Organizational Strategy and IT Workforce During Times of Environmental Turbulence

Alexander Serenko, Jaideep Ghosh, Prashant Palvia, and Tim Jacks

***Abstract*—The purpose of this study is to investigate how organizations may improve their agility in order to respond to environmental turbulence by developing an appropriate organizational strategy and adapting their information technology (IT) function. It analyzes a dataset containing responses from 10 386 IT professionals located in 37 countries, which was collected as part of the World IT Project. The findings show that to become agile and prosper in a turbulent environment, organizations should both innovate and differentiate themselves from their competition: in other words, they should become Prospectors and employ a differentiation strategy. They also need to invest heavily in their IT human capital by way of increasing their IT personnel and establishing effective collaboration between non-IT and IT workers. Such steps would ensure the maximization of IT resources and facilitate efficient business-IT alignment. However, on the flip side, navigating a turbulent business environment can take its toll on employees who experience work exhaustion and become less satisfied with their jobs.**

***Managerial Relevance Statement*—Managers should realize that strategy-based and IT-based enablers offer critical tools to help their organizations combat environmental turbulence. As markets, technologies, and competitors actions become increasingly volatile and unpredictable, organizations should strive for agility and managers should transform their business into continuous innovators. Their organizations competitive business strategy should focus on differentiation rather than trying to achieve low costs or find a market niche: customers must perceive their products and services as being different from those of their competitors, which may appear counterintuitive at first. IT-based enablers may help organizations achieve agility and implement these challenging initiatives. For this, agile organizations should educate their non-IT managers about the value of IT as a critical resource and teach them how to routinely communicate with their IT counterparts. As environmental turbulence increases, organizations must hire a sizable IT workforce to stay competitive. However, employees of agile organizations may also pay the price by becoming more exhausted and less satisfied with their jobs. Thus, organizations operating in turbulent conditions should pay more attention to their IT workers mental health and invest in supporting programs.**

***Index Terms*—Business strategy, environmental turbulence, information technology (IT) maturity, IT workforce, job satisfaction, organizational agility, organizational strategy, work exhaustion.**

I. Introduction

MANAGEMENT scholars have traditionally been concerned with the impact of the external environment on various aspects of organizational functioning [1], [2], [3], [4]. Among the numerous factors representing the firm's external environment, environmental turbulence has become one of the leading topics. Environmental turbulence refers to the extent of changeability and predictability of an organization's external environment [5], and it affects businesses operating in various industries at an exponentially growing rate. Many recent events, such as the COVID-19 pandemic, skyrocketing inflation, and the Russian invasion of Ukraine, reveal that it is difficult to find an industry completely immune to the challenges arising from environmental turbulence. Given its importance, environmental turbulence has been frequently studied in management projects in virtually all domains [6], [7], [8]. The reason is that a misalignment between the external environment and organizational strategies, as well as a lack of appropriate technologies and support personnel, may reduce the ability of businesses to turn external challenges into opportunities. In some cases, the inability to proactively anticipate and adjust to the sudden environmental changes may lead to the loss of control over the business or even bankruptcy.

One of the most effective approaches to strive in a turbulent environment is to create an agile organization by identifying and employing various agility enablers that may help businesses to effectively and efficiently deal with the unpredictable, never-ending fluctuations in external pressures. This study proposes four types of organizational agility enablers [9], [10]: selecting an appropriate strategic type of an organization, relying on a suitable competitive strategy, achieving organizational information technology (IT) maturity, and developing a sizable IT workforce. While the literature emphasizes that it is vital to acquire a solid understanding of business agility enablers, gaps in four major factors may impede the growth and survival of a firm. A strong knowledge base regarding the impact of these factors would lead to the development of evidence-based recommendations for business managers.

First, while strategic organizational agility enablers have received attention in prior research [11], [12], more empirical

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evidence is needed to inform managerial practices. The reason is that selecting an organizational type—defenders (focusing on the current market and customers base), prospectors (pursuing innovation and new market opportunities), analyzers (focusing on both current and new markets but to a lesser extent), or reactors (having no consistent strategic approach) [13]—is a major strategic decision. It requires developing corresponding business processes, securing resources, creating policies, etc. (for new businesses) or a complete overhaul and reengineering of the entire organization (for existing businesses). Implementing a competitive strategy—whether to achieve low cost through operational efficiency, differentiate themselves from others, or instill customer loyalty by focusing on a particular customer segment [14]—is also extremely costly and risky. Thus, obtaining additional empirical evidence would be useful to ensure managers that the recommended course of action will be the most fruitful.

Second, the role of organizational IT maturity and the IT workforce in a highly turbulent context remains unclear. Organizational IT maturity refers to the effective collaboration between non-IT and IT workers to optimize the utilization of available IT resources [15]. However, the literature emphasizes the importance of organizational IT maturity in a general context. What hitherto remains unknown is whether the need for achieving IT maturity increases as the external environment becomes more turbulent. A similar line of reasoning applies to the size of the IT workforce. While the literature has established that having an adequate size of the IT workforce matters, do the firms operating in a turbulent environment require more IT workers than their less turbulent counterparts? This study attempts to answer this important question.

Third, in recent years, the line of research on the "dark side of IT" has gained momentum. Thus, it is logical to assume that operating under high environmental turbulence comes at a price: does this mode of operating make employees feel more exhausted and less satisfied with their jobs? This study reveals that such worries are empirically grounded: dealing with environmental turbulence leads to the depletion of mental resources, emotional drain, and fatigue and lowers workers' job satisfaction. Having empirically supported knowledge of these issues will help scholars better understand the phenomenon of environmental turbulence and allow practitioners to manage their organizations more effectively in our continuously changing world.

Fourth, most of the previous empirical IT research has been conducted in the North American context. However, there are arguments that conclusions reported in such studies may not generalize to the rest of the world, given dramatic geopolitical, cultural, and economic differences among the countries [16], [17]. This study empirically examines the important issues above and reports the results based on an analysis of a large dataset collected from 10 386 IT professionals located in 37 countries. It also compares the results obtained from the North American dataset with those generated in the global context. This brings novelty and increases this study's contribution.

II. Literature Review and Hypotheses Development

A. Environmental Turbulence

The study of organizational environment is as old as the field of management itself. Organizational environment comprises external elements with which organizations constantly interact but which they cannot directly control. More than 70 years ago, Selznick [18], in his study of the Tennessee Valley Authority, emphasized the role of the external environment of organizations as an important constraining factor. Soon after, management scholars continued this line of inquiry by exploring the definition, dimensions, measurement, antecedents, and impacts of organizational environment in various contexts [1], [3], [4], [19], [20], [21]. They hypothesized and demonstrated that organizational environmental contexts are becoming increasingly complex and turbulent, and firms have to continuously adapt to never-ending changes [2], [22]. A common trend in these works emphasized the notion of environmental turbulence, defined as the degree of changeability and predictability of the firm's external environment [5].

In an organizational context, environmental turbulence comprises three major components: market turbulence, technological turbulence, and competitive intensity [23]. Market turbulence, which refers to the "rate of change in the composition of customers and their preferences" [24, p. 57], affects organizational strategic capabilities, actions, and outcomes [6], [25], [26]. For instance, COVID-19 has unexpectedly transformed the market for personal protective equipment. Technological turbulence, defined as "the rate of technological change" [24, p. 57], further contributes to the overall environmental turbulence [27], [28]. Presently, exponentially accelerating technological change is resulting in a high rate of technological obsolescence. For instance, the introduction of Generative AI such as ChatGPT and robotic process automation tools presents unexpected challenges for IT managers who need to find ways to implement and manage them to modernize organizational business processes. Competitive intensity pertains to the extent of competition within an industry [24], [29]. Industry rivalry is one of the major factors included in the classical Porter's Five Forces Model [30] because it affects all aspects of strategic planning and positioning [31].

Overall, organizations operating in highly turbulent environments have to continuously adapt and find ways to stay ahead of their competitors, and maintaining the status quo is not an option. For this, they need to achieve a high level of organizational agility.

B. Organizational Agility

Organizational agility refers to a deliberately developed, permanently available capability that can be performed anytime, effectively, and efficiently in order to sustain desirable business performance in a turbulent environment [9]. For several decades, this notion has received growing attention within the academic community [32], [33] because securing and maintaining a high level of organizational agility is the best way to transform an

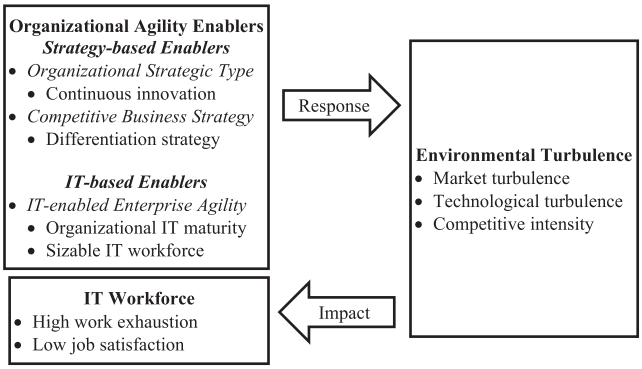

Fig. 1. Organizational response to and impact of environmental turbulence.

organization to ensure its prosperity in a turbulent environment. An agile organization must create a strong dynamic capability—the ability to adjust itself, restructure its business processes, and redirect its resources to proactively respond to environmental changes by being in a constant state of transformation [34]. Under environmental turbulence, agile organizations achieve lower costs, higher customer satisfaction, and better profitability than their non-agile counterparts [35], [36]. This sustained competitive advantage of agile organizations to succeed in high environmental turbulence comes from various agility enablers [9].

According to the environment–strategy–performance framework [37], organizations are considered effective information processors that continuously scan their external environment for changes and respond accordingly in order to achieve and/or sustain competitive advantage, and doing so is an important characteristic of an agile organization. When operating under environmental turbulence, agile organizations actively seek and implement various agility enablers that represent approaches, tools, resources, and principles that facilitate the realization of agility capabilities and allow them to successfully deal with environmental complexity, unpredictability, and instability [9], [10]. There are two major categories of agility enablers: strategy-based [13], [14] and IT-based [38] (see Fig. 1).

Strategic agility enablers are critical because they allow an organization to select a strategic positioning most suitable to its external environment. For example, some strategic approaches work well in stable environments, but they completely fail under turbulent conditions. This study argues that two key strategic decisions—selecting an appropriate strategic type of an organization and pursuing the right competitive business strategy [13], [14]—serve as the most effective ways to position an organization in a turbulent environment. When the external environment is fluent, unpredictable, and full of surprises [5], [10], choosing the strategic type of an innovator is a more fruitful long-term approach than merely protecting the existing market share or passively reacting to the fluctuating external conditions [39]. In addition to being innovative, a differentiation business strategy—the firm's ability to differentiate its products and services from those of competitors (i.e., differentiation strategy)—also leads to better financial performance than endlessly trying to achieve low cost (i.e., low-cost strategy) or targeting a niche market segment (i.e., niche strategy) in turbulent times. While other forms of strategies—including growth strategy (continuously increasing the market share), sustainability strategy (investing in environmental and social initiatives), collaboration strategy (building strategic alliances), and blue ocean strategy (discovering untapped markets)—also represent useful tools that help organizations achieve competitive advantage, they are less relevant for finding the optimal strategic positioning under environmental turbulence. For example, blue ocean strategy may initially help an organization make competition irrelevant by unlocking new demand, but it does not consider how doing so may help an organization to reposition itself under the unpredictable changes in markets, technologies, and competitors' actions.

In addition to making appropriate strategic decisions, organizations must rely on the use of IT to combat environmental turbulence. Particularly, *IT-enabled enterprise agility* helps organizations become more competitive in a changing world and support their strategies [40]. This study posits that organizational IT maturity and employing a sizable IT workforce represent the core building blocks of IT-enabled enterprise agility. Agile organizations detect and seize innovation opportunities by acquiring, absorbing, and transferring knowledge; creating communication networks; and securing requisite assets [41]. When necessary, they may effectively and efficiently alter and innovate essential business processes to defend and expand their market share [42]. To achieve organizational agility, businesses should have the ability to quickly acquire, deploy, and reconfigure IT resources [43]. IT serves as "a digital options generator in contemporary firms" [44, p. 238] to help organizations develop sensing and responding capabilities to successfully deal with environmental challenges.

Merely establishing the robust IT infrastructure is not enough to reach agility: firms need to also achieve a high level of organizational IT maturity, which serves as a critical agility enabler in high environmental turbulence [38]. Organizational IT maturity refers to the ability of non-IT and IT workers to effectively collaborate on IT issues to maximize IT utilization in order to support business processes [15]. For this, non-IT employees, including non-IT managers, should become aware of the available systems, their capabilities, their strategic value, and their constraints. Instead of treating the IT function as a silo, non-IT workers should proactively approach, communicate, and collaborate with IT personnel to find ways to deploy IT to achieve organizational strategic objectives. Organizations that align IT goals to business objectives achieve a high level of organizational IT maturity, resulting in higher agility and stronger financial performance [45]. However, the implementation of IT-enabled enterprise agility requires a substantial investment in IT personnel. It is IT workers who develop, maintain, and adjust the IT infrastructure to match the changing external conditions. Thus, this study proposes that operating under environmental turbulence requires maintaining a sizable IT workforce.

At the same time, being a member of an agile organization functioning in high environmental turbulence comes at a cost for its IT workers. Dealing with environmental turbulence may negatively affect IT employees by making them more exhausted and less satisfied with their jobs because successfully addressing the never-ending challenges and changes requires much cognitive and physical resources. This study proposes work exhaustion

[46], [47] and job satisfaction [48], [49] as the negative impacts of environmental turbulence. The extant literature shows that the demanding nature of the IT profession is frequently associated with high work exhaustion and low job satisfaction [e.g., see 50]. While environmental turbulence may produce other impacts on IT workers—for instance, work-family conflict, social isolation, and a lower sense of personal accomplishment—this study solely focuses on work exhaustion and job satisfaction because these directly affect the key aspects of organizational functioning and lead to potentially devastating outcomes such as turnover and health issues.

Thus, this study hypothesizes that four agility enablers—continuous innovation, differentiation strategy, organizational IT maturity, and a sizable IT workforce—play a pivotal role in transforming a firm into an agile organization, which is necessary for succeeding in a highly turbulent environment while IT employee work exhaustion and low job satisfaction represent the negative consequences of operating in turbulent times. The following sub-sections explicate the factors and relationships presented in this framework in detail.

C. Innovation Strategy as an Organizational Agility Enabler in a Turbulent Environment

According to Miles and Snow's [13] typology, there are four strategic types of organizations: defenders, prospectors, analyzers, and reactors. Defenders concentrate on protecting their current market, maintaining the status quo, and retaining the current customer base. They strive toward stability, prevent competition from entering, and focus on a narrow market segment. By contrast, Prospectors are highly innovative, constantly explore new market opportunities, focus on growth, and take risks when necessary [13]. Prospectors are highly flexible: they value their image of an innovator more than profitability, continuously search for opportunities, and exist in a state of constant development. While defenders and prospectors reside at the opposite ends of the strategic spectrum, analyzers are positioned in the middle: they combine the strengths of defenders and prospectors into a single strategic system. Overall, analyzers maintain existing markets yet seek to be innovative, although to a lesser degree than prospectors. Last, reactors have no consistent approach to strategy and adjust to the environment in an inconsistent and unstable manner [13]. The key argument of Miles and Snow's typology is that organizational strategy, structure, and processes should be aligned to the external environment [51], [52].

This study proposes innovation strategy as the first organizational agility enabler to successfully deal with environmental turbulence. First, in contrast to their less innovative counterparts, innovative organizations continuously pursue organizational learning [53]. By embedding organization-wide learning into the overall organizational culture, frontline employees possessing firsthand experience with customers share their knowledge with other organizational members [54]. In turbulent times, they detect changes in customer preferences, and this knowledge immediately reaches product and marketing managers, who efficiently adjust their offering to match the fluctuating customer needs. Thus, the ability to accumulate, update, and use the organizational knowledge base gives innovators a competitive edge in turbulent times.

Second, innovative organizations favor experimentation and avoid maintaining the status quo for a long time [53]. They routinely experiment with products, technologies, and business models to match the never-ending changes in external conditions, which reduces resource rigidity and removes path dependency. For example, by trying out new IT, businesses are likely to find the ones that may be used to optimize the frequently changing organizational processes. By constantly engaging in business model innovation, organizations may catch up faster with external changes, achieve differentiation, and stay competitive [55]. This is the only viable long-term strategy because under the conditions of severe environmental turbulence, it is more important to discover and focus on appropriate products, technologies, and marketing approaches than to focus on mere operational efficiencies because, in such conditions, the latter rarely lead to sustainable competitive advantage [34]. Third, innovative organizations engage in calculated risk-taking when they need to overcome uncertainty created by sudden environmental changes [34], [53]. A major issue that contemporary organizations face is that the external environment changes so dynamically that businesses have to transform themselves almost continuously, which requires an enormous investment of resources to the detriment of efficiency. To find the right balance between agility and efficiency, innovative organizations successfully manage uncertainty by means of calculated risk-taking to identify the most suitable ways to allocate and reallocate their limited resources. Fourth, the organizational structure, culture, and climate of innovative organizations are conducive to the adaptation to the never-ending changes in market conditions, technologies, and competitive pressures, which makes firms more agile [53]. By embracing an entrepreneurial orientation [56], innovators routinely scan their environment, consider external changes as opportunities rather than threats, and efficiently adapt their organizational processes to handle uncertainty with grace. Finally, through continuous innovation, agile organizations avoid long-term commitments to specific technologies and practices. They exist in a state of constant flux and agility, which are suitable for dealing with environmental turbulence. It is for this reason that innovation capability has been frequently included in various descriptions and definitions of organizational agility [57].

While all four strategic types included in Miles and Snow's typology may be found in a highly turbulent environment, prospectors, which are the most innovative type, are more likely to dominate due to various agility features [58], [59], [60]. Thus, in a highly turbulent external environment, innovation proactivity has been generally regarded as being one of the most important enablers of organizational agility [11]. It is hypothesized:

> H1: Organizations operating in higher environmental turbulence exhibit a higher level of innovation (i.e., are more likely to be prospectors than defenders, analyzers, or reactors).

D. Differentiation Strategy as an Organizational Agility Enabler in a Turbulent Environment

Porter's theory of competitive advantage [14] is a popular strategy configuration scheme that proposes three generic competitive strategies—low cost, differentiation, and focus—as unique ways to help an organization achieve and maintain profitability above the industry average. Organizations pursuing a low-cost strategy provide an identical (or very similar) product at a cost lower than their competitors. Companies that choose a differentiation strategy offer a product that is unique in terms of its quality and/or features. Businesses that select a focus strategy concentrate on a particular customer segment that is otherwise underserved [14]. The theory argues that firms should select only a single strategy, and pursuing multiple strategies simultaneously may be detrimental to their profitability [61].

Since its publication, Porter's theory has become one of the major paradigms of competitive strategy [62]. If business managers decide to achieve and maintain a high level of organizational agility in a turbulent environment, they need to select a business strategy conducive to their chosen direction. This study hypothesizes that only a differentiation strategy may serve as an organizational agility enabler in high environmental turbulence while low-cost and focus strategies are less effective.

Organizations competing with a low-cost strategy achieve operational efficiency due to learning effects (i.e., by creating and accumulating knowledge), economies of scope (i.e., by sharing resources), and economies of scale (i.e., by reducing fixed costs per unit due to large size) [63]. However, in turbulent environments, knowledge quickly becomes obsolete, previously successful resource-sharing practices lose their value, and economies of scale become less relevant. For example, after selecting a low-cost strategy, a business may invest heavily in efficient manufacturing equipment. However, the achieved competitive advantage is short-lived because customers may soon want a different product, and more efficient machinery may become available. This leads not only to the loss of competitive advantage but also to production stoppages, poor quality, and environmental waste [64]. As a result, organizations that face environmental turbulence may have to abandon a low-cost strategy if they wish to achieve agility and remain successful. Pursuing a focus strategy in a turbulent environment is also risky because customer preferences frequently change, and niche markets may appear and disappear overnight.

By contrast, following a differentiation strategy is more expedient under environmentally turbulent conditions. First, a differentiation strategy is associated with product innovation [65], which improves agility and gives organizations functioning in turbulent environments competitive advantage [8]. As discussed above, innovation is necessary for ensuring agility in a turbulent environment. Second, differentiation makes the product more unique, desirable, and valuable, which creates brand loyalty [66]. When the competitive pressure intensifies in turbulent times, differentiation also reduces customers' price sensitivity and helps them better distinguish between alternatives. In this case, businesses may reduce their marketing expenses and direct scarce resources elsewhere, which increases their agility. Finally, a differentiation strategy generally relies on integrated flexibility, which is necessary to deal with frequent environmental changes [67]. Consistent with the arguments above, Ali and Varoğlu [68] show that successful functioning in high environmental turbulence requires a greater degree of differentiation, and Parnell and Brady [12] empirically demonstrate that in turbulent markets, only the differentiation strategy leads to superior financial performance. It is, therefore, hypothesized:

> H2: Organizations operating in higher environmental turbulence are more likely to employ a differentiation strategy.

E. Organizational IT Maturity as an Organizational Agility Enabler in a Turbulent Environment

Environmental turbulence continuously challenges business-IT alignment. Extremely fast, frequent, surprising, and successive changes in customer preferences, technologies, and competitors' behavior make organizations operating in turbulent environments constantly adjust themselves [69]. After each change, organizations should also adjust their IT to maintain business-IT alignment [70]. To keep up with the never-ending changes and to avoid a business-IT alignment gap, organizations functioning in highly turbulent environments require a higher level of organizational IT maturity. First, organizational IT maturity promotes knowledge exchange between non-IT and IT workers. As environmental turbulence mounts, the role of intra-organizational knowledge sharing dramatically increases [71] because conditions in which an organization operates change dynamically, and the existing knowledge of customers, technologies, and competitors quickly becomes obsolete [72]. This erodes the value of knowledge possessed by IT employees who may not be aware of the latest environmental changes, yet these IT workers need to reengineer the IT-enabled processes in real time. Thus, to achieve business-IT alignment, IT employees should be privy to all business changes and environmental conditions that drive them [70], which is accomplished by maintaining a high level of organizational IT maturity [15]. Second, organizational IT maturity facilitates tighter integration of IT-enabled processes with frequent changes in business processes. A proactive integration and re-integration of vital IT-enabled business processes is the key attribute of organizational agility [73]. Organizational IT maturity contributes to organizational ability by helping business managers and IT managers coordinate their activities, boost intra-organizational cooperation, and achieve synergy.

Thus, organizations experiencing a higher level of environmental turbulence need to achieve a higher level of organizational IT maturity than their counterparts operating in lower environmental turbulence in order to ensure the same (or superior) level of financial performance. It is hypothesized:

> H3: Organizations operating in higher environmental turbulence exhibit a higher level of organizational IT maturity.

F. Sizable IT Workforce as an Organizational Agility Enabler in a Turbulent Environment

Developing agility to operate in high environmental turbulence also requires organizations to invest in a sizable IT workforce. If agile organizations want to thrive in the turbulent world, having a well-developed IT infrastructure is a must yet insufficient condition because organizational IT includes both technical and human elements. Technical IT elements pertain to operating systems, software applications, data management, network connectivity, and hardware. Human IT elements include IT workers' business knowledge, technical expertise, and practical skills [74]. IT professionals use their competence and expertise to understand essential business processes, sense the external environment, and manage technical elements to ensure constant alignment between IT and strategy [75], which creates IT-enabled enterprise agility. The combined effect of the variety of skills required is likely to increase the number of IT employees needed to fulfill these responsibilities. Therefore, organizations competing in a turbulent environment are expected to employ more IT workers than those operating in a less turbulent world. It is hypothesized:

> H4: Organizations operating in higher environmental turbulence employ more IT workers.

G. Negative Effect of Environmental Turbulence on IT Employees

The IT profession has traditionally been considered one of the most difficult occupations due to the amount of stress experienced by its employees [76]. The literature is rife with examples and evidence documenting the travails of IT workers, including job insecurity, career stagnation, and knowledge obsolescence [e.g., see [77], [78]]. In addition, work exhaustion and job satisfaction are considered critical factors affecting various aspects of employees' organizational functioning. Work exhaustion refers to the depletion of mental resources required to deal with one's work demands [46], [47]. It creates a feeling of tedium and emotional fatigue due to employees' long-term exposure to excessive workplace demands, overloads, uncertainties, irregularities, and pressures. Particularly vulnerable are employees of organizations operating in turbulent environments because these organizations must frequently adjust IT systems to align them to the latest business changes. As a result, employees have to work long hours and irregular shifts, respond to emergencies, deal with demanding clients, handle technological obsolescence, upgrade their skills, and be available beyond regular business hours, which leads to exhaustion.

While environmental turbulence is expected to increase the degree of employees' work exhaustion, it is also hypothesized to reduce their level of job satisfaction. Job satisfaction refers to a worker's overall assessment of all aspects of his or her job [48], [49]. It is considered one of the most important human resource management constructs [79] because unsatisfied workers are likely to develop turnover intention and quit [80]. In organizations that are exposed to high environmental turbulence, IT workers are likely to feel stressed, burned out, and disappointed with the disproportionate demands of their jobs, which reduces their job satisfaction. Thus

> H5: IT employees working in organizations that experience higher environmental turbulence report higher work exhaustion.

> H6: IT employees working in organizations that experience higher environmental turbulence report lower job satisfaction.

H. North American Perspective Versus the Global Perspective

There are arguments that a majority of studies reported in leading peer-reviewed journals are done in the contexts in which respondents are Western, educated, industrialized, rich, and democratic [17], and such participants are used from 81% to 96% of all samples [81], [82]. The Western-based samples are mostly collected in North America. However, respondents from North America differ from their non-North American counterparts in terms of their economic preferences, motivational processes, cognitive and social development, intelligence quotient, structure of personality traits, moral judgment, gender norms, educational attainment, cultural values, socialization tendencies, learning strategies, and decision-making processes [16]. Differences in organizational factors, IT infrastructure, and national issues also widen the gap between North American and non-North American respondents [83]. Thus, one of the key questions in contemporary research is whether the findings and recommendations reported in the North American context are applicable in other regions of the world. With respect to this study, it would be beneficial to know whether the hypotheses above may be supported in both the global and the North American contexts.

III. Methods

Data used to test this study's hypotheses were collected as part of the World IT Project, a comprehensive global study of worldwide IT issues documented by Palvia et al. [84], [85]. A core team of five researchers from the US, Canada, India, and Turkey, with the assistance of more than 80 country investigators, collected responses from 10 386 IT professionals located in 37 countries. The same research instrument was administered to about 300 respondents in each country. The 37 selected countries presented diverse economies, cultures, levels of IT infrastructure, political systems, religious beliefs, etc. The instrument was administered in English in most countries. When needed, it was translated to the country's official language and back translated (see Appendix I[1]). Five constructs (environmental turbulence, organizational strategic type, competitive business strategy, organizational IT maturity, and the number of IT employees) and two constructs (work exhaustion and job satisfaction) were measured from the organizational and individual perspectives, respectively. For this, the respondents were explicitly asked to answer the corresponding questions in the context of their organizations or with respect to themselves. While it was not feasible to achieve true representative sampling, it was possible to collect a very large dataset from multiple countries that can be

[1][Online]. Available: https://doi.org/10.6084/m9.figshare.28330775.v1

respected for its breadth. In each country, country investigators surveyed 10–15 IT employees from 20–30 small, medium, and large organizations from various industries. They represented various IT positions: programming, design & analysis, management/strategy, project management, system administration, operations, etc. For all respondents, more than half of their work duties pertained to IT, and they had substantial IT work experience. Appendix II[2] outlines respondents' demographics. All respondents were well-positioned to respond to questions about both their organizations and themselves.

To account for local idiosyncrasies, the country investigators employed collection techniques suitable for each country's context, e.g., online surveys, supervised and unsupervised paper-based questionnaires, phone calls, etc. Most country investigators established contacts with prospective participating organizations by approaching key executives (e.g., CEOs, CIOs) and using various directories, distribution lists, personal industry relationships, etc.

Six steps were taken to ensure data reliability and validity. First, the dataset was reviewed and cleansed by the country investigators and then by the core team of researchers by removing incomplete, inaccurate, nonvalid, and straight-lined answers. Second, for the reflective constructs, common method bias was tested and ruled out with Harman's [86] single factor test because the first factor captured only 32% of the total variance. Third, the reliability of the reflective constructs was assured: their Cronbach's alpha exceeded 0.7, item-to-total correlations were over 0.35, and all factor loadings obtained from the confirmatory factor analysis were above 0.6 [87]. Fourth, confirmatory factor analysis of these variables generated acceptable model fit indices: goodness of fit index = 0.995; comparative fit index (CFI) = 0.945; root mean square error of approximation (RMSEA) = 0.075; and standardized root mean square residual = 0.050. This further confirmed the reliability and validity of these constructs.

Fifth, because data were collected from many countries, a measurement invariance test was conducted. Data were classified into a high-income group and a low-income group based on the gross national income per capita adjusted to purchasing power parity for each country from the World Bank Database. The test was done in three stages. A configural invariance test was performed satisfactorily: $\chi^2 = 19367.39$; $p < 0.0001$; RMSEA = 0.03; CFI = 0.96. Next, a likelihood ratio (LR) test was done by comparing this model with a single-group model with $\chi^2 = 26336.89$; $p < 0.0001$, and the $\Delta\chi^2$ was significant. Then, a metric invariance test for all constructs in which the factor loadings were constrained to be equal was conducted: $\chi^2 = 18481.26$; $p < 0.0001$; RMSEA = 0.04; CFI = 0.98. The model was stress-tested by performing the strictest scalar invariance test. This gave rise to $\chi^2 = 21310.58$; $p < 0.0001$. An LR test with the metric model produced a highly significant $\Delta\chi^2$ at $p < 0.0001$. This gave confidence to consider the metric model as final. Moreover, measures of composite reliability were estimated by calculating the total variance in the scale items associated with the factor's true score. The estimate values were high, which means that a large proportion of scale variance has already been accounted for.

[2][Online]. Available: https://doi.org/10.6084/m9.figshare.28330775.v1

TABLE I
DESCRIPTIVE STATISTICS AND CORRELATIONS

Construct	Mean	1	2	3	4
1. Environmental Turbulence	3.17				
2. IT Maturity	3.50	.217			
3. # of IT Employees	50	.135	.251		
4. Work Exhaustion	3.21	.044	.140	–.008	
5. Job Satisfaction	2.13	–.111	–.204	–.008	–.369

Note: all correlations are significant at $p<0.001$.

TABLE II
ORGANIZATIONAL STRATEGIC TYPE—CONSTRUCT MEANS

Strategic Type	Environmental Turbulence Mean
Prospector	3.41
Analyzer	3.12
Defender	3.06
Reactor	2.87
$F(3, 10{,}349)=225.016$; $p<0.001$	

Sixth, endogeneity was tested and ruled out. An assumption of Multinomial Logistic Regression concerns the outcome categories having independence of irrelevant alternatives. Thus, category exclusion or inclusion is not supposed to alter the relative risks concerning the explanatory variables in the remaining categories. While executing the Hausman test with the multinomial model, the base outcome in the competing models was kept the same because a standardized comparison of model coefficients is called for. Large p-values ($p > \chi^2$ exceeding 0.6) in all cases indicate that the coefficients are consistent.

Table I presents descriptive statistics and construct correlations. Note that the Pearson correlation between work exhaustion and job satisfaction is negative ($r = –0.369$, $p < 0.001$) which is consistent with the literature: the more exhausted employees become, the less they are satisfied with their jobs [50], which further confirms the validity of the dataset. The presence of a negative correlation also rules out common method bias associated with cross-sectional surveys.

IV. RESULTS

Each hypothesis was tested by means of Multinomial Logistic Regression (if the dependent variable was nominal) or Linear Regression (if the dependent variable was continuous). Running six independent regressions was required because, in each hypothesis testing, the dependent variable was unique. Regression analysis allows testing multiple independent variables in a single test, but only one dependent variable may be used in each test. Organizational size was added as a control variable, recorded as small-and-medium sized enterprises (SMEs up to 500 employees coded as 1 versus large organizations with 501+ employees coded as 2).

Table II shows environmental turbulence means for the four strategic types. One-way ANOVA with environmental turbulence as a factor and strategic type as a dependent variable was done, followed by Tukey's honest significance test, which showed differences among all strategic types ($p < 0.0005$). The means are in the hypothesized direction with prospectors operating at the highest environmental turbulence level.

To test H1, Multinomial Logistic Regression with environmental turbulence as a predictor variable (i.e., covariate) and

TABLE III
ORGANIZATIONAL STRATEGIC TYPE—HYPOTHESIS TESTING

Strategic Type	β	Std. Error	p-value
Prospector (0) versus Analyzer (1)			
Organizational size	−.050	.051	.331
Environmental turbulence	−.700	.037	.001
Prospector (0) versus Defender (1)			
Organizational size	.185	.052	.001
Environmental turbulence	−.588	.037	.001
Prospector (0) versus Reactor (1)			
Organizational size	.077	.071	.279
Environmental turbulence	−1.074	.050	.001

TABLE IV
COMPETITIVE STRATEGY—CONSTRUCT MEANS

Business Strategy	**Environmental Turbulence Mean**
Differentiation	3.25
Cost leadership	3.02
Focus	2.99
None of the above	3.08
$F(3, 10{,}347)=76.926$; $p < 0.001$	

TABLE V
COMPETITIVE STRATEGY—HYPOTHESIS TESTING

Business Strategy	β	Std. Error	p-value
Differentiation (0) versus Cost leadership (1)			
Organizational size	−.231	.061	.001
Environmental turbulence	−.431	.041	.001
Differentiation (0) versus Focus (1)			
Organizational size	−.002	.069	.982
Environmental turbulence	−.500	.047	.001
Differentiation (0) versus None (1)			
Organizational size	.225	.057	.001
Environmental turbulence	−.343	.039	.001

TABLE VI
H3–H6 TESTING

	β	R^2	ΔR^2
	Organizational IT maturity		
Organizational size	.108 ($p < .001$)	.015	
Environmental turbulence	.209 ($p < .001$)	.059	.044
	The number of IT employees		
Organizational size	.605 ($p < .001$)	.375	
Environmental turbulence	.085 ($p < .001$)	.382	.007
	Work exhaustion		
Organizational size	.002 ($p = .804$)	.000	
Environmental turbulence	.044 ($p < .001$)	.002	.002
	Job satisfaction		
Organizational size	−.011 ($p = .275$)	.000	
Environmental turbulence	−.110 ($p < .001$)	.012	.012

TABLE VII
NORTH AMERICA VERSUS NON-NORTH AMERICA

Hypothesis	**North America**	**Non-North America**
H1	Supported	Supported
H2	Partially supported	Supported
H3	Supported	Supported
H4	Supported	Supported
H5	Supported	Supported
H6	Supported	Supported

membership in the four strategic type groups was performed. The fit between the model containing only the intercept and the final model including the predictor improved with the addition of the predictor: $\chi^2(6) = 678.382$, Nagelkerke $R^2 = 0.068$, $p < 0.001$. Prospectors (the first group) was used as a reference category (coded as 0) to test the strength and significance of environmental turbulence as a predictor. Analyzers, defenders, and reactors were coded as 1 and compared with prospectors (see Table III). Negative beta coefficients indicate that as environmental turbulence increases, organizations are more likely to be prospectors which are coded as 0. Thus, the results support H1.

Table IV presents environmental turbulence item means for competitive strategies based on One-way ANOVA and Tukey's honest significance tests. It confirms that the means are in the hypothesized direction.

H2 was tested with Multinomial Logistic Regression with environmental turbulence as a predictor variable (i.e., covariate) and membership in the four competitive strategy groups. The model fit was statistically significant: $\chi^2(6) = 266.206$, Nagelkerke $R^2 = 0.029$, $p < 0.001$. Differentiation strategy (the first group) was used as a reference category (coded as 0), and Cost leadership, Focus, or None of the above were coded as 1 and compared with differentiation (see Table V). Negative beta coefficients reveal that as environmental turbulence increases, organizations tend to employ the differentiation strategy, which confirms H2. To test H3–H6, Linear Regression with environmental turbulence as an independent variable and a corresponding dependent variable was performed (see Table VI). In all cases, environmental turbulence explained the proportion of variance in the dependent construct above that by organizational size, which supported all hypotheses.

Multinomial Logistic Regression and Linear Regression are sensitive to the presence of outliers, and even a small number of outliers may lead to unexpected deviations in findings [88]. To perform a robustness check, z-scores were calculated for the environmental turbulence variable, and the data points with 5% of the highest and 5% of the lowest z-score values (i.e., 10% in total) were removed from the dataset. Environmental turbulence was selected because it is a continuous variable that is employed in all models. All models were re-estimated, and the results were compared with those documented above. While some minor differences in the beta coefficients and the R-squared values were observed, the overall results were very similar. All hypotheses were again supported, which ensured that the robustness check was successful.

To test whether the findings above hold true in both the global and the North American contexts, the dataset was split into two parts: North America (the US and Canada) and the rest of the world. The statistical techniques above were applied to each sample separately, and the conclusions were summarized in Table VII. The results indicate that H1, H3, H4, H5, and H6 were supported in both samples, and H2 was only partially supported in the North American context. H2 proposed that organizations operating in higher environmental turbulence are more likely to employ a differentiation strategy. It was observed that in the North American sample, out of three pairs of strategies, one pair (differentiation versus cost leadership) showed no statistically significant difference, which indicates only partial hypothesis support.

V. Discussion

A. Implications for Theory

Most scholars agree that the current market, technological, and competitive changes are extremely fast and full of surprises, leading to an exponentially accelerating rate of environmental turbulence. Thus, it is important to explore solutions that may help organizations strategically position themselves to achieve competitive advantage. To shed some light on this issue, this study demonstrated that continuous innovation, a differentiation strategy, organizational IT maturity, and a sizable IT workforce act as organizational agility enablers to help firms succeed in a turbulent world. The findings identified five major points that warrant further elaboration.

First, this study empirically demonstrates that the degree of environmental turbulence determines the strategic positioning that should be selected by an organization and confirms that the current business strategy should be aligned to the external environment. This study highlights the role of continuous innovation and differentiation as the key strategies that should be pursued in highly turbulent environments. To become agile and prosper in a turbulent environment, businesses should both innovate and differentiate themselves from their competition: they should become Prospectors and employ a differentiation strategy. Previous research has identified continuous learning, experimentation, calculated risk-taking, and flexible organizational structure [34], [53], [56] as the major attributes of innovative agile organizations that help them overcome environmental turbulence. Prior studies have also reported that the differentiation strategy relies on innovation, instills brand loyalty, and focuses on integrated flexibility [65], [67], [68], which bodes well for operating under uncertain and changing conditions. This investigation further emphasizes the importance of these strategic approaches in a turbulent environment.

Second, this study reinforces the notion that organizations should avoid strategic misalignment, which happens when their strategy is not suitable for operating in a particular context. This applies not only to new but also to older, well-established businesses. As global markets and supply chains get exponentially interconnected, customers become more selective, and the rate of technological obsolescence reaches new heights, environmental turbulence may affect the industries that were previously considered stable and relied on nonagile strategies. For example, current businesses operating in the turbulent telecommunications sector must constantly innovate [89] and find unique differentiation approaches to achieve agility and gain competitive advantage. By contrast, Walmart and Motel 6 are low-cost market share defenders [90] that are not concerned about their agility because they function in stable, predictable conditions. However, the retail and hospitality industry may eventually become turbulent, which may result in strategic misalignment unless their top management proactively repositions these firms.

Third, the literature has clearly established that having a well-developed IT infrastructure is a must for all contemporary organizations regardless of their industry. This study shows that, as environmental turbulence increases, businesses that would like to achieve and maintain agility should also establish effective collaboration approaches between non-IT and IT workers to increase organizational IT maturity. Previously, the relationship between organizational IT maturity and environmental turbulence received little attention, and this study brings researchers' attention to this important topic. In addition, the study demonstrates that under the conditions of environmental turbulence, organizations should heavily invest in their human IT elements: they should increase the size of their IT workforce because IT workers are needed to adjust the IT infrastructure, reorganize business processes, and maintain the IT-strategy alignment in real time. Environmental turbulence requires agile organizations to frequently adapt or completely re-engineer their essential business processes [69], but implementing such initiatives requires going beyond the mere technical elements. Overall, while having a robust IT infrastructure is a must for competing in a turbulent environment, requisite IT personnel is also highly essential.

Fourth, the study analyzed the impact of a turbulent environment on IT workers and found that navigating a turbulent world can take its toll on IT employees because they experience work exhaustion and job dissatisfaction. A major outcome of high work exhaustion and low job satisfaction is voluntary turnover [91], which affects both organizations that lose precious human capital and employees themselves, who have to look for new job opportunities, sacrifice their income, and possibly reallocate, which may lead to further stress, disappointment, and family issues. Finally, previous projects have explored the issues above in the context of individual countries, and this study continues this line of research on a truly global scale. It empirically shows that while most conclusions hold true in both the North American and the global contexts, there may be some minor yet important differences. Thus, while global trends do exist, not every finding obtained in the North American context may always generalize to the rest of the world.

B. Recommendations for Practice

The findings of this study would help managers better understand how to strategically position their organizations, develop an IT function, and manage IT workers to achieve organizational agility and successfully navigate a turbulent world. With respect to recommendations, this study presents the following key takeaway for business and IT managers: to successfully navigate and prosper in the contemporary turbulent environment, their organizations should become agile. For this, they need to transform their organizational type, strategy, and IT function: their firms should innovate continuously, and customers must perceive their products and services as being different from those of their competitors. To accomplish these initiatives, agile organizations should educate their non-IT workers about the value of IT as a critical resource and teach them how to routinely communicate with their IT counterparts. Such initiatives should be spearheaded by the CIO, who should lead by example and collaborate with the CEO and other CXOs on strategic matters. The IT function should require growing attention and substantial investment for achieving high organizational IT maturity and hiring a sizable IT workforce. However, employees of agile organizations may ultimately pay the price by becoming more exhausted and less satisfied with their jobs. While managers

cannot possibly control environmental turbulence, they should become aware of its impacts and proactively develop strategies, solutions, and worker support programs to address these challenges. In particular, organizations functioning in highly turbulent environments should pay attention to their IT workers' mental health and invest in stress management, counseling, new opportunities, incentives, and socialization/recreational programs. When adapting recommendations proposed in management research, practitioners should always pay attention to the context in which the study was situated. While universal trends do exist, there may be small yet important differences between the findings reported in the North American and the global contexts.

VI. Limitations, Future Research, and Conclusion

This study has a few limitations. First, it relied on cross-sectional data. However, it is important to understand changes in the level of environmental turbulence over time and how these changes affect organizations and their workers, which may only be achieved by collecting longitudinal data. Second, it would be interesting to identify the level of environmental turbulence for each country and analyze how country-specific idiosyncrasies influence their strategic responses. Third, this study reports how environmental turbulence affects workers' exhaustion and job satisfaction, but it would be beneficial to learn how employees themselves cope with the turbulence pressure. Last, the recommendations presented in this study pertain to IT employees only, but environmental turbulence may have a different impact on non-IT workers.

These limitations offer avenues for future research. First, it would be interesting to know how strategic adjustments made by agile organizations operating in turbulent environments affect their profitability. For instance, are prospectors consistently more profitable than analyzers and defenders? Can reactors possibly survive under high turbulence? Second, it would be helpful for strategic managers to know what options are available for organizations operating in high environmental turbulence that pursue low-cost strategy. Third, it is vital to explore how firms may exploit environmental turbulence to create a positive impact on their workers. Organizations should also investigate avenues to reduce workers' exhaustion and to increase their job satisfaction despite their continuous exposure to a turbulent environment. Last, it would be interesting to study the temporal dimension of environmental turbulence; for example, different strategic responses may be needed when organizations are exposed to short-term vs. long-term turbulence.

The popular press often mentions that we live in the VUCA world when the external environment affecting our daily lives is volatile (V), uncertain (U), complex (C), and ambiguous (A) [92]. Indeed, the events that took place in the last several years have changed many aspects of our society in the blink of an eye. The fact that environmental turbulence affects the very functioning of the contemporary organization is undeniable. Our society evolves, new technologies appear, and businesses discover new ways to intensify competitive pressure, which continuously shakes organizations and their workers. This study shows that managers may improve the prosperity of their businesses by focusing on strategic innovation, pursuing differentiation, improving IT maturity, and investing in the IT workforce.

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