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The Influence of Error Management Leadership on Perceived Job Insecurity in Egyptian Pharmaceutical Firms: Does Leadership Matter?

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ABSTRACT

The purpose of this research was to establish the relationship between error management leadership practices and perceived job insecurity in the Egyptian pharmaceutical industry. The research objectives were to examine the relationship between error management leadership and overall perceived job insecurity, as well as how error management leadership affects job insecurity perceptions, job insecurity dissatisfaction, and job insecurity behaviors. The study employed a quantitative approach, collecting data through surveys from employees at EVA Pharma and Ibnsina Pharma in Egypt. The data was analyzed using descriptive statistics, correlation analysis, and structural equation modeling (SEM). Key findings revealed that error management leadership had a significant positive effect on overall perceived job insecurity. Furthermore, error management leadership positively influenced job insecurity perceptions, job insecurity dissatisfaction, and job insecurity behaviors, with the strongest relationship observed between error management leadership and job insecurity perceptions. These findings indicate that error management leadership, which focuses on identifying and correcting errors without reprimands, influences the perception of job security in Egyptian pharmaceutical companies. This study suggests directing future research to further understand the relationship between error management leadership and perceptions of job insecurity in this industry.

1. Introduction

Over the last few years, there have been some issues affecting the economy of Egypt, such as volatile global markets, cyber risks, and political instabilities (Abdelraouf et al. 2024; El-Shihy et al. 2024). These economic instabilities have, on average, increased instabilities in the job market, making job insecurity a growing issue of concern among employees in different industries. In such a context, people may view their occupation as insecure, resulting in increased stress levels and lower satisfaction with work (Prince et al. 2018). It is for the industry

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association to facilitate the flow of information and practices among members (Abdelraouf and Muharram, 2024). Another relevant concern is job insecurity, which always has a detrimental effect on the performance and health of employees. It is especially a problem in industries that require strict quality standards, such as the pharmaceutical industry, where employees have a feeling that their jobs cannot be secured. Nevertheless, the extent to which these and other human resource practices shape these perceptions remains poorly understood (Darvishmotevali and Ali, 2020).

The purpose of this research is to explore the relationship between error management leadership approaches and the perceived job insecurity of employees in the Egyptian pharmaceutical industry. More specifically, it focuses on the extent to which employment security is valued when employees are encouraged to make mistakes and are not disciplined for them or punished. The pharmaceutical industry in Egypt is one of the main economic sectors through which the state gains revenues from exports, creates jobs, and improves the health of the populace. The sector has garnered global recognition and been able to source sizeable investments due to its compliance with the high quality standards of international markets (Elsayed et al. 2016).

The roles in the strategic sector, in contrast, cause issues concerning the reliability of employees and the stability of their positions. Hiromura & Hassim (2018) pointed out that staff should not be afraid of learning from their mistakes or reporting problems, as this could be detrimental to compliance efforts. Previous studies have established links between MEOs and aspects of error management leadership culture, as well as hiring tenure impressions. Research evidence indicates that an organizational culture that supports learning from mistakes while not sanctioning poor decisions leads to an increased rate of risk-taking and creativity at work. Conversely, a culture that prioritizes mistakes for blame leads to increased feelings of pressure and job insecurity (Hadadian and Zarei, 2016). However, prior studies have not focused on the relationship between error management leadership practices and perceived job insecurity within the pharmaceutical industry.

Perceived job insecurity is an especially important factor affecting worker attitudes and retention in the highly regulated Egyptian pharmaceutical sector. Furthermore, perceptions that error reporting or learning from mistakes may endanger one's employment could undermine efforts to reinforce stringent compliance with global quality standards in pharmaceutical manufacturing and distribution. Therefore, the problem statement will read, "There is a lack of understanding regarding the relationship between error management leadership practices and perceived job insecurity among employees in the Egyptian pharmaceutical industry." While the study's main research question is ‘’How does the implementation of error management leadership strategies within an organization effect employees' perceived job insecurity?’’. Additionally, the study will explore the following sub-questions: ‘RQ1: What is the relationship between error management leadership and overall perceived job insecurity?’. ‘RQ2: How does error management leadership influence job insecurity perceptions among employees?’. ‘RQ3: What is the impact of error management leadership on job insecurity dissatisfaction?’. ‘RQ4: How does error management leadership affect job insecurity behaviors in the workplace?’. In this regard, the proposed study aims to address existing information gaps by exploring previously unexplored areas. Accumulating knowledge about how error management leadership influences workers' perceptions of job insecurity can support HRM tactics. This type of activity can be used to improve the sector's incremental contribution to the Egyptian socioeconomic fabric and, as a result, Egypt's successive advancement.

2. Literature review

2.1. Error management leadership

The principles of error management leadership, an action-oriented strategy for addressing errors, recognize the inevitability of a second line of defense and the inability to completely prevent action errors. This approach entails active discussion of errors, synchronization when dealing with errors, early development of error identification, and containment. The goal of error management leadership is to reduce negative error consequences and enhance positive effects, such as learning and innovation. Error management leadership training is an example of an active learning approach that emphasizes experimentation and exploration by participants rather than a tight structure and guidance (Frese and Keith, 2015).

Error management leadership is an approach that focusses on avoiding the negative consequences of errors rather than trying to prevent them altogether. It involves the institutionalisation of error reporting and shared responsibility for their occurrence within an organisation, as well as engaging in an "error process" comprising detection, explanation, handling, and recovery. The goal of error management leadership is to improve safety and quality performance within projects by acknowledging the presence of errors and learning from them (Love and Smith, 2016). According to Oostinga et al. (2018), error management leadership refers to the process of managing communication errors that occur during crisis negotiations. This includes admitting an error, rectifying it, and acknowledging the error in an immediate or timely manner. It is not the end result of the negotiation that is highlighted, but the process of negotiation and the mistakes made therein.

Moreover, Oliveira et al. (2022) asserted that error management is a process that encompasses the identification of errors, the provision of a reason, dealing with them, and the rectification of errors within an organization. It regards errors as inevitable in organisations and aims at disconnecting the errors from the outcomes. Error management leadership, therefore, aims at achieving a high level of positive outcomes, which may include learning from the mistakes, creativity, and innovation compared to the negative outcomes like delay in schedules, poor quality and production issues, and low performance by the employees.

2.1.1. Error management leadership sub-variables

Error sharing is the extent to which employees are willing to exchange information about errors and mistakes in an organisation in a bid to show knowledge of their root causes, ways of addressing them, and how future errors can be avoided. It comprises establishing conditions that encourage employees to accept that they are fallible and may occasionally make errors without getting humiliated or punished (Dahl and Werr, 2021).

In addition, this factor refers to the extent to which employees openly discuss errors that occur and share information about them with others in the organization. For instance, “If an error is made, everyone is allowed to talk about it” and “To avoid the occurrence of similar errors in the future, the content of an emergent error is shared with other employees (Han et al. 2015). While error competence deals with the capacity of employees and respective organisations to learn from errors and mistakes with respect to performance enhancement, it encompasses providing chances for the people at the workplace to get acquainted with pattern analysis of errors, causal factors, and ways of handling the mess. Key aspects of error competence include training employees on problem-solving methodologies, implementing systemic data collection practices to uncover error-contributing factors, and leveraging quality improvement teams to turn errors into process improvements (Konttila et al. 2019). Moreover, this factor refers to the

extent to which employees are able to learn from errors and use that knowledge to improve their performance. The organization provides opportunities for employees to learn from errors and exposes the employee who makes a mistake to learning opportunities (Richards, 2015).

Furthermore, error avoidance refers to the extent to which an organization or its employees try to prevent errors from occurring in the first place, rather than allowing them to happen and then learning from them. It involves setting up controls, checks, and redundancies to reduce mistakes, as well as designing standardized protocols that limit process variation (Frese and Keith, 2015). Also, error avoidance: This factor refers to the extent to which employees try to avoid errors altogether rather than learning from them when they occur. It includes phrases such as "Employees tend to hide their mistakes, worrying that they will be blamed for them" and "Employees avoid compensation for an error that occurs (Abdulshahed et al. 2015).

At the end, response to error refers to how employees react when errors or mistakes occur within an organization. It includes the attitudes, supportiveness, and degree of blame or punishment exhibited towards those who make errors (Schultz, 2016). Therefore, this factor refers to the extent to which employees respond to errors in a constructive and supportive manner, rather than blaming or punishing those who make mistakes. "Employees do not consider errors as an obstacle to achieving goals" and "If there is insufficiency in coping with an error, employees seek help from other employees" are examples of items included in this factor (Schultz, 2016).

2.2. Job perceived insecurity

Perceived job insecurity can therefore be defined as an individual’s attitude or belief towards his or her job or career insecurity. It is a psychological state that consists of a person's estimate of the threat to his or her position rather than an actual threat of termination. Employees’ perceived job insecurity can be up to the level of economic conditions, organizational changes, and/or personal events. It has been discovered to be positively linked with psychological morbidity and poor mental health (Gasparro et al. 2020).

Perceived job insecurity is defined as employees’ assessment of the risk of job loss they can face in the future owing to several factors like an increase in technological demand, unfavorable economic conditions, changes in the organizational structure, and other environmental conditions that hinder the continuity of employment. Thus, perceived job insecurity is a negative concern related to the continuation of existing jobs, capturing an involuntary transformation in terms of job continuity and stability (Nam, 2019).

Perceived job insecurity refers to an individual's subjective perception of the threat of losing their current occupation. It is related to how an individual perceives their employment guarantee in situations involving organizational changes, economic factors, and performance (Kim and von dem Knesebeck, 2016).

Perceived job insecurity is therefore an employee’s subjective evaluation of the possibility of job loss or negative changes in employment circumstances. As a result, this perception is relative and depends on personal, internal, and environmental stimuli when interpreting employment-related information (Kinnunen 2014).

2.2.1. Job perceived insecurity sub-variables

According to Kinnunen (2014), perceived job insecurity can be defined as the cognitive and emotional evaluation that an employee conducts on the possibility of losing a job or having negative changes in the job conditions. Various internal and external factors, including the individual's interpretation of job-related information, often influence this subjective perception.

Its four dimensions are: Various internal and external factors, including the individual's interpretation of job-related information, often influence this subjective perception. Its four dimensions are:

Job insecurity perceptions are therefore defined as an individual's perceived estimate and attitude towards their likely chance of being dismissed from employment in the near future. It therefore entails an assessment of the perceived risk of unemployment by obtaining any information on factors likely to influence the possibilities of continued and sustainable employment in an individual's position (Debus et al. 2014).

Job insecurity perceptions can thus be defined as an individual's appraisal of how well protected his or her job is or the likelihood of getting dismissed in the future. It is the individual's perception of the amount and degree of security that he or she has in his or her job and can be affected by many factors, including structural changes, the business climate, and individual circumstances. JIP can have a range of negative effects on the employee and the organization, including turnover intentions and work withdrawal behavior (Debus et al. 2014).

Job insecurity Dissatisfaction refers to the negative feelings, unhappiness, resentment, anxiety, and distress that individuals experience due to concerns about the continuity of their current employment. Furker and Berglund (2014) define it as the affective reaction to the perception of involuntary job loss in the future.

"Job insecurity dissatisfaction" is the term used to describe the dissatisfaction or unhappiness that employees feel due to their perception or experience of job insecurity. It represents the negative emotions and feelings associated with the uncertainty or instability of one's job (Cheung et al. 2019).

Job insecurity behaviors refer to the actual actions and coping responses that employees exhibit as a result of perceived threats to their employment continuity. These can include both constructive behaviors aimed at reducing insecurity, such as increasing skill development, and withdrawal behaviors, such as absenteeism, which demonstrate neglect of one's work duties (Lawrence and Kacmar, 2017).

2.3. Error management leadership and Perceived job insecurity

Employee perceptions of job security play a crucial role in shaping performance, well-being, and retention rates. Industries bound by stringent compliance and quality standards, such as the pharmaceutical sector, may be especially susceptible to the effects of perceived job insecurity among workers.

Error management leadership practices have been identified as a factor that could influence the degree of job security felt by employees (Ali et al. 2021; Guchait et al. 2016). Research on error management leadership suggests a potential link to perceived job insecurity. Environments where employees bear the burden of responsibility for company mistakes may heighten feelings of pressure and job insecurity (Huang et al. 2017). Based on these findings, the following hypothesis is proposed: **H1: Error management leadership has a significant effect on perceived job insecurity.**

2.4. Error management leadership and Job insecurity perception

Existing research provides evidence that error management leadership approaches can influence levels of perceived job insecurity among employees. This may reduce feelings of pressure and insecurity related to making errors on the job. In narrow industries, such supportive environments may positively affect how stable and secure employees feel in their

roles (Jung et al. 2021). Other prior research has also demonstrated that the use of non-punitive error reporting techniques may lead to higher levels of employee creativity and risk-taking. The freedom to test new processes and procedures while avoiding blame should something bad occur could improve the level of delegation within employees. It may also lead to perceptions of job security rather than vulnerability or insecurity, perhaps through control and discretion in one's work (Anselmann and Mulder, 2018). Thus, H1a is developed as follows: **H1a: Error management leadership has a positive significant effect on Job insecurity perception.**

2.5. Error management leadership and Job insecurity dissatisfaction

Studies that have been conducted recently point out that if error management leadership is practiced, it can help to minimise feelings of job insecurity and dissatisfaction among workers. If organisations use a positive approach that does not blame employees for having made mistakes but instead encourages evaluation and learning, it may lead to the creation of a psychological climate within the organization. To work effectively, staff members should not be afraid to take reasonable risks and to share them with management instead of hiding them due to possible sanctions. This kind of encouragement also gives employees the message that the firm is interested in their continuous service and development. This might lead to higher self-esteem and overall well-being in the workforce, knowing that when performance appraisals and promotions are conducted, their faults will not be used discriminatorily against them (Lamm et al. 2015; De Witte et al. 2015). Thus, H1b is developed as follows: **H1b: Error management leadership has a significant effect on Job insecurity dissatisfaction.**

2.6. Error management leadership and Job insecurity behaviours

Presbitero and Teng-Calleja (2023) pointed out that job insecurity behaviours are defined as the actions that an employee goes through or the behaviours they exhibit in response to perceived job insecurity. These behaviours can be beneficial or costly, depending on how much the individuals' concerns get addressed about job insecurity. It is hypothesised that error management leadership can have a significant positive relationship with job insecurity behaviours. If organisations and managers embrace the error management leadership approach, it could bring about conditions under which workers are protected from the negative repercussions of making faults (De Spiegelaere et al. 2014). This way, employees are willing to take risks and go for innovations, knowing that in the event of failure, it will not be considered a mistake but rather a lesson. This reduction in perceived threat could help reduce employees' behaviours of job insecurity (McInnis et al. 2016). Thus, H1c is developed as follows: **H1c: Error management leadership has a significant effect on Job insecurity behaviours.**

2.7. Research limitations

The following is a summary of the research study limitations that should be noted when analysing this study's outcomes: First, the research will be conducted specifically within the pharmaceutical industry within Cairo only and not include other industries or other parts of Egypt. As a result, the findings could not be generalised to different industrial sectors or geographical locations in Egypt (Abdelaal et al. 2020). Secondly, this study will focus only on a limited central sample of pharmaceutical companies, which are ''Ibnsina Pharm and GSK' due to time constraints and resource limitations.

As a result, the study's findings may not be fully generalisable to all firms within the pharmaceutical industry in Egypt (Masic, 2023). In addition, the study will collect data at one

point in time only, thus not being able to review the changes in error management leadership and perceived job insecurity over a longer period of time. Finally, the research will be based on the data collected directly from the employees through questionnaires; this sometimes tends to produce biased data because respondents have a tendency to respond based on what they consider socially acceptable.

Nevertheless, the study is expected to provide significant findings to advance the understanding of the relationship between error management leadership and perceived job insecurity in the pharmaceutical industry in Egypt (Azab, 2016). It is essential to note that no previous studies have conducted an investigation between error management leadership and perceived job insecurity in pharmaceutical firms globally or in Egypt. Therefore, this research paper has a practical and academic contribution. In addition, it will be the first gateway for scholars to investigate this topic more thoroughly, specifically in the pharmaceutical industry.

2.8. Conceptual framework

The study consists of error management leadership as an independent variable and perceived job insecurity as a dependent variable. Observing figure (1), the results of the experiment reveal that the dependent variable, perceived job insecurity, may be impacted by changes and manipulations of the independent variables. The primary focus of the research and the basis for its results is the behavior of this dependent variable. Therefore, in this research, error management leadership remains the principal research focus, portraying the primary independent variable. The first hypothesis, H1, posits that Error Management Leadership is a leadership approach that not only tolerates errors but also views them as opportunities for learning and development. Leaders who adopt error management leadership create an environment where employees feel secure in taking risks and learning from their mistakes, rather than fearing negative consequences for errors.

When leaders encourage open communication about errors and emphasize the importance of learning from them, employees are likely to perceive a lower threat of job loss or negative repercussions, which directly impacts their sense of job security. This supportive environment may reduce perceived job insecurity because employees feel that mistakes will not lead to punitive actions or job loss. Therefore, prioritizing error management as a specific leadership behavior can mitigate the perceptions of job insecurity that arise from job instability. In addition, Hypothesis H1a establishes that a job insecurity perception is a self-reported measure of the perceived threat of job loss or job conditions' deterioration. When Error Management Leadership is present, one of the main ideas is that mistakes are simply part of the learning process, and this is likely to change the employees' perception of job security. In the context of error management leadership, employees may experience a paradoxical sense of job insecurity at work. However, what WMPL may do is eliminate the likelihood that employees fear losing their jobs because of their mistakes, only to provide them with a subtle reminder about their growing vulnerability in the face of increasing pressures that stem from the daily requirement to continuously improve and adapt while enhancing sensitivity to possible errors.

This can result in a higher sensitivity to job insecurity, where employees are fully informed of the risks they face but are also provided with the tools to overcome them. In Hypothesis H1b, job insecurity dissatisfaction means the perceived threats to job security evoke a negative emotional response. Leadership in error management can play a crucial role in influencing this dissatisfaction. Adopting an error management approach fosters a culture that views mistakes as growth opportunities rather than failures, thereby reducing the stress and dissatisfaction associated with job insecurity. Employees in organizations with strong error management leadership are likely to feel less dissatisfied with their job security because they know that

errors will not lead to immediate negative consequences. This supportive environment can alleviate the anxiety and dissatisfaction that often accompany job insecurity, as employees feel more secure in their roles and more confident in their ability to navigate challenges. Finally, hypothesis H1c proves that job insecurity behaviors refer to the actions employees take in response to perceived job insecurity.

These behaviors can range from withdrawal and disengagement to proactive efforts to secure their positions. Presbitero and Teng-Calleja (2023) assert that the effectiveness of addressing employees' concerns about job insecurity determines the potential benefits or drawbacks of these behaviors. Error Management Leadership has the potential to influence job insecurity behaviors by fostering a culture of risk-taking and fostering the development of innovative ideas. This is because employees understand that any mistakes they make will not result in punishment, but rather serve as a learning opportunity. Such security in the workplace can result in more positive behavioral outcomes that relate to job insecurity, which include increased working efforts and efforts to develop the organization since employees do not have to fear job loss as much. However, in the absence of error management leadership, job insecurity can lead to some negative employee behaviour, such as disengagement or withdrawal, as a coping mechanism.

Therefore, error management Leadership plays a crucial role in determining the overall pattern of employees' behavior in the context of job insecurity, with positive or negative outcomes based on the leadership model. It is the theoretical framework, together with a host of other factors, that will be used for an analysis of the given phenomenon. Since each variable could only be perceived once, multiple measures were needed to assess each variable. The efficiency of every one of the measures examined herein was calculated during the execution of the statistical processing. Therefore, this study aims to empirically investigate these theoretical connections in the selected organizational environment, examining the topic through the presented example of the specific industry and utilizing the research design it has developed.

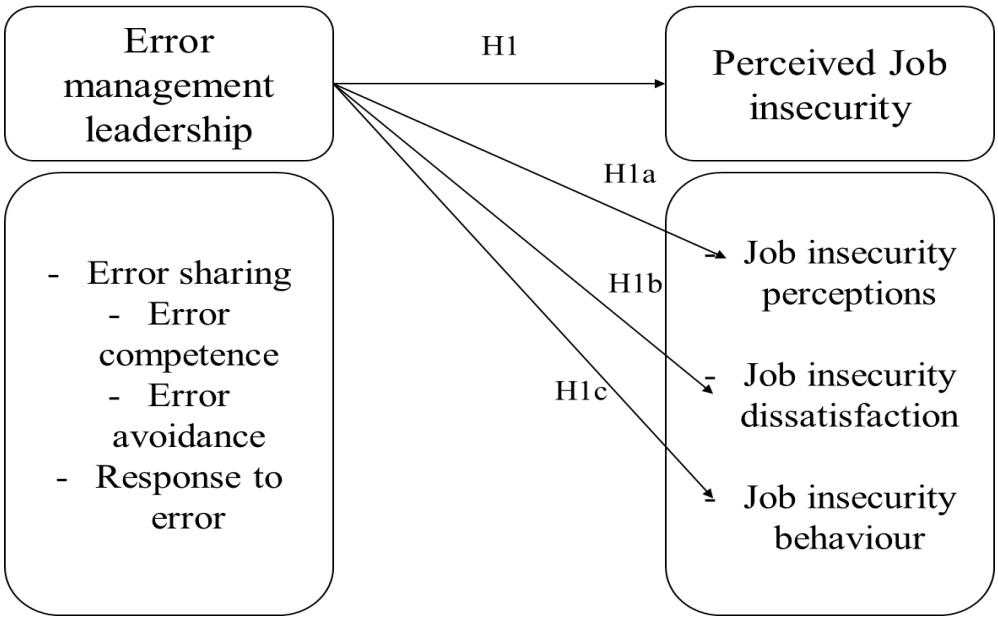

Figure 1. Conceptual framework
Source: Developed by the researchers

3. Research methodology

3.1. Data source and description

The main purpose of this section is to level up the hypothesis results. Therefore, the survey was developed by different previous studies, such as El-Shihy et al. (2021). The questionnaire was created using a Google Form, and the survey was distributed to collect the firms' employees' opinions. When it comes to verifying or refuting the previously stated hypothesis, The pharmaceutical sector perceives that it benefits the Egyptian economy and health care system. Drug manufacturing is sensitive and has strict specifications. The drug production industry is sensitive. The mistakes made in manufacturing may have an impact on patients' lives. Error control is critical in this area because pharmaceutical personnel may face severe penalties if they make mistakes. These protocols are rigorous. In this field, our research on how mistake management affects job insecurity is important.

Egypt's pharmaceutical industry is vital to its economy and job market. The Ministry of Health and Population (2023) reports that the logistics and packaging sectors employ 232,203 people. Locally manufacturing pharmaceuticals at low cost boosts the economy and creates jobs. Europe, Asia, and Africa are the main destinations for Egyptian APIs and generics. Egypt earned $2 billion from pharmaceutical exports in 2021 (Ahram, 2023). The business's strict restrictions have earned it a global reputation, emphasizing the need for high quality and error reduction. The pharmaceutical industry in Egypt has received major investments from domestic and international corporations, resulting in highly technological facilities (Gericke et al. 2019). Significant investments from both domestic and international corporations have resulted in advanced manufacturing facilities. With such investments, companies prioritize operational efficiency and error reduction to safeguard their assets, which can impact employment stability and employee trust. Therefore, this study is directly relevant to understanding how error management leadership influences perceptions of job insecurity in the pharmaceutical industry.

3.2. Research sample and measures

When it comes to the procedure for sampling, the approach of cluster random sampling will be utilized. System sampling, in which the selection process involves sampling a cluster using a random approach, is a method of sample selection that is convenient to use. According to Patil et al. (2014), the respective cluster comprises divided parts. Based on the formation-based distribution of these two organizations in the context of this application, it can be observed that the firms are complex, consisting of several clusters with nearly equivalent personnel ratios at both the managerial and departmental levels. In addition, the companies are divided into separate organizations. Next, we must randomly select a cluster from the developed sample frame. Setia (2016) asserts that this approach enables the generalization of the study's conclusions to other businesses without introducing any bias.

The business directory known as the "Egyptian business directory" of the year 2024 was used to screen all of the companies, and EVA and Ibnsina Pharma were chosen as two of the first ten pharmaceutical industries in Egypt. Since they provide the most extended market base locally and internationally, they are among the largest medication production companies in the country. This is the reason why they are so successful. The primary aim of writing this article is to call for the need to carry out an evaluation of the business of producing and selling pharmaceuticals in Egypt with reference to the value that the business brings to the country in terms of the economy, health care services, and employment opportunities. These features are going to explain the role of error management in job insecurity in this industry, and thus this

field of research is considered to be relevant because it outlines factors that contribute to or hinder the job security and satisfaction of pharmaceutical employees.

Sample size is thus a very important factor in the process of making sure that the results of the study are actually valid and reliable for the population. In this study, the sample size was calculated using the formula for estimating proportions in a population:

$$n = \frac{z^2 * p*(1-p)}{e^2} = \frac{2.58^2*(0.5)*(0.5)}{0.05^2} \approx 665.64 \ = 666 < 769 \quad (1)$$

The sample need to exceed 666 respondents to obtain a margin of error of 0.1

Where:

The target population, population size, sampling error tolerance, confidence level, and method of sampling are used to determine:

- Z: The Z-score, which is equivalent to the degree of confidence required by the analyst. The confidence level is an indicator of the extent to which you can be confident that the population parameter is within the confidence interval. A typical, or ordinary, level of confidence is about 95 percent, which uses a Z-score of 1.96. For this study, a higher level of confidence of 99% is adopted to enhance the level of accuracy, which is equivalent to a Z-score of 2.58.
- p: Statistical estimations based on sample data relative to the total population of those possessing the characteristic of interest. Because there is a lack of information on the possibility of employees in the pharmaceutical industry developing job insecurity due to the management of errors by applying leadership styles, we use a conservative estimate of 0.5. This assumption reduces the chances of having a small sample size, hence meeting the power of the study.
- e: The magnitude of variation, or statement of precision, which refers to the extent with which the true population parameter should be expected to lie. With a smaller margin of error, there is a need to use a larger sample size. The organisers of this study chose a margin of error of 5%, which is equivalent to 0.05; this is standard in most research carried out in the social sciences.

  - Why is this important?

  • Ensuring Precision: The 5% level of confidence indicates that in case of repeating the study times and times again, 95% of the times the sample estimate would be ±5% off the actual population parameter. This precision is quite important when drawing conclusions on the association of error management leadership and job insecurity in the pharmaceutical industry.

  • Confidence Level: The idea of using a 99% confidence level indicate that the sample used is also assured to be 99% similar to the population. This is particularly the case in studies such as this, where the variables at play (for instance, employees' perception of job insecurity) are of considerable concern.

  • Conservative Estimate of p: By assuming p=0 Figure 1 populates the matrices and their subsequent computations make the rest of the calculations straight forward. 5p = 0. 5p=0. 5 the calculation adopts maximum variability in the population so the sample size of the population of interest is given adequate measure regardless of the actual proportion regardless of whether it is 50% or not.

3.3. Data collection process

Data were collected from employees working in administrative offices, human resources departments, and research and development departments, as well as from the selected pharmaceutical companies. This paper set out to use a survey to collect several variables, such as perceptions of job insecurity, the effects of error management leadership, and others, that could have a bearing on employment stability and satisfaction.

3.4. Methods

The presented research propositions are to examine the moderating role of error management leadership and perceived job insecurity in the pharmaceutical industry. The work adopts a quantitative methodology with CFA and SEM as methods of data analysis (Hox, 2021; Luo et al. 2020). Thus, CFA is applied to assess the measurement model and estimate the reliability of the calculated KPIs (Hox, 2021). Continuing CFA, SEM further evaluates the possibility of the theoretical causal models fitting the data collected (Danner et al. 2015).

Hair et al. (2017) defined propositions of SEM, such as multivariate normality, no outliers' occurrences, a large sample, and an accurate model. In SEM, the estimation involves the use of the data reduction method known as Partial Least Square (PLS) due to its capabilities, such as a decrease in the dimensionality of the correlated variables relative to the examined variables and relatively less strict execution as compared to the data reduction method known as Ordinary Least Square (OLS) (Lu et al. 2014; Shen et al. 2016). PLS-based structural equation modelling has been accepted in a range of statistical applications as well as in journals and provides reliability as well as validity for analysis (Michelot et al. 2016). Most commonly, it is applied for theory confirmation purposes, particularly if there is a lack of backing from the literature (Purwanto, 2021).

The study utilises descriptive statistics, including mean and standard deviation, to characterise the research sample. Pie charts are employed to display variable percentages. Data is collected from administrative offices, human resources departments, and R&D in the pharmaceutical industry. This approach combines the strengths of CFA, SEM, and PLS to provide a robust analytical framework for investigating the complex relationships between artificial intelligence, operations management, and the Integrated Internal Stream in the automotive sector.

3.5. Data management

A procedure that involves modifying data in order to make it simpler to comprehend or to better organise it is referred to as data management. Detailed explanations of the data processing technique are going to be provided in this portion of the report. On the basis of the data that was collected via the use of the Google form, a few modifications were performed.

1) A numerical number has been allocated to each of the claims, with one being assigned to those who strongly disagree with it and five being assigned to those who do agree with it. This code would have been necessary in order to finish the remaining analysis, which would have been impossible without it.
2) There was a value that was missing from the data, the mean of each value was used to impute other values that were missing.

The dataset was then analysed using SPSS and SmartPLS software, providing a comprehensive framework for investigating the relationships between error management leadership, job insecurity, and other variables within the pharmaceutical industry.

4. Data results

Table 1.
Spearman Correlation coefficients of the phenomenon

		Error management leadership	Job insecurity perceptions	Job insecurity dissatisfaction	Job insecurity behaviours
Error management leadership	Correlation Coefficient	1.000			
	Sig. (2-tailed)	.			
Job insecurity perceptions	Correlation Coefficient	.961**	1.000		
	Sig. (2-tailed)	.000	.		
Job insecurity dissatisfaction	Correlation Coefficient	.549**	.578**	1.000	
	Sig. (2-tailed)	.000	.000	.	
Job insecurity behaviours	Correlation Coefficient	.592**	.629**	.896**	1.000
	Sig. (2-tailed)	.000	.000	.000	.

Source: Based of SPSS V26. output

There is a significant, strong positive relationship between error management leadership and job insecurity perceptions at a 99% confidence level. On the other hand, there is a significant, strong positive relationship between error management leadership and job insecurity dissatisfaction at a 99% confidence level. In addition to that, there is a significant, strong positive relationship between error management leadership and job insecurity behaviours at a confidence level of 99%.

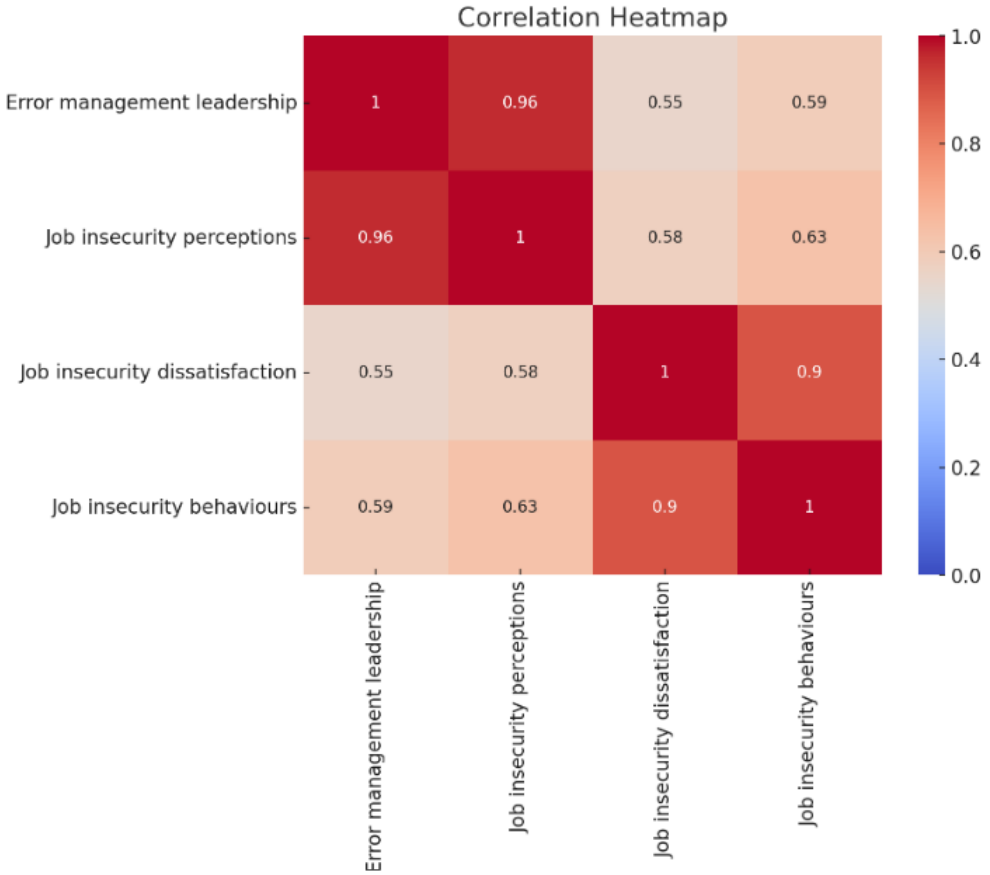

Figure 2. Heatmap Correlation
Source: Based on matplotlib.pyplot output

The values represent the strength of the correlations, with warmer colours indicating higher correlations between the variables. By using colour gradients, heatmaps allow for the quick identification of strong or weak correlations. It also supports a decision making by providing a quick overview of relationships, heatmaps can inform decisions on which variables to prioritize, explore further, or exclude in modelling or analysis.

4.1. Confirmatory factor analysis

Table 2.
Reliability and Validity analysis for phenomenon

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Error management leadership	0.989	0.991	0.939
Job insecurity behaviours	0.950	0.976	0.953
Job insecurity dissatisfaction	0.981	0.985	0.915
Job insecurity perceptions	0.971	0.986	0.972

Source: Based of SmartPLS V4. output

For the purpose of determining the reliability and validity of the variables that were collected via the use of EFA, CFA is used. Cronbach's alpha was used to determine the level of dependability. Cronbach's alpha was greater than 0.7 for each and every one of the data points. Consequently, the research accurately reflected the elements in each of the claims. Both the composite reliability and the average variance extracted were calculated in order to have a better understanding of the validity of the statements they included in terms of conveying the components. The AVE and CR of each factor exceeded 0.5 and 0.7, respectively. As a result, this demonstrates that the assertions were appropriate for inclusion in the factors.

4.2. Structural equation modelling

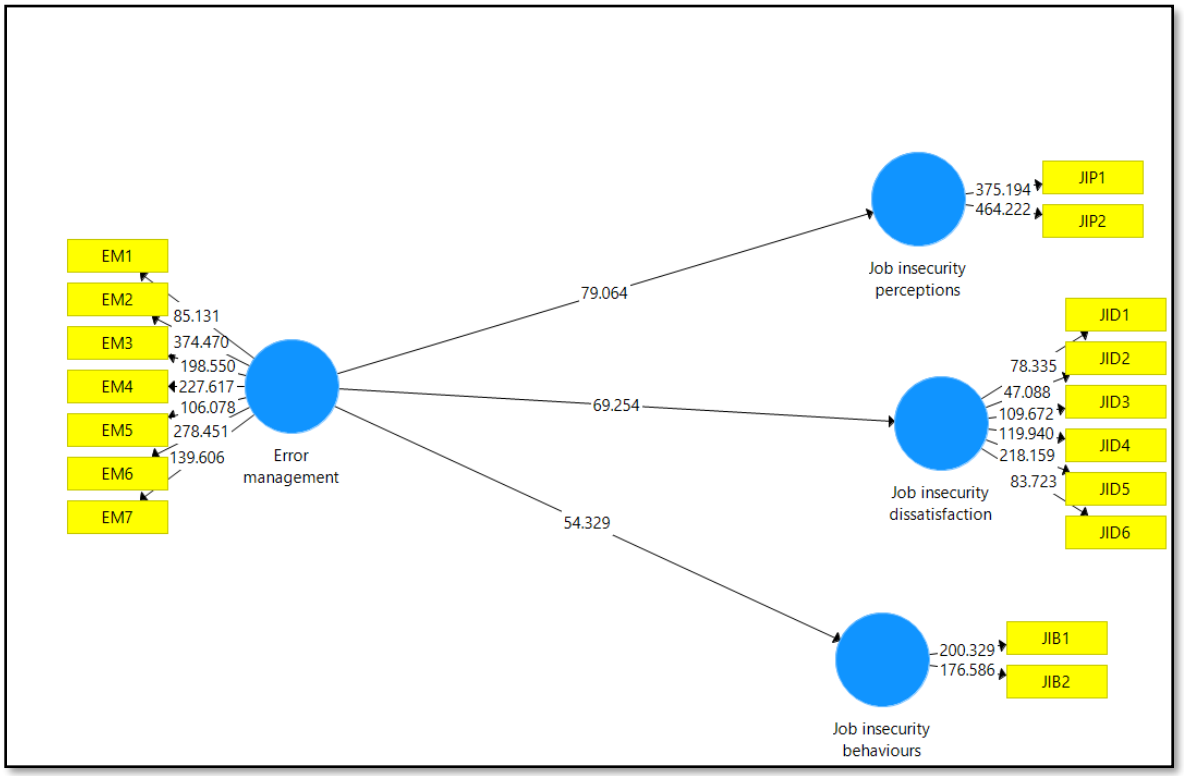

Figure 3. Structural equation model of the 4 factors provided by using SmartPls.
Source: Based of SmartPLS V4. output

The previous figure illustrates the construction of relationships within the structural equation model. All the loadings are above 0.7, which gives an indication that no statements shall be removed from the study. The structural equation modeling is used to investigate the effect of variables on each other. It gives an understanding of the phenomenon. After applying CFA, the SEM meets its assumptions and can accurately model the data.

Table 3.
Estimates of structural equation model of phenomenon

	Original Sample (O)	**Sample Mean (M)**
Error management leadership-> Job insecurity behaviours	0.933***	0.934
Error management leadership-> Job insecurity dissatisfaction	0.943***	0.944
Error management leadership-> Job insecurity perceptions	0.942***	0.943

**p-value<0.01, * p-value<0.05, “” p-value>0.05
Source: Based of SmartPLS V4. output

After applying SEM, the phenomenon was better understood. From the table above, the results of the study indicate that error management leadership has a significant effect on job insecurity behaviour, dissatisfaction, and perception. Therefore, if H1a, H1b, and H1c are accepted, then H1 is accepted.

Table 4.
Summary of Hypothesis table

Independent Variable	**Dependent Variable**	**Hypothesis**	**Accepted/Rejected**
Error management	Job insecurity behaviours	significant effect	Accepted
Error management leadership	Job insecurity dissatisfaction	significant effect	Accepted
Error management	Job insecurity perceptions	significant effect	Accepted

Source: Developed by the Researchers
Note: SEM stands for Structural Equation Modelling, which is a statistical technique used to analyse the relationships between multiple variables.

4.3. Discussion

The present study's results indicate a significant correlation between the leadership in error management and the employee's perception of job security, which includes perceived job insecurity, dissatisfaction, and behavior. The findings of this study provide an important strategic understanding of the nature of organizational error management practices and their interaction with perceived job insecurity among employees in Egypt's pharmaceutical industry. Error Management, Leadership, and Overall Job Insecurity: Therefore, the validation of the first hypothesis (H1) confirms that the extent of error management leadership practices significantly influences employees' perceived job security. Previous research by Safavi and Karatepe (2019) and Debus et al. on error management leadership practices and employee perceptions also supports this finding. The current study builds upon these studies by being more specific and focusing on the Egyptian pharmaceutical industry, where adherence to high quality requirements and increased regulatory scrutiny may even intensify job insecurity concerns. Theoretically, this result aligns with the premises of the psychological safety theory advanced by Edmondson (1999), which posits that when organizations frame mistakes as learning experiences, not a cause for sanctioning, subordinates feel safe in their working station. The minimized anxiety of negative outcomes accompanying organizational errors, particularly in industries like pharmaceuticals, may contribute to this sense of security. Examining the findings established here, this research affirms Edmondson's (1999) psychological safety theory and takes it further by showing the practicality of its application in life-critical areas of operation, such as the pharmaceutical industry. The study found a positive

correlation between the impulse to use the error management leadership method and the perception of job security, suggesting that psychological safety may be even more crucial in situations where errors could potentially lead to serious consequences. Therefore, this study extends knowledge about psychological safety by identifying the industry-level factors that might exacerbate its impact."

Error Management Leadership and Job Insecurity Behaviors (H1a): Therefore, the validation of hypothesis H1a revealed that the EMLP of first-line managers significantly influences the JSR behaviors of their subordinates. Thus, this finding aligns with Lawrence and Kacmar's (2017) study, demonstrating that effective error management in the pharmaceutical industry mitigates negative behaviors associated with job insecurity, such as decreased commitment or reduced job performance.

From a theoretical perspective, Blau's (1964) social exchange theory easily explains this result. In a similar vein, when organizations adopt supportive error management leadership styles, employees are likely to perceive this as support from the organization, leading to tendencies of reciprocation through positive work behaviors and the demarcation of behaviors associated with insecurity. This mutual relationship could be particularly important for maintaining high performance in pharmaceutical product production. The results of the present study regarding the role of error management leadership practices in predicting job insecurity behaviors also support the social exchange theory (Blau, 1964) and expand on the idea into the realm of error management. Thus, the 'currency' of social exchange, embraced in these social transactions, appears to be tolerance for errors and learning opportunities. The interaction becomes even more crucial because it occurs in a highly sensitive and exacting environment.

Error Management Leadership and Job Insecurity Dissatisfaction (H1b): Our findings support the hypothesis H1b, which suggests that effective error management leadership practices positively influence job insecurity dissatisfaction. In extending Probst et al. (2013)'s research, the present study proves that in the pharmaceutical sector, where a number of complaints could have disastrous results, commonsense shows that effective error management leadership can significantly reduce the effect of perceived job insecurity in the negative way observed in the participants' emotions.

Lazarus and Folkman's (1984) cognitive appraisal theory of stress provides a theoretical explanation for the result. Another direction of leadership practices we discover is that error management leadership practices may relate to the way employees perceive potential threats to the stability of their tenure and thus experience less stress and dissatisfaction. The reduction of stress in one’s working environment, which is especially prominent in the pharmaceutical industry, could, therefore, have massive impacts on the health of each employee as well as the subsequent performance of the company. Furthermore, the obtained results support Lazarus and Folkman's (1984) cognitive appraisal theory, while the provided data suggests a more nuanced application of this theory within the error management framework. This suggests that the leadership in error management may be altering the primary appraisal process, causing employees to perceive potential errors as challenges. Thus, the present study expands knowledge in the area of cognitive appraisal theory, revealing how organizational practice can systematically shape the appraisal process in high-stakes work environments."

Error Management, Leadership, and Job Insecurity Perceptions (H1c): Endorsing hypothesis H1c, which posits error management leadership has a strong influence on job insecurity impressions, is consistent with and builds on the study by Debus et al. (2014). In the context of the Egyptian pharmaceutical industry, this prospect underlines the significant role of error management leadership practices as far as the impact on the nature of the consequent cognitive appraisal of the specific aspects of the employee’s job security is concerned.

This finding can be best understood with the help of the signaling theory, originally developed by Spence (1973). Organizations may use error management leadership practices to signal to employees their commitment to training and continued employment, thereby enhancing their perception of job security. If the industry experiences frequent and complex changes in technology and regulation, these signals could play a crucial role in maintaining a steady and confident workforce. Therefore, the study findings not only corroborate Spence's (1973) signaling theory but also apply it to the field of error management within this particular industry. Indeed, the fact that error management leadership has a strong impact on job insecurity perceptions supports the idea that these practices serve as strong signals in the Egyptian pharmaceutical industry. This finding is relevant to signaling theory by showing how practices in specific industries serve as signals, which may be more salient than other 'work-related' signs such as compensation or job titles in specific settings. undefined

Theoretical and Practical Implications: Altogether, these studies may help support and explicate theoretical propositions regarding error management and job insecurity. According to them, error management leadership is a key organizational practice that can protect against the negative consequences of potential job insecurity in high-risk sectors. The findings also underscore the conceptual nature of job insecurity, showing that it is possible for error management leadership to affect cognitive appraisals, emotional experience, and behavioral approach or avoidance of job insecurity.

In fact, these findings echo the notion of establishing sound and effective error management leadership benchmarks in the context of the analyzed pharmaceutical entities, especially those operating in such a new economy as Egypt. In particular, organizational culture, which encourages employees to view mistakes as a means of learning, can improve perceptions of job security, decrease dissatisfaction, and eliminate negative actions that come with insecurity about the job. This in turn could translate into better organizational performance, adjusted for factors such as the need for higher innovation, improved quality assurance, and better staff turnover—all important given the competitiveness of the 'pharmaceutical space'.

"Based on the research findings, the study proposes an integrated theoretical model of error management leadership and job insecurity (EMLJI). This model posits that error management leadership creates a psychologically safe environment (drawing from psychological safety theory), which initiates a positive social exchange (based on social exchange theory). This exchange influences employees' cognitive appraisals of their job situation (informed by cognitive appraisal theory) and serves as a strong organizational signal (grounded in signaling theory). The EMLJI model provides a comprehensive framework for understanding how error management leadership holistically impacts various facets of job insecurity, particularly in high-reliability industries like pharmaceuticals."

Future Research Directions: This study presents potential avenues for future research, and the researchers suggest that future investigations should broaden the classification model. Future research could more systematically investigate the changes in the association between error management leadership and job insecurity across time—for example, in the face of sector-specific demands or macroeconomic conditions. Finally, future research could also compare the current pattern of responses across different cultures or industries to understand the approximations and possible mediators.

Therefore, the present research provides useful knowledge to comprehend error management leadership and perceived job insecurity in the pharmaceutical industry. Altogether, this work advances the understanding of the effects of error management leadership on different aspects of job insecurity and offers both scholarly and practitioner benefits for minimizing employees' perceptions and behaviors in organizations where informational conditions are critical.

5. Conclusion

More specifically, the present research contributes to the understanding of the impact of error management leadership on perceived job insecurity among organizational employees in Egypt's pharmaceutical sector. As a result, the study emphasizes the importance of leaders adopting robust error management leadership practices when addressing job security issues, as this can significantly influence their employees' perceptions, feelings, and actions. Through the acceptance of hypotheses H1, H1a, H1b, and H1c, this research has provided significant theoretical and practical advances in the two fields of organizational behavior and human resource management.

In terms of contribution, the present research builds on the error management leadership theory, going beyond the influence on error rate and establishing the effect on another important employee outcome: job security. It expands the concept of error management leadership theory to make it more relevant to employee health and other organizational behaviors. The research also extends the literature on job insecurity by considering it from an industry perspective, more specifically the Egyptian pharmaceutical industry, and how industry features can influence and be influenced by error management leadership practices. Furthermore, the fact that the study considered job insecurity in terms of perceptions, job dissatisfaction, and behaviors helps to establish a much more complete paradigm than would have been the case with studying job insecurity in isolation. There is evidence supporting the use of psychological safety theory to show how error management leadership affects job insecurity and social exchange theory to portray how it may relate to signaling theory, all of which provide a more detailed theoretical framework for future research.

In other words, in terms of practical relevance, this study provides insights that can be helpful to HR practitioners, managers, and executives, as well as organizations, particularly those in the pharmaceutical industry. The results can be used as a guide to frame specific recommendations for the enactment of error management leadership strategies, possibly lowering job insecurity and its detrimental consequences. If organizations are to incorporate leadership development programs that enhance error management skills, the implications suggest that leaders must receive training on error management leadership practices. In addition, it highlights the two shared learning areas and underscores the significance of acknowledging mistakes as a natural part of the process, devoid of punishment. This implies that any company willing to embrace this cultural change can significantly impact the health of its employees and the overall performance of the organization. It is also expected that the integration of the principles of error management leadership into performance management systems can further assist in the diminishment of job vulnerability as well as enhance organizational efficiency.

Therefore, we suggest that pharmaceutical organizations in Egypt actively start to enhance the EM leadership practices. Firstly, there must be the creation of detailed and extensive, industry-specific leadership in error management training programs. These programs should include cases related to pharma operations, recurrent workshops, and revisit sessions to enhance the learning of seemingly routine facts. This training should continue at all levels of management to ensure uniformity in implementation throughout the companies. Similarly, there is a need for organizations to update their performance management activities to incorporate error management. Organizations must integrate error management competencies into job descriptions, performance appraisals, and promotion criteria for leadership roles. In this way, the organizations can establish a clear correlation between the error management measures applied and the employees who will advance in the company.

To promote learning from mistakes, pharmaceutical firms should incorporate protocols for reporting and reviewing mistakes without assigning responsibility. It may include the formation of multidisciplinary error control teams responsible for analyzing important errors, potential root causes, and organizational response plans. Setting up a practice of daily or weekly 'error workshops' where teams discuss the errors made in their recent projects and how to avoid them in the future is another way to reinforce this culture of learning. Given the unique nature of the pharmaceutical industry, we recommend collaborating with relevant authorities like the Egyptian Drug Authority to develop guidelines for error management specific to this sector. The guidelines should effectively take into account the unique aspects of drug development, manufacturing, and quality control and undergo periodic updates to incorporate new research and advancements. Overcoming psychological safety limitations is critical in decreasing job insecurity due to errors. Organizations should refrain from punishing employees and their teams for reporting mistakes and close calls, implement methods for reporting issues without revealing personal details, and conduct periodic polls among employees to gauge their psychological safety and employment security. Using this approach can help develop a culture that encourages people in the organization to report and learn from mistakes.

Lastly, the study recommends integrating error management with organizational innovation processes and/or quality management systems. This means prompting and managing systematic trial and error of new products at the R&D stage, implementing quick and efficient methods of developing, testing, and using prototypes, as well as incorporating systems containing error control measures within the GMP and other quality assurance frameworks. In this way, pharmaceutical companies can also use error management as not only a tool to minimize job insecurity but also as a stimulus to innovation and product improvement. Through these recommendations, it is possible to promote structural change within the organizations of the pharmaceutical field in Egypt, which not only addresses the problem of job insecurity but also results in an improvement in overall efficiency, creativity, and compliance with the requirements. The favorable approach to error management leadership, as presented in this paper, may provide substantial added value to the wellbeing of employees and the success of organizations operating in the increasingly competitive and complex context of the pharmaceutical sector.

This study comprises recommendations that can help the pharmaceutical industry of Egypt and other emerging markets tackle the problems associated with ‘employability’ and ‘job insecurity’ in a climate that is both highly controlled and increasingly quality-conscious. Hence, organizations should put in place several leadership practices for error management to enhance safety, efficiency, and, more importantly, innovation, to the benefit of the workers as well as the organization.

There are several directions for further research that can be derived from this study: The development of longitudinal studies to analyze how error management leadership shapes long-term job insecurity and cross-sectional comparisons to reveal how the relationship between error management leadership and job insecurity depends on the country's culture. Research of Moderators to identify possible moderators, The impact of leadership in error management on other factors like innovation, quality assurance, and turnover rate is significant.

Therefore, this research suggests that error management leadership plays a significant role in reducing job insecurity and its associated impacts. The pharmaceutical industry, with its high potential costs of misrepresentation and employment instability, provides a context to understand these findings. By acknowledging errors as an inherent aspect of work and adhering to error management leadership practices, one can enhance employee well-being and attain

organizational performance and success, particularly in situations where organizations encounter intense competition and an increasingly intricate business environment.

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Appendices

Appendix A

Dear Participants,

We cordially invite you to take part in our research study focusing on the influence of Error management leadership on perceived job insecurity. This survey is an integral part of our research paper. Your participation is invaluable to us as it will contribute to advancing our understanding of the dynamics between Error management leadership and perceptions of job insecurity in the workplace.

Please take a moment to respond to the survey questions thoughtfully and candidly. Your responses will be kept confidential and used solely for academic purposes.

Thank you for your time and contribution.

		Strongly Agree 5	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**
Error management (إدارة الأخطاء)	1. I feel that mistakes provide me with useful information and important lessons to improve my work أشعر أن الأخطاء تزودني بمعلومات مفيدة ودروس مهمة لتحسين عملي					
	2. In the performance of my work I constantly try to detect my mistakes في أداء عملي أحاول باستمرار اكتشاف أخطائي					
	3. When I make a mistake, I immediately try to correct it عندما أرتكب خطأ، أحاول على الفور تصحيحه					
	4. When I make a mistake at work, I share it with my colleagues so they don't make the same mistake عندما أرتكب خطأ في العمل، أشاركه مع زملائي حتى لا يرتكبوا نفس الخطأ					
	5. I feel that mistakes help me to evolve أشعر أن الأخطاء تساعدني على التطور					

		Strongly Agree 5	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**
	6. I constantly try to avoid mistakes that will occur in my work أحاول باستمرار تجنب الأخطاء التي ستحدث في عملي					
	7. When I make a mistake, I analyse it minutely عندما أرتكب خطأ، أقوم بتحليله بدقة					
Job insecurity perceptions **تصورات انعدام (الأمن الوظيفي)**	8. My future in this company is safe even though others have to quit. مستقبلي في هذه الشركة آمن على (الرغم من أن الآخرين يجب أن يستقيلوا)					
	9. It is possible that I will be transferred to another section during this year. من الممكن أن يتم نقلي إلى قسم آخر (خلال هذا العام)					
	10. You likelihood to retain the same job one year from now? من المحتمل أن تحتفظ بنفس الوظيفة بعد عام من الآن					
Job insecurity dissatisfaction **عدم الرضا عن (انعدام الأمن الوظيفي)**	11. I become emotionally involved when I think about the chances of being affected by organizational changes and downsizing اصبح عاطفيا عندما أفكر في فرص التأثر بالتغييرات التنظيمية وتقليص الحجم					
	12. I become indignant when I think about the chances of being affected by organizational changes and downsizing أشعر بالسخط عندما أفكر في فرص التأثر بالتغييرات التنظيمية وتقليص الحجم					
	13. I become irritated when I think about the chances of being affected by					

		Strongly Agree 5	**Agree 4**	**Neutral 3**	**Disagree 2**	**Strongly Disagree 1**
	organizational changes and downsizing أشعر بالغضب عندما أفكر في فرص التأثر بالتغييرات التنظيمية وتقليص الحجم					
	14. I become worried when I think about the chances of being affected by organizational changes and downsizing أشعر بالقلق عندما أفكر في فرص التأثر بالتغييرات التنظيمية وتقليص الحجم					
	15. I am not capable to think about the uncertainty related to my future job possibilities أنا غير قادر على التفكير في الغموض المرتبط بإمكانيات وظيفتي المستقبلية.					
	16. I become depressed when I think about the chances of being affected by organizational changes and downsizing أشعر بالاكتئاب عندما أفكر في فرص التأثر بالتغييرات التنظيمية وتقليص الحجم					
Job insecurity behaviours	17. Sometimes I get so worried of losing my job that I perform so hard that it may reduce my health in the long run. حيانًا أشعر بالقلق الشديد بشأن فقدان وظيفتي لدرجة أنني أجتهد كثيرا في العمل مما يؤثر على صحتي على المدى الطويل.					
	18. I am worried of having long sick leave because then, I might have to go the next time. أشعر بالقلق من أخذ إجازة مرضية طويلة، لأن ذلك قد يجعلني أكثر عرضة لأخذ إجازة أخرى في المرة القادمة					

Appendix B

Research Variable	Source	Questionnaire Instrument
Error management	Oliveira et al. (2022)	1,2,3,4,5,6,7.
Job insecurity perceptions	Emberland and Rundmo (2010)	8,9,10.
Job insecurity dissatisfaction	Emberland and Rundmo (2010)	11,12,13,14,15,16
Job insecurity behaviours	Emberland and Rundmo (2010)	17,18.

Appendix C

```
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

# Correlation matrix based on the provided correlation coefficients
corr_matrix = np.array([
   [1.000, 0.961, 0.549, 0.592],
   [0.961, 1.000, 0.578, 0.629],
   [0.549, 0.578, 1.000, 0.896],
   [0.592, 0.629, 0.896, 1.000]
])

# Labels for the heatmap
labels = ['Error management leadership', 'Job insecurity perceptions', 'Job insecurity dissatisfaction', 'Job insecurity behaviours']

# Create a heatmap
plt.figure(figsize=(8,6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', xticklabels=labels, yticklabels=labels, vmin=0, vmax=1)

plt.title('Correlation Heatmap')
plt.show()
```