by its own laws."

3. The emergence of the neoclassical paradigm and its critics

In the last third of the 19th century, the *neoclassical or marginalist revolution* took place, with the simultaneous appearance of different works on the *theory of marginal utility* (Schumpeter, 1971).

Because of his complete and structured analysis, Léon Walras (1834-1910) is considered the leading *marginalist* author (Schumpeter, 1971). If classical scholars understood economics as the science of wealth, the continuationism of Walras in this aspect is evident, in opposition to what in the future will be customary among economists, as it defines it objective as "the theory of social wealth" (Walras, 1987, p. 126). He identifies the two conditions of an asset in order to consider it part of the wealth of a society: it must be *useful* (permitting a need to be satisfied) and *scarce* (available in limited quantities) (Walras, 1987). Here is where many elements that are the source of life and happiness only come to form part of the economy when they acquire an exchange value. For this reason, neoclassical economics is only concerned with natural resources once they have been recognized and exchanged, which has enormous significance for the understanding of the current ecological crisis.

Alfred Marshall (1842-1924), the incarnation of the economic orthodoxy referred to as *neoclassical synthesis*, approaches the objective of economics in a manner that is much less structured, but equivalent to Walras's approach. The author proposes the new idea of considering *free goods* to be those that are found in nature and available to man, the appropriation of which requires no effort whatsoever (Marshall, 2005). Therefore, it is easy to conclude that, for the neoclassicists, based on Walras and Marshall, property is the criterion through which assets become scarce that were not previously considered to be so.

Following the acceptance of the perfect capacity for resources to be replaced, the Neoclassicists not only disregarded the prevailing role of labor as the source of value and wealth that had been granted to it by the Marxists and Classicists, they also failed to take into account unorthodox visions, such as the Malthusian insights into the limits of growth and the scale of consumption of the population, the reflections by Jevons on the limited horizon offered by the carbon reserves (Jevons, 2000), and Stuart Mill's doubts about the sense of unlimited growth (Mill, 1978).

Another critical version: Mill proposed overcoming unlimited growth with the stationary state

With regard to the sense of the unlimited growth process, it should be pointed out that Mill proposes overcoming it through the defense of the stationary state, anticipating by more than 200 years the main proposal contained in the first report to the Club of Rome in 1972 on the limits to growth (Meadows, Meadows, Randers & Behrens, 1972; Meadows, Meadows & Randers, 2006). For Mill, the trend towards unlimited growth of economic aggregates must promote questioning its intrinsic sense, a progressive phenomenon closely linked to the industrial revolution and mass production. In his opinion, it would not be fitting to infer a stagnation of human progress from a stationary situation, in terms of population or capital; quite the opposite, such an equilibrium could be understood as a great opportunity for the spiritual development of human beings (Mill, 1978).

We believe it is appropriate to observe that, in spite of the fact that the scale of the flow of the resources used and their finite nature are critical factors for evaluating the environmental impact of the economic activity, the allocation mechanisms used by neoclassical economists are indifferent to them (Daly & Cobb, 1993). As sustained by ecological economists, ignoring the difference that exists in nature between renewable flows and stocks prevents the proper management of natural resources (Naredo, 2015).

Furthermore, Neoclassicists have borrowed from the Classicists the driving idea behind the economic system: the desire for enrichment that supports the rationality of the *homo economicus*. Their contribution consisted of making this idea more specific, proposing that man acts with the aim of maximizing his own satisfaction through the consumption of goods and services. They thus define the *utility* provided by consumption as an explanatory variable. We believe the indicated change is crucial, as it means that economic analysis is shifting its focus away from the objective concept of wealth toward another emphasizing the psychological elements of human enjoyment. Many authors have highlighted important objections to this basis for human behavior, convinced that it represents a reduction of the principle of rationality of the economic agent. At this point, we should once again refer to Polanyi, who in the aforementioned booklet maintains that, according to Aristotle, man is a social being, not only an economic one. According to his opinions, it could be believed that man seeks the appropriation of material goods more for reasons of a social and relational nature than a desire to accumulate wealth. According to his reasoning, the incentives associated with human behavior have a mixed character: economic, of course, but also recognition of social approval (Polanyi, 1947).

With regard to Neoclassical scarcity, it should be indicated that, for example, Lionel Robbins (1898-1984) stresses that it is not an assessable phenomenon in absolute terms, but rather quite the opposite, it is relative in comparison (Robbins, 1944). This notion of scarcity is impossible to pigeonhole within objective limits: induced by ethical, social and institutional standards, it is born of human subjectivity. As a counterpoint, Naredo (2015) states that, in spite of the enormous power of our technology and the unprecedented accumulation of consumer objects that are found in industrial societies, they are headed towards, more than ever, scarcity.

Furthermore, we must indicate that the social and economic world at the end of the 19th century was characterized by the great expansion of manufacturing production. As a direct consequence of this, not only was enormous growth seen in commerce and the accumulation of capital, there were also deplorable living conditions for the workforce (Polanyi, 1989). Thus, for Marx, the sense of economic analysis is restricted to revealing the laws of historical change that would bring about the destruction of capitalism. The development of the productive forces would be brought about by socialism, breaking the capitalist shell. For Marxists, therefore, any remedy intended to solve the problems associated with capitalist society is

For Polanyi, the fathers of economics transformed labor and land into commodities, as if they were created to be sold

completely futile, given that the pretense of a constructive reform of capitalism is absurd in itself (Barber, 1982).

Concern for the environment is barely mentioned in Ricardo's work, and much less so in that of Marx. Both identify the origin of wealth and value with labor; i.e., in the social realm, abstracting the physical feasibility of the economic activities. Marxism, as an alternative social and economic model, did not represent any divergence in this regard from the capitalistic world (Naredo, 2015).

Moreover, the industrialized societies suffered an unprecedented crisis between the two world wars. The Russian revolution and the great crisis of 1929 shaped the economic concerns of the time. The orthodox economic tradition did not seem to be prepared to face the situation (Schumpeter, 1971). The reason why Keynes's *General Theory* (1956) was so difficult to accept at the time, in Joan Robinson's opinion, owes to one of the most disturbing propositions, which includes what is known as the paradox of thrift, according to which private virtues can be susceptible to becoming a source of social problems. In the words of this author, following the publication of Keynes's work, economics recovered its political economic nature (Robinson, 1966). However, the Keynesian terms (multiplier and accelerator, among others) introduced to capture the mechanical tendencies of the economic system, did not represent a break from the prevailing analysis with regard to the environmental dimension (Naredo, 2015).

When trying to comprehend the scarce sensitivity shown by the economy towards the natural environment, it must be remembered that the magnitude of the scientific and technological advances in the first half of the 20th century were such that, as Jonas (2008) indicates, faith was stimulated in the omnipotence of technology to solve any energy or material supply problem. The increase in the price of crude oil in the 1970s was what eventually brought about the demise of the illusion.

4. The focus on the institutional economy

Arthur C. Pigou (1877-1956) makes progress in the integration of the environmental problem by defending the implementation of political-economic instruments aimed at developing economic welfare, understood as a crucial component of mankind's well-being. In doing so, he laments the lack of exchange value that goods and services have that lie outside the market, among others, those provided by the natural environment. Since this circumstance is not captured autonomously by the economic system, Pigou reckons that intervention is necessary in order to ensure that community resources are distributed in a more efficient and rational manner (Pigou, 1946). Furthermore, Pigou also dedicates attention to another matter with enormous relevance for our study, according to which we tend to prioritize attention to present needs over future ones (Pigou, 1946), an idea that the concept of sustainability will re-examine.

In short, Pigou calls for State intervention, both to provide an incentive for activities that have positive effects for others, and to halt those whose social cost exceeds the private cost (*negative externalities*). The technical problem will revolve around their estimation, in order to determine the premium or tax to be considered. For Pigou, state intervention must not be understood as synonymous with premiums or taxes, but rather including the institutional framework in which the economic activity takes place. The line of thought inaugurated by Pigou considers the state responsible for and capable of arresting the environmental crisis. It was accepted among economists until 1960, when Ronald H. Coase (1910-2013) published *The Problem of Social Cost*. Coase was disgruntled because, in his opinion, the state had been the main legitimizing institution behind the appropriations and aggressions perpetrated against the environment (Coase, 1981).

Coase criticized this interventionist focus and proposed reinforcing agreements among the affected parties

Coase describes three scenarios, for which he suggests different solutions. In the first one, there are no *transaction costs*, the *property rights* are clearly specified, there is liability for damages, competition is perfect and there are only two parties involved. It is the simplest archetypal situation, corresponding to what is known as *Coase's Theorem*: agreement among the parties involved is possible. Many authors observe that, faced with the localized and reversible impacts to which this Theorem refers, the environmental problems surpass the limits of property, extending into the ecosystems and accumulating over time. While it is true that Coase's analysis makes it possible to internalize certain externalities, for others it proves futile.

Coase's works represented the starting point for a new focus: institutions matter when it comes to better understanding economic and environmental problems. In light of the neoclassical vision of economics, focused on scarcity and utilitarian, rational behavior, *institutional economics* is concerned with the study of the structure and functioning of the system in which human relations are embedded, including social and group objectives, parallel to individual ones (Kapp, 1995). For Jacoby (1990), the characteristics in common with the institutionalists would be: *indetermination* (the economy has an evolutionary character, as opposed to the neoclassical determinism), *endogeneity* (individual preferences are shaped by social institutions) and the *realism of economic behavior* (as opposed to *homo economicus*, they opt for psychological and sociological motivations, as well as economic ones).

5. Reintegrating economics with ecology

At this point, a critical reflection is necessary about the frontiers between economics and the natural environment. Two separate schools of thought have emerged that approach the matter in radically different ways: environmental economics and ecological economics.

Environmental economics seeks to revise the instruments of orthodox analysis in order to incorporate the environmental impact within the customary economic system. Its decisions are based on price, cost and profit, and their corresponding optimal values and equilibriums (Azqueta, 1994). Pigou and Coase are recognized by most environmentalists as being the most influential economists (Aguilera, 1998). The precise measure of the environmental impact is a topic that is dealt with extensively in the literature. However, this task proves difficult or even impossible for many critics, due to the following factors (among others) (Baumol & Oates, 1982; Pearce & Turner, 1995):

- The complexity of the earth's ecosystems and their evolution.
- The uncertainty regarding the scope of the damage occurred in terms of time and space.
- The existence of numerous temporal asymmetries between the damage and its effects.
- The fast evolution of the applicable science and technology.

The main problem, according to Naredo (2015), stems from the fact that the very nature of the problems considered is opposed to any monetary valuation. Even if it were possible to overcome this difficulty, another problem arises: the pressure applied in order to prioritize the consumption of the present period of time. Tackling future needs with a finite stock of resources would mean accepting that the prices of environmental assets would skyrocket, generating a complete shock in our current economic system.

In any case, we believe it is only fair to mention some of the most important contributions made from this focus, beyond the limitations indicated by the ecological authors, such as the renewable and non-renewable resource management models (Pearce & Turner, 1995), instruments for measuring environmental impact, such as the ecological footprint

In light of the emergence of the environmental problem, two main schools of thought have emerged: environmental economics and ecological economics

(Wackernagel & Rees, 1996), or the focuses incorporated into bioeconomics or the economics of sustainability (Baumgärtner & Quaas, 2010).

In short, both the allocation of Pigouvian taxes and negotiations among those affected seem to offer only a partial and rather unsatisfactory response to serious environmental problems. It calls to mind Robbins, when he states that economics cannot relieve us of the obligation to choose; in short, to declare our preferences (Robbins, 1944).

As a result, an alternative focus emerges, *ecological economics*, which expands the objective of economic science to include, independently of property rights, both resources and waste. Along with the problems of allocation and distribution, to which economics has traditionally dedicated its attention, it focuses its interest on scale (Aguilera, 1998). An appropriate scale is one that does not diminish the carrying capacity of the environment over time, and thus it must not be determined according to prices, but rather by a social decision that reflects the ecological limits of the planet (Daly & Cobb, 1993). More than a theory per se, ecological economics would represent the strategy that scientists of different disciplines would use to work shoulder to shoulder with one another, with the pretense of learning together and defining new economic policies together that contemplate the human impact on the natural environment (Costanza, Cumberland, Daly, Gooland & Norgaard, 1999).

Ecological economists have refocused their work towards a new form of economics that transcends both the lack of information that economists have about the natural sciences and the specialized knowledge that characterizes their practitioners. It is difficult for a system to be managed for which we lack in-depth knowledge. Thus, one salient characteristic of ecological economics is its systemic focus. From the perspective of *general systems theory* (von Bertalanffy, 1993), classical economics offers appropriate focuses for understanding a system with weak interaction among its parts, but it is not very appropriate when attempting to understand a complex system.

Furthermore, Garrett Hardin (1915-2003) offered the opinion that the future of mankind is disastrous if it pursues its interests while considering common spaces as free spaces. Ecological economists believe it is very important to consciously define, through political decision-making, the carrying capacity of the environment by linking it to the desired standard of living. In this regard, Hardin questions the difficulty of promoting moderation, given that regulations normally set limits for how we act that must be obeyed, but not suggestions for a better life (Hardin, 1989).

Nicholas Georgescu-Roegen (1906-1994) proposes, in turn, that entropic degradation not be relegated to the environment, thus preventing the magnification of the utilitarian aspects of production and consumption. Its proposal enters into direct conflict with the faith in economic growth maintained not only by a majority of economists, but also scientists, politicians and citizens even today (Georgescu-Roegen, 1989). Along these lines, ecological economists coincide in believing that reversing our dependence on crude oil will represent a huge evolutionary change (Costanza et al., 1999).

Kenneth Boulding (1910-1993), one of the most representative and prolific authors to take part in this focus, in his article *The Economics of the Coming Spaceship Earth*, describes the economics of the past as cowboy economics, characterized by the identification of the increase in human well-being with the increase in material consumption and in which nature is reduced to the status of the resources provided by the suppliers. This perspective, as Boiral (2007) states, leads to an abstract and immaterial vision in which the ecological aspects are missing,

Environmental economics seeks to revise the orthodox instruments to incorporate the impact on nature

something that is present, for example, in a large portion of the conventional literature on business management and administration. For example, for Hellriegel, Slocum and Woodman (1998), the environment is an “essential contingency” that includes several aspects, among them “terrorists and others,” while no mention is made of any element of the natural environment.

In light of such reductionist perspectives, Boulding presents, in a metaphoric style, the economics of the future as spaceman economics, in which economic success would not be explained through the behavior of the aforementioned variables, but rather for the mental and cultural state of humanity (Boulding, 1989). Thus, any technological change that favors the maintenance of the overall heritage with lower levels of production and consumption would clearly be considered as profitable for the system.

Finally, it should be pointed out that the research group led by Crawford S. Holling (1930-2019) describes the behavior of the ecosystems as a dynamic sequential interaction among four functions: exploitation, conservation, release and organization. The resistance of the ecosystem depends directly on the effectiveness of the latter two, and so ecosystems do not have a single equilibrium status. It has been proposed that scientists and environmental agencies work together in order to continuously adapt management experiments to a changing system. Faced with a paradigm based on scientists who work in search of the truth, managers who apply it and citizens who passively contemplate the process, Holling invites us all to share in the learning and to assist with the definition, implementation and revision of the environmental policies (Holling, 1978).

6. By way of a conclusion

Ecological economics continues to evolve through the questioning of historical assumptions and the interaction of multiple disciplinary bases. Starting with the premise that the earth has a limited capacity to sustain the population, it proposes the development of specific policies that facilitate our subsistence in a stable manner, relocating the economic system within these limits.

Regarding proper environmental management, Margalef states that it must be acknowledged that often the most successful solutions to ecological problems are those that provide a focus based on the defense of individual interests, as opposed to those that attempt to defend the environment without taking into account the practical aspects of the matter (Margalef, 1977).

In any case, the use of accommodative strategies can only be defended to the extent that they serve to seriously tackle ecological challenges.

According to radical authors like Naredo, it would seem evident that the pretense of moving towards a socially and ecologically more balanced and stable world without questioning the current expansive trends of financial assets, monetary aggregates and the commodification of life in general is so naïve and uninformed that it would border on being stupid (Naredo, 2015). Likewise, it would also be naïve and dangerous to pretend that the exacerbated consumerism that unfortunately seems dominant in many countries could be something simply reconcilable with true sustainable development through proposals with varying degrees of sophistication aimed at generating a certain social Daltonism that makes it possible to confuse certain harmful realities that can be associated with brownish colors — popularly associated with various problems and afflictions — with the green hope of environmental awareness, but also with *greennwash*.

In closing this work dedicated to exploring the relationship that exists between economics and the environment, we believe it is fitting to remember Keynes, now that the generation of his

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grandchildren, about whose economic possibilities he pondered in his famous work (Keynes, 1988) is reaching an age when they should do the same with regard to another upcoming generation. Keynes said that, for at least another century, man must accept the bad with the good on the quest for utility. Therefore, greed, usury and caution should be adored during this time, because they will be what saves man from need. However, Keynes warns us at the same time about overestimating these elements of human behavior, since they sometimes lead us to sacrifice matters of much greater value than economic need (Keynes, 1988). There are only a few years left before reaching the time horizon referred to by this great economist and scholar, and the need and urgency to end this fiction once and for all is undeniable. Therefore, welcome is the debate stirred by movements like that of a downturn that, with more or less precision, reposition the focus on the contribution made by great scholars, such as Ivan Illich (2008), an authentic archaeologist of modernity. But beyond intellectual debates of varying degrees of productiveness, it is clear that the time has come to move from awareness to continuous and integrated action, by citizens, businesses and other social agents alike.

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Market structure and “frequency economics” in air transport in the United States

Pablo Coto-Millán

Professor of Fundamentals of Economic Analysis at the University of Cantabria. Spain. ORCID: [0000-0002-6320-4647](https://orcid.org/0000-0002-6320-4647).

Javier Gundelfinger Casar

Air transport technician. Government of Cantabria. Doctor of Economics. University of Cantabria. Spain. ORCID: [0000-0002-3891-3572](https://orcid.org/0000-0002-3891-3572).

pedro.coto@unican.es, jgundelfinger@cantabriasi.org

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Abstract

This article provides an original theoretical model for air transport companies in the U.S. air travel market. The theoretical model of competition among airlines is empirically tested by estimating two equations of demand and price fixing. This estimate is made for 239 routes and 23 airports.

This research provides estimates of the elasticity of demand in terms of price and income. It also provides the elasticities of demand in relation to the frequencies and elasticities of price fixing with regard to the frequencies that would allow us to introduce the new concept of “*frequency economics*” for the airlines.

Finally, the article presents results that might be useful to the airlines and public authorities, since it also analyzes the effect of the existence or absence of competitive transportation alternatives to air transport, as well as the influence of the hub airports and the population variable. Knowing the results offered here will undoubtedly prove useful to the actors involved in this industry, in terms of how distance, occupancy and the number of frequencies on each route influence costs.

Key words

Frequencies; airports; competition models; elasticities.

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The theoretical model of competition among airlines is tested, estimating two equations of demand and price fixing

1. Introduction

The U.S. domestic air transport system is characterized by a hub and spoke system, with several larger hub airports, such as Atlanta, Chicago, Los Angeles and Miami, which distribute domestic passengers to another 23 large airports and more than 100 medium-sized spokes.

The aim of this study is to provide an original theoretical model for air transport companies in the U.S. air travel market, as well as to empirically test this theoretical model of competition among the airlines by estimating two equations of demand and price fixing.

The unique contribution to the existing literature is made by increasing both the sample size (239 routes) and the time horizon (60 quarters), introducing for each of these routes variables such as frequencies, price per mile charged by the airlines, aircraft capacity and the distance between each origin-destination pair, as well as several dummy variables, among other factors.

For this purpose, a theoretical oligopolistic model of competition was applied, with vertical differentiation of products that could be empirically tested by means of two equations (demand and price). The vertical differentiation will be gathered based on the service frequency as a variable of competition.

This work is structured as follows: after the introduction, a review of the existing literature on this field will be undertaken in the second section, with a theoretical discussion of the hypotheses to be tested in the third section. The empirical model is offered in Section 4. The sources of the data are detailed in Section 5. Section 6 shows the results obtained, while Section 7 presents the conclusions that can be drawn from the study that has been conducted. Finally, Section 11 presents the bibliographic references.

2. Review of the existing literature

Rich and varied literature exists on the effect frequencies have on demand in air transport. However, De Vany (1975) is the first author to empirically show how flight frequencies, measured as quality of service, are an important variable that affects the demand for air transport.

Douglas and Miller (1974), Eriksen (1977), Swan (1979) and Ippolito (1981) built demand models based on both airplane capacity and the number of frequencies operated by the airlines.

Years later, Abrahams (1983), Reis and Spiller (1989), Brander and Zhang (1990), Brander and Zhang (1993), Wei and Hansen (2007), Berry and Jia (2010), Yan and Winston (2014), Ko (2016) and Mohammadian, Abareshi, Abbasi and Goh (2019) modeled the demand for air transport using variables such as the number of frequencies, fleet size and ticket price.

Demand models can also be developed from a microeconomic perspective. Norman and Strandenes (1990) modeled the demand for air transport based on the supposition that the flight frequencies have a uniform distribution. Nikulainen (1992) also developed a demand model during a specified period of time, with the main supposition being the fact that said demand is a function of the frequencies that are scheduled by the airlines in a given market.

The study consists of an analysis of 239 routes and 23 airports in the United States

Logit models, in turn, have been extensively used in characterizing the demand for air transport. Kanafani and Ghobrial (1985), Hansen and Kanafani (1989), Hansen (1990), Dobson and Lederer (1993), Pels, Nijkamp and Rietveld (2000), and Adler (2001) developed demand models based on frequencies and prices, among other variables.

3. Methodology

3.1. A theoretical demand model that can be empirically estimated for air transport services

The background provided in the air transport literature reveals different theoretical models that can be empirically estimated. The model presented here is an original model for transport demand inspired by the one presented by Coto-Millán (1999, 2002). Accordingly, it is based on a function of utility expressed as:

$$U_0 = U_0(x_1, x_2, \dots, x_H; x_{H+1}, \dots, x_Z); \quad (1)$$

In which U_0 represents the vector of utility for the consumer; the vector $_{12H}$ represents the quantities of transport services demanded by consumers; the vector $_{(H+1)Z}$ represents the rest of the non-transport service-related goods and services.

For reasons of simplicity, we will assume that the function of utility is characterized by the additive property, which permits (1) to be expressed as follows:

$$U_0 = U_1(x_1, x_2, \dots, x_H) + U_2(x_{H+1}, \dots, x_Z); \quad (2)$$

From expression (2), of interest is the first summand related to the utility of transport services. This function can be specified for an origin and a destination that we will designate as route k . Furthermore, the transport services are demanded according to their number of frequencies, and thus we will introduce the good f_{ik} , as the number of frequencies demanded by the consumer on route k . This can be expressed as:

$$U_{ik} = U_{ik}(x_{ik}; f_{ik}); \text{ where } i = 1, \dots, H \quad (3)$$

Where U_{ik} represents the utility of the individual on route k to purchase a quantity of transport services x_{ik} , with a frequency f_{ik} .

The budgetary restriction can be expressed as follows:

$$Y_{ik} = \sum P_{ik} x_{ik} - \sum w_{ik} f_{ik}; \quad (4)$$

Where Y_{ik} represents the level of income from consumers demanding transport i on route k ; P_{ik} represents the price of transport i on route k ; w_{ik} represents the time savings for the consumer

De Vany (1975) was the first author to demonstrate how frequencies are an important variable that affects the demand for air transport

of transport i on route k as the result of the existence of a certain frequency; supposedly with more frequencies, individuals can dedicate more time to work and thus this increase generates and increment in income in $\sum w_{ik} f_{ik}$.

The balance of consumers demanding transport services will be determined by solving the following maximization problem:

$$\begin{aligned} \text{Max } U_{ik} &= U(x_{ik}; f_{ik}); \text{ where } i = 1, \dots, H \text{ means of transport} \\ \text{Subject to: } Y_{ik} &= \sum P_{ik} x_{ik} - \sum w_{ik} f_{ik}; \end{aligned} \quad (5)$$

The demand functions for the balance of the consumers demanding transport services that emerge from solving for the optimal value of (4) are:

$$x_{ik} = x_{ik}(P_{ik}; w_{ik}; Y_{ik}); \quad (6)$$

$$f_{ik} = f_{ik}(P_{ik}; w_{ik}; Y_{ik}); \quad (7)$$

Where the optimal demands for transport services, x_{ik} , depend on the prices P_{ik} of the transport service i . In addition, demand also depends on the number of frequencies of the transport service which, when increasing the traveler's time, generates an increase in income.

The reason is that the traveler might spend more time on his or her job, and therefore increase his or her income.

From here, it is possible to estimate the functions of the transport service demand i on route k with frequency f . A recurrent issue is how to assess the existence of frequencies on a route k . Typically, the greater the number of frequencies, the greater the time savings are for the traveler, in such a way that (6) and (7) can be compacted into (8) as follows:

$$x_{ik} = x_{ik}(P_{ik}; f_{ik}; Y_{ik}); \quad (8)$$

The general demand for transport services in expression (8) can now be expanded for air transport as follows:

$$x_{ik} = x_{ik}(P_{ik}; f_{ik}; Y_{ik}; \text{Pop}_k; DV_k^{\text{att}}; D_k^{\text{hub}}); \quad (9)$$

Where x_{ik} now represents the demand for transport services of airline i on route k ; f_{ik} represents the frequencies of air transport of airline i on route k ; Y_{ik} represents the income of the individual who uses airline i on route k ; the variable Pop_k represents the population level on route k ; the variable DV_k^{att} represents the existence of alternative means of transport on route k as a variable that is assigned the value of 1 if there is an alternative means and 0 if there is

Reis and Spiller (1989), Wei and Hansen (2007) and Mohammadian et al. (2019) also used frequencies to model the demand for air transport

not; the variable D_k^{hub} is a “dummy” variable that represents the existence (or lack thereof) of a connection with an airport hub; if the origin or destination is an airport hub, the dummy variable is assigned a value of 1 and 0 if this is not the case.

Once the equilibrium demand functions for the transport services are obtained, the offer side will now be addressed. Transport companies offer their services while attempting to maximize their profits. Thus, the profit equation can be written as:

$$\Pi_{jk} = P_{jk} x_{jk} - C_{jk}; j = 1, \dots, N \text{ companies} \quad (10)$$

Where Π_{jk} are the profits of airline j on route k ; P_{jk} represents the price of airline j on route k ; where x_{jk} is the amount of services offered by airline j on route k ; and where C_{jk} represents the costs of providing transport services by airline j on route k .

The equilibrium of the company requires maximizing Π_{jk} in (10), and finding an equilibrium function for the inverse demand, dependent on the marginal cost.

In the case of air transport, we are referring to the costs of transport on route k , and therefore, the marginal costs function for air transport on route k becomes MC_k , which is defined as:

$$MC_k = MC(X_k; D_k; F_k); \quad (11)$$

The inverse demand function can now be expressed as:

$$P_{jk} = (x_{jk}; f_{jk}; Y_{ik}; D_k; IHH_k); \quad (12)$$

Finally, the system of equations to be estimated will consist of an equation for the demand and an equation for the behavior of the industry, through the price fixing behavior. In other words, the logarithmically linearized functions (11) and (12) that follow.

$$\begin{aligned} \ln x_{ik} &= \beta_0 + \beta_1 \ln P_{ik} + \beta_2 f_{ik} + \beta_3 \ln Y_{ik} + \beta_4 \ln \text{Pop}_k + \beta_5 DV_k^{\text{att}} + \beta_6 D_k^{\text{hub}} + \varepsilon \\ \ln P_{jk} &= \alpha_0 + \alpha_1 \ln x_{jk} + \alpha_2 \ln D_k + \alpha_3 f_{jk} + \alpha_4 \ln (IHH_k) + \alpha_5 DV_k^{\text{No}} + e \end{aligned} \quad (13)$$

4. The empirical model

4.1. Demand equation, by route and airline

Using the system of equations in expression (13), our empirical specification for the demand equation takes on the following logarithmic form:

$$\ln x_{ik} = \beta_0 + \beta_1 \ln P_{ik} + \beta_2 f_{ik} + \beta_3 \ln Y_{ik} + \beta_4 \ln \text{Pop}_k + \beta_5 DV_k^{\text{att}} + \beta_6 D_k^{\text{hub}} + \varepsilon$$

The sample consists of panel data, including 60 quarterly observations between 2001 and 2015

Where the dependent variable is the number of passengers transported on each route, $\text{Ln } x_{ik}$. The explanatory variables included in this equation are the following:

$\text{Ln } P_{ik}$: The prices offered by each of the airlines i on each route k . A negative sign is expected on the coefficient of this variable, assuming a normal demand curve.

$\text{Ln } f_{ik}$: Number of daily frequencies that are offered by each of the airlines i with regard to the market mean on each route k . A positive coefficient for this variable is expected as an indication of the “quality” perceived by the consumer of this type of services.

$\text{Ln } Y_{ik}$: Per capita income of each U.S. state in which every airport is located from which a passenger takes off. A positive coefficient is expected for this variable.

$\text{Ln } \text{Pop}_k$: The population data for each state on each origin-destination route. A positive sign is expected.

DV_k^{att} : Is assigned a value of 1 if the alternative means of transport (bus, train, fast ferry) takes less than 210 minutes. A negative sign is expected.

D^{hub}_k : This is a dummy variable that reflects the effect of a hub airport. As positive sign is expected, as the presence of a hub airport implies a larger number of passengers attracted by the connection advantages.

4.2. Price equation, by route and airline

In this case, using the second equation from the system (13), the price equation is specified as follows:

$$\text{Ln } P_{jk} = \alpha_0 + \alpha_1 \text{Ln } x_{jk} + \alpha_2 \text{Ln } D_k + \alpha_3 \text{Ln } f_{jk} + \alpha_4 \text{Ln } (\text{HHI}_k) + \alpha_5 DV_k^{\text{N}^g} + e$$

Where the dependent variable is the price per mile charged by each airline j on each route k , $\text{Ln } P_{jk}$.

The explanatory variables included in this equation are the following:

$\text{Ln } x_{jk}$: Number of passengers transported on each route by each airline j and on each route k . A negative sign is expected, since the price increases would result in a reduction in the number of passengers.

$\text{Ln } D_k$: The distance between the origin and the destination of route k . A negative sign is expected for the distance variable coefficient, since the costs per mile decrease with the distance, and these reductions are expected to be transferred to the prices.

$\text{Ln } f_{jk}$: Number of daily frequencies offered by each airline i as compared to the market mean on each route k . A positive sign is expected for the coefficient of this variable as a proxy of the relative perceived quality.

$\text{Ln } \text{HHI}_k$: Herfindahl index, which is defined as the sum of the square of the market shares of each airline i as compared to the market mean on each route k . A positive sign is expected for

The source of the data is the United States Department of Transportation

the coefficient of this variable, since the greater the market power, the more facility there is to increase ticket prices.

DV_k^{No} : This is a dummy variable that represents the number of operators on each route k . It is assigned a value of 1 on routes with competition from other airlines and 0 on the rest. A negative sign is expected, since the existence of competition implicitly implies less market power to increase prices.

5. Data sources and the sample

The sample used in the analysis is made up of panel data. This technique makes it possible to carry out a more dynamic analysis by incorporating the time dimension of the data, which enriches the study. This panel includes 60 quarterly observations from 2001 to 2015 for the U.S. market for scheduled flights, consisting of 239 routes. The information related to the total number of passengers transported by the airline i on route k , x_{ik} , the prices P_{ik} for each airline on each route and the frequencies of the flights for the airline i as compared to the market mean f_{ik} on route k has also been obtained from the same official source: the United States Department of Transportation.

The distance variable on the route k , D_k , refers to the distance in miles between the origin and destination on each route. The exogenous income variable y_{ik} has been obtained from the per capita income of each U.S. state provided by the United States census bureau, as well as the population of each state on each origin-destination route, Pob_k .

The following three dummy variables have also been included: alternative transport time (DV_k^{att}) which is assigned a value of 1 if the alternative means of transport (bus, train, fast ferry) takes less than 210 minutes, since it is considered that in this case there is a competitive alternative means of transport, and a value of 0 if this is not the case. For this calculation, the websites of each of the operators of each alternative means of transportation were checked.

Number of operators (DV_k^{No}), which is assigned a value of 1 on routes with more than one operator and 0 if there is not more than one, and the existence of a hub airport (D_k^{hub}), which is given a value of 1 in the case of airports that have more than 10 million passengers and 0 if this is not the case.

6. Estimate and results

The estimate was made correcting for heteroscedasticity by means of White robust standard errors. This method is appropriate for large samples such as ours.

Tables 1, 2 and 3 show the results of the main statistics, while Tables 4 and 5 show the results of the estimates for both the demand and price equations, respectively.

In Tables 4 and 5, the explanatory variables are marked with an asterisk when the contrast produces a confidence interval of 90%, 2 asterisks if it is 95%, and 3 asterisks if it is 99%.

Finally, Table 6 shows the airline routes in the U.S. domestic market that were analyzed in this study.

The regressions performed have been calculated using Gretl econometric software.

It is estimated through heterocedasticity correction, using White robust standard errors, which is very appropriate for large samples

Table 1
Descriptive statistics

	Mean	Median	Minimum	Maximum
$\ln P_{ik}$	5.2855	5.3137	4.2838	6.1882
DV_{ik}^{att}	0.083333	0.0000	0.0000	1.0000
$\ln Pob_k$	16.239	16.139	14.100	17.483
$\ln y_{ik}$	4.8961	4.9229	4.6052	5.3152
$\ln f_{ik}$	1.1400	1.1571	-1.6040	4.2720
D_k^{hub}	0.36250	0.0000	0.0000	1.0000
$\ln x_{ik}$	7.1990	7.1983	4.9924	10.041
$\ln D_k$	6.9970	7.0591	4.8598	7.9099
DV_k^{NP}	0.15090	0.0000	0.0000	1.0000
$\ln HHI_k$	8.4881	8.3504	8.1117	9.4752

Table 2
Descriptive statistics (continued)

	Standard Dev.	V.C.	Asymmetry	Exc. Kurt.
$\ln P_{ik}$	0.30676	0.058038	-0.36787	-0.33244
DV_{ik}^{att}	0.27639	3.3167	3.0151	7.0909
$\ln Pob_k$	0.76525	0.047124	-0.30230	-0.28421
$\ln y_{ik}$	0.17715	0.036181	0.016583	-0.73943
$\ln f_{ik}$	0.88482	0.77614	-0.014890	0.098906
D_k^{hub}	0.48074	1.3262	0.57206	-1.6728
$\ln x_{ik}$	0.86284	0.11986	0.17381	-0.24133
$\ln D_k$	0.64878	0.092723	-0.74752	0.041829
DV_k^{NP}	0.35797	2.3722	1.9505	1.8045
$\ln HHI_k$	0.34666	0.040841	1.2405	0.16556

Table 3
Descriptive statistics (continued)

	5% Perc.	95% Perc.	IQR	Miss. Obs.
$\ln P_{ik}$	4.7435	5.7411	0.44711	0
DV_{ik}^{att}	0.0000	1.0000	0.0000	0
$\ln Pob_k$	14.877	17.483	1.0931	0
$\ln y_{ik}$	4.6052	5.1722	0.27778	0
$\ln f_{ik}$	-0.35664	2.5937	1.2088	20
D_k^{hub}	0.0000	1.0000	1.0000	0
$\ln x_{ik}$	5.8102	8.6126	1.2461	0
$\ln D_k$	5.6498	7.8318	0.94497	0
DV_k^{NP}	0.0000	1.0000	0.0000	0
$\ln HHI_k$	8.1479	9.2103	0.31790	0

Prices, the existence of alternative means of transportation, the population, the income, the frequencies and the existence of a hub airport all affect the air transport demand

Table 4
Results of the estimate for the demand equation

Dependent variable: $\ln x_{ik}$

Explanatory variables	Coefficient	Standard Dev.	Z	P Value
Constant	4.07149	0.154231	26.40	5.21e-150 ***
$\ln P_{ik}$	-0.623426	0.0163412	-38.15	1.95e-303 ***
$\ln f_{ik}$	0.661679	0.00553928	119.5	0.0000***
$\ln y_{ik}$	0.817748	0.0250232	32.68	5.14e-226***
$\ln \text{Pop}_k$	0.100006	0.00570539	17.53	4.44e-068 ***
DV_k^{att}	-0.229193	0.0222333	-10.31	7.87e-025 ***
D_{hub_k}	0.167571	0.00867923	19.31	5.10e-082***

Adjusted R²: 0.62

P Value (from F): 0.0000

Table 5
Results of the estimate for the price equation

Dependent variable: $\ln P_{jk}$

Explanatory variables	Coefficient	Standard Dev.	Z	P Value
Constant	2.20075	0.120543	18.26	1.24e-073 ***
$\ln x_{jk}$	-0.0734962	0.00298870	-24.59	7.77e-131 ***
$\ln D_k$	0.289717	0.00322225	89.91	0.0000 ***
$\ln f_{jk}$	0.0149730	0.00296448	5.051	4.45e-07***
$\ln \text{HHI}_k$	0.189193	0.0129974	14.56	1.16e-047***
DV_k^{NP}	-0.241251	0.0125118	19.28	8.22e-082 ***

Adjusted R²: 0.44

P Value (from F): 0.0000

Analyzing the data in Table 4, we can see that the explanatory variables have the expected sign and are significant at 1%. In this manner, it is shown that prices, the existence (or lack thereof) of alternative transport, population, income, frequencies and the existence (or lack thereof) of a hub airport are important determining factors in the air transport demand in the United States of America.

Given that the variables in both equations have been estimated by logarithmic transformations, we can make an interpretation in the form of elasticities.

By first analyzing the effect of prices (P_{ik}) on the estimate for the demand equation, a 1% increase would result in a 0.62% decrease in the volume of transported passengers (x_{ik}), which is entirely reasonable. Furthermore, the existence of competitive alternative transportation, DV_k^{att} , triggers a 22% decrease in the number of passengers transported by air.

Table 6

U.S. domestic market routes that form the sample used

Origin	Destination	Origin	Destination	Origin	Destination
Atlanta	Boston	Boston	Seattle	Dallas	Los Angeles, CA
Atlanta	Charlotte	Boston	Tampa, FL	Dallas	Miami, FL
Atlanta	Chicago	Boston	Washington	Dallas	Minneapolis
Atlanta	Dallas	Charlotte	Chicago	Dallas	New York City
Atlanta	Denver	Charlotte	Dallas	Dallas	Orlando, FL
Atlanta	Detroit, MI	Charlotte	Denver	Dallas	Philadelphia, PA
Atlanta	Houston, TX	Charlotte	Detroit, MI	Dallas	Phoenix
Atlanta	Las Vegas, NV	Charlotte	Houston, TX	Dallas	Portland, OR
Atlanta	Los Angeles, CA	Charlotte	Las Vegas, NV	Dallas	Salt Lake City, UT
Atlanta	Miami, FL	Charlotte	Los Angeles, CA	Dallas	San Diego, CA
Atlanta	Minneapolis	Charlotte	Miami, FL	Dallas	San Francisco, CA
Atlanta	New York City	Charlotte	Minneapolis	Dallas	Seattle
Atlanta	Orlando, FL	Charlotte	New York City	Dallas	Tampa, FL
Atlanta	Philadelphia, PA	Charlotte	Orlando, FL	Dallas	Washington
Atlanta	Phoenix	Charlotte	Philadelphia, PA	Denver	Detroit, MI
Atlanta	Portland, OR	Charlotte	San Francisco, CA	Denver	Houston, TX
Atlanta	Salt Lake City, UT	Charlotte	Tampa, FL	Denver	Las Vegas, NV
Atlanta	San Diego, CA	Charlotte	Washington	Denver	Los Angeles, CA
Atlanta	San Francisco, CA	Chicago	Dallas	Denver	Miami, FL
Atlanta	Seattle	Chicago	Denver	Denver	Minneapolis
Atlanta	Tampa, FL	Chicago	Detroit, MI	Denver	New York City
Atlanta	Washington	Chicago	Houston, TX	Denver	Orlando, FL
Boston	Charlotte	Chicago	Las Vegas, NV	Denver	Philadelphia, PA
Boston	Chicago	Chicago	Los Angeles, CA	Denver	Phoenix
Boston	Dallas	Chicago	Miami, FL	Denver	Portland, OR
Boston	Denver	Chicago	Minneapolis	Denver	Salt Lake City, UT
Boston	Detroit, MI	Chicago	New York City	Denver	San Diego, CA
Boston	Houston, TX	Chicago	Orlando, FL	Denver	San Francisco, CA
Boston	Las Vegas, NV	Chicago	Philadelphia, PA	Denver	Seattle
Boston	Los Angeles, CA	Chicago	Phoenix	Denver	Tampa, FL
Boston	Miami, FL	Chicago	Portland, OR	Denver	Washington
Boston	Minneapolis	Chicago	Salt Lake City, UT	Detroit, MI	Houston, TX
Boston	New York City	Chicago	San Diego, CA	Detroit, MI	Las Vegas, NV
Boston	Orlando, FL	Chicago	San Francisco, CA	Detroit, MI	Los Angeles, CA
Boston	Philadelphia, PA	Chicago	Tampa, FL	Detroit, MI	Miami, FL
Boston	Phoenix	Chicago	Washington	Detroit, MI	Minneapolis
Boston	Portland, OR	Dallas	Denver	Detroit, MI	New York City
Boston	Salt Lake City, UT	Dallas	Detroit, MI	Detroit, MI	Orlando, FL
Boston	San Diego, CA	Dallas	Houston, TX	Detroit, MI	Philadelphia, PA
Boston	San Francisco, CA	Dallas	Las Vegas, NV	Detroit, MI	Phoenix

Table 6 (continued)

U.S. domestic market routes that form the sample used

Origin	Destination	Origin	Destination	Origin	Destination
Detroit, MI	Salt Lake City, UT	Los Angeles, CA	Phoenix	Orlando, FL	Philadelphia, PA
Detroit, MI	San Diego, CA	Los Angeles, CA	Portland, OR	Orlando, FL	Phoenix
Detroit, MI	San Francisco, CA	Los Angeles, CA	Salt Lake City, UT	Orlando, FL	Portland, OR
Detroit, MI	Seattle	Los Angeles, CA	San Francisco, CA	Orlando, FL	Salt Lake City, UT
Detroit, MI	Tampa, FL	Los Angeles, CA	Seattle	Orlando, FL	San Diego, CA
Detroit, MI	Washington	Los Angeles, CA	Tampa, FL	Orlando, FL	San Francisco, CA
Houston, TX	Las Vegas, NV	Los Angeles, CA	Washington	Orlando, FL	Seattle
Houston, TX	Los Angeles, CA	Miami, FL	Minneapolis	Orlando, FL	Washington
Houston, TX	Miami, FL	Miami, FL	New York City	Philadelphia, PA	Phoenix
Houston, TX	Minneapolis	Miami, FL	Orlando, FL	Philadelphia, PA	Salt Lake City, UT
Houston, TX	New York City	Miami, FL	Philadelphia, PA	Philadelphia, PA	San Diego, CA
Houston, TX	Orlando, FL	Miami, FL	Phoenix	Philadelphia, PA	San Francisco, CA
Houston, TX	Philadelphia, PA	Miami, FL	Portland, OR	Philadelphia, PA	Seattle
Houston, TX	Phoenix	Miami, FL	Salt Lake City, UT	Philadelphia, PA	Tampa, FL
Houston, TX	Portland, OR	Miami, FL	San Diego, CA	Phoenix	Portland, OR
Houston, TX	Salt Lake City, UT	Miami, FL	San Francisco, CA	Phoenix	Salt Lake City, UT
Houston, TX	San Diego, CA	Miami, FL	Seattle	Phoenix	San Diego, CA
Houston, TX	San Francisco, CA	Miami, FL	Tampa, FL	Phoenix	San Francisco, CA
Houston, TX	Seattle	Miami, FL	Washington	Phoenix	Seattle
Houston, TX	Tampa, FL	Minneapolis	New York City	Phoenix	Tampa, FL
Houston, TX	Washington	Minneapolis	Orlando, FL	Phoenix	Washington
Las Vegas, NV	Los Angeles, CA	Minneapolis	Philadelphia, PA	Portland, OR	Salt Lake City, UT
Las Vegas, NV	Miami, FL	Minneapolis	Phoenix	Portland, OR	San Diego, CA
Las Vegas, NV	Minneapolis	Minneapolis	Portland, OR	Portland, OR	San Francisco, CA
Las Vegas, NV	New York City	Minneapolis	Salt Lake City, UT	Portland, OR	Seattle
Las Vegas, NV	Orlando, FL	Minneapolis	San Diego, CA	Salt Lake City, UT	San Diego, CA
Las Vegas, NV	Philadelphia, PA	Minneapolis	San Francisco, CA	Salt Lake City, UT	San Francisco, CA
Las Vegas, NV	Phoenix	Minneapolis	Seattle	Salt Lake City, UT	Seattle
Las Vegas, NV	Portland, OR	Minneapolis	Tampa, FL	Salt Lake City, UT	Washington
Las Vegas, NV	Salt Lake City, UT	Minneapolis	Washington	San Diego, CA	San Francisco, CA
Las Vegas, NV	San Diego, CA	New York City	Orlando, FL	San Diego, CA	Seattle
Las Vegas, NV	San Francisco, CA	New York City	Phoenix	San Diego, CA	Tampa, FL
Las Vegas, NV	Seattle	New York City	Portland, ME	San Diego, CA	Washington
Las Vegas, NV	Tampa, FL	New York City	Portland, OR	San Francisco, CA	Seattle
Las Vegas, NV	Washington	New York City	Salt Lake City, UT	San Francisco, CA	Tampa, FL
Los Angeles, CA	Miami, FL	New York City	San Diego, CA	San Francisco, CA	Washington
Los Angeles, CA	Minneapolis	New York City	San Francisco, CA	Seattle	Tampa, FL
Los Angeles, CA	New York City	New York City	Seattle	Seattle	Washington
Los Angeles, CA	Orlando, FL	New York City	Tampa, FL	Tampa, FL	Washington
Los Angeles, CA	Philadelphia, PA	New York City	Washington		

Demand, distance, competition, the number of frequencies and the Herfindhal index have an impact on the establishment of air transport prices

With regard to demographic factors, a 1% increase in the population would increase the passenger volume by 0.10%.

In turn, elasticity of the demand as compared to income is 0.81. In other words, with a 1% increase in income, the number of passengers transported would increase by 0.81%.

Moreover, the elasticity of the demand as compared to the number of frequencies is 0.66. That is to say that a 1% increase in frequencies suggests a 0.66% increase in the number of passengers. Finally, and analyzing the effect a hub airport has on overall traffic, we can conclude that this variable has a value of 0.16, which implies that the existence of this type of airports contributes to increasing the passenger volume by as much as 16%.

Analyzing the data in Table 5, we can see that the explanatory variables have the expected sign and are significant at 1%. In this way, it is shown that demand, distance, whether or not there is competition, the number of frequencies and the Herfindhal index are important determining factors in the establishment of air transport prices in the United States of America.

Price elasticity with regard to the demand is -0.07 , i.e., with a 1% price increase, the demand for air transport would be affected by a drop of 0.07%.

The coefficient of the distance variable, D_k , has a value of (0.28). A priori, this effect is the opposite of what is expected and could reveal diseconomies of scale, as the greater the distances, the higher the prices are.

The elasticity of the price to the number of operators is significant and has a negative sign (-0.24). This implies that if more than one operator is competing on a route, the price per mile decreases by 24%.

With regard to the coefficient of the daily frequencies variable with regard to the market average, it is significant at 1% and with a value of (-0.01), i.e., the greater the frequencies, the lower the prices.

Finally, the Herfindhal index shows a value of 0.18, in other words, with every 1% increase in the concentration index, the prices will tend to increase by 0.18%.

7. Conclusions

This article has provided an original theoretical model for airlines in the air transport market in the United States. A theoretical model of competition among airlines has been empirically tested by estimating two equations of demand and price fixing.

This estimation was carried out for 239 routes and 23 airports, which represents 90% of the total traffic, measured in terms of the number of passengers transported.

The econometric analysis of this study has served to be able to provide estimates of the elasticities of demand and price fixing with regard to frequencies, which allows us to introduce the new concept of “frequency economics” for the airlines. It also provides elasticities of demand with regard to price and income.

The most interesting result, in our opinion, is that the frequencies variable shows a positive elasticity (0.66). This implies that the greater the number of frequencies, the more possibilities

Regulators should support increased frequencies, since there are seen as greater service quality, thus generating greater demand

consumers have to save time and thus increase their incomes, which in turn will result in a greater demand for air transport.

This result fully coincides with most of the previously cited authors, especially Ippolito (1981), whose demand function had a value of 0.75 for its frequencies variable.

After income, the frequencies variable in this case is identified as the most important variable when generating passengers, which is consistent with most of the results presented by the scientific literature in this field, especially in the most recent times (Mohammadian et al., 2019).

The proper scheduling of the frequencies can be considered a key parameter when evaluating the quality of airline services, since one of the major attributes of quality, according to the scientific literature, is the number of frequencies that are offered by the airlines. Accordingly, a low level of frequencies can cause the market share of the airlines to drop, and thus a loss in passenger demand.

On the contrary, an increase in frequencies reduces the total travel time for passengers and increases demand. As a result, there is a trend to compete to offer more frequencies and thus attain greater market power.

On the price side, the frequencies variable on each route, f_{ik} , also reflects a positive effect on costs, and therefore on prices. However, the price increases are not proportional, rather given the estimated value of the elasticity (0.014), 100% increases in the frequencies only produce increases of 1.4% in price.

This means that there are “frequency economies”, understood to mean those situations in which the 100% increases in the number of frequencies produce increases in costs that are less than 100% and therefore make it possible to increase prices in proportions of less than 100%.

This paper not only provides a tool to support the decisions of airline managers to determine flight frequencies and the airfares offered, it also estimates the key variables in generating demand and in determining prices such as income, the population, distance or the Herfindahl index.

The political economic recommendations drawn from our results is that regulators should support the increase in frequencies, since these are seen as greater quality in the service offered and generate a greater demand. However, the limited capacity of airports to absorb this increased number of flights must also be taken into consideration. This challenge faced by managers to assign airport capacity to the airlines could be a future line of research to consider.

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The impact of culture on sustainable development

Alicia Paola Partida Hernández

University Center for Economic-Administrative Sciences (CUCEA). University of Guadalajara. Mexico.

ORCID: [0000-0002-8832-4629](https://orcid.org/0000-0002-8832-4629).

aliciapaolaph@gmail.com

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Abstract

Culture plays an essential role in the sustainable and economic development of cities. There are currently more and more cities that recognize their importance and include it in their development plans, thus demonstrating its transversality. However, the prevailing question is how to measure its impact. In this sense, an alternative proposal to the UNESCO Culture for Development Indicators (CDIS) for evaluation is presented, consisting of 27 indicators organized in seven categories. The model is applied in the cities of Stockholm, Bilbao, and the Guadalajara metropolitan area (ZMG, consisting of the municipalities of Guadalajara, San Pedro Tlaquepaque, Zapopan, Tlajomulco de Zúñiga, Tonalá and El Salto). These cities have been chosen for their public policies and the cultural and creative projects that have been carried out there in recent decades. Lastly, the results show that cities that position culture in a cross-cutting manner achieve greater sustainable development.

Key words

Culture, creative economy, cultural and creative industries, sustainable development and creative cities.

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1. Introduction

Over the last two decades, much has been said about the importance of the creative economy for cities. An increasing number of economists, internationalists, sociologists, political scientists, cultural managers, local governments and international institutions have shown interest in the relationship between sustainable development and culture. In this sense, it would be thought that the questioning of the relationship between culture and economy considered during the 60s has been relegated to the past (Baumol & Bowen, 1966). Two decades ago, in his book “Economics and culture” (2001), David Throsby pondered the type of relationship that exists between culture and economy, and if there is one, what type it would be. In conjunction with this questioning, theorists such as Adorno and Horkheimer (1994) and Yúdice (2002) reflect on the commercialization of culture and how this has incorporated other manifestations (creativity and technology), becoming the so-called “cultural and creative industry.”

And more than two decades later, the question raised by academia and cultural managers in international forums is still how to measure culture in terms of development, and at the same time, convince local governments that it is not just any other industry with the capacity to revive an economy.

2. Culture, a concept in constant evolution

One of the main difficulties that people involved in the cultural economy and Creative and Cultural Industries (CCIs) face is defining what is understood by culture. As William (1958, p. 87) points out, “The word culture is exceptionally complex, the second or third most complex word in the English language.” Meanwhile, the United Nations Educational, Scientific and Cultural Organization (UNESCO), in the Mexico Declaration on Cultural Policies, Mondiacult (1982), states:

“...Culture might be considered at present as the combination of distinctive features, spiritual and material, intellectual and affective, that characterize a society or a social group. It encompasses, in addition to humanities and the arts, ways of life, fundamental rights of human beings, value systems, traditions and beliefs... And that culture bestows humans with the capacity for reflection on himself/herself. It makes us as beings, specifically humans, rational, critical and ethically committed. Through it, we discern values and make options. Through it, humans express, become aware of themselves and recognize themselves as an unfinished project, questioning their own fulfillment, looking tirelessly for new meanings and creating works which transcend them...”

UNESCO (1982).

The definition proposed by UNESCO has been adopted by different cities, which also shows the amplitude that it encompasses, and as it is related to people's manifestations, it will be in constant evolution. Nevertheless, establishing a unique definition is not the main obstacle; related to this is the determination of the value of culture. Authors like Frey (2000, pp. 15-16) and Throsby (2001, pp. 43-44) indicate the following 12 values: authenticity, existence, prestige, education, legacy, option or choice, economic, spiritual, aesthetic, historical, symbolic and social. Of the 12 values identified, the economic value is the easiest to quantify; however, it is not possible to reduce the contribution of culture to development by considering this value alone. Another question then arises: does culture coincide with the logic of economics? Pollak

Traditionally, the cultural sector has attempted to keep the distance between it and politics

(1970, pp. 745-763) speaks about the formation of the cultural habit, while Heilbrun and Gray (2004, p. 75) mention that in the case of arts, it is different, due to the fact that art is an acquired taste, “in the sense that, one must expose himself/herself to art to develop taste, and perhaps be exposed to the right circumstances and for a longer period of time.” Thus, to boost cultural consumption and production, people must be helped through different public strategies and policies.

3. Culture and public cultural policies

The expansion of the entire industry surrounding the field of culture and creativity has promoted an approximation to both the world of politics and decision-makers in cultural management. As for Miralles (2005), he points out two aspects, the first of which is the increasing importance of culture and the risk of leaving it in the hands of cultural policies; the second is that culture generates wealth, but wealth does not generate culture. Along this same line, Fernández (1991, p. 15) indicates two risks: the first one is the politicization of culture and second one is the evocation of a cultured policy. Traditionally, the cultural sector has sought to maintain the distance from politics, arguing the risk of censure and the fact that it might be used only as a political resource to generate wealth and soft power.

There is no point of agreement about the origin of public cultural policies, but in an attempt to present a starting point, we can indicate the situation at the end of World War II, as this period is characterized by fragmentation in the structures of the states, the need to reactivate economies that were damaged by the war, rebuild the devastated (mainly European) cities and lay the foundations for a solid welfare state. For Fernández (1991, p.33), there are five factors that modified the relationship between the government and the cultural realm, which are mentioned in Table 1.

Table 1
Factors of change in the relationship between the government and the cultural realm

Factors	Description
1 Decolonization processes.	With the recognition of the independence of the States that had the status of colonies begins a period of self-reappraisal.
2 The crisis produced in the artistic market by new means of dissemination and reproduction of cultural creations.	The incursion of new media forced us to rethink the market system and its structures.
3 The welfare demands of the middle classes.	The postwar crisis increased the number of middle and lower class people, who demanded greater access to culture, which implied an increase in funding and patronage.
4 The dominant presence of positive political attitudes towards a greater role of the welfare state for citizens.	Derived from the crisis, the need to restore the welfare state became imperative, with the aim of offering people better living conditions.
5 The need to provide a response to the lack of social cohesion revealed the manipulation of public opinion during the war.	Both States and individuals required the presence of social cohesion, which favored coexistence.

Source: Author's own work; Fernández (1991, p. 33).

Culture and politics are two realms that constantly interact, leading to a coexistence that demands cooperation from both

Having observed the five factors of change between the government and the cultural realm, it is inferred that culture was not considered an element that helps to consolidate sustainable development, but rather as just another element; and that in a postwar situation, culture was not seen as a priority, and it was far from being seen as a large industry with the capacity to regenerate cities.

Miller and Yúdice (2004, p. 12) offer a reflection on the relationship between culture and politics, specifying that this occurs in two aspects, the first of which is the aesthetic, which arises from people's creativity and it is valued from a critical and historical-cultural approach; culture is thus considered a differentiating indicator of tastes and status. Meanwhile, the second is the anthropological, which situates culture as an indicator that reflects the way in which one lives. Along the same lines, Sanz (1991) establishes the following definition:

“A cultural policy is a coordinated action oriented towards multiple objectives that allows the fulfillment of strategic social functions, has as its horizon the expressiveness and creativity of multiple persons and groups, and is an important instrument of social and political growth.”

(Sanz, 1991, p. 33).

Both Miller and Yúdice (2004) focus on the characteristics and objectives of cultural policies, acknowledging their importance for social and political growth. Nevertheless, this approach remains at the level of growth and not sustainable development. Another definition mentioned is that proposed by Fernández (1991), noting that although it is not an official UNESCO definition, it is the one used in the framework of meetings:

“The representatives of the round table on cultural policies have decided by common agreement not to commit themselves to the search for a definition of culture; the representative of the managing director had deemed it necessary to issue the reminder that it was not up to UNESCO to replace the States in the definition of their cultural policy. It has been judged preferable to a) understand “cultural policy” as a set of conscious and deliberate social practices, of interventions or the absence of interventions aimed at satisfying certain cultural needs through the optimal use of all the material and human resources available to a society at that time; b) specify certain criteria of cultural development and link culture to personality enrichment and to economic and social development.”

(Fernández, 1991, pp. 18-19).

The previous theoreticians maintain a critical posture towards the relationship between the cultural and the political realms, since the latter can permeate and condition the freedom of artistic expression and creativity or be at the service of the State. However, the current international situation, the growth of the CCIs and the high economic flows that it generates have accelerated this rapprochement. Despite the reluctance of previous theoreticians, it is recognized that culture and politics are two realms that constantly interact, giving way to a coexistence that demands cooperation between both of them. This is a fundamental factor to establish public policies outlined in a model of sustained development, based on culture.

Each State has adopted and developed a unique model of cultural politics

Each state has adopted and developed a unique model of cultural policy under which protection, subsidies and support have been provided to manifestations considered as priorities, and therefore these decisions directly affect cultural production and development. It should be noted that cities wishing to adopt a sustainable development model, positioning culture as a cross-cutting element, must focus their development plans on favoring culture and development. Otherwise it will simply constitute support for an industry, just like any other.

4. Culture as an element of sustainable development

The first studies on sustainable development emerged in the 1980s and were conducted by economists, focusing on economic growth, social inclusion and the environmental balance.

In the report *Our Common Future* (UN, 1987), known as the Brundtland Report, it was stated that, in order to achieve sustainable development, States must base their actions on economics, social inclusion and governance. This concept of development is based on that established by the Organization for Economic Cooperation and Development (OECD). Thus, States must not compromise their environmental resources. By 1992, at the Earth Summit, the three pillars of sustainable development were discussed: economics, social inclusion and governance.

In the early conceptions, culture was not regarded as a pillar of sustainable development. The perception that people had of culture was limited, and remained that way until 2001, when the article 3 of the UNESCO Universal Declaration on Cultural Diversity stated:

“Cultural diversity broadens the choice provided to everyone: it is one of the sources of development, understood not only in terms of economic growth, but also as a means of access to a satisfactory intellectual, affective, moral and spiritual existence.”

Despite academic efforts to demonstrate the importance of culture in sustainable development, it is not until 2005 that UNESCO officially speaks of re-evaluating development policies and including culture in them. Likewise, Article 13 of the Convention on the Protection and Promotion of the Diversity of Expressions states:

“Parties shall endeavor to integrate culture in their development policies at all levels for the creation of conditions conducive to sustainable development and, within this framework, foster aspects relating to the protection and promotion of the diversity of cultural expressions.”

(UNESCO, 2005, p. 8).

Currently, the discourse on the contribution and importance of culture appears frequently in the documents by the UN and UNESCO. The UN General Assembly at the Millennium Development Goals Follow-up Summit entitled “Keeping up the Promise: United to Achieve the Millennium Development Goals” held in 2010 mentions in section 66 that “We consider the cultural dimension to be important for development. We encourage international cooperation in the field of culture, aimed at achieving developmental goals.”

Culture, being multifaceted, cannot be seen as an associated element

And even though the role performed by culture in the sustainable development of society is recognized, there are two challenges: the first is to establish indicators that verify the level of impact and, the second, it must be ensured that these indicators can be used in every State.

Like the concept of culture, the concept of development has also evolved, reconsidering its foundations and bringing about changes in government actions. Hawkes (2001), in turn, proposes that culture constitutes the fourth pillar of sustainable development, and it is since then that work has been done to include culture in government actions. However, it is observed that there is still a Europeanist vision of development, which continues to be measured with the same indicators.

There are criticisms of the model proposed by Hawkes (2001); authors such as Miralles (2005) and Throsby and Withers (1979) do not contemplate culture as simply another element, but rather as a cross-cutting element, linked to and influencing the economy, social inclusion and governance. Thus, as culture has a polymorphic characteristic, it cannot be seen as an associated element, but rather as an integral element, directly linked to sustainable development.

Political actions function as a geared system, in which each piece is fundamental to consolidate sustainable development, and culture is an inherent factor in each element. Therefore, it is necessary to conceive of sustainable development with a holistic vision, which implies rethinking its conception.

There has thus been a constant evolution since the 1930s, in which the concept of culture has evolved, opening up to more and new manifestations, public spaces, taking the art of museums and private collections to the streets. Two decades later, the first studies in Sweden appear with Andersson (1985a, 1985b, 1985c), who relates culture and creativity to development.

In the 1990s, cities began to stand out on an international level; it is then that terms such as creative, intelligent or sustainable cities arise (Martine & Marshall, 2007; Landry, 2012), leaving behind the so-called global cities (Sassen, 2001). Culture and creativity, as argued by Hawkes (2001) and Nurse (2006), form the fourth pillar of development, while Throsby (2001) affirms that it is not just another pillar, but rather a cross-cutting element.

5. Innovative industries: the Cultural and Creative Industries. What they are, and why they attract cities

Since the 1980s, an increase has been observed in the role of culture in the sustainable development of cities through the so-called CCIs, a sector that has unique characteristics that do not follow traditional economic logic. This has created a new economy, representing a new model of sustainable development.

CCIs emerge from people's imagination and ideas. They are thus what creates and modifies traditional forms of industry and also reconsiders the concept of sustainable development (Gray, 2007). As Hartley (2005, p.4) argues, "Creativity can have decisive social and economic effects." Thus, creativity has become an industry with the capacity to regenerate cities and create clusters (Scott, 2000 and 2010).

Creativity has become an industry with the capacity to regenerate cities and create clusters

CCIs are changing the way the industries, dynamics of local governments and their paradiplomacy are understood, and are creating new actors in cultural diplomacy, new jobs and new models of city projection. As UNESCO notes:

“Creative industries are an increasingly important component of knowledge-based post-industrial economies. Not only do they contribute to economic growth and job creation, but they also act as vehicular elements for the transmission of cultural identity, which is an essential aspect for the diffusion and promotion of cultural diversity.”

(UNESCO, 2006).

In this context, CCIs seem to integrate an amorphous figure in which there is room for any innovative and creative cultural manifestation or production, and thus it is changing and represents a challenge for the classic structures of the cultural public policies. The growth of CCIs over the last two decades has generated important economic flows worldwide. According to the world map of CCIs, revenues of 2.25 trillion USD and 29.5 million jobs were recorded in 2015 (EY, 2015, p. 8).

The CCIs might be a catalyst for urban development since projects such as museums, performance centers, creative complexes and urban art, among other manifestations, help to create both a new image and the brand of a city. However, it should be noted that owning a franchise museum recognized worldwide is no guarantee of success; that is to say, a museum by itself does not generate development. For example, the Guggenheim Museum in Bilbao is not the engine of development and economy of the city, although it is a strong attraction for tourists and foreign students. The success in Bilbao was based on the commitment to an articulated development plan, which had the CCIs as a cross-cutting theme, and in which different actors have participated, as shown in the document *Culture as an economic and society-transforming engine in Bilbao* (Bengoetxea, 2014, pp. 4-5), as part of the BCreative program. As Bengoetxea states:

“The policies of the 1990s focused on establishing the necessary conditions to turn Bilbao into the city of service it is today (67% of economic activity corresponds to the services sector and 24% to the industrial sector). To this end, the strategy materialized through significant investments in infrastructure and cultural equipment to take advantage of the urban opportunities generated for the dismantling of industry and the reform of the port and railway infrastructures.”

Bengoetxea (2014, p.2).

One indicator associated with the impact of industry is the generation of jobs; however, one of the characteristics of the CCIs is that the bulk of them are micro and medium-sized companies, so it would either require a significant number of companies to generate a large number of jobs or establishing a cross-cutting action plan linking companies and different sectors together, generating a network of beneficial actions for local development. There are industries within the CCIs, such as the cinema industry, which alone generate large revenue streams, but it is different with other industries, such as museums, libraries, literature, painting or photography.

CCIs are changing how we understand industries, the dynamics of local governments and their paradiplomacy

So far, culture, its position in sustainable development and the relationship with public policies have been discussed. The following section will show the proposed model to measure its impact on sustainable development.

6. Cultural indicators

The characteristics of CCIs make it hard to quantify the non-economic aspects, and thus measure its impact on sustainable development. Faced with this challenge, different indicators and monitors have been developed, based on the different classifications of the CCIs. Social indicators originated in the 1960s in the United States in order to determine the social consequences of the American Space Agency's space program. At that point there was no theoretical framework or methodology that would permit a detailed quantitative analysis; it is then that the work *Social Indicators* by R. Bauer (1966) established the first social indicators (García, 2000).

For Fukuda (2001, p. 82), the indicators "are a tool of political dialog, which must contain information that serves to evaluate certain matters of current interest." It is easy to understand why different cultural indicators are presented if we start from the principle that there is no one definition of CCIs, and that the industry is in constant evolution, and therefore so are the indicators. One of the first observations by Fukuda regarding the development policies was the absence of the cultural factor and, after two decades of debates, finally there is talk of culture as a fourth pillar of sustainable development, which requires a reconsideration of the concept of development and the factors that have an impact on it.

A little over five decades later, the difficulties in establishing cultural indicators still continue. Attempts by UNESCO to establish them began in 1972 at the Intergovernmental Conference of Cultural Policies in Europe, held in Helsinki. Here cultural policies and the contributions of culture to development were discussed. Point 20 indicates: "The conference unanimously recognized that cultural development was an integral part of overall development and that cultural policy was an essential factor in each nation's social and economic development" and adds in Point 22 "[...] The relationships between culture, work and the use of free time that were also the subject of numerous considerations, demand new reflections in the perspective of the cultural dimension of social life." Later, the Conference on Science and Technology for Development held in Vienna (1979) on cultural indicators and their characteristics said in Section 9:

- "They must be capable of offering the global characteristics of the cultural development of society as a whole and identifying its inequalities."
- "They must help in the classification of the cultural sectors and must indicate comparable traits."
- "They must identify the causes of cultural development, thus making it easier to decide which variables have an influence on development to achieve the proposed objectives."

However, it is not until 1982 at the World Conference on Cultural Policies when the Mondiacult Declaration on Cultural Policies emerged, which included cultural statistics. In 1986 the *Framework for Cultural Statistics* was published, which proposed an early framework for the construction of cultural statistics that considered nine categories, corresponding to a situation in which CCIs were not mentioned yet. It therefore only contemplated categories related to culture, leaving aside factors such as tolerance, democratic access, etc. UNESCO, along with the Spanish government, presented the *UNESCO Indicators of Culture for Development (UICD)*

CCIs can be a catalyst for urban development

(2014), which reflected a broader amplitude of categories considered within the CCIs, as well as the environment that must exist.

In spite of the different attempts to create cultural indicators and their impact on the economy and sustainable development, in 1996 the European Union created the Eurostat initiative; however, deficiencies still exist in these indicators. As mentioned by Cardona (1995) “the statistical indicators are plagued by problems related to social issues, definitions, methodologies and frequencies.” Unlike the demographic or economic indicators, which have a more developed theoretical basis, the CCIs are lacking in this regard, as they are still seen from an economic - or even at times political - perspective, which makes it difficult to see them from a purely cultural and creative perspective. Thus, CCI statistics have yet to be recognized that are based on cultural and creative theories. An economic focus prevails in those that have been proposed, leaving aside the six cultural values indicated by Throsby (2001, pp. 43-44).

7. Proposal of an alternative model to measure the impact of culture on development

The UICD represent an early attempt to measure the impact of culture on development. They are currently in an early pilot phase in the countries of Bosnia and Herzegovina, Burkina Faso, Colombia, Cambodia, Ecuador, Namibia, Peru, Swaziland, Uruguay and Vietnam, and it should be noted that no country in North America, Western Europe or Australia has been selected, nor has any developing country. Two observations that come from an analysis of the UNESCO UICD are the prevalence of a focus on developed western countries and that there is no grouping based on factors like GDP, population level or infrastructure. The UICD do not consider factors like urban planning, registered patents or political climate, or even the percent of subsidies, which are factors that impact the development of the CCIs.

The creation of an indicator is thus proposed that provides a cross-cutting vision of culture and that coincides with the current concept of sustainable development. For this purpose, several indicators and theoretical proposals have been reviewed, such as the reviews by De Beukelaer (2015), who maintains that the UICD model established by UNESCO was designed to rebalance world trade relations, given the importance that the CCIs have come to have. This favors those sectors that contribute a larger economic percentage over those that contribute a greater spiritual, social, historic or symbolic value or greater authenticity (Throsby, 2001). It would thus be worthwhile to reconsider what is meant by sustainable development and how it is being measured.

Following the line proposed by De Beukelaer (2015), it can be stated that the characteristics of the CCIs do not permit a single focus of intervention to achieve them more quickly. This depends on the creativity of people, the political decisions regarding which sector to support, previously existing equipment and infrastructure, and the financial support of international and private organizations.

The aim of the model is not the trade rebalancing of the CCIs, or the identification of the main industries for the economic revival of a city, rather to evaluate the elements that have an impact on sustainable development, such as infrastructure, academic training focused on the CCIs, professional training, a prior cultural environment, security, tolerance, freedom of expression, protection of cultural heritage, openness to foreigners and communications networks. While the previous factors do not determine the success of a development model based on CCIs, they do favor, promote and support the development of creativity in people.

The main difference between the UICD model and the *extended model* is that in order to measure the impact of the CCIs on sustainable development, they must be grouped according to three factors: the GDP, level of population and infrastructure, since this makes it possible to establish subgroups and monitor the behavior of cities that share similar characteristics. The second difference lies in the number of indicators and categories that they consist of: the UICD are made up of 22 indicators (see Table 2), divided into seven categories.

Table 2
UICD indicators*

Category	Indicator
Economy	Contribution of cultural activities to the GDP
	Cultural employment
	Household expenditure on culture
Education	Inclusive education
	Multilingual education
	Arts education
	Training of professionals in the cultural sector
Governance	Regulatory framework in culture
	Political and institutional framework in culture
	Distribution of the cultural infrastructures
	Participation of civil society in cultural governance
Social participation	Participation in cultural activities outside the home
	Participation in cultural activities strengthening one's identity
	Tolerance of other cultures
	Interpersonal trust
	Free will
Gender equality	Inequality between men and women
	Perception of gender equality
Communication	Freedom of expression
	Internet access and use
	Diversity of fiction contents on public television
Heritage	Sustainability of heritage

Source: Author's own work (UNESCO, 2014).

*For more information on methodology, please consult the UICD methodology manual (2014).

Furthermore, the *extended model* (see Table 3) includes 27 indicators grouped into seven categories. The differences between each category are summarized below:

With regard to the Economy category (E), the percent of the subsidy to each sector of the CCIs is also considered, since there are cities in which the different CCIs depend on subsidies.

Table 3
Extended model

	Indicator	Description
Economy (E)	E1. Contribution of CCI-related activities to the GDP	Percentage of activities from the CCIs in the GDP
	E2. Employment generated from the CCIs	Percentage of employment from the CCIs as compared to the rest of the employed population
	E3. Household expenditures on Culture	Percentage of household income destined to CCI activities, goods and services, as compared to total consumer spending
	E4. Subsidy to each sector of the CCIs	Percentage of the subsidy in each of the sectors of the CCIs
Education (Ed)	Ed1. Multilingual education	Percentage of hours dedicated to promoting multilingualism
	Ed2. Arts education	Percentage of instructional hours dedicated to artistic training as compared to the total hours of instruction
	Ed3. Training of professionals in the ICT/CCI sector	Training index for professionals in the sector related to ICT/CCIs
	Ed4. Patents related to ICT/CCIs	Number of annual patents related to ICT/CCIs
	Ed5. Graduates in ICT/CCIs	Annual number of students earning a degree in an area related to ICT/CCIs
	Ed6. Foreigners graduating in ICT/CCIs	Annual number of foreign students earning a degree in an area related to ICT/CCIs
	Ed7. Exchange students related to ICT/CCIs	Annual number of exchange students in an area related to ICT/CCIs
	Ed8. Average ranking of the universities	Position of the universities in the ranking
Governance (G)	G1. Regulatory framework in culture	Development index of the regulatory framework for the protection and promotion of culture, cultural rights and cultural diversity
	G2. Political and institutional framework in CCIs	Development index of the political and institutional framework for the protection and promotion of CCIs
	G3. Participation of civil society in the governance of CCIs	Participation index of the representatives of CCIs in the formulation and execution of public policies
	G4. Security	Security index
Social participation (SP)	SP1. Participation in cultural activities outside the home	Percentage of the population that has participated at least once in a cultural activity outside the home in the last year
	SP2. Participation in activities related to the CCIs	Percentage of the population that has participated at least once in an activity related to the CCIs, strengthening their identity, in the last year
	SP3. Tolerance of other cultures and/or religions	Degree of tolerance that exists in a society with regard to persons of different cultural and religious origins
	SP4. Tolerance of the LGTBI collective	Degree of tolerance that exists in a society with regard to people belonging to the LGTBI collective
Gender Equity (GE)	GE1. Equality between men and women	Index of the disparity between men and women in educational, political, labor and legislative realms
	GE2. Perception of gender equality	Degree of positive evaluation of gender equality
Communication (C)	C1. Freedom of expression	Index of the freedom of the press in all areas
	C2. Internet access and use	Percentage of people who have access to and use the Internet
Heritage (H)	H1. Sustainability of the heritage	Degree of protection and promotion for the sustainability of heritage
	H2. Infrastructure	Number of museums, theaters, art galleries, forums, public spaces, workshops, libraries, spaces for the production of software, television, cinema, audio, radio, music, video games and fashion
	H3. Local and international connections	Existing local and international connections

Source: Author's own work.

The characteristics of the CCIs make it difficult to quantify non-economic aspects

The following differences are considered in the Education category (Ed): the training of professionals in the ICT/CCI sector, the number of patents related to ICT/CCIs, the number of graduates in ICT/CCIs, the number of foreigners graduated in ICT/CCIs, the number of exchange students related to ICT/CCIs and the university ranking.

In the Governance category (G), security is considered as a crucial indicator so that people can create and participate in manifestations related to CCIs, since insecurity negatively affects the quality of life of people, cultural activities in public and private places, and the capacity to attract exchange students, artists and tourism.

In terms of Social Participation (SP), tolerance of the LGTBI collective is considered a factor for coexistence, but also human rights and civil guarantees. However, it must not be seen merely as an area for attracting the pink economy, but rather as an area in which all people enjoy the same rights and civil guarantees.

There are no differences in the categories of Gender equality (GE) and Communication (C), in which the same indicators are considered. Meanwhile, in the category Heritage (H) the sustainability of the heritage, infrastructure and local and international connections are considered, since these three indicators make it possible to measure the effort of local governments to safeguard and maintain the local heritage in good condition, integrating communications and transportation connections.

For the development of the *extended model*, elements have been considered in relation to the economy, education, governance, social participation, gender equality, communication and heritage, which promote an environment conducive to the development of different manifestations included in the CCIs.

The theoretical review of the works of different authors has made it possible to reflect on the behavior of cities and CCIs. In turn, an analysis of the different development models made it possible to identify the positioning of culture and creativity, thus elucidating aspects with a direct and indirect impact.

Culture is not only causing the meaning of sustainable development to be reconsidered, it is also calling into question how it should be measured. The *extended model* does not intend to measure the impact of an industry on the economy or on development, rather it contemplates the multifaceted and cross-cutting nature of culture, which is precisely how this model breaks away from the traditional vision of culture. Local governments and the cultural agents involved are recommended to maintain a cross-cutting vision that takes into account aspects of the economy, education, governance, social participation, gender equity, communication and heritage.

8. Bilbao

Bilbao is the capital of Vizcaya, and forms part of the Autonomous Community of the Basque Country (Euskadi) in northern Spain. It has an area of 4,059 km² and a population of 342,481, according to 2016 figures provided by the Basque Institute of Statistics. Bilbao is the largest city in a metropolitan area consisting of 26 municipalities situated along the Bilbao estuary.

The founding of the Town of Bilbao dates back to around the year 1300, and its history has been linked to an industrial past based on mining, metal working and shipbuilding that prevailed during the 19th and 20th centuries (Bilbao Tourism (n.d.) and Bilbao Ría, 2000). With the decline of the industrial model and faced with the need for an economic revival and urban

Culture is not only reconsidering the meaning of sustainable development, but also the way in which it should be measured

renovation following the floods of 1983 and the shipyard crisis of 1985, Bilbao, according to Alayo, Henry and Plaza (2016), went through the following conditions:

“More than one hundred years of industrialization, combined with few regulations and environmental controls. The growth of the population and immigration in the 20th century dramatically expanded the existing urban areas at a pace that local planning authorities fought to contain. The effects of the profound socioeconomic crisis that followed the industrial decline in the late 1970s and 1980s, when a large part of Bilbao’s industry collapsed.”

(Alayo, Henry and Plaza, 2016, pp. 138-139).

Bilbao not only needed to reinvent itself, it also had to overcome problems derived from an eroded industry, a polluted estuary, the lack of urban planning, the instability generated by the terrorist attacks by Euskadi Ta Askatasuna (ETA), the interventions by the Anti-Terrorist Liberation Groups (GAL), the degradation of the social fabric caused by the high level of heroin consumption, unemployment and marginalization. Rodriguez (2002, p. 76) mentions that “Bilbao seemed hopelessly trapped in a process of unstoppable socioeconomic, demographic, environmental and functional collapse.” A change was needed and for this to occur, the participation of the Provincial Government, the Basque Government and society was essential. There was an express need for a transformation; as Azkuna says:

“Bilbao has had no choice but to transform itself, just like the metalworking industry and its port have had to do. Its revitalization strategy, which has opted for daring alternatives like the Guggenheim Museum, has been based on innovative elements such as urban marketing. To free itself of its image, pessimism and decline, the “new city” had to awaken its residents, instill hope and confidence, create focuses of attraction and “sell” its emerging reality.”

(Azkuna, 2001, p. 25).

Areso (2001, pp. 35-36), in turn, talks about an economic mutation and an ambitious urban renovation based on four pillars: 1) accessibility to the outside world and internal mobility within the metropolitan area, 2) environmental and urban regeneration, 3) investment in human resources and in values like knowledge, creativity, education and the capacity for initiative and 4) cultural centrality as an essential element of dynamism for the city and its external image.

Bilbao is working to consolidate its position on an international level, to be a reference in terms of CCI, to strengthen and attract the local and foreign creative class. The attractiveness of Bilbao is more than just a titanium building; it lies in its very essence, in its rapid reinvention, its streets, its gastronomy, its creativity, its innovation and its traditions.

9. Stockholm

Stockholm was founded in 1252 and is made up of 14 islands¹ along Lake Mälaren, connected by 57 bridges. It had a population of 1,372,565 people in 2012 and was named an

¹ Hässelby-Vällingby, Spånga-Tensta, Rinkeby-Kista, Bromma, Kungs-holmen, Norrmalm, Östermalm, Södermalm, Skärholmen, Hägersten-Liljeholmen, Alvsjö, Enskede-Arsta-Vantör, Farsta and Skarpnäck.

The adoption of this development model means that cities must formulate public policies that consider culture from a cross-cutting perspective

Alpha class global city by the GaWC in 2008². Cultural politics in Sweden since the 1960s have been based on the freedom of expression, participation and democracy, culture for everyone in all creative and cultural expressions. For Sweden, “societies need a strong cultural life. Through its potential to move and inspire, culture contributes to both the strengthening of individuals and the developing of society as a whole” (Swedish Arts Council, n.d.).

The trend in Swedish cultural politics of conceiving the artistic and creative sector as entrepreneurs has been strengthened with the support of microloans (Stallabrass, 2004). The development of Swedish cultural policies is linked to the Nordic model, and Nielsen (2008, pp. 15-16) maintains that the current model of CCIs in Sweden³ is based on the experience industry.

From the 1980s on, the CCIs have opened up to the private sector and since then, cultural politics have had the following objectives: to promote opportunities for everyone to experience culture, to participate in educational programs and to develop their creative skills, to promote artistic quality and renewal, to promote a dynamic cultural heritage that is preserved, used and developed, to promote accessibility, to promote international and intercultural exchanges and cooperation in the area of culture and to strengthen the right to culture of children and young people (Swedish Art Council, n.d.).

Stockholm is currently portrayed as a city that bases its cultural and creative development on sustainability, equity, tolerance and freedom. Observing the historic evolution of cultural policies in Stockholm since the 1930s, they have been focused on guaranteeing access by all persons to culture, establishing cultural consumption as a daily practice with which the society feels identified, so that it demands more cultural and creative activities, consolidating the image of Stockholm as a creative city.

10. The ZMG

Guadalajara is the capital of the state of Jalisco, located in western Mexico. The increasing urban sprawl has promoted the merging of neighboring municipalities to form the ZMG, which had a population of 4,796,603 people in 2015 (INEGI, 2015).

Cultural activities in the ZMG depend mainly on the state and municipal governments, the University of Guadalajara, private institutions like the Guadalajara Chamber of Commerce and Civil Society Organizations.

The ZMG has been consolidated in terms of cultural offerings, hosting cultural events on an international level, such as the Guadalajara International Book Fair⁴ (FIL), the Mariachi and Charrería Festival⁵, The Guadalajara International Film Festival⁶ (FICG) and the May Cultural Festival⁷, among others that may yet need consolidation on an international level, but still strengthen the ZMG as a city of cultural relevance that is beginning to focus on the development of the CCI.

² Concept established by the University of Loughborough.

³ The Swedish model of CCIs is made up by architecture, art, design, gastronomy, learning based on the fashion industry, cinematography, literature, music, photography, the media, tourism and video games (Nielsen, 2008, p. 17).

⁴ Event organized by the University of Guadalajara.

⁵ Event organized by the Guadalajara Chamber of Commerce.

⁶ Event organized by the University of Guadalajara.

⁷ Event organized by the Jalisco State Government.

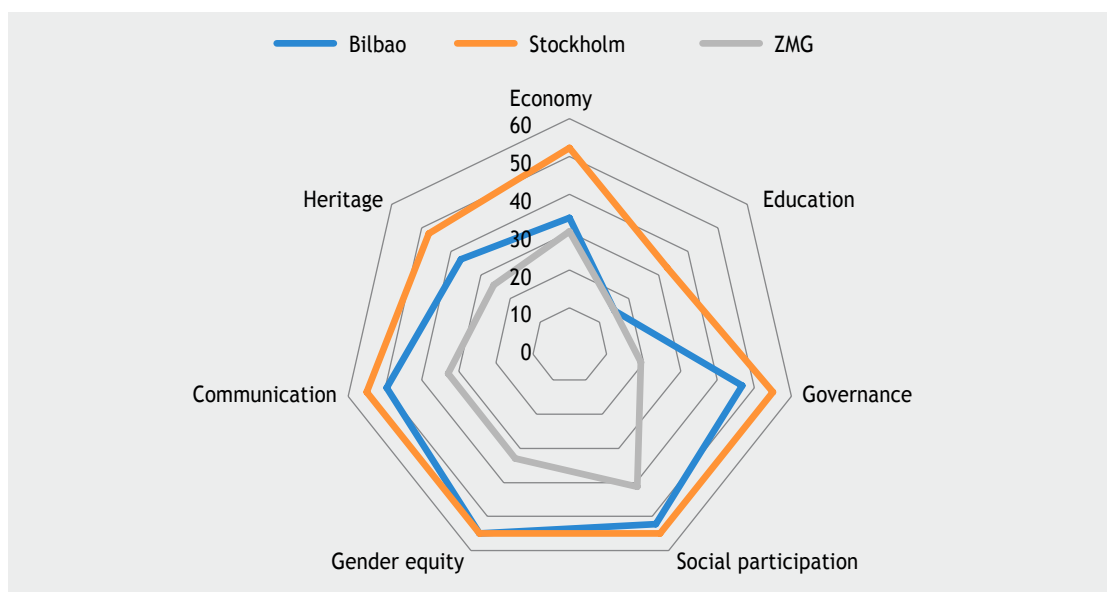
Culture must be prioritized, designing development plans with a cross-cutting vision, fostering their democratization and guaranteeing that everyone can participate in them

Another initiative of the University of Guadalajara is the creation of the University Cultural Center project, which began in 2001 and was joined by the municipal government of Zapopan in 2003. The project includes the creation of an urban district for learning, leisure and creativity, in order to “offer opportunities to coexist with culture in a different, closer way, as an essential part of our lives, that provides creativity, generates ideas and stimulates education”. One of the main objectives is to attract cultural tourism to the ZMG (University Cultural Center, n.d.).

11. Application of the extended model to the cities of Bilbao, Stockholm and the ZMG

Below are the overall results by category for the application of the extended model to these three cities (see Figure 1).

Figure 1
Overall results

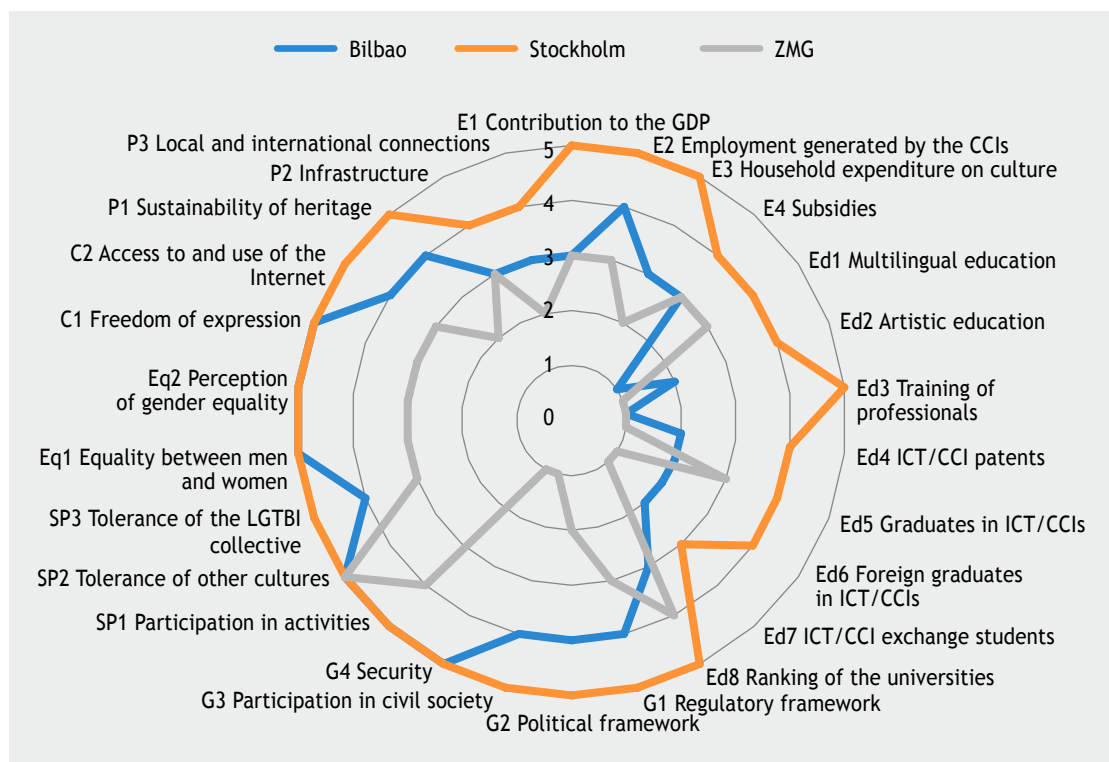


Source: Author's own work. Bilbao Lan Ekintza, Estudio sobre el potencial de las Industrias creativas en Bilbao 2009, Bilbao en datos, CEPREDE, Centro de Predicción Económica, Comisión Europea, Monitor de Innovación Regional, CONEVAL, Consejo Nacional de Evaluación de la Política de Desarrollo Social, Eusko Jaurlaritz-Gobierno Vasco, Industrias culturales y creativas en Euskadi 2014, Eustat, Instituto Vasco de Estadística, Gobierno de Jalisco, Informe de Gobierno 2011, KTH Royal Institute of Technology, Observatorio Vasco de la Cultura, OCDE, la estrategia de Innovación de la OCDE, Statistiska Centralbyrån, Statistics Sweden, Stockholm University, Facts in numbers 2016, Swedish Govt Official Reports (SOU), CONACULTA, sección sobre Jalisco, Eusko Jaurlaritz-Gobierno Vasco, Industrias culturales y creativas en Euskadi 2014, Panel de Indicadores de Innovación Europeo, Swedish Govt Official Reports (SOU), UKÅ, Swedish Higher Education Authority, annual report 2017, Universidad de Deusto, Universidad de Guadalajara, University College of Music Education, UPV/ EHU Euskal Herriko Unibertsitatea - Universidad del País Vasco en cifras. Tecnológico de Monterrey, Swedish Arts Council, Stockholm University, Facts in numbers 2016, Stockholm School of Economics, Stockholm University of the Arts, Stockholm Culture Administration, Culture Report 2015, Södertörn University, Royal Institute of Art, Royal College of Music Stockholm, Orkestra Basque Institute de Competitiveness, Kulturskå 2011-2014, Konstfack University of Arts, Crafts and Design, ITU, International Telecommunications Union, medición de la sociedad de la información, ITESO, Instituto Tecnológico y de Estudios Superiores de Occidente y Beckmans College of Design, Observatorio Jalisco Cómo Vamos, Stockholm Culture Administration, Culture Report 2015, Kulturskå 2011-2014, , Culture Report 2015, Swedish Arts Council, Swedish Govt Official Reports (SOU), SEPLAN, 2012, Green IT, Green IT strategy for the City of Stockholm, INEGI, Instituto Nacional de Estadística y Geografía, ITU, International Telecommunications Union, medición de la sociedad de la información, Subseplan, Monitoreo de Indicadores del Desarrollo de Jalisco, Green IT, Green IT strategy for the City of Stockholm, Research and Creative Metropolises Project, SEPLAN, 2012, Culture Report 2015, Subseplan, Monitoreo de Indicadores del Desarrollo de Jalisco, The European Cluster Observatory, Indicadores CRUE.

Figure 2 shows the discrepancies in each indicator, permitting a more in-depth analysis of the evaluation of these three cities. Tolerance of other religions is the indicator showing the least dispersion, while the training of professionals is the indicator with the greatest dispersion among Stockholm, Bilbao and the ZMG.

It can also be observed that the evaluation of the indicators for Stockholm trend towards the radial extremes, with the lowest level corresponding to the number of exchange students in ICT/CCI.

Figure 2
Detailed results



Source: Author's own work. Bilbao Lan Ekintza, Estudio sobre el potencial de las Industrias creativas en Bilbao 2009, Bilbao en datos, CEPREDE, Centro de Predicción Económica, Comisión Europea, Monitor de Innovación Regional, CONEVAL, Consejo Nacional de Evaluación de la Política de Desarrollo Social, Eusko Jaurlaritza-Gobierno Vasco, Industrias culturales y creativas en Euskadi 2014, Eustat, Instituto Vasco de Estadística, Gobierno de Jalisco, Informe de Gobierno 2011, KTH Royal Institute of Technology, Observatorio Vasco de la Cultura, OCDE, la estrategia de Innovación de la OCDE, Statistiska Centralbyrån, Statistics Sweden, Stockholm University, Facts in numbers 2016, Swedish Govt Official Reports (SOU), CONACULTA, sección sobre Jalisco, Eusko Jaurlaritza-Gobierno Vasco, Industrias culturales y creativas en Euskadi 2014, Panel de Indicadores de Innovación Europeo, Swedish Govt Official Reports (SOU), UvA, Swedish Higher Education Authority, annual report 2017, Universidad de Deusto, Universidad de Guadalajara, University College of Music Education, UPV/ EHU Euskal Herriko Unibertsitatea - Universidad del País Vasco en cifras. Tecnológico de Monterrey, Swedish Arts Council, Stockholm University, Facts in numbers 2016, Stockholm School of Economics, Stockholm University of the Arts, Stockholm Culture Administration, Culture Report 2015, Södertörn University, Royal Institute of Art, Royal College of Music Stockholm, Orkestra Basque Institute de Competitiveness, Kulturskolan 2011-2014, Konstfack University of Arts, Crafts and Design, ITU, International Telecommunications Union, medición de la sociedad de la información, ITESO, Instituto Tecnológico y de Estudios Superiores de Occidente y Beckmans College of Design, Observatorio Jalisco Cómo Vamos, Stockholm Culture Administration, Culture Report 2015, Kulturskolan 2011-2014, , Culture Report 2015, Swedish Arts Council, Swedish Govt Official Reports (SOU), SEPLAN, 2012, Green IT, Green IT strategy for the City of Stockholm, INEGI, Instituto Nacional de Estadística y Geografía, ITU, International Telecommunications Union, medición de la sociedad de la información, Subseplan, Monitoreo de Indicadores del Desarrollo de Jalisco, Green IT, Green IT strategy for the City of Stockholm, Research and Creative Metropolises Project, SEPLAN, 2012, Culture Report 2015, Subseplan, Monitoreo de Indicadores del Desarrollo de Jalisco, The European Cluster Observatory, Indicadores CRUE.

It is the people who are determining the type of city they want, and the dynamics that are established in them

In the case of Bilbao, a radial asymmetry is observed, with the best values on the indicators corresponding to social participation, gender equity, communication and heritage, while asymmetrical variations are present in the indicators corresponding to the economy and education.

In the case of the ZMG, it is observed that the indicators corresponding to security, exchange students in ICT/CCI and foreigners graduating in ICT/CCI are the ones that have the lowest scores, followed by household expenditure on culture and access and use of the Internet in homes and public spaces.

12. Conclusions

The role of culture is changing the understanding of sustainable development. The current situation situates both culture and creativity in a strategic position in cities, making it a new model of development that is being adopted by different cities around the world. However, culture and creativity are not isolated elements; they are linked to dynamics and structures of a social, economic, environmental, educational and political nature in cities, which is to say that they are cross-cutting elements that have aesthetic, spiritual, social, historic and symbolic values, as well as those related to authenticity, existence, prestige, options, education and legacy. Thus, in order to adopt this model of development we must first assume that culture and creativity are a means in themselves to ensure sustainable development.

The adoption of this development model means that the cities must formulate public policies that incorporate culture in a cross-cutting manner, with clear objectives focused on strengthening institutions, urban planning, connectivity, social participation, gender equality and internationalization.

Stockholm is then observed to be a pioneering city that adopted this model decades ago, prioritizing culture, designing their development plans with a cross-cutting vision, fostering its democratization and guaranteeing that everyone can participate in them, thus strengthening social cohesion and cultural habits.

In the case of Bilbao, the change in the development model has been recent and rapid; it is a city that has not only transformed itself in the sense of urban planning, by rehabilitating spaces along the estuary, with projects such as the Bilbao Guggenheim Museum and the island of Zorrotzaurre, it has focused its acclaim with a cross-cutting vision of culture and creativity, which distances itself from the vision that conceives them as a simple industry.

Meanwhile, the case of the ZMG is unique, first because it is detected that the main cultural and creative development agent is the University of Guadalajara. As a result, not only are the cities positioning themselves as agents on an international level, we are also talking about new agents. A lesson yet to be learned by the ZMG is that the sustainable development model which contemplates culture as a cross-cutting element implies the cooperative work of local governments, universities and agents from the cultural and creative sectors.

The three cases analyzed show that local governments and universities are the new international agents, but the people are the ones who are determining the type of city they want, the dynamics that are established in it and the relationship with nature, as well as the desired life and lifestyle.

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Patricia Vargas Portillo

Senior Lecturer. ESIC Business & Marketing School. Spain.

ORCID: [0000-0002-0226-3053](https://orcid.org/0000-0002-0226-3053).

jennypatricia.vargas@esic.edu

There is little doubt that Internet is playing an increasingly greater role in our lives and daily tasks. From the moment we get up until we go to bed, we have involuntarily allowed numerous applications to gain access to an extraordinarily large amount of our personal data. It seems unlikely that this trend will reverse itself, and it is quite likely to increase. Our privacy is exposed to the processing of our data without our consent, data violations and even virtual fraud. It should be noted that the latter includes identity theft. There are numerous companies that are working with very sensitive data and that are processing our data in unauthorized ways. Moreover, some of them are increasingly becoming the target of cyber criminals. In this sense, we must allude to a phrase that has been heard for some time now with regard to this particular issue. Data are this century's new black gold. This statement is correct. Even though legislators try to protect user's privacy in various ways, their success is limited. The situation is very complex, as we will see below. It is difficult to place limits on the sea or gates on the countryside.

If we try to place a value on quantitative data, the truth is simply incredible. The fact is that every minute, half a million tweets are sent, more than 60,000 photographs are edited on popular social networks like Instagram, and over three million searches are conducted on the famous Google search engine. These data will probably be exceeded by far in a very short time. As the author rightly states, most of the time when we use the Internet, we accept the terms and conditions, privacy policies and data processing automatically, without even reading them. Ironically, it is very common on a social level to ignore the consequences of what they state. It is difficult, even extremely unusual, to find a user who reads the privacy policy or the general conditions for any data processing they are about to accept. All of this might very soon be something of the past. There are some very interesting projects in Artificial Intelligence that read the privacy policies for us and tell us of any risks that they might pose. Among others, we are referring to Guard. As a matter of fact, the developer of the application has analyzed the privacy policies of some well-known websites such as Netflix, LinkedIn and YouTube, among others. The system determines how many black spots each site has with a very high level of reliability. It is important to emphasize that the results also provide information about cases in which these companies have violated the users' privacy.

More often than we would like, privacy-related problems can be prevented by the users themselves. Among the actions that they can take in this regard, we can mention periodically changing passwords and installing antivirus software. However, there is a certain laziness or reluctance to change passwords. A specific term has been coined to describe this situation. It has been referred to as privacy fatigue.

The book being reviewed is divided into sixteen large sections. It is a work with an extremely interesting and updated content that addresses some very timely issues. The usefulness of the contents is evident. The case study, as is evident in the synopsis, is dedicated to analyzing “all the personal data you give without realizing it and everything that companies do with them.” The laws that protect the users’ privacy are very relevant, as LLANEZA emphasizes with regard to the words of Apple CEO Tim Cook. He refers to the need to have a Federal Privacy Law in the United States. As the author correctly surmises, we have transitioned from a productive economy to a data economy. This statement is quite right.

In line with what was outlined earlier, it is very appropriate to bring up at this time the author’s observations with regard to the privacy paradox. This latter term refers to the fact that while most people seem to show a theoretical interest in their privacy and maintain a positive attitude towards privacy protection, this seldom translates into any real preventive behavior. Many times we share our privacy in exchange for personalized services. On a similar note, not everything on the Internet is free - far from it. Everything has a price. In this case, it is our data. We must be consistent in order to mitigate all the risks that are entailed by our actions. As the author states, “we are aware of the risks, but we don’t want the party to end.”

The observations made about the Google search engine are especially relevant. The search engine collects and processes massive amounts of user data, with an absolutely marvelous potential. Google has many different applications and services that are constantly evolving, and which go far beyond Chrome, Gmail, Maps or YouTube.

We mustn’t lose sight of fake news and the relevance that this can have. In this sense, we must consider the role this played in the latest U.S. elections in which Trump was elected president. As the author indicates, the Russians used fake accounts and bots to share incendiary messages and to manipulate the social networks. Naturally, data processing and creation of profiles by Cambridge Analytics should not go unnoticed. Some voices are of the opinion that the data obtained by this company were used to condition such important events as the U.S. elections and the Brexit. The observations made by McNamee are especially interesting.

In this area, the Internet of things plays a very significant role. There are very popular devices that process many of our data. The author refers to the cases of Alexa and the popular Roomba vacuum cleaner, among others. The statement LLANEZA makes, paraphrasing GEORGE DYSON, makes a lot of sense: “we are creating systems that go beyond our capacity for control.”

SIRI and the Google voice assistant are other tools that process our personal data. Most people surely do not know that our conversations are being listened to by company technicians (without those affected having given their consent). Alexa also acts in the same way. These devices have an infinite potential. For example, Amazon

has registered a patent based on the analysis of the environment to know whether the user is happy, sick or bored, among other moods.

Geopositioning is another topic subject to examination. Google is not the only one to track our movements and monitor us for different reasons, as there are other applications that do the same thing, such as Signal or Silent Phone.

It is quite likely that in the very near future we will reach what the author refers to as the Internet of emotion. In short, this refers to the fact that mobile devices will very soon pay attention to our mood in real time.

The scenario we have just described is as exciting as it is risky. Of concern are our privacy and the non-consented use of our personal data. This is not a minor issue, given the existence of applications and devices that tend to increase our dependence on them. One example, among many others, is the Amazon Alexa device. It is one of the most popular tools, with a more promising future from Jeff Bezos's company. It is said that the popular assistant will try to anticipate the users' desires. Accordingly, it is assumed that it must have an in-depth knowledge of the tastes and personal data of those who have it in their homes. In conclusion, it can be said that unless we take certain precautions, and if we continue to allow companies to manage our data as they like, we will weaken ourselves as people. This can all be compared to what Orwell said. As any seasoned reader will remember, his novel tells about a State that controlled every moment of the lives of its citizens, thus repressing their rights. Information is power, but it is within our right to provide (or not) data about our private lives that can be used against us, through policies aimed at prevention. ▢