

Brazilian Research Panorama on Information Ergonomics and Graphic Design

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Abstract. With the emergence and easy access to new interfaces that are present and necessary to current daily life, a concern about the interface projects begins, and so, new research methods and analyzes emerge to support that growing demand. In seeking to understand how those researches are being treated in Brazil, this paper uses a bibliometric study concerning the area of Graphic Design and Informational Ergonomics in the largest conferences of Design in Brazil: “EGODESIGN/USIHC” and the “P&D Design”, in order to provide a panorama of the growth of research and study groups through the publications in the area. In addition it seeks to demonstrate the regions in the country which concentrates the focus on those themes and how Brazil is concerned with the issues related to the study and with the improvement of technological interfaces.

Keywords: Bibliometrics · Graphic design · Informational ergonomics · Brazilian conferences · Research

1 Introduction

The expansion of the promotional materials in the last century was greatly facilitated by both the use of digital technologies and low cost printing. In the virtual world there was an unprecedented advertising explosion that made those advertisements or newsletters massive and often poorly designed. That scenario stimulated the need for new digital interfaces that seek to be intuitive and easy to access.

It should be noted, however, that the rapid propagation of digital media, as well as easy access to such interfaces, have hampered the development of new graphic materials, since the excess of characteristic attributes and mechanisms of that system could affect the harmony of the information and the devaluation of its interface by what might be called “visual pollution”.

Therefore, there is a need of studies regarding the Information Architecture and the Digital Interface Design. In this way, the Graphic Design area promotes tools and methods that are able to configure all information submitted to the user in a more assertive and efficient manner.

The specialized professional should organize that information properly, always evaluating the impact on the user's daily life. In this context, the Informational Ergonomics (IE) makes use of a number of instruments to improve and enhance the various informational devices, since it integrates cognitive processes inherent in mankind.

Currently, the growing number of institutions with the Graduate Program in Design in Brazil is moving parallel to the gradual growth of scientific publication and production related to the Design area (Industrial Design). Regarding this fact, the Graphic Design, in parallel to the Informational Ergonomics, has been of increasing interest within the scientific field over the last decade because of its scope and complexity, both in theoretical and practical terms.

It is important to assess the degree of scientific development of the area. A portrait of the scientific production in the area can be created from bibliometric studies that examine development indicators from different areas of knowledge. In Brazil, the set of papers published in the International Conference of Ergonomics and Usability of Human-Technology and Human-Computer Interfaces – ERGODESIGN/USIHC – and in the Brazilian Conference of Research and Development in Design – P&D Design – form a significant body of knowledge for IE area. In this context, this study aims to trace a panorama about the research on Informational Ergonomics and Graphic Design that has been carried out over the last years in Brazil by bibliometric analysis of published material in those two scientific events.

2 Theoretical Review

2.1 Design and Informational Ergonomics

Graphic design refers to visually communication of a concept, idea, or even a principle. It comprises the conception, development and implementation of visual systems projects of physical or virtual configuration, presented in a two-dimensional plane. It can also be considered as a means to structure and shape the printed communication or interfaces that, overall, deal with the relationship between image and text [1].

To send the right information to the right person at the desired time, in an effective and efficient way, it is necessary to use the principles of information theory - the field of Informational Ergonomics (IE) - to bring satisfaction to the users respecting their diversity. This field reaches its goal contemplating cognition and perception, covering aspects of verbal and non verbal language [2]. Therefore, this area of ergonomics is related to the knowledge of human cognition process.

Cognition is the event of the mind in carrying out daily tasks and involves cognitive processes of interaction, such as thinking, speaking, and others [3]. Such concepts may be divided in two ways: experimental and reflexive. With regard to the first, it involves the action and reaction of the humans involved in a given activity; while the second involves the thought, the comparison and the decision-making, this one develops ideas giving way to creativity [4].

These cognitive models use some paradigms for functionalities such as attention, perception, comprehension and memorization. Attention is related to the alert level of the organism. Perception is the relationship of the individual to the cultural context.

The comprehension refers to the correspondence of the message meanings attributed by the source; and the memorization by selective retention of the message [5].

The role of IE is the application of specific techniques that provide a tight balance among man, his work and the environment. When applied, and managed correctly in the institutions, it enables the worker (or user) higher rates of health, comfort and safety perception [6].

2.2 Design Research in Brazil

The consequences of the design, as well as its inter and multidisciplinary approach, promoted the formalization of the Graduate Programs in Design, both at Masters level and doctorate in Brazil. Regarding the interdisciplinary of the design research, the varied backgrounds of the programs' professors promotes the development of research based on topics related to their areas of expertise, thus stimulating the research inter-disciplinarity [7].

This permeability of information among areas of knowledge contributes to the generation of joint productions and to proposals for new born research fields and related interests. So, the specialties of the lines of research linked to the Design are established, such as the Graphic Design or specifically the Informational Ergonomics.

The concentration areas and lines of research, characterized by multi and inter-disciplinarity, provide to the researcher the opportunity to reflect and discuss about challenging issues that result from economic, social and cultural needs of the reality in which they operate.

However, for the contributions acquired within the academies to be effective and validated, the research carried out should be available to access by interested parties, as those are configured as essential tools for reflection, discussion and democratization of scientific knowledge of the area. Scientific dissemination is characterized by its ability to transmit to the society the knowledge of new discoveries, new materials, new methodologies, and others [8].

In this sense, the scientific production of the Design area helps to consolidate it as a scientific field that is able to contribute to the development of society by promoting the construction of critical knowledge. The scientific conferences as well as journals, and books consist of one of the effective actions for the exchange of knowledge. Through those channels, the results of research are disseminated, shared and put to debate, collaborating with the learning process and the collaboration among the areas.

One of the main Brazilian design conferences is the P&D Design that takes place every two years, and contributes to the discussion and dissemination of research. The 1st P&D Design took place in São Paulo/SP in 1994 and expanded over time: 2nd P&D Design - Belo Horizonte/MG, 1996; 3rd P&D Design - Rio de Janeiro/RJ, 1998; 4th P&D Design - Novo Hamburgo/RS, 2000; 5th P&D Design - Brasília/DF, 2002; 6th P&D Design - São Paulo/SP, 2004; 7th P&D Design - Curitiba/PR, 2006; 8th P&D Design - São Paulo/SP, 2008; 9th P&D Design - São Paulo/SP, 2010; 10th P&D Design - São Luís/MA, 2012; and 11th P&D Design - Gramado/RS, 2014.

Other two important annual conferences to the area of Design are the ERGODESIGN and USIHC, which occur together and have the main focus in the areas of Ergonomics and Usability. Their first editions took place in Rio de Janeiro/RJ from 2001 to 2005, since then, other cities have hosted such events, as follows: 2006 in Bauru/SP; 2007 in Balneário Camboriú/SC; 2008 in São Luís/MA; 2009 in Curitiba/PR; 2010 in Rio de Janeiro/RJ; 2011 in Manaus/AM; 2012 in Natal/RN; 2013 in Juiz de Fora/MG; and 2014 in Joinville/SC.

Previous studies indicate that, in recent years, the Brazilian scenario has an improvement on the number of publications on the fields of this paper, such as Graphic Design, and especially the IE [13, 14]. Thus, an updated bibliometric research about the publications of those areas provides data to portray the evolution of scientific research and it can also identify their quantitative profile.

2.3 Bibliometrics

The bibliometrics is an area of studies of Information Sciences employing mathematical and statistical tools to investigate and quantify the processes of written communication, so it is a set of research methods, using quantitative data analysis, it can map certain scientific field, while acting as behavioral analysis tool of researchers in the decision-making for the construction of this knowledge [9].

The word ‘bibliometrics’ was first used in the work entitled *Traité de Documentation* in 1934 by Paul Otlet, defined as “the set of the bibliography that deals with the extent or amount applied to books” [12, p. 60]. However, it was in 1969 that Alan Pritchard popularized the term defining it as “all studies that seek to quantify the writing communication processes” [12, p. 60]. Pritchard suggested that the word ‘bibliometrics’ should replace the term previously used “statistical bibliography” first mentioned in 1922 by Edward Wyndham Hulme [9–12].

Currently, bibliometrics has three basic principles: the principle of Lotka, describing the productivity of authors; the principle of Zipf, which describes the use frequency of words in a given text; and the principle of Bradford, which describes the distribution of the periodical literature in a specific area. The Lotka’s Law, also known as the Inverse Square Law, was formulated in 1926. This law follows the principle that many researchers publish little and few researchers publish a lot, so a great number of publications comes from a small number of efficient producers. In contrast, Zipf’s Law, formulated in 1949, became known as the Minimum Effort Law. This law is based on the relation between words in a given text and the serial order of those words, so by the frequency which the words appear in various texts it is possible to generate an ordered list of a certain subject [9–11].

Finally, the Law of Bradford, also known as Dispersion Law, allows to estimate the relevance of journals in a given area of knowledge, in other words, the productivity of journals. As the initial articles are introduced in the publications in the media targeted to them, the discussion on the topics increases, attracting more articles about the subject discussed. In the course of scientific events, it takes a greater range and developments,

resulting in centers of studies and research, making the subject deeper and broader, producing more knowledge about the area and, finally, spreading this new theme. In this context, bibliometrics is a useful tool to estimate development and growth of a focused area [10].

3 Methodology

According to the objectives of this study, the bibliometric analysis was focused on concepts related to Bradford's Law. However, the analysis was not limited to productivity in the journals, but to the production of institutions and to the topics published in conferences, in order to study possible links among subject areas and centers of study or research.

We reviewed and analyzed all the proceedings of ERGODESIGN/USIHC from 2010 to 2014; and also the annals of the P&D Design editions from 2010 to 2014. Data from previous editions of those events were obtained in studies published by [13, 14]. To collect data, each paper was read individually, and this procedure was standardized for all analyzes. Then, it was calculated the total number of articles in each issue of the Conferences, and it was tried to obtain the total number of items that encompassed the theme "Graphic Design" and the total number of articles dealing about "Informational Ergonomics".

It was considered as "Graphic Design" publications that dealt with any theme related to the display of imagery or visual information, but not the formal configuration (three-dimensional) of a product. In "Informational Ergonomics" it was considered the articles which dealt with analyzes and methods to display that information in order to improve the user interface, both in physical and digital media.

The productions related to "Graphic Design" were also subdivided by state of the federation, it was considered as origin only the state of the first author. In the case of absence of such information, we attempted to locate them at Lattes (Brazilian curricula database) of each author. Then, the general data was organized in a spreadsheet and graphics were generated for a better visualization of the results. Data analysis was based on descriptive statistics, grouping the data based on previously defined criteria.

4 Results

The collected data allowed to identify a significant increase in the number of papers published in ERGODESIGN/USIHC since their first edition. Between 2010 and 2011 the number of publications practically doubled, from 125 to 232 papers. In more recent editions, the number of published papers oscillated at approximately 200 papers. Because this event is unique to issues related to ergonomics, the articles related to graphic design are automatically related to IE. Figure 1 shows a graph of the evolution of the total number of papers and, among them, the number of papers related to Informational Ergonomics.

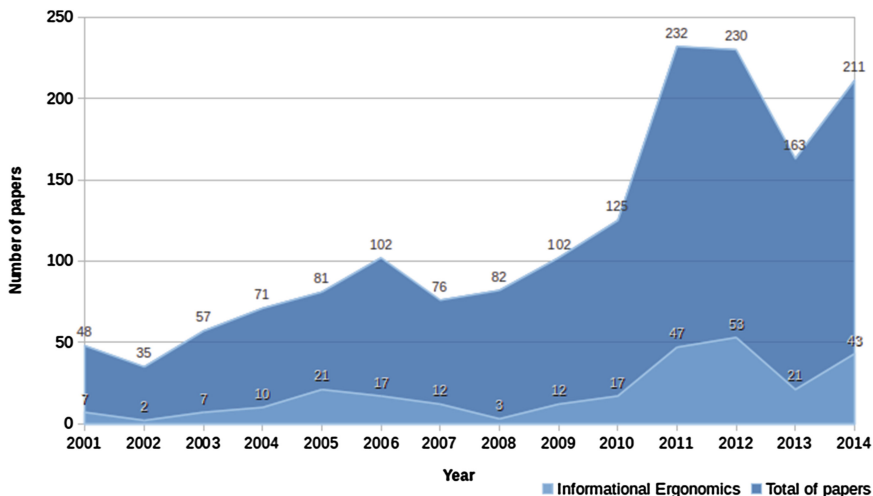


Fig. 1. Total number of articles per year and related to Informational Ergonomics published in ERGODESIGN/USIHC (Source: the authors).

In Fig. 1 it is possible to observe that the total number of papers related to IE almost tripled between 2010 and 2011, going from 17 to 47 papers. In percentage terms, it has increased from approximately 14 % to 20 % of the total of the event. In the edition of 2013 that percentage followed the fall in the number of publications, but it showed a new rise in the last edition, held in 2014. The historical percentage suggested by the data series obtained for EI articles in relation to the total for this event is 17 %.

When analyzing the geographical distribution of papers related to graphic design published in this event, it is noticed that there is a concentration of publications in the Southeast and South region, mainly in the states of Rio de Janeiro, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul. Figure 2 shows the map of Brazil and the quantitative distribution of papers in each State of the Federation. The omitted States have not added any publication in all editions of the event.

For the P&D Design, the biggest design conference in Brazil, it is also observed an increase in the number of publications. For this event, the multiplicity of themes first demand the identification of papers related to graphic design area. Thus, Fig. 3 shows the total number of papers per edition and, among them, the amount of publications related to graphic design accounted between 2010 and 2014 editions. The data are associated to those presented in [14].

It is noted that the total number of papers increased from 529 to 923 between 2010 and 2012 editions of that event. This growth was accompanied by the quantitative increase of papers related to graphic design (from 109 to 263). In percentage terms, the field increased from 21 % to 28 % of the total. In the edition of 2014 however, they opted for a more compact conference and the total of approved papers fell to 322, and 87 of those were related to graphic design. This reduction did not affect the relative participation of the area, which remained at 27 % of the published papers.



Fig. 2. Distribution of articles published in ERGODESIGN/USIHC by states in Brazil (Source: the authors).

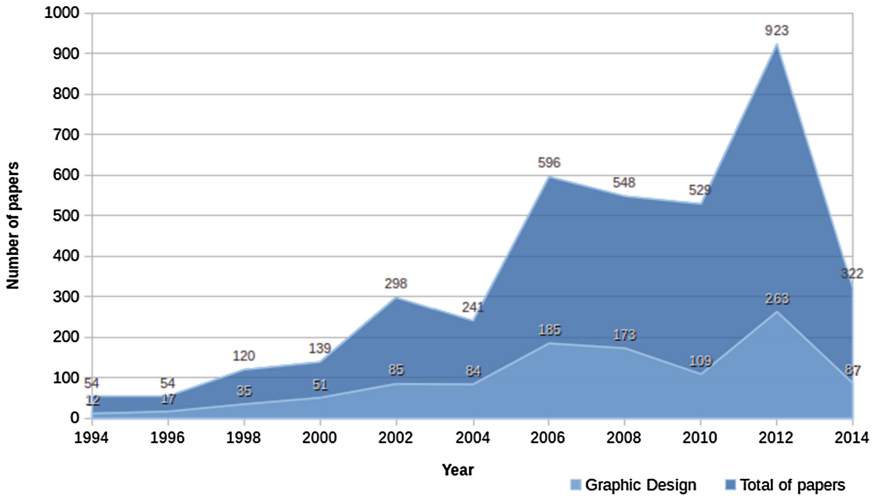


Fig. 3. Total number of articles per year related to Graphic Design published in P&D Design (Source: the authors).

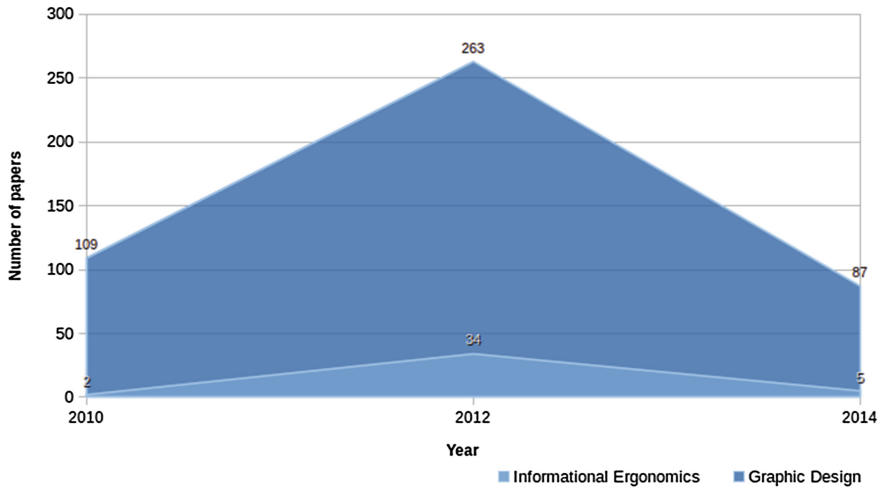


Fig. 4. Total number of articles per year related to Informational Ergonomics published in P&D Design (Source: the authors).

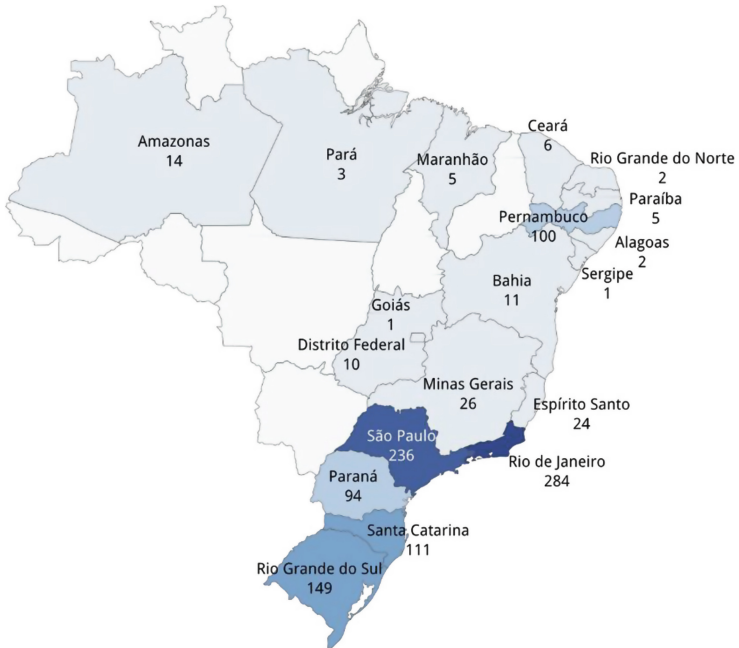


Fig. 5. Distribution of articles published in Graphic Design in the P&D Design conference by states of Brazil (Source: the authors).

When analyzing the publications related to the Informational Ergonomics (from 2010 to 2014), it was possible to realize a large quantum leap occurred in 2012. In the 2010 edition only 2 articles among the 109 of graphic design dealt with aspects related to IE. In 2012 this number changed to 34, increasing from 2 % to 14 % of graphic design papers. In 2014 that number fell again, where only 5 publications were related to IE, representing 6 % of graphic design articles. Figure 4 shows a comparative graph of the quantitative papers of graphic design and IE between 2010 and 2014.

When analyzing the geographical distribution of papers related to graphic design published in this event it can be noted, once again, a concentration of publications in the Southeast and South of Brazil, mainly in the states of Rio de Janeiro, Sao Paulo and Rio Grande do Sul. Figure 5 shows the map of Brazil and the quantitative distribution of papers in each State of the Federation. The omitted States have not added any publication in all editions of the event.

5 Conclusions

The results show that these conferences, throughout their editions, were organized by different research groups in Brazil. The recent expansion of graduate programs in design in the country promoted the scientific production in the area. However, the production in HCI (Human Computer Interaction) still represents a small portion of the production. This is possibly due to the diversity of themes and performance of Design.

The growth of publications in the events analyzed is remarkable, both with regard to the total number of articles and in the themes related to Graphic Design and Informational Ergonomics. It was also noticed that there seems to be no deepening in a specific theme. This demonstrates a quantitative growth of studies related to Design, from the construction of its history and theoretical basis to its various areas of performance.

Regarding the graphic design there is a constant growth in publications, following the increasing number of papers presented in those events. The Informational Ergonomics is strongly related to ERGODESIGN, and it has been a relevant topic since its first edition. In P&D Design, the subject appears only in 2012, but as a constant topic, which follows the trend of total articles.

Analyzing the geographical distribution of papers published in both events, it can be noticed a large concentration of publications which originated in the Southeast and Southern region of Brazil. At that point it should be noted that the first editions of both events were held in institutions of those locations [13, 14]. Considering the size of Brazil, that aspect favored the publication by the closest institutions.

It can also be highlighted the effective participation of research groups linked to *stricto sensu*¹ graduate programs in Design of those regions. Although there is still the prevalence of publications in those regions, the apparent increase in the national

¹ Graduate degrees in Brazil are divided in two types: *latu sensu* and *stricto sensu*. The *stricto sensu* graduate degree is generally for those who wish to pursue an academic career.

production was also promoted by concomitant progress of publications of research groups in other regions of the country.

This aspect also reflected in the location of the most recent editions of the analyzed events, hosted by institutions in different places, particularly some of the Northeast region of Brazil. It is also a result of the partnerships and the creation of Graduate Programs throughout the national territory. According to CAPES [15], only 18 Brazilian institutions have Graduate Programs in Design, and only seven of these Programs have lines of research directed linked to IE and Graphic Design. Those institutions are spread through the Southern (02), Southeast (02), Midwest (01), North (01) and Northeast (01) of Brazil.

It was also observed that the number of papers published in the different editions of those events, when compared, presents considerable quantitative difference, especially when analyzing the P&D Design proceedings. In such event, when comparing the numbers of approved and published articles between 2012 and 2014, it is observed that while in 2012 over 900 articles were approved, in 2014 that number was about 300. This fact is closely related to the size and ability of the institution in which the event is held.

Either way, the growth of total publications, accompanied by those relating to graphic design and Informational Ergonomics is consequence of the Design maturation in Brazil. Although there is still a small number of institutions which have *stricto sensu* graduate programs, that growth demonstrates the commitment of Brazilian researchers. The constant participation of the analyzed themes demonstrates the concern of the country with the issues related to the study and to the improvement of technological interfaces, particularly in information processing.

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