

Double Bias of Mistakes: Essence, Consequences, and Measurement Method

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Abstract: There is no learning without mistakes. However, there is a clash between ‘*positive attitudes and beliefs*’ regarding learning processes and the ‘*negative attitudes and beliefs*’ toward these being accompanied by mistakes. This clash exposes a cognitive bias toward mistakes that might block personal and organizational learning. This study presents an advanced measurement method to assess the bias of mistakes. The essence of it is the detection of the existing contradictions between attitude and behavior toward mistakes at the personal and organizational levels, as well as combined. This study is based on empirical evidence from a sample of 768 knowledge workers, divided into biased and non-biased subsamples following the procedure proposed in this paper. Those subsamples were next applied to the structural model, examining knowledge, learning, and collaboration cultures (the KLC approach) 's influence on organizational intelligence to validate the proposed method. Results showed that the applied method efficiently detects the DBM and exposes that in doubly mistakes-biased knowledge-driven organizations, the influence of knowledge culture on the mistakes acceptance component of learning culture is negative. So, organizations with a dominated double bias of mistakes do not accept the affirmation of learning from mistakes. Summing up, this study constitutes the Double Bias of Mistakes Theory, which states that the clash between positive attitudes and beliefs regarding learning processes and negative attitudes and beliefs toward mistakes exposed by focusing on control managers (bosses) might block organizational learning from mistakes and, as a consequence, negatively affect organizational intelligence. Without the empirical support for this theory, there was a risk that the idea of accepting mistakes as a potential source of learning would be simplified by biased minds to mistakes tolerance and rejected as ridiculous. Accepting that mistakes can be a source of precious learning does not equal mistake tolerance. On the contrary, it is the first step to managing mistakes and creating efficient error avoidance systems thanks to lessons learned from failures. This study introduces the method of measurement and detection of the Double Bias of Mistakes phenomenon, contributing to the science of organizational learning and collective intelligence-building.

Keywords: Cognitive bias of mistakes, Double bias of mistakes, Knowledge culture, Learning culture, Collaborative culture, Company culture, Organizational intelligence, Collective intelligence, Fixed mindset, Growth mindset, Change adaptability, Tacit knowledge sharing, Explicit knowledge sharing, Trust, The KLC cultures approach

1. Introduction

The bias of mistakes is rooted in the specific cognitive bias (Tversky and Kahneman, 1981) named the framing effect (Clark, 2009; Druckman, 2001a,b; Plous, 1993) and is caused by the positive claims about mistakes as a natural part of humanity and learning processes but at the same time experiencing negative consequences of the mistake event. This clash results in the negative framing effect of mistakes (experiences affect us more powerfully than statements do). The framing effect is observed if the negative or positive connotations of the particular phenomenon (here: mistakes) impact its perception and judgment. The framing bias is one of the most significant biases influencing situational judging and decision-making (Thomas and Millar, 2011). So, the negative framing effect of mistakes can be powerful in organizations and societies—it can affect situational judgment and decisions. Therefore, its detection and measurement are important in organizational studies.

There is no learning without mistakes (Argyris, 1982; Argyris and Schön, 1996; Senge, 2006). However, knowledge workers still see making mistakes as shameful. The clash between positive attitudes and beliefs regarding learning processes and negative attitudes and beliefs toward the accompanying mistakes can make personal and organizational learning problematic (Hosseini *et al.*, 2023; Samhran *et al.*, 2023; Rass *et al.*, 2023).

Furthermore, in organizations, this cognitive bias is often doubled by the other shared solid belief that “bosses never make mistakes”, or in other words, the belief that only excellent employees can be promoted and hold managerial positions. Therefore, mistakes are perceived as indicators of negligence and in strong contradiction to excellence and perfection, and thus are hidden by employees afraid to be labeled as “losers”. This situation creates an illusion of personal and organizational perfection. Self-awareness is the most important skill for intelligence-building (Gallup, 1998; Rai and Rai, 2024). Hence, maintaining this perfection illusion kills intelligence. In biased societies and organizations, people try to expose excellence and hide mistakes. Mistakes,

if ignored, diminished, and hidden, cannot be a lesson either for the mistake-maker or for the organization. In this case, personal and organizational learning is jeopardized, and the consequences of the cognitive bias of mistakes are severe. Therefore, it is important to understand the phenomenon of the cognitive bias of mistakes and its consequences. Without it, there is a risk that the entire idea of accepting mistakes as a potential source of learning will be simplified by biased minds to mistake tolerance and rejected as ridiculous. In practice, accepting that mistakes can be a source of valuable learning is not the same as being tolerant of mistakes. On the contrary, it is the first step to managing errors and creating effective systems to avoid mistakes through lessons learned.

Understanding the essence of the cognitive bias of mistakes and, even more importantly, the consequences of this phenomenon can significantly enhance mistake management and, in this way, support the avoidance of hiding mistakes in organizations. The key benefit of these efforts is organizational learning. Kucharska, Bedford, and Kopytko (2023) introduced a method for identifying and measuring the cognitive bias of mistakes, focusing mainly on the DBM. The personal bias of mistakes (PBM) and Organizational (OBM) were omitted. It is unknown if the bias of mistakes affects individuals (PBM) and organizations (OBM) synchronously or asynchronously. If so, is it frequent? What are the consequences? It is unknown whether the discrepancy exists between bosses and organizations or whether a boss's bias impacts organizational bias.

To find answers, this study aims to expand Kucharska *et al.*'s (2023) procedure to expose and compare the consequences of mistake bias at the organizational (OBM), personal (PBM), and doubled (DBM) levels. Such expansion is important for a better understanding the DBM phenomenon's impact on organizational learning and collective intelligence building. It is important to find out if the omission of personal bias of mistakes (PBM) or organizational bias of mistakes (OBM) influence organizations in the Kucharska *et al.* (2023) study modify our understanding of DBMs impact on organizations gained so far. Finally, it will be beneficial if the identification and measurement method of the DBM proposed by the Kucharska *et al.* (2023) study be simplified to make it easier to apply. This study aims to deliver this.

2. Literature Review

2.1 Learning From Mistakes

It is known that there is no learning without making mistakes. However, in most organizations, mistakes are perceived as an indicator of negligence and poor performance. Therefore, when people make mistakes, they will most likely do everything in their power to conceal them because they are ashamed (Senz, 2021). This situation pushes individuals and organizations to create an illusion of excellence that blocks organizational intelligence (Kucharska *et al.*, 2023). Feuerstein *et al.* (1979) defined intelligence as the ability to adapt to change. Following him, the organizational capacity to adapt to change is seen in this study as organizational intelligence.

For organizations to learn from mistakes, communal reflexivity is needed (Ellis *et al.*, 2014). Parker, Racz, and Palmer (2020) noted that organizational reflexivity is not exclusively the individual's action—it is a co-created practice of the whole team within a specific organizational context.

Bryans (2017) noted that 80% of employee learning occurs informally and is entirely unplanned, incidental, and mainly experiential. An example of incidental learning is, e.g., learning from mistakes. Therefore, most organizational learning is tacit. Kucharska and Bedford (2020) discovered a paradox that even if employees learn from mistakes, their companies usually do not. This is caused by company culture issues. Unfortunately, individual learning in a workplace is not equal to collective learning (Wiewiora, Smidt, and Chang, 2019). Therefore, for organizations, it is important to be aware of and manage mistakes and the bias accompanying them.

According to the Transformative Learning theory (Mezirow, 1995, 1997), which claims that adult learning happens thanks to modified interpretations of the meanings of personal experiences and frames of reference through critical reflection, where critical reflection is seen as a result of "intuitively becoming aware that something is wrong with the result of one's thought, or challenging its validity through discourse with others of differing viewpoints and arriving at the best-informed judgment" (Mezirow, 1995, p. 46), mistake reflectivity is a critical factor for learning. If mistakes are denied or ignored they cannot be a source of reflection and learning for anybody, neither the mistake-maker, nor anyone else. Hidden mistakes cause harm and are a waste of value rather than a precious learning source (Kucharska, 2021). This in line with the concept of negative resource spirals (Hobfoll *et al.*, 2018), according to which the loss of one resource (e.g., knowledge from mistakes) can generate losses of other resources. A lack of learning from experience is a waste. Mistakes are precious, common human experiences. Without accepting them, we can neither understand their meaning nor learn from them.

Exposing the cognitive bias of mistakes can help in releasing it. The lower the cognitive bias of mistakes, the better organizational learning. Without learning, neither individuals nor organizations can build intelligence and grow.

Both small mistakes and big failures can provide precious lessons and contribute to intelligence-building; the difference is that small mistakes can be hidden while big failures cannot. More precisely, the bigger the mistake and its consequence, the more problematic it is to hide the error. In extreme cases, it is downright impossible. Therefore, the "game of blame and shame" (Ferguson *et al.*, 2017; Tingle, 2022) is very common in organizations that do not see mistakes as a potential source of learning and do not manage them at all.

"Being human is that we have to understand the meaning of our experiences" (Mezirow, 1997, p.5). Mistakes are precious, common human experiences. Without accepting the fact we make them and can learn from them, we can neither understand their meaning nor learn from them. Therefore, the shift from the culture of apparent perfection (which is radical and harmful) into the authentic learning culture that constantly modifies interpretations of experiences to fully understand their meaning (mental model change), and frames reference through shared critical reflection, and creates organizational dynamic capabilities is highly desirable in a dynamically changing business environment (Béliveau and Corriveau, 2021; Kimberley, 2021; Kucharska and Bedford, 2023a-b;). It is necessary, especially since acting in hyperdynamic conditions may naturally be accompanied by mistakes.

Organizations and their leaders have been slow in adopting error management, an orientation that accepts error occurrence and focuses on correction and learning from errors (Dimitrova and Hooft, 2021; Edmondson, 2023). These authors suggest that the key problem with this concerns image and, based on their experimental and field study, Dimitrova and Hoft (2021) revealed positive outcomes of leaders' error orientation as employee-perceived leader warmth, competence, and employee job satisfaction, reduced turnover intention, greater work engagement, and better job performance. Farnese *et al.* (2019) and Farnese, Fida, and Picoco (2020) confirmed authentic leadership's positive influence on error management. Moreover, Reason (2005) classified errors into two groups: active (easy to detect) and latent (hidden). Latent errors reside in weakened organizational defenses and are related to managerial decisions regarding safety procedures, organizational structure, and cultural factors. The consequences of managerial latent errors may remain hidden for a long time, only becoming exposed when they combine with active failures and local triggering factors to breach the system's many defenses (Reason 2005, p. 58). These studies confirm that cognitive bias doubled by leaders' biases is worth studying.

Many positive examples of error management and learning from errors come from the healthcare industry (Fischer *et al.*, 2006; Van Dyck *et al.*, 2013; Waeschle *et al.*, 2015; Metcalfe, 2017; Kalender, Tozan, and Vayvay, 2020; Keith, Horvath, and Klamar, 2020). Frese and Keith (2015) and Weinzimmer and Esken (2017) studied learning from mistakes and revealed that the essence of organizational learning is to identify and modify errors. Jung *et al.* (2021), Kalender *et al.* (2020), Anderson and Abrahamson (2017), and Zhao and Olivera (2006) noted that the critical problem of organizational learning from mistakes is a lack of reporting. These authors highlighted the need for organizations to change their attitude toward errors. Based on Ferguson (2017), Zabari and Southern (2018), and Robertson and Long (2018), the reporting problem in healthcare may stem from an organizational culture of "blame and shame". To avoid blame and shame, people hide mistakes. If their mistake stays hidden, it cannot be a lesson for anybody except the person who made it. Mohsin, Ibrahim, and Levine (2019) suggest that error reporting should be a standard learned at medical schools.

Learning from the healthcare industry may help promote a similar standard of behavior more widely. A learning culture that is open to organizational learning from all available resources can significantly improve mistake reporting, management, and learning and also benefit the avoidance of mistakes in the future. Such a culture should be built with a full understanding of cognitive bias and how severe its consequences may be for individuals, organizations, and societies.

2.2 The Essence of the Cognitive Bias of Mistakes and its Consequences

The existing clash between positive attitudes and beliefs regarding learning processes and the negative attitudes and beliefs accompanying mistakes is the essence of the cognitive bias of mistakes, which can make personal and organizational learning from mistakes problematic (Hosseini, Treur, and Kucharska, 2023; Hull, 1930; Kucharska and Bedford, 2023b). Moreover, in organizations and societies, this cognitive bias is often doubled by the shared belief that those who hold managerial positions are expected to never make mistakes and should hold such a disposition to legitimize their credentials to be leaders. In other words, the belief exists that only

perfect individuals can hold power and consequently only excellent employees can be promoted to managerial positions. Therefore, mistakes are perceived as indicators of negligence and thus in strong contradiction to excellence, and thus are hidden by employees afraid to be labeled as “losers”.

This double bias leads to a chain of consequences. First, the fear of personal consequences of mistakes may lead to the cultivation of a fixed, instead of a growth mindset in society (Dweck, 2017; Athota, 2021). Mindset (mental model) is the psychological construction of an internally held structure (Vazquez, Liz, and Aracil, 1996) that shapes a particular person’s perception of things and determines their understanding of the world (Shih and Alessi, 1993; Doyle and Ford, 1998). Such personal perceptions and understanding shape attitudes and behaviors toward everything, including those important for mistakes that influence learning abilities. So, growth mindsets are learning-oriented (constant progress), while fixed mindsets are image-oriented (constant confirmation of self-perfection). As a consequence, a fixed mindset makes people non-learners in the long run (Dweck, 2017). Learning-oriented mindsets love a challenge, believe in learning effort, are resilient in the face of setbacks, and are creative (Dweck, 2017, p. 19). Fixed mindsets perceive failure as a lack of intelligence, so any validation of their own actions is risky. They often believe that avoiding any challenge that can expose setbacks and cause a social rejection as a result of revealing a lack of perfection is better than taking the risk of failure because “bosses never make mistakes”.

So, bosses avoid the risk of making mistakes for two reasons: first, to maintain their positive self-image; second, to prove to others they are fully justified in keeping their positions due to the shared belief that “bosses never make mistakes”, and therefore they are perfect. This is why we have a crisis in transformational leadership. Leaders with fixed mindsets avoid any risk of losing their image, so the fixed mindset dominates organizations, and this also affects the organization’s ability to learn and adapt to changes. The double bias of bosses’ mistakes, which act here as a trigger for a dominant collective, immediate performance orientation, is remote from long-term sustainability and is a waste of long-run learning as well as a loss of potential social growth.

The negative framing effect of mistakes is powerful in organizations and societies, as it affects situational judgment and decisions. Kucharska *et al.*’s (2023) findings revealed the severe impact that the DBM has on organizational adaptability by weakening collaboration and learning cultures and blocking tacit knowledge creation. Hosseini *et al.* (2023) and Kucharska *et al.* (2023) see the DBM as a serious impediment to collective learning and expose the negative consequences for organizational learning and intelligence-building. Therefore, methods to detect and measurement this phenomenon are essential for organizational studies. Based on the literature outlined above, Table 1 summarizes the essence of the bias of mistakes.

Table 1: The essence of the bias of mistakes

BIAS OF MISTAKES: The contradiction between the declared positive attitude toward mistakes and the exposed negative behavior detected at the personal or organizational level					
Respondents' views*	PERSONAL LEVEL				
	attitude	positive	BIAS	negative	behavior
		positive	BIAS	negative	
	ORGANIZATIONAL LEVEL				
DOUBLE BIAS OF MISTAKES: The contradiction between a declared positive attitude toward mistakes and the negative behavior DETECTED AT THE SAME TIME at the personal and organizational level					

*The respondent answers for themselves (self-view report) and about the organization or society she/he works or lives in (her/his workplace observation report).

2.3 Measurement of the Cognitive Bias of Mistakes

Kucharska *et al.*’s (2023) study introduced the method of the cognitive bias of mistakes at the personal (cognitive bias of mistakes, PBM) and organizational level (doubled cognitive bias, DBM) measurement, which is based on the detection of the contradiction between the attitude and the behavior at the personal and organizational levels at the same time. More precisely, Kucharska *et al.* (2023) focused on the DBM and its consequences for organizations and assumed that if the aim is to detect the DBM via questionnaires, this bias should be observed simultaneously for the responder and the organization the responder refers to. Based on a sample of 640 Polish knowledge workers and following this procedure they detected the DBM in 28% of their sample, and showed

51% cases of this sample were free from DBM. Next, they validated the method by comparing findings obtained for the same model (structure of variables) but developed separately for the DBM-biased sample and sample free from DBM (Table 2, Figure 1). In this way, these authors not only proved the existence of the DBM, but also exposed its negative consequences for organizational learning culture, tacit knowledge sharing, change adaptability, and innovativeness.

Following Senge (2006), learning is a matter of the company's shared mindset. Therefore, it may be the case that people with growth mindsets working in an organization where a collective mindset is a fixed one behave according to a fixed mindset because the company culture ensures this, or they stay as they are, or the converse. Hence, the bias of mistakes can affect individuals and organizations both synchronously and asynchronously. Therefore, the proposal by Kucharska *et al.* (2023) should be expanded.

The question arises regarding the 21% of their sample that is not free of the DBM but, at the same time, is not affected by the DBM. This sample probably represented respondents who are affected by the cognitive bias at a personal level (PBM), or are not, but their organizations are biased. To summarize, in this group of respondents, mistake perception is undoubtedly biased somehow, but this bias is not doubled in the case of this group of respondents. So, it is assumed that in this group, mistake bias exists at the personal (employees) or organizational y levels (organization). The method for assessing the DBM proposed by Kucharska *et al.* (2023) should be advanced by including these two additional, previously omitted situations of the existence of mistake bias that, although not doubled, still exists and may affect organizations. This study aims first to advance the existing mistake bias measurement procedure by including the options of organizational bias and personal bias and, next, to compare how frequent these options are and how the identified variants affect organizations.

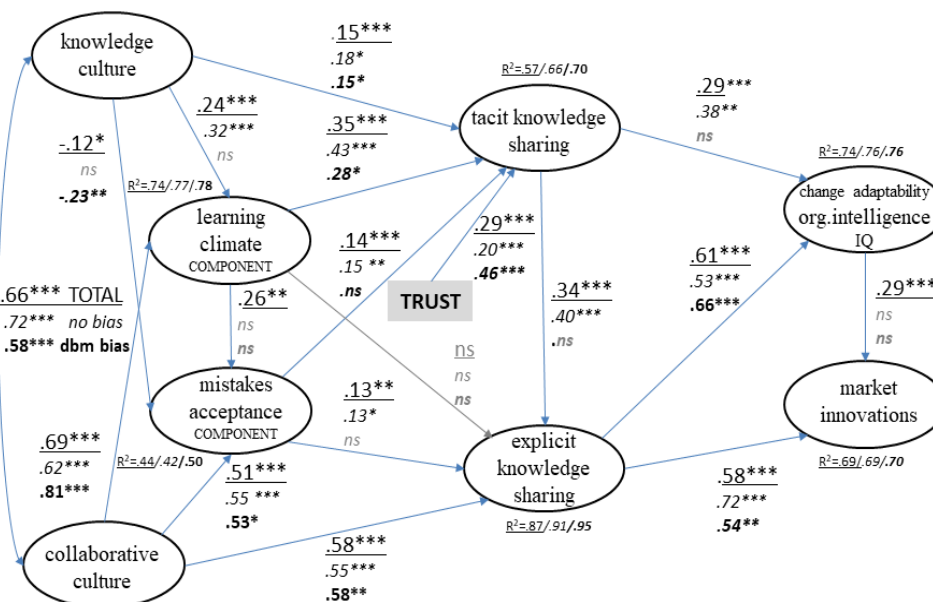


Figure 1: Consequences of DBM

Note: $n=640/n=327/n=183$ (total/no bias/DBM bias) ML; $\chi^2=1043.45(331)/700.082(305)/638.55(305)$; CFI=.941/.939/.896; TLI=.933/.930/.880; RMSEA=.059/.063/.078; Cmin/df=3.15/2.27/2.09; $p < .05$ $**p < .01$ $***p < .001$; ns-not significant result; DBM bias, the double bias of mistakes.

Source: Kucharska *et al.* (2023)

3. A new Approach: The DBM Identification and Measurement Method Improvement

Kucharska's *et al.* (2023) model method validation is very complex (Figure 1). The advantage of such a complex structure is that it clearly exposes the consequences of the DBM. Kucharska *et al.* (2023) proved that DBM severely affects organizations, based on 79% of their study sample ($n=640$ cases). However, 21% of their study sample was omitted because this sub-sample was not large enough (reason: Structural Equation Modeling (SEM) methodology restrictions) to validate the study model, which, in fact, should be additionally divided into biased individuals and biased organizations. As a result, the measurement and consequences of the cognitive bias of mistakes at the personal-only or organizational-only levels were omitted in Kucharska *et al.*'s (2023) study. It is unclear if 21% of the sample represents 'other options' rather than 'no bias', if the DBM is a characteristic of this

particular sample, or if it is a general pattern observed in the population. Therefore, this study focuses on expanding the procedure and validation based on all possible options: first, no bias; second, PBM; third, OBM; and last, the DBM (2023) to check the legitimacy of its omission. It might be that because of this omission, some critical knowledge about the cognitive bias of mistakes impact on organizations has been lost. The essential advantage of the proposed new approach is that it lets us identify the frequency of the omitted earlier options in a totally different sample. Next, if the frequency is reasonable, then verify how these omitted biases affect organizations and, in this way, gain a better understanding of their nature. To do so, the advanced mistake bias procedure of measurement (Table 2) and detection (Table 3) were proposed and validated based on the simplified model of Kucharska *et al.* (2023), visualized in Figure 2.

Table 2: The advanced measurement method for mistake bias

		Statements	Procedure
PERSONAL LEVEL	(E) EMPLOYEE	A. <u>ATTITUDE</u> <u>Positive</u> - Mistakes are inevitable <u>Negative</u> - I do not accept mistakes	The positive and negative statements are presented. The respondent selects the one that fits him/her best (TRUE/FALSE).
		B. <u>BEHAVIOR</u> <u>Positive</u> - I report my mistakes <u>Negative</u> - I hide my mistakes	The positive and negative statements are presented. The respondent selects the one that fits him/her best (TRUE/FALSE).
ORGANIZATIONAL LEVEL	(O) OTHER EMPLOYEE S	- ATTITUDE <u>Positive</u> - Mistakes are accepted in my organization/society as a natural part of learning and experimenting <u>Negative</u> - My organization members/society does not tolerate mistakes - Employees generally hide mistakes	The positive and negative statements regarding the shared organizational attitude are presented. The respondent selects the one that best describes his/her organization (TRUE/FALSE).
		<u>BEHAVIOR</u> <u>Positive</u> - Employees generally report and openly discuss mistakes <u>Negative</u> - Employees generally hide mistakes	The positive and negative statements regarding the most frequent organizational behavior are presented. The respondent selects the one that best describes his/her organization (TRUE/FALSE).
	(B) BOSS	A. <u>ATTITUDE</u> <u>Positive</u> - Company leaders see mistakes as part of learning and experimenting <u>Negative</u> - Company leaders do not tolerate mistakes	The positive and negative statements regarding the attitude of the leader are presented. The respondent is asked to select one statement that best describes the supervisor's declarations (TRUE/FALSE).
		B. <u>BEHAVIOR</u> <u>Positive</u> - Company leaders admit mistakes <u>Negative</u> - Company leaders must always be right (blame others for their own mistakes)	The positive and negative statements regarding the behavior of the leader are presented. The respondent is asked to select one statement that best describes the supervisor's behavior (TRUE/FALSE).

Note: To detect the bias more naturally, researchers should consider the certainty and reliability of responses. Therefore, the EMPLOYEE-BOSS-COMPANY (E_B_C) parts should be intentionally separated in a questionnaire (not displayed in a sequence one by one) to avoid blindly consequent or image-filtered answers.

Based on the literature (Schein, 1992; George, Sleeth, and Siders, 1999), we assumed that leaders shape organizations more strongly than organizations shape leaders (Schein, 1992; George *et al.*, 1999). However, both options are possible (Cogner, 2004), including the shared leadership idea that assumes shared company culture creation (Cullen *et al.*, 2012). So, bearing in mind this study's purpose, we have assumed that the boss's attitudes and behaviors toward mistakes are equal to those of the organization and that the boss's attitudes and behaviors are reflected in the organizational (employees) attitudes and behaviors. This assumption was applied to the bias mistake detection method (Table 3). However, the bias of mistakes can affect individuals and organizations synchronously or asynchronously. This study aims to determine whether the discrepancy between bosses and organizations exists and how frequent this phenomenon is.

Table 3: The bias mistake detection method

Personal	Organizational		BIAS DETECTED
E	C	B	
employee	company/employees	boss	
no bias	no bias	no bias	no bias detected (NOB)
bias	no bias	no bias	personal bias detected (PBM)
no bias	no bias	bias	organizational bias detected (OBM)
	bias	no bias	
bias	bias	bias	double bias detected (DBM)
	no bias	bias	

4. Validation of the new Method of Measurement and Identification

Kucharska *et al.* (2023) proved that if the bias of mistakes is evidenced by employees and company leaders simultaneously (is doubled), this affects organizations severely. This study aims to verify it and advance their contribution by proving that DBM and the bias of mistakes itself (not simultaneously) may jeopardize organizational learning. To do so, this study aims to describe the theoretical framework and measurement methods enabling the identification of the empirical evidence that both the bias of mistakes and the DBM are barriers to the growth of organizational intelligence. Precisely, this study aims to focus on the four possible cases: first, no bias detected in the sample (NOB); second, PBM only; third, OBM only; and fourth, the DBM, to verify if the 21% of the Kucharska *et al.* (2023) sample representing 'other options' than 'no bias' and the DBM were characteristics for this particular sample or might be that it is a general pattern observed in the Polish population. Since the validation process is based on the simplified model introduced by Kucharska *et al.* (2023) and Kucharska and Bedford (2023 a,b), this study does not repeat the justification of the hypotheses included in the theoretical model structure (Figure 2). The general idea of the simplified model is that the knowledge, learning, and collaboration cultures synergy - the KLC approach introduced by Kucharska and Bedford (2023) affects organizational intelligence (Kucharska and Bedford, 2023a,b). Feuerstein *et al.* (1979) defined intelligence as the ability to adapt to change. Following him, the organizational capacity to adapt to change is seen in this study as organizational intelligence. So, our DBM detection method is validated based on this simplified model reflecting the KLC cultures and organizational intelligence relation (Kucharska and Bedford, 2023 a,b). So, this study does not repeat the justification of the hypotheses, but for validation clarity, all are visualized in Figure 2 and listed below:

H1a: Knowledge culture positively affects the learning climate component of the learning culture.

H1b: Knowledge culture negatively affects the mistakes acceptance component of the learning culture.

H1c: The learning climate component of learning culture positively affects the mistakes acceptance component of a learning culture.

H1d: Collaborative culture positively affects the learning climate component of the learning culture.

H1e: Collaborative culture positively affects the mistakes acceptance component of the learning culture.

H1f: Knowledge culture and collaborative culture are correlated.

H2a: Knowledge culture positively affects organizational intelligence.

H2b: The learning climate component of learning culture positively affects organizational intelligence.

H2c: The mistakes acceptance component of the learning culture positively affects organizational intelligence.

H2d: Collaborative culture positively affects organizational intelligence.

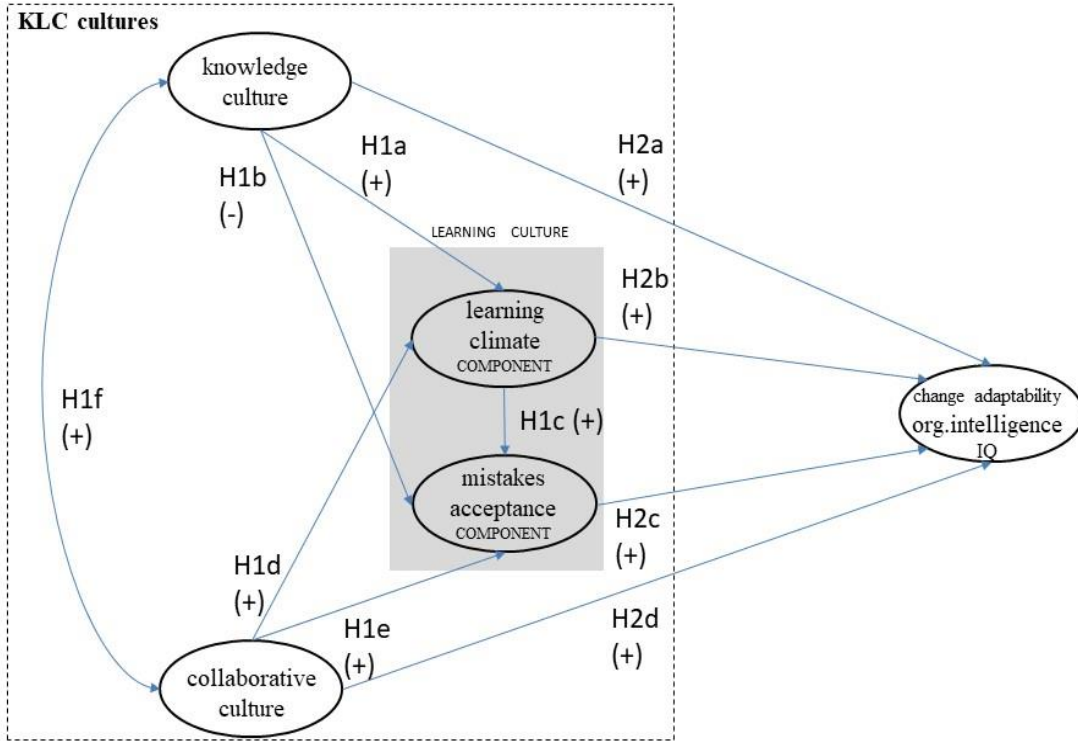


Figure 2: Validation stage: Theoretical model visualization

Source: Simplified model by Kucharska and Bedford (2023 a,b)

Below, Table 4 presents the steps of the validation of the new advanced methodological approach, from the procedure for measuring the bias of mistakes (personal, organizational, and doubled) through to the detection of the bias type, its frequency, and verification of its impact.

Table 4: Validation procedure

STEPS of the procedure		STEP	DETAILS
1.	Measurement stage		
A	Bias measurement procedure	Gather questionnaire responses	Table 2
B	Bias type detection procedure	Bias type detection in the sample No bias PBM only OBM only DBM	Table 3
2.	Validation stage		
a.	Theoretical model development	Simplification of Kucharska et al.'s 2023 model	Figure 2
b.	Empirical models development and comparison	Models run and assessed using SEM techniques	Figure 3

The statements presented in Table 2 were incorporated into the questionnaire for knowledge workers to validate the method. The sampling method and sample characteristics are presented below.

Sampling procedure and measures: This study was targeted at a convenience sample of Polish knowledge workers. The respondents included were those who declared that their work's first input and output was

knowledge. Moreover, to ensure the respondents' familiarity with their organizations' issues, we included only those who had worked for a minimum of one year for their current employer. Data were collected in October 2023 by computer-assisted web interviewing.

The respondents answered the majority of the test statements using a 7-point Likert scale, but to statements regarding the measurement of cognitive bias (Table 1), respondents answered stating whether the particular statement was TRUE=1 or FALSE=2.

The study by Kucharska and Bedford (2023 a, b) describes the construct scales and their sources. The reliabilities obtained are given in Tables 5a-e together with basic statistics and AVE root squared, and correlations between the constructs for each sub-sample creation according to the bias detected when following the procedure described are given in Table 3 (total sample, no bias sub-sample, personal bias sub-sample, organizational and double bias sub-samples). The model by Kucharska and Bedford (2023b) was simplified to enable data analysis using exact SEM.

Sample characteristics: The conceptual framework of the original model is given in Kucharska *et al.* (2023) and Kucharska and Bedford's (2023a,b) studies. However, the sample selected for the advanced method validation in this study is different. The study sample is composed of 768 cases (fully completed and valid questionnaires with SD > .4) representing Polish knowledge workers: 227 specialists and 541 managers, 389 women and 379 men working mostly in private (76%) companies in different sectors and almost equally represented by micro (3%), small (31%), medium (35%), and large companies (31%). The dominant sectors in the study sample were knowledge-intensive sectors: IT (9%), finance (7%), higher education (10%), health care (6%), trade (10%), and construction (6%), accounting for 48%. However, production (15%), other than higher education public services (12%), and other private services (23%) categories were also included. Compared to the samples from Kucharska *et al.* (2023) and Kucharska and Bedford's (2023b) studies, this sample contains more managers and a greater diversity of sectors.

Method of analysis: SEM with the use of SPSS Amos 26 software.

Sample quality: Sample quality assessment began with the Kaiser–Meyer–Olkin test to determine the suitability of the data for factor analysis. The result of KMO test, .946 was good (Hair *et al.*, 2010). The total variance extracted was 78%, while common method bias, tested using the common latent factor method, was 38%. This suggested that the sample quality is good and enabled us to proceed to the subsequent stage of the analysis.

5. Validation Results

The proposed method was aimed to be validated by a comparison of the results for the total sample (n=768) and the four identified sub-samples based on the procedure outlined in Table 2. However, the sub-samples representing 'PBM' (n=58) and 'OBM' (n=80) are too small to be included in further analysis of their impact on organizations using the SEM method. So, they were concluded as marginal and excluded from further analysis. The comparison then proceeded for the total sample, 'no bias', and the DBM subsamples. This required an assessment of the qualities of the total sample and all two sub-samples; next, empirical models for all three were formed and analyzed (Figure 3, Table 6).

The evaluation of the models' qualities was initially conducted based on construct measurement consistency tests, such as the average of variance extracted (AVE), composite reliability (CR), and Cronbach's alpha. The AVE value exceeded 0.57 for all constructs, which was acceptable (Byrne, 2016; Hair *et al.*, 2017). Cronbach's alpha test was used to confirm the consistency of the construct measurement model. The alpha coefficient was greater than 0.77 for all constructs, which was adequate (Hair *et al.* 2017, pp. 112). The CR was greater than 0.73 for all loadings, exceeding the required minimum of 0.7 (Hair *et al.*, 2017). The square root of each construct's AVE exceeded the correlations between the majority pairs of distinct constructs, but not for all. The collaborative culture and the learning climate components in the total sample and the 'no bias' sample may slightly supercharge one another. This case does not arise in the DBM sub-sample.

Table 5: Basic statistics and AVE root square and correlations between constructs

a) Total sample

	Mean	SD	AVE	CR	Cronbach's alpha	CC	KC	LCc	LCm	IQ
CC	4.2	1.86	0.60	0.82	.86	0.776				
KC	4.60	2.3	0.71	0.88	.89	0.587	0.845			
LCc	4.06	2.04	0.60	0.82	.83	0.796	0.688	0.777		
LCm	3.60	1.50	0.60	0.82	.79	0.626	0.398	0.593	0.776	
IQ	4.20	1.88	0.81	0.93	.90	0.765	0.533	0.702	0.6	0.902

Note: n=768 KC-knowledge culture, LCc-learning culture climate component, LCm-Learning culture mistakes acceptance component,

CC-collaborative culture, IQ- organizational change adaptability.

b) No bias of mistakes detected in the sample

	Mean	SD	AVE	CR	Cronbach's alpha	CC	KC	LCc	LCm	IQ
CC	3.5	2.0	0.62	0.76	.81	0.790				
KC	4.2	2.5	0.74	0.90	.89	0.587	0.862			
LCc	3.8	2.3	0.64	0.84	.79	0.796	0.698	0.800		
LCm	3.87	1.7	0.85	0.95	.94	0.626	0.398	0.593	0.923	
IQ	3.5	2.1	0.64	0.84	.86	0.765	0.533	0.702	0.6	0.797

Note: n=326 KC-knowledge culture, LCc-learning culture climate component, LCm-Learning culture mistakes acceptance component,

CC-collaborative culture, IQ- organizational change adaptability.

c) DBM detected in the sample

	Mean	SD	AVE	CR	Cronbach alpha	CC	KC	LCc	LCm	IQ
CC	4.2	1.94	0.66	0.85	.80	0.812				
KC	4.5	2.29	0.70	0.88	.89	0.596	0.839			
LCc	4.08	1.87	0.64	0.84	.79	0.737	0.545	0.798		
LCm	2.80	1.82	0.84	0.94	.88	0.614	0.256	0.571	0.919	
IQ	3.90	1.83	0.57	0.73	.77	0.785	0.451	0.616	0.62	0.755

Note: n=304 KC-knowledge culture, LCc-learning culture climate component, LCm-Learning culture mistakes acceptance component,

CC-collaborative culture, IQ- organizational change adaptability.

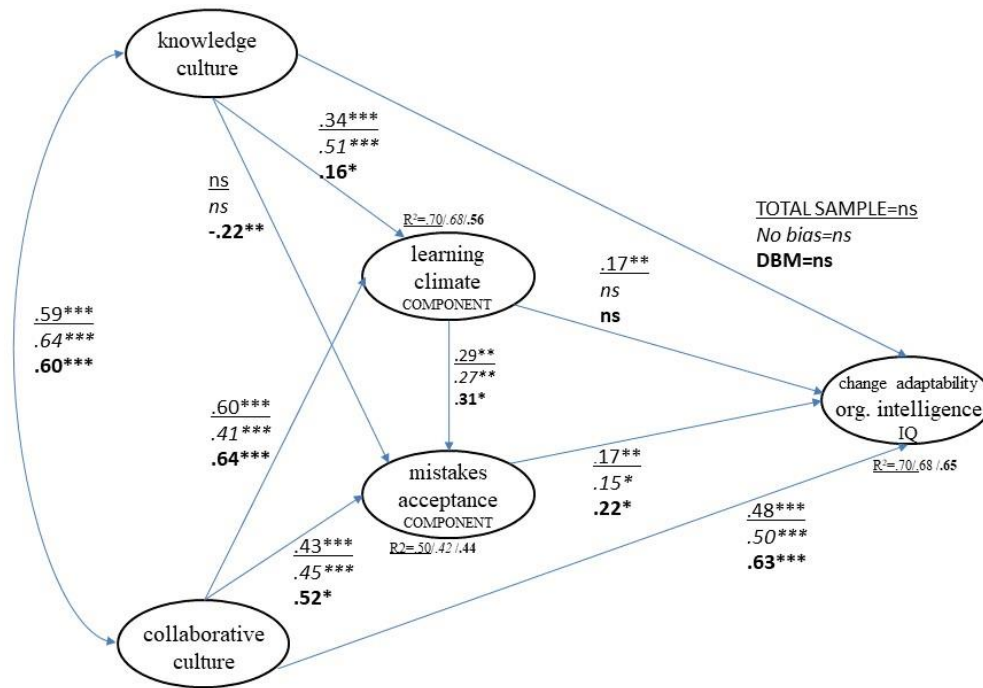


Figure 3: Validation stage: Empirical model

Note:

a) Total sample n=768 $\chi^2=204(80)$ CFI=.979 TLI=.973 RMSEA=.050 Cmin/df=2.55; $p<.05$ ** $p<.01$ *** $p<.001$; ns-not significant result; ML – maximum likelihood

b) No bias sub-sample n=326 $\chi^2=80(44)$ CFI=.987 TLI=.980 RMSEA=.050 Cmin/df=1.82; $p<.05$ ** $p<.01$ *** $p<.001$; ns-not significant result; ML – maximum likelihood

c) DBM n=304 $\chi^2=55(25)$ CFI=.981 TLI=.967 RMSEA=.064 Cmin/df=2.22; $p<.05$ ** $p<.01$ *** $p<.001$; ns-not significant result; ML – maximum likelihood

OBM sub-sample n=80 is too small size to create a SEM model

PBM-sample n=58 is too small size to create a SEM model

Table 6: Hypotheses verification

Hypothesis	Total sample n=768	No bias sub-sample n=326	Doubled bias sub-sample n=304
H1a	.34***	.51***	.16*
H1b	ns	ns	-.22**
H1c	.29**	.27**	.31*
H1d	.60***	.41***	.64***
H1e	.43***	.45***	.52**
H1f	.59***	.64***	.60***
H2a	hypothesis rejected	hypothesis rejected	hypothesis rejected
H2b	.17**	hypothesis rejected	hypothesis rejected
H2c	.17**	.15*	.22**
H2d	.48***	.22*	.63***
	$\chi^2=204(80)$ CFI=.979 TLI=.973 RMSEA=.050 Cmin/df=2.55	$\chi^2=80(44)$ CFI=.987 TLI=.980 RMSEA=.050 Cmin/df=1.82	$\chi^2=55(25)$ CFI=.981 TLI=.967 RMSEA=.064 Cmin/df=2.22

Note: $p<.05$ ** $p<.01$ *** $p<.001$; ns-not significant result; ML – maximum likelihood.

This study clearly exposed that in doubly mistakes-biased knowledge-driven organizations, as reflected here by the DBM sub-sample, the influence of knowledge culture on the mistakes acceptance component of learning culture is negative. So, it confirms the risk of adverse consequences of such a situation for organizational intelligence. The empirical model (Figure 3) exposes the broader picture of the KLC culture's synergic power supporting organizational intelligence building. Therefore, it is clear that the collaborative culture and learning climate component of learning culture facilitate the negative effect of the KC impact on the LCm (H1b) observed for the DBM sub-sample. So, in mistakes-biased organizations, collaborative culture and learning climate components of the learning culture are critical to building organizational intelligence—studies by Kucharska and Bedford (2020, 2023a,b) explore the KLC approach power more in-depth.

Focusing on this study purpose, the critical finding of the DBM measurement and detection method validation stage is precisely the knowledge from comparing the H1b verification in all samples. This comparison, in the light of the entire model structure (Figure 3), exposes that DBM-biased knowledge-driven organizations cannot build their collaborative intelligence without a collaborative culture and learning climate component of a learning culture, which facilitates the negative affection of knowledge culture on the mistakes acceptance component of a learning culture.

Returning to the study's fundamental purpose, the simplified DBM measurement and detection procedure was positively validated. Moreover, the validation stage results (Figure 3; Table 6) revealed that while personal and organizational mistake-related biases exist, their frequency is marginal in this sample of knowledge workers. The dominant sub-samples in knowledge-driven organizations are no-biased and doubly-biased subsamples. Based on this, it is clear that bosses' bias impacts organizational bias. So, the omission of personal bias of mistakes (PBM) or organizational bias of mistakes (OBM) influencing organizations in the Kucharska et al. (2023) study did not modify our understanding of DBMs' impact on organizations gained so far. It confirmed our understanding because data from two different samples confirmed the general conclusion - the DBM negatively affects organizational learning through mistakes culture by annihilating the development of mistakes acceptance component of a learning culture and, consequently, jeopardizing organizational intelligence.

6. Discussion

Comparing these results to those of Kucharska *et al.* (2023), the main conclusion is that the knowledge workers group in Poland shows personal and organizational mistake-related biases. However, their frequency is marginal compared to the 'no bias' or the 'DBM' sub-samples. In light of this, the current broader study confirms the general finding of Kucharska *et al.* (2023) that DBM negatively affects learning from mistakes. The value of this confirmation is that it is made based on a different sample, and the applied new, simplified methodology proposed for DBM detection and measurement was positively validated. In other words, based on these results, from a business research perspective, the DBM detection method efficiently reveals the negative impact of the double cognitive bias of mistakes on organizations. The sample applied to this study, similar to (Kucharska *et al.*, 2023), contains more managers and a greater diversity of sectors. This might be the reason why the sample was still too small to explore the PBM and OBM in more depth. This might be that further studies should rely on the biggest samples dedicated to the particular sectors. Sample size matters to avoid potential biases rooted in methodological limitations (Andrieux *et al.*, 2024).

When assessing each hypothesis in detail, H2a, regarding the direct influence of knowledge culture on adaptability to change, was rejected for all samples. This suggests that Kucharska *et al.*'s (2023) model, presented in Figure 1, proves that the KLC approach matters for adaptability to change and, while omitted in this study's simplified model (Figure 2, 3), knowledge sharing is a very significant mediator between a knowledge culture and adaptability to change. In other words, this relation is indirect, rather than direct.

Moreover, the negative direct influence of knowledge sharing on the acceptance of mistakes (H1b) is confirmed for the DBM sub-sample. This is similar to the result obtained by Kucharska *et al.* (2023) for the total and DBM samples, but this hypothesis is not confirmed for the total and 'no bias' samples; it is confirmed only for the DBM sub-sample. The results obtained for H1c also differ from those of Kucharska *et al.* (2023). In this study, the direct, positive influence of the learning component on the acceptance of mistakes component of a learning culture is confirmed for all samples, in findings given in Figure 1 (Kucharska *et al.*, 2023) only for the total sample. Similarly, the synergy between the learning culture component of organizational climate for a learning and collaborative culture observed in the total and 'no bias' samples is also observed in Kucharska *et al.*'s (2023) study for all samples, including the DBM.

Summing up, these comparisons show that in social sciences, results based on data collected from questionnaires are not identical, even if they are repeated in the same population (Gorrell *et al.*, 2011; Kountur, 2011). However, sample size may also play a significant role here. Larger samples would allow the identification of more sensitive and weaker relations (Shi, Lee, and Maydeu-Olivares, 2019). Moreover, the models compared in this study are similar but not identical. What is essential is the fact that the general findings are confirmed. This study revealed that while personal and organizational mistake-related biases exist, their frequency is marginal in this sample of knowledge workers. The dominant sub-samples in knowledge-driven organizations are the 'no bias' or the 'DBM' groups. Thus, the omission by Kucharska *et al.* (2023) of the personal and organizational biases of mistakes samples is fully justified.

7. Practical Implications

This study confirms the DBM's negative impact on organizational learning. There are profound practical implications regarding the effect of the DBM when it is dominant in organizations. Our findings indicate that rethinking and re-framing the organizational approach to mistakes is necessary. Enterprises with zero tolerance for mistakes in divisions and areas other than in production or operations can face severe difficulty in creating a competitive advantage that comes with adaptability to change (intelligence) and innovations developed over the long run. The essence of collective intelligence, seen as a network of knowledge workers' 'brilliant minds' that collaborate smoothly, is a crucial organizational strength that needs to be activated. The DBM can severely impede achieving this due to its negative impact on collective learning.

Summing up, from the practical perspective, the fundamental starting point is to be aware that the cognitive bias of mistakes can severely affect organizations. The next step is to try to control it to secure the aptness of managerial decisions.

8. Scientific Implications

This study is the first to introduce a method enabling the identification of persons and organizations affected by the DBM to measure its influence on different aspects of human, organizational, or social life and to confirm that the DBM blocks collective intelligence. Further studies are needed to expose any other serious impacts that the DBM may cause. Furthermore, this study is based on a sample of Polish knowledge workers and is therefore highly specific. There may be numerous national or local factors that can strengthen or weaken the DBM. Similarly, the consequences of the DBM may also differ between organizations, societies, regions, and nations. Thus, further studies are worthwhile to fully understand how the DBM impacts countries, cultures, institutions, organizations, and communities and how to deal with this impact and free the collective intelligence. Another important line of research inspired by this study's findings is the question: How can organizations deal with the DBM to perform better? How should we train managers to deal with the DBM reflected in the paradox of simultaneous learning from mistakes and mistakes avoidance, which is vital for supporting employees' performance and development? Moreover, how can artificial intelligence (AI) influence an organization's collective intelligence? Furthermore, how does AI deal with human mistake bias? These exciting questions require further investigation.

9. Limitations and Further Study Ideas

This study and Kucharska *et al.*'s (2023) study are based on the Polish population and present a Polish perspective, and other nations' perspectives are needed to understand this phenomenon entirely. Moreover, the comparison of findings based on two different samples confirmed the general knowledge about the negative consequences of the DBM but also exposed another limitation: the size of the sample. The validation of the advanced method showed that further studies would probably require comparatively larger samples. This is because "mistakes" are very sensitive issues. Therefore, to detect a DBM and then examine it within complex structures and compare effects with and without a DBM being detected using, for example, SEM methods, it is recommended to employ samples of 400 or greater per cohort.

Furthermore, regarding the SEM model, the square root of each construct's AVE exceeded the correlations between the majority pairs of distinct constructs, but not for all. The collaborative culture and the learning climate components in the total sample and the 'no bias' sample may slightly supercharge one another. This case does not arise in the DBM sub-sample. This means that the collaborative culture and learning climate components of the learning culture in the double-biased sub-sample are not as expressly tied as in the 'no bias' and 'total' samples. The favorable climate for learning in organizations is created thanks to collaboration. In the DBM sub-sample, this relation is not so inherent. Kucharska *et al.* 2023 found a correlation between these two

variables in all three samples (in the DBM sub-sample, too). So, it might be that this issue is a characteristic of the Polish population. The collaboration culture in Polish organizations can be seen as an extreme motivational power and, consequently, a lack of it as a blocker. So, this issue, to formulate an unequivocal statement, requires further studies.

Moreover, this study concludes that while personal and organizational mistake-related biases exist, their frequency in organizations is marginal in the samples of knowledge workers that naturally characterize higher-level self-awareness and intelligence compared to most of society. It is highly possible that exploring DBM based on the sample representing the findings of the general society will be significantly different. The cognitive bias awareness and control depend on the personal intelligence of the particular individual. In light of this study's findings, it strongly depends on leaders' intelligence and self-awareness.

Finally, further studies based on samples that represent society can expand our knowledge regarding the cognitive bias of mistakes phenomenon. Especially when examining entire societies, we can better understand how the cognitive bias of mistakes happens. So far, we know that a significant part of society is affected by the cognitive bias of mistakes, which might block collective learning. Mindsets are shaped until early childhood. However, we do not pay enough attention to raising youths or training adults, especially managers, to prevent the double bias of mistakes. This study shows we should. So, it is another topic worth scientists' attention.

10. Conclusions

The proposed advanced method to measure the DBM was positively validated in this study. So, the presented advanced methodology for DBM detection and validation is simplified comparably to that introduced by Kucharska *et al.* (2023), which makes it easier to use. Moreover, the dominant sub-samples in knowledge-driven organizations are the 'no bias' or the 'DBM' groups. So, the omission by Kucharska *et al.* (2023) of personal and organizational biases of mistakes samples seems to be justified, and the current study confirms the findings of Kucharska *et al.* (2023) that the DBM negatively affects learning from mistakes. Moreover, this study concludes that while personal and organizational mistake-related biases exist separately, their frequency in organizations is marginal in the samples of knowledge workers that naturally characterize higher-level self-awareness and intelligence compared to most of society. On the contrary, the DBM is more frequent, and its negative impact is more straightforward to expose. Organizations affected by the DBM face troubles in collective learning from mistakes, which negatively affects their collective intelligence building. This study clearly exposed that in doubly mistakes-biased knowledge-driven organizations, the influence of knowledge culture on the mistakes acceptance component of learning culture is negative. So, this study constitutes the Double Bias of Mistakes Theory, which states that the clash between positive attitudes and beliefs regarding learning processes and negative attitudes and beliefs toward mistakes exposed by focusing on control managers (bosses) may block organizational learning from mistakes and, as a consequence, negatively affect organizational intelligence. It is highly possible to explore DBM based on the sample representing the general society, not only knowledge workers, as this study did so that the findings will be significantly different. The cognitive bias awareness and control depend on the personal intelligence of the particular individual. Knowledge workers' intelligence is above the mean society level. So, by selecting a representative for the entire society sample, we can better understand the scale of the cognitive bias of mistakes and find methods to manage and prevent its consequences. So, further studies should focus on leaders' mindset training, shaping the attitudes and behaviors that support learning from mistakes and balancing mistake avoidance simultaneously. Those two contradicting approaches - might cause some tensions. However, smooth managing paradoxes is precisely what is expected from modern leaders today. So, this direction of further studies is promising and valid in the context of organizational and societal benefits. Leaders who are free of the DBM and skilled in managing paradoxes can improve society's lives and development.

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