

DEVELOPMENT OF SYSTEMIC ENVIRONMENTAL TURBULENCE

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ABSTRACT

How does contingency theory underpin the concepts of the organizational environment? Although it may seem like a simple question, it requires further reflection on how this theory emerged and how environments have evolved from simple to complex, turbulent, and hyper-turbulent. The organizational environment was addressed differently in earlier studies, both during the development and the consolidation of contingency theory. Initially, only characteristics of uncertainty were considered as environmental variables necessary to maintain an adequate structure for example, in organic or mechanistic organizations. However, the description of the environment remained broad until 1972, when a watershed moment occurred by delineating internal and external components and incorporating the concepts of environmental turbulence contexts. In this regard, the deepening of environmental concepts in contingency and turbulence studies had two notable pioneers. Consequently, consistent measures of environmental turbulence were developed, focusing on perceptual assessments. This integration brought environmental turbulence into contingency studies. Nonetheless, environmental turbulence began to encompass other forms of turbulence within these constructs, highlighting the need for a more comprehensive perspective. Thus, efforts directed toward environmental turbulence represent a holistic view of contingencies that aims to measure eventualities at the company, sector, and country levels. Perhaps the greatest challenge lies in the wide array of social and economic variables required to form these constructs, as determining the relevance of each factor to the business environment remains an open question.

Keywords: Environmental Turbulence. Contingency Theory. Turbulent Environment.

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1 INTRODUCTION

How does contingency theory underpin the concepts of the organizational environment? Although it may seem like a simple question, it requires much more reflection on how this theory emerged and how environments evolved from being simple to complex, turbulent, and hyper-turbulent. However, to reflect on this issue it is necessary to revisit the early studies of contingency theory in order to describe how the sociological barrier of the environment was overcome, as well as to observe the development of contingency theory and its encounter with turbulent environments.

If we examine the origins of the interest in studying formal, complex, or large organizations until the 1960s, we can note that this interest emerged almost at the inception of the discipline of sociology. In this context, authors such as Dunkheim, Spencer, and Tönnies referred to the principles of rational organizations, focusing on discussing social organizations and the stage of societal development. However, this perspective, with sociology's broader positioning, was not conducive to analyzing the structure and functioning of organizations. Thus, at the end of World War II, the terms organizational sociology, organizational analysis, or modern organization theory were developed to study these complex organizations (Mayntz, 1965).

In this way, Burns and Stalker (1961) broke with the traditional sociological view by criticizing the influence of sets and patterns which at the individual level do not modify the framework of beliefs but noting that at the organizational level decisions are made in the presence of other individuals who, in turn, have the knowledge to understand and implement them. Therefore, the most relevant considerations in any decision-making process must be shared and acceptable to the other members. In this regard, the most efficient organizations develop a management model that facilitates decision-making.

Burns and Stalker (1961) argued that organizations could be described in two ways mechanistic and organic depending on their environment. Mechanistic structures are more suitable for stable environments because they are characterized by a reinforced hierarchical structure, task specialization, and a greater emphasis and prestige on internal knowledge compared to external sources. In contrast, organic structures are more appropriate for unstable environments, as they adapt to changing conditions and constantly emerging problems and requirements. Moreover, organic structures are characterized by a more horizontal rather than vertical orientation, shared responsibilities, and a network-based structure of control, authority, and communication.

Focusing on the structure of power, Perrow (1961) argued that organizational behavior is related to objectives, as these objectives tend to reflect organizational policies. To explain the power structure within organizations, he related the stages of technology and growth to the need for resource acquisition, legitimation, skills, and coordination. In this way, Perrow (1961) described how the organization's objectives influence the power structure. For instance, in a company engaged in research and development, where there is a greater concern for skills, it is likely that professionals with those skills will dominate the power structure. In organizations that require legitimation, it is likely that administrators will dominate the power structure, as they legitimize the organization's status and ensure that resources are not misused. In this sense, Perrow (1961) also maintained that external variables influence the organizational environment.

Chandler's (1962) contribution was to establish the relationship between strategy and structure. With the territorial expansion of large companies after World War II, he sought to describe the structure used to manage major enterprises. The organizational structure known as the multidivisional form was the most widely used across various economic activities. In this management model, there is a headquarters responsible for planning, coordinating, and evaluating the activities of the divisions, as well as for allocating financial, human, physical, and other resources. The divisions, in turn, are responsible for managing the necessary functions of a product line or a set of services within a broad geographic area. In this sense, the company's structure

follows its strategy, driven by both volume and geographic expansion, which gave rise to the decentralized management model.

Although an organization's structure may be influenced by technology, objectives, and the environment in which it operates, no single relationship has emerged as superior over the other types of organizational structures and environmental characteristics. Even with research efforts based on the teaching of business administration subjects, there remains an absence of a clear relationship between an organization's success and the "correct" organizational structure. In this way, the success inherent in organizational performance may result from various structures; evidently, environmental factors can influence managers' decisions (Woodward, 1977).

In light of these seminal contributions, a broad foundation for contingency theory was established, evolving differently from the predominant sociological perspective. Studies began to describe the management methods of formal and complex organizations from a new perspective, thereby initiating research that expanded the analysis of management forms and the existing influences. However, although the organizational environment was considered in these analyses, it was not deeply examined through refined constructs. Up to a decade after these seminal studies, other authors contributed to the development of contingency theory and expanded the concepts of environment.

The contribution of Lawrence and Lorsch (1967) lies in formulating hypotheses about organizational structure, as they describe that organizations can be both differentiated and integrated, depending on the environment. Differentiation is characterized by a higher specialization of knowledge, while integration refers to the quality of collaboration among departments. In this context, the hypotheses assert that environmental uncertainty influences both the structure and the economic performance of the organization. Their findings indicated that the degree of differentiation was inversely related to the degree of integration, even when the environment demanded that organizations be highly differentiated and well integrated. Additionally, it is noteworthy that the term "contingency" emerged, marking the beginning of the development of contingency theory.

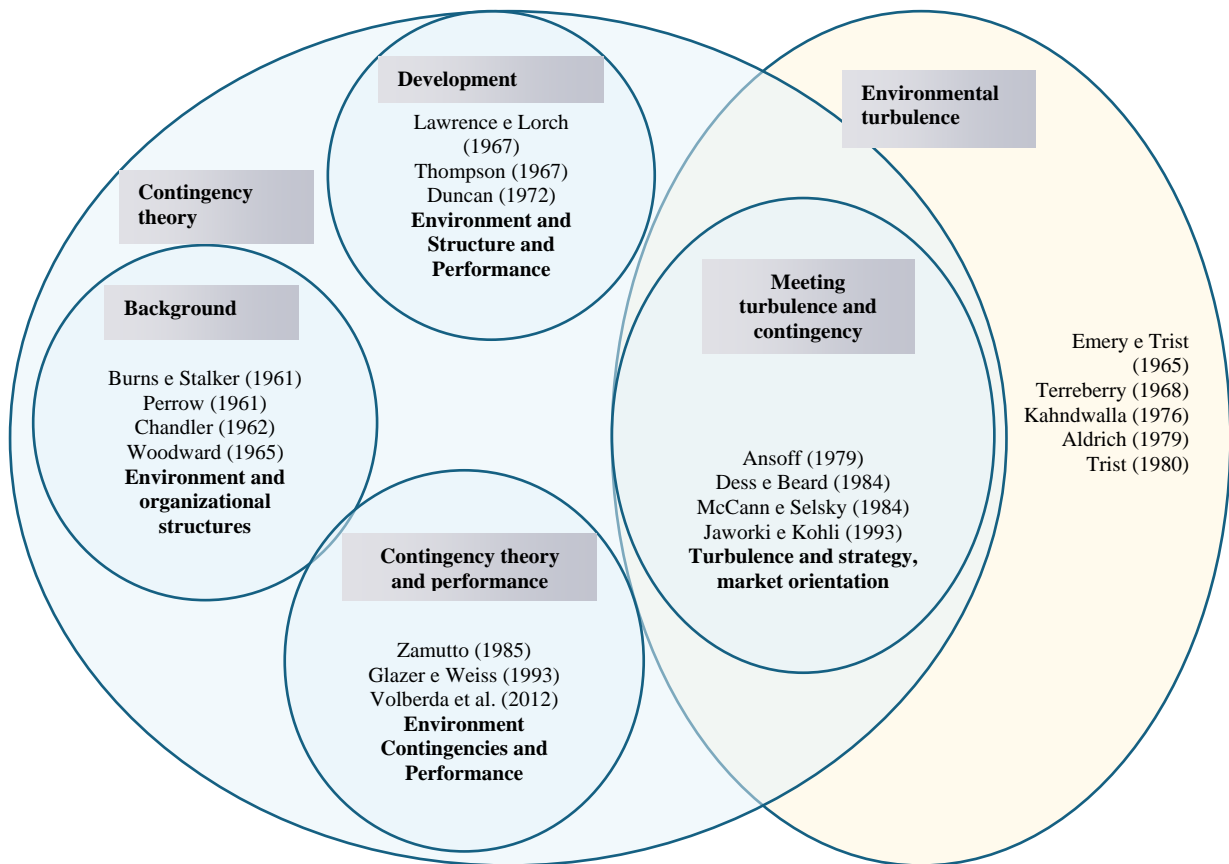
In view of these seminal contributions, this article seeks to present a theoretical discussion on how contingency theory underpins the development of environmental turbulence concepts. Although the concept of environment has been explored in seminal research (Burns & Stalker, 1961; Chandler, 1962; Lawrence & Lorsch, 1967; Perrow, 1961; Thompson, 1967), the literature had yet to define the possible components and their respective dimensions. To fill this gap, Duncan (1972) addressed environmental concepts derived from macroeconomic definitions, studies such as Emery and Trist's (1965) research on turbulence, as well as concepts of environment stemming from task-related (internal environment) aspects of organizations, similar to the work of Lawrence and Lorsch (1967).

2 ENCOUNTER BETWEEN CONTINGENCY THEORY AND TURBULENCE

Contingency theory has its antecedents in studies by Burns and Stalker (1961), Perrow (1961), Chandler (1962), Thompson (1967), among others in the 1960s. During that same period, a macroeconomic view of the environment emerged that enhanced the concept of environmental turbulence, as demonstrated by Emery and Trist (1965). However, contingency studies addressed the concept of environment in an unstructured manner until Duncan's (1972) study, which defined the types of environments and classified them according to levels of uncertainty.

In Figure 1, the intersection point between contingency theory and environmental turbulence is highlighted.

Figure 1
Intersection point between contingency theory and environmental turbulence



Source: Author (2024).

One possible intersection between contingency theory and environmental turbulence is found in the studies by Ansoff (1979) and Jaworski and Kohli (1993), which relate the adjustment of management practices (strategy, market orientation) to turbulent environments and explain how this relationship affects organizational performance. Other connections reinforcing the importance of the environment are presented in various forms in the literature, such as the study by Zammuto (1985), which highlights this intersection by emphasizing that organizations must first understand the potential changes occurring in the environment and then implement future plans that are consistent with it, as any divergence between the environment and planning may lead to organizational decline.

Consistent with the idea that management practices must be aligned with a turbulent environment to influence organizational performance, Glazer and Weiss (1993) contribute an intersection between contingency theory and environmental turbulence by examining information processing. They emphasize that planning depends on the speed at which a company processes information, and in turbulent environments, planning can slow down the decision-making process.

These studies suggest an attempt to contribute to the construction of a unifying theory between organizational adjustment and performance that takes the environment into account. Volberda et al. (2012) reinforce the notion that different schools of thought use the concept of adjustment to indicate the possible synergy between the organization and its environment. Adjustment is explained mainly within the scope of contingency and institutional theory.

Figure 1 clearly illustrates, by way of the study dates, the epistemological trajectory of contingency theory until it met environmental turbulence. First, one can identify the antecedents

that initiated studies focusing on organizational structures and the environment. Subsequently, the term “contingency” emerged, accompanied by studies focused on structures, performance, and the environment. Moreover, contingency theory underwent research that integrated other contingencies with the same focus. However, the convergence of turbulence and contingency is most evident in the studies by Ansoff (1979) and Jaworski and Kohli (1993).

In this sense, it is possible to reflect on the view that strategic alignment with a turbulent environment is key to achieving results, especially when it is combined with continuous adaptation in response to uncertainties. Consequently, the ability to develop strategies in response to environmental changes enables organizations to maintain their relevance and competitiveness. These behaviors indicate that agility and resilience are indispensable in turbulent environments.

However, this thesis may be criticized for overestimating organizations' ability to predict and respond to changes, which are rapid and complex, while ignoring constraints such as financial resources, human resources, and especially accurate information. It is possible that organizations face extreme uncertainties to the extent that even the best analytical models possess low explanatory power and fail to provide clear conclusions. Moreover, strategic readjustments for adaptation may lead to a loss of identity as companies become reactive to the external environment, sacrificing long-term vision.

On the other hand, this critical reflection underestimates the evolution of data analysis technologies and the sophistication of predictive models. Big data tools, artificial intelligence, and real-time analytics can provide organizations with a foundation for informed decision-making, even in turbulent scenarios. Thus, although strategic planning is not infallible, its capacity to build resilience and mitigate risk remains relevant in unpredictable, turbulent environments.

3 FOUNDATIONS OF ENVIRONMENTAL TURBULENCE

Although seminal studies in contingency theory (Burns & Stalker, 1961; Chandler, 1962; Perrow, 1961; Woodward, 1977) have related organizational characteristics to the environment, the complexity and changes of the environmental context have also emerged as a distinct line of research. Initiated by Emery and Trist (1965), this line of study characterized the environment at different levels of complexity, the highest and most complex being environmental turbulence.

Emery and Trist (1965) identified that one of the main problems inherent in organizational change studies was the quality of the environment—that is, the environmental context in which organizations are embedded—since they described a growing pace towards increased complexity. However, the environment was not yet well understood within the behavioral sciences, partly because technological changes were having an impact and there was a belief that progress would occur more rapidly.

Nevertheless, the way Emery and Trist (1965) conceptualized the environment was based on systems thinking. The concept of systems provided an appropriate and available conceptual response for the studies, as it demonstrated an inherent property of organization; thus, understanding the nature of interdependencies became a key research objective. However, the initial concepts in systems theory were directed towards analyzing internal processes within organizations.

In light of examples from other fields that could represent models of closed systems, Emery and Trist (1965) observed that these models should be related to environments, steering the focus toward open systems. Yet, environmental interdependencies often involve relationships that cannot be neatly confined within boundaries. By isolating ideal types of causal texture, it becomes possible to approximate the real-world environment experienced by most organizations (Emery and Trist, 1965).

As the environment becomes turbulent, its components consist of an infinite number of formal organizations. The more turbulent the environment, the more an organization's markets are

composed of other organizations from material suppliers and labor to a greater number of increasingly powerful regulatory groups. The organization interacts with its environment by exchanging inputs, usually money, for its products, which may serve as inputs for other organizations. However, there are other types of interactions that go beyond products as inputs, such as energy inputs and informational inputs. Energy inputs include machinery, personnel, customer portfolios, energy, among others, while informational inputs refer to the collection, processing, and distribution of information. In this sense, organizational environments are becoming increasingly turbulent, organizations less autonomous, and formal organizations more relevant (Terreberry, 1968).

Among the phenomena that can render an environment turbulent are technological change, competitiveness, cyclical fluctuations, sociocultural changes, and shifts in governmental policies. Technological change can introduce numerous new products or operational processes into the environment, as observed in the electronics and aerospace industries. Competitiveness contributes to environmental turbulence not only because companies compete on price, but also through advertising, promotion, product quality, services, after-sales support, as well as the sourcing of specialized inputs and labor. Similarly, cyclical fluctuations and oscillations in the economic activities of rapidly growing sectors also engender turbulence. Rapid sociocultural changes alter customer needs, and changes in governmental policies can prompt decision-makers to perceive increased turbulence. Thus, the more components that occur concurrently, the more turbulent the environment becomes (Khandwalla, 1976).

Although organizations are significantly shaped by environmental turbulence, a turbulent environment can also be beneficial, as it offers numerous growth opportunities in addition to challenges and contingencies. A turbulent environment is challenging due to the combination of uncertainty and opportunity, and it tends to attract entrepreneurs and risk-takers, much like stable environments attract more conservative investors (Khandwalla, 1976).

Environmental changes occur through a natural evolution that progressively increases the available knowledge. Initially, one can only identify a general stage of turbulence in the environment—a rumble before an earthquake. For example, consider the advances in the electronics industry in the early 1940s; there was an overall expectation of significant development. However, predictability was not so clear, as early post-war specialists anticipated progress driven by semiconductor phenomena—which did not materialize—until the invention of the transistor in 1946 provided concrete advancement (Ansoff, 1979).

By the 1970s, conditions of environmental turbulence became increasingly pronounced. During this period, (i) oil prices quadrupled under the Organization of Arab Petroleum Exporting Countries (OAPEC) and (ii) the international monetary system based on fixed exchange rates was abandoned, resulting in the turmoil of floating exchange rates and a devaluation of the U.S. dollar. In addition, endemic inflation emerged alongside persistent unemployment. These unforeseen and poorly understood events not only generated perplexity but also elevated the levels of environmental turbulence (Trist, 1980).

In this context, environmental turbulence represents a condition that intensifies complexity; conditions that are excessively turbulent can overload an organization's capacity to adapt. Before evolving into hyper-turbulence and an ungoverned environment, participants typically attempt to collaborate in search of adaptive solutions. The escalation in complexity and change intensely challenges adaptive capacities, prompting individuals to confront even uncontrollable levels of complexity and change in order to safeguard their adaptive capacity (McCann & Selsky, 1984).

Com uma organização diferente das dimensões ambientais, Dess e Beard (1984) descrevem três Dimensões: munificence, dynamism, and complexity. Munificence refers to the extent to which the environment supports sustainable growth. Dynamism pertains to turnover or the absence of predictable patterns, as changes are difficult to forecast and increase uncertainty for the organization's key members. Complexity is based on the perception of greater uncertainty among

managers, thereby raising the level of information processing required compared to a simple environment.

An important lesson, according to Zammuto (1985), is the need to learn about the environment and the possible directions in which it may evolve. Only in this manner can strategic actions enhance an organization's long-term viability. If the dynamics of environmental change are not understood, organizations run the risk of decline. By employing strategies for environmental digitization and strategic planning, organizations tend to improve their chances of survival and long-term performance.

Bourgeois and Eisenhardt's (1988) contribution to understanding environmental change brings to light a paradox. On one hand, it refers to the time required for planning, emphasizing the need for careful and analytical planning; on the other, it calls for making decisions swiftly and decisively. In this regard, CEOs must rapidly formulate an overall strategy and activate it only when necessary. Some sectors, such as the microcomputer industry, exhibit these characteristics. With the trend toward technological depreciation, deregulation, and global competition, it is possible that other sectors may also experience similar rates of change.

Turbulence exists when the changes organizations face are far from trivial, occurring rapidly and discontinuously. The view of turbulence constructed by some seminal contingency theory studies often uses environmental turbulence and environmental uncertainty interchangeably. However, a conceptual distinction should be made to differentiate between the rate of change and unpredictability in other words, turbulence tends to create uncertainty. Thus, uncertainty is one of the implications of environmental turbulence (Cameron et al., 1987).

Change is inevitable and independent of individuals' approval, as it is impossible to stop aging and becoming both more experienced and more fragile. The difference between past and present conditions lies in the speed of change, which is faster, more intense, and more diversified. This trend points toward a future that is technologically more complex, interconnected, and characterized by networks of relationships. One aspect that can be understood is the behavioral pattern of society, with the aim of identifying underlying patterns and causes. For example, the once rigid and traditional leadership style is becoming less tolerated, as access to information, education, and societal evolution tend to reject authoritarian approaches (Waterhouse, 1992).

Aligned with Bourgeois and Eisenhardt's (1988) discussion of the paradox between the time required for careful planning and the need for rapid decision-making in turbulent times, Glazer and Weiss (1993) reinforce the relationship between information processing, decision-making, and performance in turbulent environments. They posit that market performance depends on managerial decisions, and managerial decisions depend on the information processing carried out by decision-makers; superior performance results from the congruence between the level of market turbulence and the processing of information and the decisions made.

Since the seminal studies of contingency theory, as well as the seminal studies on turbulence, the concept of turbulence has remained ambiguous, as there is no clarity or consensus regarding the meaning of environmental turbulence. In the limited discussions inherent to the concepts of environmental turbulence, one can observe a set of various dimensions related to change, with some dimensions being more determinative than others (Volberda & Van Bruggen, 1997).

In light of this, the concept of systemic environmental turbulence can be defined as a chain of dynamic, complex, and unpredictable contingencies that generate strategic reconsiderations. Thus, it can be measured by latent variables composed of indicators from the main sectors in which society is observed.

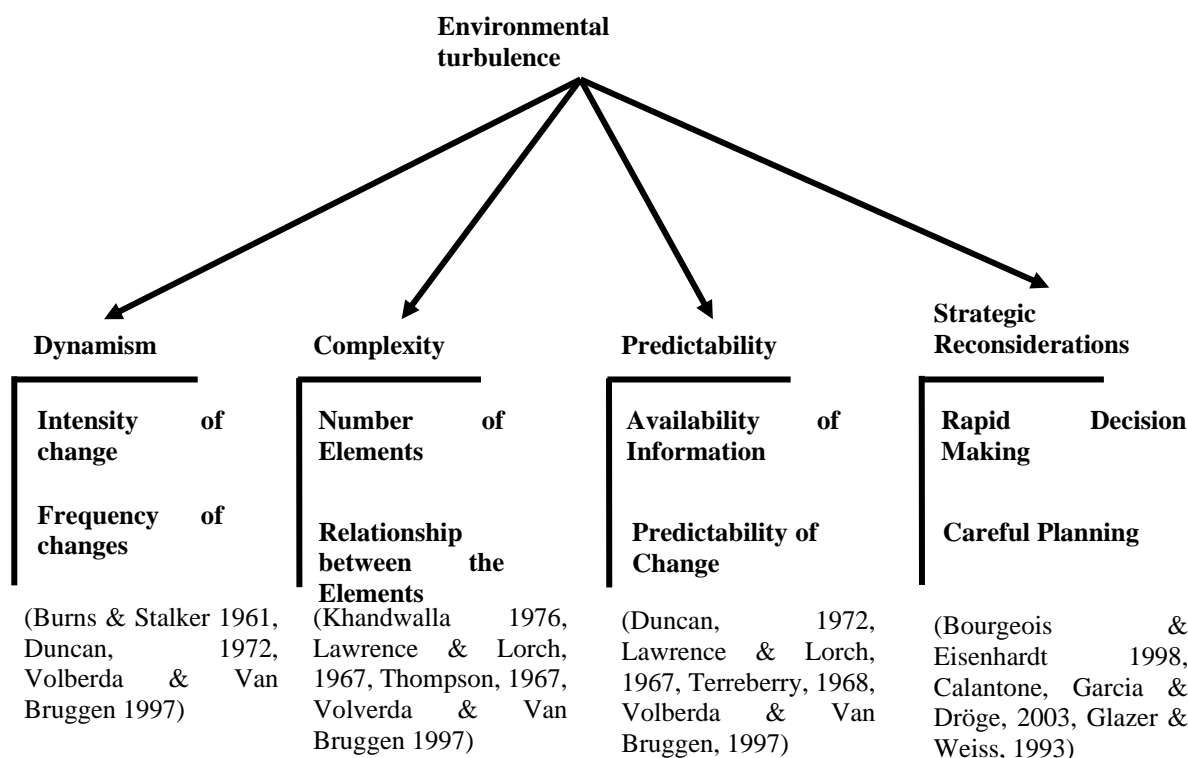
The concept of dynamism refers to the degree to which the inherent elements of environmental components remain constant within the organizational unit. In this way, this dimension of environmental turbulence can be either static or dynamic. Furthermore, dynamism is comprised of the frequency of environmental changes, which encompasses conditions ranging

from commercial to technical aspects of organizations (Burns & Stalker, 1961; Duncan, 1972; Volberda & Van Bruggen, 1997).

On the other hand, the concept of complexity is grounded in the number of elements, as the greater the number of elements in the environment, the more complex it becomes. In addition, the relationships among these elements also contribute to environmental complexity, since low interdependence between elements allows for their division into homogeneous groups (Khandwalla, 1976; Lawrence & Lorsch, 1967; Thompson, 1967; Volberda & Van Bruggen, 1997).

Regarding unpredictability, it can be based on the transition of environmental components, which can be linear, cyclical, or both. In predictable environments, cause-and-effect relationships become less complex, allowing managers to anticipate future developments. Conversely, in unpredictable environments, development has divergent effects, making anticipation by managers difficult. However, organizations may find themselves in environments so unpredictable that data become unavailable, leading them to develop a high degree of flexibility (Duncan, 1972; Lawrence & Lorsch, 1967; Terreberry, 1968; Volberda & Van Bruggen, 1997).

Figure 2
Definition of environmental turbulence



Source: Adapted from Volberda and Van Bruggen (1997).

A turbulent environment can also be defined as one in which market changes are frequent and unpredictable, and technological changes tend to accentuate risk and uncertainty inherent in the strategic planning process. The lack of capacity to predict even when considering contingencies is a characteristic that contributes to the definition of environmental turbulence. This definition emerges from the perspective of top management teams (Calantone et al., 2003).

Organizations tend to adapt or adjust to environmental conditions permanently, and the outcomes of these changes may occur either in a planned manner or naturally. Due to environmental changes that occur independently of companies' actions, strategic changes arise as

a response to these shifts. These environmental changes transform aspects ranging from technology and regulation to demographics, as new products and services emerge, increasing competitiveness and making negotiations with suppliers and customers more complex, as well as elevating the level of uncertainty in decision-making. These characteristics may indicate that the sector is undergoing a state of turbulence. Environmental turbulence is defined by the presence of three elements: dynamism, uncertainty, and complexity (Rodriguez, 2010).

Although the initial definitions of turbulence were based on the concept of environment with four contexts, the literature now presents concepts that incorporate additional levels—up to a fifth level called hyper-turbulence, and even scales with six levels. Even with the robustness that turbulence can be defined through the amount of changes and environmental complexity—and that the greater the number of changes in technology, globalization, socioeconomic regulation, as well as other factors, the higher the level of environmental turbulence—Kiple et al. (2012) add a sixth level, termed entropy. In this sense, the sixth level of environmental turbulence refers to an environment in which companies or sectors experience chaos, disorder, and multiple effects of imbalance.

Thus, the literature has long suggested that turbulent environments can be characterized according to different levels. According to Pratono and Mahmood (2015), low turbulence within companies allows for environmental predictability and the adoption of innovations, as well as a greater willingness to take risks. Conversely, when environmental turbulence becomes extreme, companies tend to be risk-averse and focus on managing environmental changes. Therefore, a drastic shift in environmental turbulence can negatively impact performance.

Based on these foundations, environmental turbulence has evolved in relation to various topics, such as performance (Chege & Wang, 2020; Pudjiarti & Priagung Hutomo, 2020), strategy (Balodi, 2020; Yu et al., 2022), supply chains (Arora et al., 2021), and innovation (Song et al., 2021), among others. In light of this, the next section addresses the theoretical perspectives on environmental turbulence.

4 THEORETICAL PERSPECTIVES ON ENVIRONMENTAL TURBULENCE

The theoretical perspectives on environmental turbulence and contingency can be described through the literature on market orientation, as they are focused on market turbulence and technological turbulence as important environmental factors that impact contingencies and, subsequently, firm performance (Chung & Low, 2017). These studies are influenced by the constructs developed by Ansoff (1979) and, later, by Jaworski and Kohli (1993).

Ansoff (1979) presents an environmental turbulence diagnosis that measures various attributes, ranging from market and technological aspects to governmental factors. Notably, it is a comprehensive diagnosis in terms of market aspects, addressing perceptions regarding differentiated marketing strategies, the frequency of new strategies, and consumer pressure. The technological aspect covers everything from the diversity of competitors' technologies to the critical success factors for innovation. Additionally, it also gauges managers' perceptions of governmental and environmental pressures. In this diagnosis, a scale from 1 to 5 is used, where the environment is considered turbulent when values exceed 3, as the semantic differentials of this scale represent revolutionary changes, threatening pressures, among other factors.

In the view of Jaworski and Kohli (1993), environmental turbulence is measured by three distinct constructs, comprising six, six, and five items, respectively. The first construct, with items related to market turbulence, aims to measure the changes in the composition and preferences of the organization's customers, which tend to evolve over time. The second construct, with items related to competitive intensity, evaluates aspects ranging from behavior to the resources and capabilities of organizations in differentiating themselves from competitors. The third construct measures perceptions regarding the technological flow within the sector.

Thus, it is possible to identify that subsequent studies on environmental turbulence generally exhibit three main subdivisions: (I) market turbulence, (II) competitive intensity, and (III) technological turbulence. This outcome can be attributed to the influence of Ansoff (1979) and Jaworski and Kohli (1993) on the environmental turbulence literature. Therefore, it is evident that environmental turbulence is closely linked to innovation.

In line with this reasoning, research has posited that environmental turbulence through its constructs related to market, technological, and competitive intensity aspects has a positive relationship with innovation, as well as with the capacity of firms to innovate (Bodlaj & Čater, 2019; Sung & Choi, 2021; Zaidi & Zaidi, 2021).

Em uma análise macro, os países devem incentivar os investimentos em pesquisa e desenvolvimento e o melhoramento das fontes de financiamento para empresas orientadas à tecnologia. Além disso, o desenvolvimento e o melhoramento das fontes de financiamento para empresas orientadas à tecnologia também são promovidos. In this way, turbulence increases the perceived importance of innovation, as it becomes necessary to closely monitor changes in the external environment in order to quickly recognize new opportunities (Bodlaj & Čater, 2019). Consequently, one of the positive aspects of environmental turbulence is that it stimulates companies to innovate (Sung & Choi, 2021).

The implications of turbulence on companies suggest that responses to the inherent changes in the external environment must be rapid. However, due to the difficulty in predicting these changes, companies must enhance their ability to manage them. They should therefore assign importance to shifts in the factors that make up the environment such as technological changes, shifts in customer demand, and changes in industry competition. In addition, they must be adept at securing external resources that boost company performance, including information and knowledge (Song et al., 2021).

Nevertheless, certain contingencies alone are not sufficient to address environmental turbulence. Given the high complexity and instability of environmental variables, companies need to integrate various assets and skills to enhance their innovative capacity. In this sense, promoting integration and differentiation through internal mechanisms can be beneficial for achieving a competitive advantage in turbulent environments (Mokhtarzadeh et al., 2022).

Environmental turbulence influences companies in two ways. Negatively, through the adverse impacts of environmental characteristics such as complexity and instability and positively, by influencing managers' behavior in managing various contingencies to boost innovation and, consequently, performance (Dost et al., 2019; Ikhlaiq & Raza, 2022; C. Wang et al., 2022; Yang et al., 2019; G. Zhou et al., 2022; Y. Zhou et al., 2019).

Other managerial topics also address environmental turbulence, such as strategic orientations (Ho & Plewa, 2020), competitiveness (Alawamleh et al., 2022), strategies (Kuankuan & Liming, 2022; Meng et al., 2020; Yasmeen et al., 2020), sustainability, and knowledge management. There appears to be a consensus among these studies on the importance of managers monitoring the external environment in which companies operate to understand the level of changes occurring over time.

The managerial literature itself addresses additional turbulence concepts alongside market and technological turbulence, such as competitive turbulence (Despoudi et al., 2021; Rego et al., 2022), regulatory turbulence (Despoudi et al., 2021; Witschel et al., 2022), governmental policy turbulence (Yang et al., 2019), institutional turbulence (Liu et al., 2019), and economic turbulence (Despoudi et al., 2021).

Competitive turbulence differs from market turbulence in that, instead of addressing consumer-oriented market attributes, it focuses on attributes related to the adoption of new strategies in response to change by all market participants (Rego et al., 2022). It also encompasses managers' understanding of competitor behavior as well as market competitiveness, as seen, for example, in the European Union (Despoudi et al., 2021).

Regulatory turbulence is incorporated as a fourth dimension of Jaworski and Kohli's (1993) environmental turbulence construct, because in some environments regulatory uncertainties affect companies due to potential regulations on technologies (Witschel et al., 2022) or the specific characteristics of companies' products, such as regulatory changes in food regulations (Despoudi et al., 2021). Following this reasoning, governmental policy turbulence focuses on observing the influence of the government for example, in the Chinese market, where many policies have been introduced to encourage industries to adopt low-cost strategies as a means of differentiation (Yang et al., 2019).

Institutional turbulence tends to measure the level of complexity and uncertainty perceived by managers regarding government policies affecting their sectors. In this sense, countries with weak formal institutions, a lack of intellectual property protection, deficient commercial laws, and non-transparent judicial systems may encourage companies to engage in piracy, as well as be imitated by others (Liu et al., 2019).

It is possible to identify a research front more aligned with the finance field, focusing on studies that attempt to measure environmental turbulence or some of its constructs through observable variables. In this area, there are, albeit to a limited extent, studies oriented toward market orientation. This may be explained by the difficulty of measuring environmental turbulence through observed variables. Moreover, some studies attempt to analyze environmental turbulence using sector-specific constructs to capture only the market and technological aspects or certain characteristics of the turbulent environment (Chen et al., 2022; Chung & Low, 2017).

Nevertheless, various constructs endeavor to measure characteristics of the turbulent environment by focusing on companies' revenues. For example, environmental uncertainty is measured by the standard deviation of abnormal revenue returns (Chen et al., 2022; K. Wang & Wei, 2021; Zhang et al., 2022) or similarly by the coefficient of variation over the past five years (Annida & Firmansyah, 2022). At the country level, environmental turbulence is measured using economic, political, and social variables (Panucci Filho et al., 2022).

There are other approaches as well, such as in the study by Pasha and Poister (2019), which considers environmental turbulence as a specific period and employs economic proxies to gauge its effect. However, in theoretical perspectives, studies that examine environmental turbulence through perceptual measures either as moderators or mediators of other management characteristics are predominant (Balodi, 2020; Pratono & Mahmood, 2015; Turulja & Bajgoric, 2019).

Other approaches assess environmental turbulence within the realm of capital markets by using established indices and specific periods with autoregressive models as proxies. For instance, Hauptmann et al. (2014) base their analysis on the monthly series of the S&P 500; however, the focus of that study is on identifying signals to construct a portfolio with superior performance and lower risk compared to other strategies.

Similarly, Engel et al. (2018) used a comparable method based on the Nikkei 225 and EuroStoxx 50 indices, segmenting the market into calm, positive turbulence, and negative turbulence. Nonetheless, these studies differ from the present research, as environmental turbulence here is not focused on specific periods nor based on a market indicator.

5 CONCLUSION

The organizational environment has been approached in various ways throughout the early studies on the development and consolidation of contingency theory. Initially, uncertainty characteristics were considered as environmental variables necessary to maintain an adequate structure for example, through either organic or mechanistic approaches. However, the description of the environment was still broad, as the most notable work that marked a turning point in defining environmental components was Duncan (1972), who described internal and external components

while leveraging concepts from Emery and Trist (1965), citing these seminal authors twice in his work.

In the early stages of environmental turbulence, it is noteworthy that the environment was divided into four parts, which can be considered as levels ranging from the simplest to the most complex, or turbulent. Nonetheless, the perspective on the environment was more oriented towards a macroeconomic view. Although the seminal study by Emery and Trist (1965) described examples of turbulence related to technological change at the time, the interpretation of these environments can be seen as economic and has been supported by subsequent authors (Aldrich, 1979).

In this context, the deepening of environmental concepts in both contingency and turbulence studies had two notable pioneers: Ansoff (1979) and, later, Jaworski and Kohli (1993). These studies constructed consistent measures of environmental turbulence, thereby integrating it into contingency research. While Ansoff (1979) adopted a broader approach by measuring various environmental components at both the company and sector levels, Jaworski and Kohli (1993) offered a more focused view by subdividing turbulence into three parts related to the characteristics of the sectors to which the company belongs namely, technological, market, and competitive turbulence.

However, the theoretical contributions have reinforced that the environment influences a company both positively and negatively. On the negative side, it relates to the difficulties of predicting environmental components due to rapid and complex changes. On the positive side, it is grounded in the behavior of organizations in finding opportunities amid adverse events; perhaps this is why innovation is prevalent in various studies related to environmental turbulence.

Thus, the inherent limitations of relying predominantly on perceptual constructs albeit useful have accompanied the development of the turbulence concept. Furthermore, the complexity of the multiple dimensions of environmental turbulence has begun to render the topic excessively fragmented, potentially compromising the precision of analyses. On the other hand, the methodological challenges in measuring turbulence through observable variables have also presented limitations, due to the lack of consensus on the number of variables that should comprise an environment for turbulence measurement. Nonetheless, studies on environmental turbulence have incorporated additional forms of turbulence, making it evident that a more comprehensive view is necessary. Efforts directed toward environmental turbulence should aim to develop a holistic, systemic vision an environmental turbulence variable that jointly measures three levels of turbulence, encompassing contingencies at the company, sector, and country levels. Perhaps the greatest challenge lies in the vast array of social and economic variables needed to form these constructs, as the determination of how relevant each one is to the business environment still remains an enigma.

The development of systemic turbulence involves creating a comprehensive environmental description that is not fragmented by the aggregation of constructs at the sector level. Systemic turbulence should consider the main representative indicators of the most relevant sectors of society. In this way, systemic environmental turbulence can be defined as an interconnected set of dynamic, complex, and unpredictable contingencies that require constant strategic adjustments.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding this submitted work.

AUTHORS' CONTRIBUTIONS

Roles	1° author	2° author	3° author
Conceptualization	◆	◆	◆
Data curation			
Formal analysis	◆		
Funding acquisition		◆	
Investigation			

Methodology	◆	◆	◆
Project administration			
Resources			
Software			
Supervision		◆	◆
Validation			
Visualization			
Writing – original draft	◆		
Writing – review & editing	◆		◆