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# MAPPING OF SCIENTIFIC PRODUCTION ON UNCERTAINTY IN INTERNATIONAL ENVIRONMENTAL BASIS

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## ABSTRACT

The purpose of this article is to map the scientific literature on the topic environmental uncertainty in international databases ProQuest and EBSCO providing results on the state of the art of this subject and the characteristics of scientific papers published. The method used was bibliometrics, being investigated 97 items from a universe of 1.194. All of the works comprised the period from 1975 to 2010. The results suggest that: a) during the period examined different social networks of researchers and institutions were formed to study this issue, b) the work of Duncan (1972), although it's been nearly four decades of its publication, it continues to influence the formulation variables for the measurement of environmental uncertainty, and c) the research on environmental uncertainty has received over the years other terminologies and methodologies. It was observed that the studies were applied in various business segments, always aiming to minimize the environmental turbulence and thereby maximizing organizational results. This research also revealed that the way to measure them cannot be normalized, since each segment is facing a different environment several variables (customers, suppliers, competitors, society, politics, government actions, among others).

**Keywords:** environmental uncertainty, environment, bibliometrics

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# 1 INTRODUCTION

Companies of the most varied sizes and segments are submitted daily to the dynamism of the market, result of the fierce competition that ends up forcing managers to make decisions in real time with surgical precision, under penalty of losses, often irreversible. According to Wallace et al. (2010), stable environments are characterized by minimal changes in customer preferences, technologies and competitive dynamics, while highly dynamic sectors are characterized by a high rate of change and instability, increasing the decision uncertainty, however, all companies are, involuntarily, susceptible to environmental conditions.

For the correct understanding of situations experienced by organizations as a result of environmental uncertainties, the modern management requires a detailed interpretation through specific variables that surround the company, which may result in a performance superior to the competition. Miller (1992) emphasizes that environmental variables do not only include those external to the organization, in their understanding one must take into account the internal environment in decision-making. According to the author, a lasting disequilibrium in the organization, regarding the structure or process, may result in the incessant search for internal adjustments, where uncertainty manifests itself as a challenge in managerial decision-making, which must mirror the best interpreters of emerging new technology and new competitive markets.

This way, realizing the uncertainties provided by the environment becomes fundamental for the *performance* of the enterprise. This dichotomy (environmental uncertainty and *performance*) has been researched for more than three decades, as in the works of Huber, O'Connell and Cummings (1975), Weed and Mitchell (1980), Bourgeois III (1985), Stearns, Hoffman and Heide (1987), Koberg and Ungson (1987), Swamidass and Newell (1987), Schrader, Mulford and Blackburn (1989), Boyd (1990), Chow and Haddad (1991), Gul (1991), Gerloff, Muir and Bodensteiner (1991), Kren and Kerr (1993), Germain, Dröge and Daugherty (1994), Tan and Litschert (1994), Sabherwal and Kirs (1994), Reed and Lemark (1996), Chong and Chong (1997), Kumar and Seth (1998), Abramson and Ai (1998), Luo (1999), Vickery, Calantone and Drape (1999), Claycomb, Dröge and Germain (2001), Waldman, Ramirez, House and Puranam (2001); Sarkar, Echambadi and Harrison (2001), Li and Atuahene-Gima (2002), Kreiser and Marino (2002), Gosselin (2005), Desarbo, Benedetto, Songs and Sinha (2005), Lee, Lin and Pai (2005), Babakus, Yavas and Haahti (2006), Fink, Edelman and Hatten (2006), Carmeli and Tishler (2006), Agle, Nagarajan, Sonnenfeld and Siunivasan (2006), Krishnan, Martin and Noorderhaven (2006), Paulraj and Chen (2007), Liao and Tu (2007), Jr, Parke and Lee (2008), Sun, Hsu and Hwang (2009), Wallace, Little, Hill and Ridge (2010), Silveira-Martins and Tavares (2014a), Silveira-Martins and Tavares (2014b).

In the face of these aspects, it is observed the importance of discussing and understanding this theme that attracts the interest of strategy researchers and managers. In this perspective, the present study aims to map scientific production on environmental uncertainty in the international databases ProQuest and EBSCO.

Miles, Snow and Pfeffer (1974) demonstrated already the importance of understanding the environmental variables, especially the uncertainties produced by them. According to the authors, a growing number of studies have been developed, however, at best, with modest results, generating confusion about the organization's role in counteracting to the environmental demands, in addition to its links with technology, structure and organizational processes. This way, the authors justify the development of research with contributions to the thematic, since the inconsistencies generated by environmental uncertainties afflict every area related to organizational behavior.

By approaching the environmental uncertainty in the light of population ecology, Hannan and Freeman (1977) point out that the interpretation of effects of the environment on the organizational structure has changed to a central place in theory and research organizations in recent years. This change has opened a series of possibilities that motivate the development of research on the subject. In addition, Simon (1978) states that many of the organizational weaknesses are largely due to the failures to know all of the alternatives, the uncertainty about relevant exogenous events, and the inability to calculate consequences. Thus, the condition of uncertain decision-making is considered to be one of the most important skills required of decision makers (SIMON, 1991).

In this context, it is observed the importance of the development of researches that cover the environmental uncertainty theme, looking out to verify the approaches of it, either from the perspective of the behavior of the manager (Miles, SNOW, PFEFFER, 1974), populational ecology (HANNAN; Freeman, 1977), rationality in decision-making (SIMON, 1978, 1991), or by other prisms that may guide managers and researchers interested in the knowledge produced on this construct.

Thus, the present study is justified by the need to explore the environmental uncertainty theme in scientific productions recognized by the academy, verifying its characteristics in international research and subside new researches. Another aspect that legitimates this research is the fact that similar studies with this approach haven't been found in Brazil, besides Silveira-Martins et al. (2013) that addressed the issue of environmental uncertainty on a national level.

In this sense, this article is organized in five sections. The first part explores step by step the genesis, development and consolidation of environmental uncertainty. In the second section, the theoretical frame of reference that seeks to situate the intellectual context where the study was undertaken is presented, followed by a methodology that guided the conduction of the study under analysis. In the fourth section, we discuss and ponder the analysis of bibliographic data and in the last section, as a conclusion, we construct reflections and new directions and possibilities for studies on environmental uncertainty.

# 2 ENVIRONMENTAL UNCERTAINTY

The definition of the concept of environmental uncertainty is permeated by three components: i) the lack of information on the environmental factors associated with a particular decision-making situation; ii) the lack of knowledge of the outcome of a specific decision in terms of how much the organization could lose if the decision is incorrect; and; iii) the inability to assign probabilities with any degree of confidence regarding how the environmental factors will affect the success or failure of the unit during the decision-maker management (DUCAN, 1972).

The author studied group decisions in industries aiming to identify the characteristics of the environment that contribute to the decision unit members being able to manage the environmental uncertainties. In the two dimensions study, are identified: a) the simple/complex dimension, defined as the number of factors taken into account in decision making; and; b) the static/dynamic dimension, understood as the degree to which these factors in the decision-making environment remain basically the same over time, or are in a continuous process of change. The results indicated that individuals in decision units in dynamic/complex environments experience the greatest amount of uncertainty in the decision process. The data also indicate that the static/dynamic dimension of the environment contributes more to the uncertainty than the simple/complex dimension.

Kreiser and Marino (2002), after systematically analyzing the historical development of uncertainty, concluded that multiple operations have been developed over the past 60 years to measure the amount of uncertainty present in the external environment. Each of these measures can be effectively used in organizational performance research, depending on the specific research questions to be addressed. The conceptualizations of uncertainty have continued to evolve and diverge among themselves over the last 60 years, integrating research lines, ensuring that the difficulty of generalizing the results on this topic.

Most of the economic decisions are complex and often need information from more than one source. Thus, managers of small business ventures seeking to expand and/or maintain the venture, need to know about factors such as: availability of human resources, financing and potential retaliation of competitors. While small business managers could research these issues on their own, it's often cheaper and more convenient to get information and advice from others. In other words, it's important to develop a network of personal contacts, since networks can play a vital role in reducing uncertainty, facilitating the receipt of information. In this sense, it is important to highlight another important aspect, effective networking can consume a considerable amount of time and energy, especially for entrepreneurs and managers of new enterprises, which can cause more problems than organizational solutions. These were the findings of a study developed by McGee and Sawyerr (2003) that sought to analyze the relationship between strategic perception, environmental analysis, and the sources of information used by owners and managers of small, high-tech industrialists.

Nevertheless, even when the research not being illogical, it enriches managers' knowledge of decision-making about whether or not to imitate products and services to overcome environmental uncertainty.

It is observed in the study developed by Wallace, Little, Hill and Ridge (2010) the test of small business regulation focuses (promotion focus and prevention focus) and its correpondence with the performance of the organization differently when levels of environmental uncertainty vary. The results suggest that the focus of promotion is positively related to the company performance, while the focus of prevention is negatively related to company performance. It should be noted that these relationships were moderated by the degree of environmental dynamism. In more dynamic environments, the relationship between promotion focus and company performance is reinforced, while the relationship between the company's focus on prevention and performance is adversely affected. The inverse was found for less dynamic environments.

# 3 METHODOLOGY

The methodological procedures of this research are anchored in the bibliometry technique. According to Araujo et al. (2000), this type of study seeks to observe the evolution of the literature and the knowledge produced over the years.

In these lines, the terms *Environmental Uncertainty* and *Environment Uncertainty* were used to locate environmental uncertainty articles in the ProQuest and EBSCO databases. It was considered that these keywords must be in the title or abstract of the works. All articles that were not complete, and those from literary criticism, were disregarded. This procedure resulted in a total of 402 articles in the ProQuest database and 792 in the EBSCO database.

Then, only the articles with *Index H* equal to or greater than 5 were considered, remaining 124 articles originating from the ProQuest database and 56 from EBSCO after this selection. The third filter applied was the exclusion of articles that were in the two databases and those

that used the terms *Environmental Uncertainty* and *Environment Uncertainty* in a generic way, without linking it to the strategy theme. Tthe table 1 summarizes this article selection process that resulted in a total of 97 valid articles, including the time span between 1975 and 2010.

**Table 1** – Synthesis of the article selection process

| PROQUEST | | | EBSCO | | | TOTAL |
|---|---|---|---|---|---|---|
| TOTAL ARTICLES | HIGH IMPACT | THIRD FILTER | TOTAL ARTICLES | HIGH IMPACT | THIRD FILTER | |
| 402 | 124 | 84 | 792 | 56 | 13 | **97** |

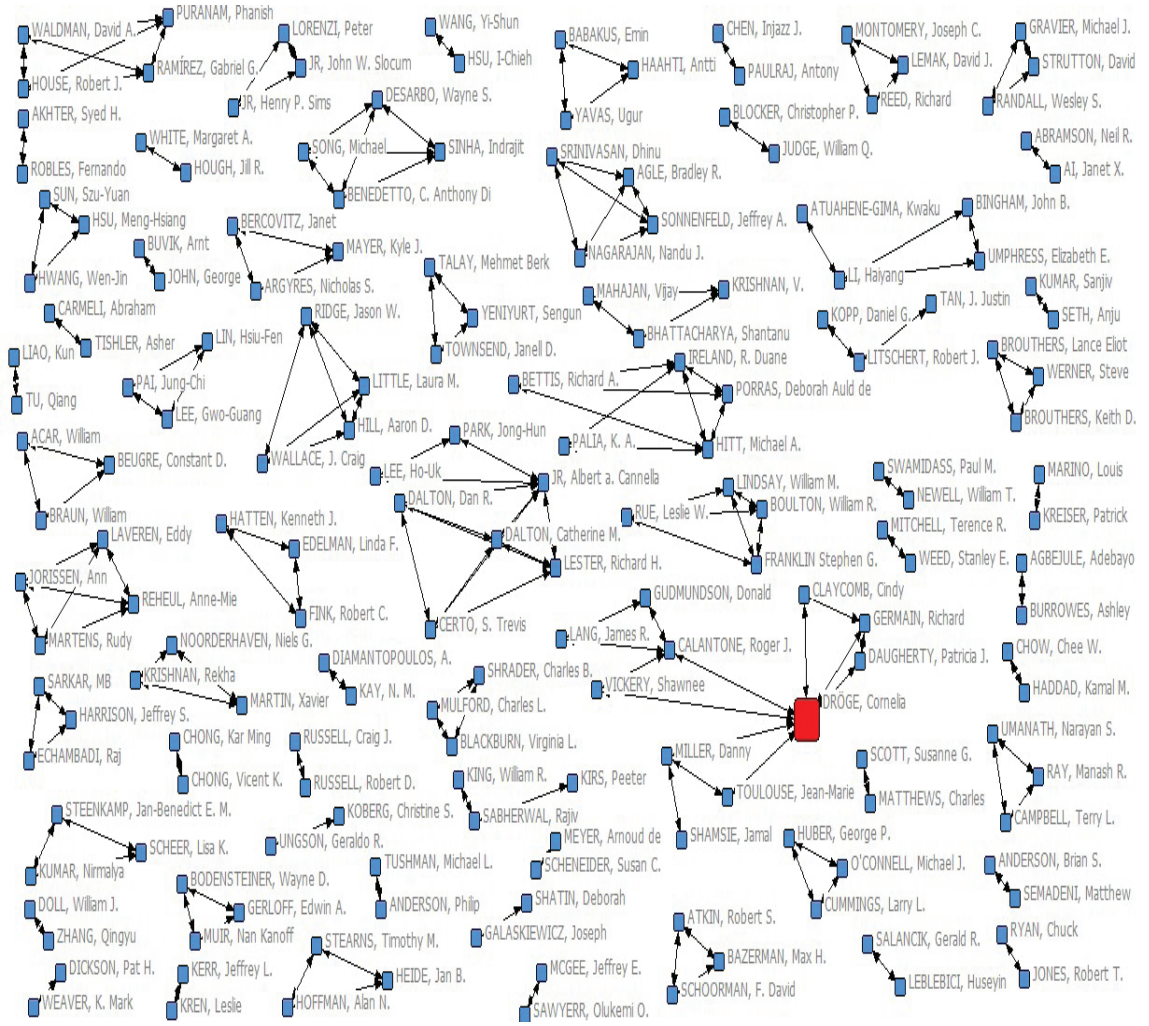
**Source:** Authors (2014)

After the presentation of the methodological aspects that guided the development of this research, the bibliometric analysis on the publications identified in the data collection will be carried out.

# 4 BIBLIOMETRIC ANALYSIS

Among the articles analyzed, it was observed the formation of cooperation networks, among authors, for the development of research on environmental uncertainty. In this regard, Dröge (1986, 1988, 1994, 1999, 2001) is highlighted by the number of ties with its peers, adding nine inbounds and nine outbounds. These data reveal that the author, in this specific theme and in this sample of articles, stands out for the partnerships established for the development of scientific research. Such networks can be best observed in the graphic representation on figure 1.

**Figure 1** – Authors Networks



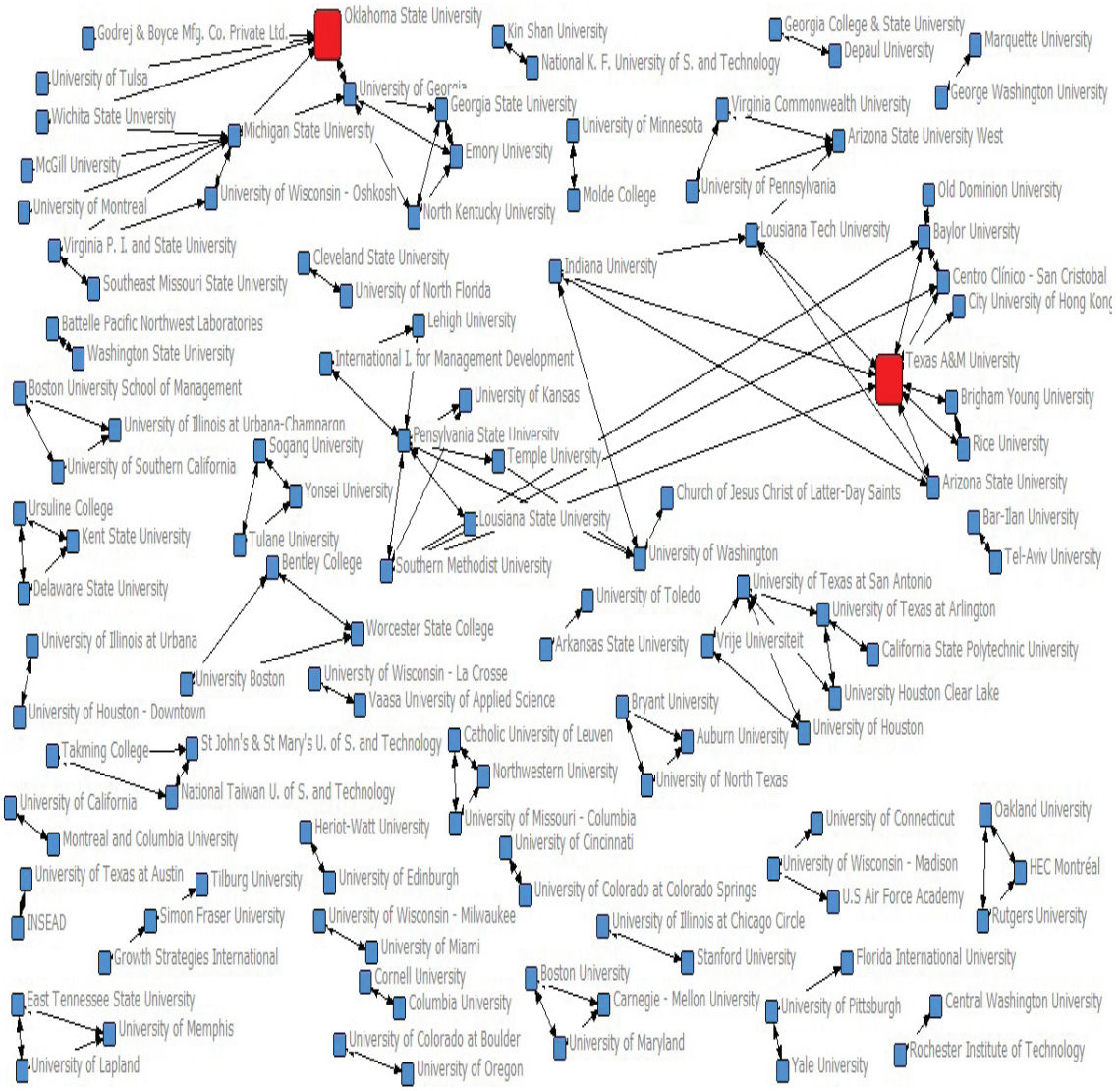

**Source:** Authors (2014)

The networks previously identified do not reveal, as a rule, that the featured authors are the ones that produced the most work on environmental uncertainty (only their relationships networks), however, in this specific research the exception to this rule must be applied. Dröge (1986, 1988, 1994, 1999, 2001), in addition to being highlighted in terms of cooperation networks of authors, is also written as having authorship in the largest number of articles published, totaling five articles. In the sequence Miller (1986, 1988, 1999), Litschert (1980, 1994), Hitt (1982, 1987), Ireland (1982, 1987), Koberg (1987a, 1987b), Sabherwal (1992, 1994), Sawyerr (1993, 2003), Germain

(1994, 2001), Calantone (1997, 1999), Li (2002, 2007) and Jr (2006, 2008) with two published works, each of the authors. It is important to note that the authors' signature orders were not differentiated. In the other papers analyzed, the researchers published only one article.

In this reasoning, we tried to identify the existence of cooperation networks between the institutions of the researchers, thus, several articulations were characterized. The Texas A&M University and the Oklahoma State University, as shown in figure 2, stand out from the others by the partnerships that signed (outbound ties) for a total of ten and nine, respectively.

**Figure 2** – HEI (Higher Education Institutions) Networks




**Source:** Authors (2014)

Aiming to explore not only the authors and their respective Institutions, table 2 summarizes the periodicals and the number of articles published in them. This indicator seeks to assist future submissions of papers, as it identifies journals that may have lines of interest in papers that address the issue of environmental uncertainty. It was observed that among all those studied in the *Academy of Management Journal,* 20 papers were located between 1975 and 2010, 11 more than the second with the largest number of publications, namely *Strategic Management Journal*.

**Table 2** – Periodic, H Index and number of articles published

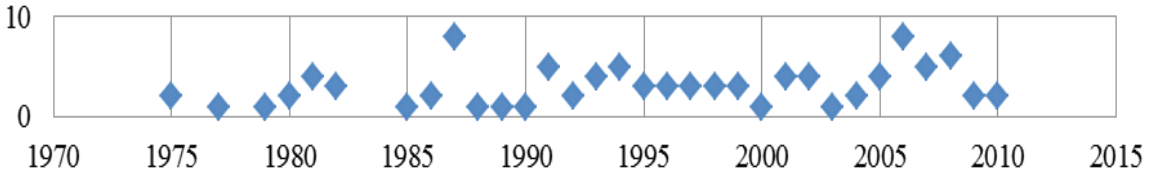
| TITLE OF THE PERIODIC | H INDEX | ARTICLES |
|---|---|---|
| Academy of Management Journal | 119 | 20 |
| Strategic Management Journal | 116 | 9 |
| Journal of Management | 77 | 7 |
| Journal of Small Business Management | 31 | 7 |
| Administrative Science Quarterly | 86 | 4 |
| Management Science | 97 | 4 |
| Academy of Management Review | 114 | 3 |
| Accounting and Business Research | 18 | 3 |
| Decision Sciences | 45 | 3 |
| Journal of International Business Studies | 74 | 3 |
| Journal of Marketing | 99 | 3 |
| Organization Science | 90 | 3 |
| European Journal of Marketing | 19 | 2 |
| International Journal of Manpower | 18 | 2 |
| Journal of Knowledge Management | 16 | 2 |
| Journal of Marketing Research | 70 | 2 |
| Journal of Supply Chain Management | 13 | 2 |
| Management Decision | 13 | 2 |
| Supply Chain Management | 39 | 2 |
| Business Process Management Journal | 13 | 1 |
| European Business Review | 8 | 1 |
| Europen Journal of Innovation Management | 9 | 1 |
| Family Business Review | 13 | 1 |
| International Journal of Productivity and Performance Management | 11 | 1 |
| International Marketing Review | 29 | 1 |
| Internet Research | 32 | 1 |
| Journal of Global Information Management | 18 | 1 |
| Journal of Manufacturing Technology Management | 21 | 1 |
| Journal of Marketing Theory and Practice | 8 | 1 |
| Management International Review | 12 | 1 |
| Managerial Auditing Journal | 8 | 1 |
| Managerial and Decision Economics | 14 | 1 |
| Team Performance Management | 5 | 1 |

**Source:** Authors (2014)

Following, in order to identify the evolution in the number of articles published between the period of 1975 and 2010, the graph 1 was elaborated. By means, it becomes possible to observe that in the years of 1987 and 2006 there was an increase, culminating in the greater number of productions related to environmental uncertainty, making a total of 16 researches published in high impact periodicals.

The effectiveness of these years is due to the work of: Ireland, Hitt, Bettis and Porras (1987), McCabe (1987), Milliken (1987), Stearns, Hoffman and Heide (1987), Koberg and Ungson (1987), Koberg (1987), Kay and Diamantopoulos (1987), Swamidass and Newell (1987), Babakus, Yavas and Haahti (2006), Lester, Certo, Dalton, Dalton and Jr (2006), Akhter and Robles (2006), Fink, Edelman and Hatten (2006), Carmeli and Tishler (2006), Beugré, Acar and Braun (2006), Agle, Nagarajan, Sonnenfeld and Srinivasan (2006) and Krishnan, Martin and Noorderhaven (2006).

**Graphic 1** – Scientific production per year




**Source:** Authors (2014)

In order to identify how the environmental uncertainty was measured and contributing to future researches, in table 3 were presented the analyzed works, the indicators used and the researches that supported the elaboration of the variables.

**Table 3** – Variables used to measure environmental uncertainty

| ARTICLE | VARIABLES USED | REFERENCE WORK |
|---|---|---|
| Huber, O'Connell and Cummings (1975) | military operations; economy; diplomatic negotiations; intelligence activities | |
| Lev (1975) | stock risk; actions risk | |
| Jones (1977) | measures of change; information; prediction | Ducan (1971) |
| Sperkman (1979) | purchases outside the company; purchases from other departments | Ducan (1971) |
| Kopp and Litschert (1980) | low and high uncertainty | Ducan (1971); Downey et al (1975) |
| Weed and Mitchell (1980) | information and predictability | |
| Ford (1981) | internal entities to the organization; entities external to the organization | Ducan (1971); Sathe (1974) |
| Lorenzi, Jr., Jr. (1981) | dynamism; complexity; unpredictability | Duncan (1972); Toni et al (1973) |
| Galaskiewicz and Shatin (1981) | stability/instability; homogeneity/heterogeneity; wealth/poverty | Dill (1958), Thompson (1967), Aldrich (1972) |
| Boulton, Lindsay, Franklin and Rue (1982) | external environment; measures of uncertainty; planning activities | Ducan (1972); Bourgeois (1978); Lindsay and Rue (1980) |
| Hitt, Ireland and Palia (1982) | relations with suppliers; prices of competitors; quality and design changes; financial suppliers; government agencies; unions | Miles and Snow (1978) |
| Leblebici and Salanik (1982) | market price volatility | |
| Bourgeois III (1985) | client; providers; competitor; socio-political; technological component | Ducan (1972) |
| Miller and Dröge (1986) | market practices; obsolescence of products; competitors' actions; tastes of demand and consumption; changes in modes of production and service | Khandwalla (1974, 1977); Miller (1983) |
| Tushman and Anderson (1986) | prediction of capacity errors | |
| Ireland, Hitt, Bettis and Porras (1987) | providers; competitors; customers; finance; regulatory agency; unions | Miles and Snow (1978) |
| McCabe (1987) | information; forecasting results; prediction of environmental factors | Ducan (1972); Sathe (1974) |
| Stearns, Hoffman and Heide (1987) | advertising | |
| Swamidass and Newell (1987) | users; poviders; competitors; regulatory agencies; political and public opinion; unions | Duncan (1972); Bourgeois (1978) |
| Boyd (1990) | environmental dynamism; complexity; munificence | Dess and Beard (1984); Keats and Hitt (1988); Grossack (1965); Aldrich's (1979) |
| Chow and Haddad (1991) | high; low | |

| ARTICLE | VARIABLES USED | REFERENCE WORK |
|---|---|---|
| Gul (1991) | competitors; competitors; technology; product/project; demand; raw material (price/availability); government; unions | Miles and Snow (1978); Govindarajan (1984) |
| Gerloff, Muir and Bodensteiner (1991) | state of uncertainty; uncertainty effect; uncertainty response | Ducan (1972); Milliken (1987) |
| Sabherwal and King (1992) | environmental dynamism; heterogeneity; hostility | Friesen and Miller (1982) |
| Sawyerr (1993) | change in the environment; environmental complexity; industry dependence | Daft et al. (1988) |
| Kren and Kerr (1993) | customers; competitors; providers; regulatory groups; industrial technologies | Govindarajan (1984) |
| Miller (1993) | providers; competitors; customers; capital/financial market; regulatory agencies; unions | Miles and Snow (1978) |
| Umanath, Ray and Campbell (1993) | nº of products; nº of areas; nº of competitors; socio-political climate | Ducan (1972) |
| Germain, Dröge and Daugherty (1994) | marketing practices; competition actions; demand and the tastes of the customer; Production processes | |
| Tan and Litschert (1994) | dynamism; hostility; complexity | Khandwalla (1977); Jauch, Osborn and Glueck (1980) |
| Sabherwal and Kirs (1994) | demand; government actions; availability of faculty; availability of staff/administrative staff | |
| Ganesan (1994) | diversity; volatility | |
| Buchko (1994) | amplitude and frequency of exchange of products of their companies and processes | Milliken (1987) |
| Kumar, Scheer and Steenkamp (1995) | tendencies; volume of industry; sales forecasts | Heide and John (1988) |
| Matthews and Scott (1995) | customers; providers; distributors; competitors; government; public opinion; technology; financial markets | Ducan (1972); Jausch, Osborn and Glueck (1980) |
| Mangliso (1995) | education, technological formation and skills of employees; socio-cultural and team language; technological or managerial experience; management styles; skilled workforce in the organization; individuals and integration groups; consumers and / or distributors; suppliers, equipment or services; job offer; contest for suppliers or customers; government; attitude of the public with the company and its product/service; unions; technological needs. | Ducan (1972) |
| Werner (1996) | government policies; macroeconomics; resources and services used by the company; product market and demand; competition; technology uncertainty | Miller (1993) |

| ARTICLE | VARIABLES USED | REFERENCE WORK |
|---|---|---|
| Damanpour (1996) | turbulence; environmental variability and competition; different environmental conditions or sectors | Kim (1980); Zmud (1984), Aiken et al. (1980); Damanpour (1987); Miller and Friesen (1982); Kimberly and Evanisko (1981) |
| Dickson and Weaver (1997) | dynamism; external environment; behavior; general uncertainty; technological demand; volatility; predictability of markets; future growth potential; profits; degree of internationalization | Covin and Slevin (1989) and Schultz, Slevin, and Covin (1995); Dickson and Weaver (1997) |
| Chong and Chong (1997) | industrial environment; economic; technological; competitive; customers | |
| Kumar and Seth (1998) | governmental and regulatory policies; competitive climate; providers; technology; client | Egelhoff (1988) |
| Abramson and Ai (1998) | local attitude; local culture; technology; laws; environment; commitment; price | |
| Miller and Shamsie (1999) | environment; organization; decision | Milliken (1987) |
| Luo (1999) | complexity; dynamism; hostility | |
| Vickery, Calantone and Drape (1999) | volatility in marketing practices; rate of obsolescence of products; competitors; demand and tastes; modes of production or service | Miller and Dröge (1986) |
| Buvik and John (2000) | provider; specificity of assets; investments; gross annual turnover of the manufacturer; annual volume purchased from the supplier; long-term relationships | Anderson (1985); Heide and John (1990); Noordewier, João and Nevin (1990) |
| Claycomb, Dröge and Germain (2001) | demand; product; changes | |
| Waldman, Ramirez, House and Puranam (2001) | dynamism; risk; expansion; stress | Khandwalla (1976: 641-643) |
| Sarkar, Echambadi and Harrison (2001) | technological dynamism; competitive and market | Jaworski and Kohli (1993); Dickson and Weaver (1997) |
| Li and Atuahene-Gima (2002) | price; product; technology; competitiveness | Miller (1987) |
| McGee and Sawyerr (2003) | variability in the environment; environmental complexity; importance of the sector | Duncan (1972); Daft, Sormunem, Parques (1988) |
| Hough and White (2004) | dynamic or static environments | Duncan (1972) |
| Desarbo, Benedetto, Songs and Sinha (2004) | technology; marketplace; competition | |
| Lee, Lin and Pai (2005) | customers; competitors; products; competitor prices | Kearns and Lederer (1999), |
| Jorissen, Laveren, Martens and Reheul (2005) | competitors; providers; customers; public; technology; government financial markets; regulatory agencies; unions | |

| ARTICLE | VARIABLES USED | REFERENCE WORK |
|---|---|---|
| Babakus, Yavas and Haahti (2006) | work; providers; customers; capital | |
| Lester, Certo, Dalton, Dalton and Jr. (2006) | munificence; dynamism; complexity | |
| Fink, Edelman and Hatten (2006) | technological uncertainty | Withey, Daft and Cooper (1983) |
| Carmeli and Tishler (2006) | business practices; obsolescence of products; action of competitors; tastes and demand forecast; rate of change of production/service technology | Miller and Droge (1986) |
| Agle, Nagarajan, Sonnenfeld and Siunivasan (2006) | volatility of stock returns | Core Holt Hausen and Larcker ( 1999) Gray and Canella (1997) Miller, Wiseman, and Gomez-Mejia (2002) |
| Krishnan , Martin and Noorderhaven (2006) | instability; unpredictability | Bergh and Lawless (1998) Keats and Hitt (1988) Glick, Ogilvie, and Miller (1990); Wholey and Brittain(1989) |
| Li, Bingham and Umphress (2007) | customer preference; customer needs; competitors; marketplace | |
| Paulraj and Chen (2007) | suppliers and needs of the company; suppliers and quality of materials; inspection of materials; material rejection | |
| Agbejule and Burrowes (2007) | rate of change; rate of innovation in products/services and process; rate of change in the taste of customers and their preferences | Miller and Friesen (1983) |
| Argyres, Bercovitz and Mayer (2007) | uncertainty level associated with the project | |
| Liao and Tu (2007) | demand's tastes and preferences; industrial product innovation; obsolescence of products; rate of technological innovation in the productive process | |
| Hsu and Wang (2008) | customers; technology; competitors | Miller and Friesen (1978, 1983), Eisenhardt (1989) and Daft (2003) |
| Jr, Parke and Lee (2008) | absence of pattern; unpredictability; unexpected change | Dess and Beard (1984); Keats and Hitt (1988) |
| Wallace, Little, Hill and Ridge (2010) | marketing practices; obsolescence of products and services; competitors' actions; consumer demand and tastes; values and beliefs; technological advances in industry | |

**Source:** Authors (2014)

In addition to the work presented in table 3, we highlight the works of: Koberg and Ungson (1987), Koberg (1987), Miller, Dröge and Toulouse (1988), Schrader, Mulford and Blackburn (1989), Schneider and Meyer (1991), Russell and Russell (1992), Alexander (1991), Lang, Calantone and Gudmundson (1997), Gosselin (2005), Moschuris (2007), Sahadev (2008), Sun, Hsu and Hwang (2009), Townsend, Yeniyurt and Talay (2009), Semadeni and Anderson (2010), that didn't have their variables specified by the authors.

It was observed that among the studies that didn't explain the indicators for the measurement of the environmental uncertainty, some quoted the work(s) that were used as reference for the data collection in their research. These informations can be seen in table 4.

**Table 4** – Reference works used by the articles that didn't mention the environmental uncertainty measurement variables

| ARTICLES | REFERENCE WORKS |
|---|---|
| Koberg and Ungson (1987) | Thompson (1967) and Ducan (1972) |
| Koberg (1987) | Ducan (1972) |
| Miller, Dröge and Toulouse (1988) | Miller and Droge (1986) |
| Schrader, Mulford and Blackburn (1989) | Ducan (s.d) and Bourgeois III (s.d) |
| Alexander (1991) | Koberg ( 1987) and Zammuto (1983) |
| Gosselin (2005) | Gordon and Narayanan (1984) |
| Sahadev (2008) | Celly and Frazier (1996). |

**Source:** Authors (2014)

Besides these, the studies of Schoorman, Bazerman and Atkin (1981), Milliken (1987), Kay and Diamantopoulos (1987), Reed and Lemark (1996), Bhattacharya, Krishnan and Mahajan (1998), Zhang and Doll (2001), Greve (2002), Jones and Ryan (2002), Kreiser and Marino (2002), Callanan (2004), Akhter and Robles (2006), Beugre, Acar and Braun (2006), Judge and Blocker (2008) and Gravier, Randall and Strutton (2008) were not included for not having their methodology aimed to establish a theoretical essay on the subject and didn't specifically focus on identifying ways to measure environmental uncertainty.

Among the analyzed studies, a significant contribution of the quantitative research on the other studies was observed. It was verified that of the 97 articles analyzed, 83 used quantitative investigations, representing 85% of the studies, while the rest (14 papers) carried out theoretical essays on the subject representing 15% of the sample surveyed.

In order to help future researches on environmental uncertainty, during the analysis of each article, terminologies related to the subject were identified and could be used in future scientific questions as keywords. Such information can be seen in table 5.

**Table 5** – List of terminologies that refer to the content of environmental uncertainty

| TERMINOLOGIES | | |
|---|---|---|
| Environmental Uncertainty | Environmental Turbulence | Response Uncertainty |
| Effect Uncertainty | Environmental Unpredictability | State Uncertainty |
| Environment | Environmental Variables | Supply Uncertainty |
| Environmental Context | Environmental Volatility | Uncertainty |
| Environmental Decision | E.U. | Uncertainty Future |
| Environmental Information | Perceived Environmental Uncertainty | Uncertainty Management |
| Environmental Instability | Perceived Strategic Uncertainty | Uncertainty Modeling |
| Environmental Risk | Perceived Uncertainty | |
| Environmental Scanning | P.E.U. | |

**Source:** Authors (2014)

In order to identify the works used to base the researches, the references used in each of the articles were selected. Thus, in table 6 the ten most referenced authors were listed in the surveys and in the column next to it the number of times quoted was identified. In addition to this information, we present the most referenced work and the number of times it was quoted.

It is observed that, although Miller was the most referenced author, the works of Duncan (1972) was consistently the most mentioned work in the researches carried out between 1975 and 2010.

**Table 6** – Most quoted references

| AUTHOR | QUO. | WORKS MOST QUOTED | QUO. |
|---|---|---|---|
| MILLER, Dany | 65 | MILLER, D.; FRIESEN, P. H. Strategy-Making and Environment: The Third Link. **Strategic Management Journal**, 4(3), 221-235, 1983. | 9 |
| DUCAN, Robert B. | 57 | DUNCAN, R. B.. Characteristics of Organizational Environments and Perceived Environmental Uncertainty. **Administrative Science Quarterly**, 17(3), 313-327, 1972. | 49 |
| PFEFFER, Jeffrey | 51 | PFEFFER, J.; SALANCIK, G.R**. The External Control of Organizations: a resource dependence perspective**. New York: Harper & Row Publishers, 1978. | 26 |
| HAMBRICK, Donald C. | 50 | HAMBRICK, D. C. Environmental Scanning and Organizational Strategy. **Strategic Management Journal**, 3(2), 159-174, 1982. | 10 |
| LAWRENCE, Paul R. | 49 | LAWRENCE, P. R. and LORSCH, J. W. **Organization and Environment**, Harvard University Press, Cambridge, MA, 1967. | 27 |
| THOMPSON, James D. | 43 | THOMPSON, J. D. **Organizations in action**. New York: McGraw-Hill, 1967. | 39 |
| MILES, Raymond E. | 42 | MILES, R. E.; SNOW, C. C. **Organizational strategy, structure, and process**. New York: McGraw-Hill. 1978. | 25 |
| BOURGEOIS, L. J. III | 35 | BOURGEOIS, L. J. III. Strategy and environment: a conceptual integration. **Academy of Management Review**, 5, pp. 25-39, 1980. | 10 |
| DOWNEY, H. Kirk | 35 | DOWNEY, H. K.; HELLRIEGEL, D.; SLOCUM, J. W. Jr. Environmental uncertainty: The construct and its applications. **Administrative Science Quarterly**, 20: 613-629, 1975. | 15 |
| PORTER, Michael E. | 31 | PORTER, M. E. **Competitive Strategy: Techniques for Analyzing Industries and Competitors**. The Free Press, New York, NY. 1980. | 9 |

**Source:** Authors (2014)

It was identified that a big number of papers presented as a complement to the study and the instruments used in the research (questionnaires or detailed research procedures) that went through that study.

These researches are highlighted on table 7. It must be pointed out that these papers may contribute to future researches as examples of mechanisms for the collection of data on the subject of environmental uncertainty.

**Table 7** – Papers that present a detailed research instrument or procedure

| ARTICLES | | |
|---|---|---|
| Lorenzi, Jr and Jr (1981) | Miller (1993) | Abramson and Ai (1998) |
| Miller and Dröger (1986) | Germain, Dröge and Daugherty (1994) | Waldman, Ramírez, House and Puranam (2001) |
| McCabe (1987) | Tan and Litschert (1994) | Desarbo, Benedetto, Song and Sinha (2005) |
| Koberg (1987) | Ganesan (1994) | Lee, Lin and Pai (2005) |
| Swamidass and Newell (1987) | Kumar, Scheer and Steenkamp (1995) | Agbejule and Burrowes (2007) |
| Schneider and Meyer (1991) | Magaliso (1995) | Hsu and Wang (2008) |
| Sabherwal and King (1992) | Wener, Brouthers and Brouthers (1996) | Wallace, Little, Hill and Ridge (2010) |
| Kren and Kern (1993) | Kumar and Seth (1998) | |

**Source:** Authors (2014)

Thus, based on the bibliographic review and methodological procedures previously presented, besides the bibliometric analysis on the environmental uncertainty theme, following it will be presented the final considerations and suggestions for future works.

# 5 FINAL CONSIDERATIONS

In the course of this article, several analyzes were carried out in order to explore the environmental uncertainty theme, using the bibliometrics method. From the analysis of 97 publications over the period from 1975 to 2010, it can be observed the highlight of some characteristics of these surveys.

Before the results found, it is lawful that there are several small networks of researchers interested in publications on environmental uncertainty, however, it is worth mentioning the fact that there's not a constant number of publications in international journals with high impact on the part of these scholars. This very consideration is also valid in terms of partnerships between educational institutions.

It is known that in this scenario, it must be considered the slowness of the analysis process of the works by the periodicals, however, this possibility can be practically discarded, since the study covered the temporal space of 35 years, which rejects this possible justification for low publication.

Among the periodicals, it was observed that the *Academy of Management Journal* was highlighted on the number of articles published, which suggests the interest for publications directed to environmental uncertainty. This kind of information is appropriate for researchers who are dedicated to developing studies in this line.

The years of 1987 and 2006 were highlighted due to the expressiveness of the number of articles published. On the other hand, it's necessary to point out that the total number of articles was only 16 internationally. It's observed that this number is not so expressive when considering the suggestions for future work present in the studies analyzed. These contributions point to a gigantic universe of research possibilities.

Regarding the variables used to measure the environmental uncertainty, the importance of the study by Ducan (1972), which served as a reference for the elaboration of many data collection instruments, is also conclusive, as well as to substantiate a large part of the work.

Thus, it is concluded with this work that the environmental uncertainty over the years has gained space, but it hasn't acquired a uniform methodological form. The space is characterized by the number of international publications that is restricted, but existent. The absence of a definite form of method, concept and instrument is due to the different characteristics of the segments and companies studied, which correlated the environmental peculiarities, resulting in a continuous process adaptation to each study.

The main limitation of this study is the fact that the database is limited to some periodicals and to the methodological filters of the authors, which may result in leaving margins of the collection on some relevant work.

For future studies, it is recommended to expand this study by identifying other variables that couldn't be studied here, such as the Country of origin of the researchers and the place of the research, as well as the application of a multivariate analysis technique, such as multiple correspondence analysis that can identify the studies that have a correlation. In addition, the conduct of a similar study in the national databases.

Finally, we tried to address some aspects that certainly deserve future attention on the part of the researchers and managers of the organizations. This way, the effort to present some important elements of the environmental uncertainty studies will contribute towards deeper discussions on the subject.

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