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## From an Error Management Culture to Performance-An Empirical Study on the Influence of Motivation and Learning

## Hannah Schlamann

Faculty of Communication and Environment **Rhine-Waal University of Applied Sciences** Email: Hannah.Schlamann@t-online.de

German

**Tammy Brandenberg** Faculty of Communication and Environment Rhine-Waal University of Applied Sciences

Email: Tammy.Brandenberg@hochschule-rhein-waal.de

German

**Professor Dr. Nicki Marquardt** 

Faculty of Communication and Environment Rhine-Waal University of Applied Sciences

Email: Nicki.Marguardt@hochschule-rhein-waal.de

German

### ABSTRACT

For human beings, it is natural to conduct errors. Therefore, every company is confronted with erroneous actions that cannot be avoided. Several studies proved that managing errors and error consequences appropriately is indispensable. To ensure long-term benefits from errors, an organization needs to implement an error management culture (EMC). In this way, errors are collectively accepted and openly addressed. Research has been exploring how EMC results in increased performance. The current empirical study focuses on work motivation and informal workplace learning (IWL) that are assumed to mediate the relationship between EMC and performance. The purpose is to ex- plain this relationship with the help of both influencing factors. For this, an online survey was used to analyze the self-assessments of 186 employees from various companies and industries in Germany. The statistical results proved that companies with an EMC show elevated performance. Work motivation and IWL were found to partially mediate this relationship. More specifically, autonomous motivation, subsequent reflection as well as trial and application of own ideas were proven to be influencing factors. Building on the significant results, this study derives practical implications for organizations focusing on the design of an EMC while considering the three influencing factors. Future should dive deeper into the interaction between all these factors.

KEYWORDS: Human Error, Error Management Culture, Performance, Informal Workplace Learning, Work Motivation

#### 1. Introduction

Companies have always been affected by errors (Prümper et al., 1992; van Dyck et al., 2005; Hofmann & Frese, 2011). Human beings always conduct errors, no matter how much experience they have (Prümper et al., 1992; Zapf et al., 1992). Consequently, it is impossible to avoid the occurrence of errors, i.e., error prevention approaches will not succeed (Reason, 1990, 1997; Zapf et al., 1992; Prümper et al., 1992; Garud et al., 1997; van Dyck et al., 2005; Frese & Hofmann, 2011; Frese & Keith, 2015). Bill Gates, the founder of Microsoft, once said that "[it is] fine to celebrate success but it is more important to heed the lessons of failure "(Johnson, 2020). Hence, one of the world's most successful businessmen confirmed the literature in the statement that the key is to manage errors appropriately (Prümper et al., 1992; van Dyck et al., 2005; Hofmann & Frese, 2011). Error management aims at reducing negative (e.g., loss of quality) and promoting positive (e.g., initiative) error consequences (Zapf et al., 1992; van Dyck et al., 2005; Hofmann & Frese, 2011). To achieve this, a collective understanding of errors in form of an error management culture (EMC) is crucial (Edmondson, 1996; van Dyck et al., 2005). An EMC supports an organization in fostering positive error consequences in the long term, leading to performance improvements (van Dyck et al., 2005). Van Dyck et the methodological part, samples, measures, procedures, and

al. (2005) assumed that these positive error consequences mediate the relationship be- tween EMC and performance. Since past research has already indicated an influence of work motivation and learning, the present study focuses on these two constructs (Bell & Kozlowski, 2008; Homsma et al., 2009; Frese & Keith, 2015). Learning is indispensable for organizations (Edmondson, 1996; Marquardt, 2019). Up to 75% of the learning occurring in a company is informal workplace learning (IWL; Marsick & Volpe, 1999; Bear et al., 2008). IWL means natural learning arising from personal needs, in contrast to for- mal workplace learning (FWL) which refers to explicit training programs (Marsick & Volpe, 1999; Kyndt & Baert, 2013; Wolfson et al., 2018; Cerasoli et al., 2018).

Frese and Keith (2015) already discussed errors as motivators and the relevance of learning from errors. Building on this, the current study deals with the following research question: How do work motivation and IWL affect the relationship between EMC and performance? To answer the research question, this study first establishes a theoretical background on the main constructs of EMC and performance as well as on the assumed mediators of work motivation and IWL, followed by the formulation of hypotheses and the method description. Within

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analyses are explained. Then, the results are presented and discussed to answer the hypotheses. To critically reflect on the study, its strengths, limitations, and areas for future research are identified. Last, practical implications for organizations are derived to conclude the study.

### 2. Theoretical Background

### 2.1 Errors and Error Management Culture

The term *error* is widely used and embedded in daily life (Zapf et al., 1999). How- ever, there is no standard scientific definition (Senders & Moray, 1991; Zapf et al., 1999). Many authors agree on three core elements of human errors (Reason, 1990; Senders & Moray, 1991; Zapf et al., 1992, 1999; Dimitrova et al., 2017): First, when humans behave in a goal-oriented way, errors may occur. Second, errors mean missing this goal. Third, the error is traced back to an individual's decision, i.e., it was potentially avoidable and not affected by uncontrollable forces (e.g., natural disasters). These three elements appear in the working definition of errors by Reason (1990). According to Reason (1990), errors as a whole refer to a controllable, planned series of mental or physical activities of an individual that miss prior intentions.

Depending on the research purpose, studies focus on different sometimes overlap-ping taxonomies categorizing human errors (Zapf et al., 1992; Rizzo et al., 1995; Sharit, 2012; Czaja & Nair, 2012). Since the current study focuses on general error management in a company, the variety of taxonomies is not popular approach differentiates presented. One between unintentional and intentional errors (Swain & Guttmann, 1983; Reason, 1990; Hofmann & Frese, 2011). Most errors occur unintentionally (Swain & Guttmann, 1983). The intention was correct but the realization of the action fails. Slips, lapses, and mode errors belong to unintentional errors (Swain & Guttmann, 1983; Reason, 1990). A slip means performing an incorrect action that is inconsistent with the pre-defined intention (Norman, 1981; Reason, 1990). A lapse refers to the failure of memory, i.e., a person forgets to execute an intended action (Reason, 1990; Wickens et al., 2021). The error of executing an action in the wrong context is called mode error (Norman, 1981; Wickens & Carswell, 2012; Wickens et al., 2021). Other errors occur intentionally. In case of a mistake, the definition and formulation of the correct intention fail (Reason, 1990; Wickens et al., 2021). The action aligns with the current inappropriate intention but not with the correct one (Swain & Guttmann, 1983; Wickens et al., 2021). Comparable to Frese and Keith (2015),

this study defines errors as actions not achieving the pre-defined purpose as well as misstated intentions.

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There are two different strategies to cope with errors: error prevention and error management (see figure 1). Error prevention aims at avoiding errors and eliminating negative effects (Zapf et al., 1992; van Dyck et al., 2005; Hofmann & Frese, 2011). To prevent errors from happening, inaccurate behavior is inhibited (Frese & Keith, 2015). How- ever, only using this strategy results in a variety of negative consequences, like non-dis- the closure of errors (Edmondson, 1996; van Dyck et al., 2005; Dimitrova et al., 2017). Besides, employees do not expect more errors to occur (Bainbridge, 1983; Reason, 1990). Nevertheless, companies mainly use error prevention strategies (van Dyck et al., 2005; Frese & Keith, 2015). As stated in chapter 1, errors are inevitable, i.e., error prevention lacks effectivity (Prümper et al., 1992; Reason, 1997; Garud et al., 1997; van Dyck et al., 2005). Instead, organizations need to examine the causes of errors to better deal with and benefit from them (Swain & Guttmann, 1983; van Dyck et al., 2005).

Frese (1991) developed an error management concept to supplement the error prevention strategy. Error management distinguishes between the error itself and the potential consequences (Hofmann & Frese, 2011). The purpose is to diminish negative effects while fostering positive consequences (van Dyck et al., 2005; Dimitrova et al., 2017). The key is to accept errors (Dimitrova et al., 2017). According to L. R. Murphy (1996), it is crucial to improve the employees' attitude towards errors instead of changing the error itself. For this, the error process by Frese (1991) describes three error management phases. It starts after the error occurrence (van Dyck et al., 2005; Hofmann & Frese, 2011; Frese & Keith, 2015). During error detection, employees discover that an error happened (Frese, 1991). It is important to quickly detect and report errors (Frese, 1991, 1995). Error explanation is the analysis of an error to answer why it occurred and how it happened. Coping with the error consequences (e.g., through training) and correcting the error refer to the phase of error handling (Frese, 1991). In summary, error management easily and quickly detects and corrects errors to minimize negative consequences (Zapf et al., 1999). Since damage is limited and learning from errors through exploration is promoted, error management ensures organizational control and learning (van Dyck et al., 2005).







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Following van Dyck et al. (2005), error management on an individual level can be extended to the organizational level when considering the concept of culture (Klein et al., 1994). Among a variety of concepts, many authors agree on a multilevel concept of culture (Rentsch, 1990; Schein, 2010; Schneider & Barbera, 2014; Hartnell et al., 2011; Wróblewski, 2017; Ashkanasy & Dorris, 2018). According to Schein (2010, p. 18, 2012, p. 313), culture is "a pattern of shared basic assumptions" formed and developed by an existing group. Schein (2010) introduced a three-level concept of culture. The core is the level of *basic* underlying assumptions which relate to unconscious values and beliefs that are collectively taken for granted. They are indispensable to evaluating espoused beliefs and values and interpreting artifacts. Espoused beliefs and values refer to conscious goals, values, and justifications a group is known for (Schein, 2010). Artifacts serve as the sur- face level and comprise tangible and observable components, such as climate, products, and language style (Schein, 2010; Schneider et al., 2013). In an organizational context, corporate culture is a system of shared values, norms, and beliefs striving toward patterning and integration through organizational practices (Reichers & Schneider, 1990; Schein, 2010). It characterizes employees and their behavior and helps to understand their personalities (Schein, 2010; Schneider & Barbera, 2014).

Building on this, an EMC relies on a collective understanding and shared assumptions on errors and error consequences (Edmondson, 1996). Its purpose is to reduce negative error consequences and foster positive ones (van Dyck et al., 2005). An EMC should be well elaborated and anchored in all three cultural levels by Schein (2010) because it influences error detection, error handling, and learning from errors (Edmondson, 1996). The core (basic underlying assumptions) of an EMC is to accept errors within the organization (S. Fischer et al., 2018). It is important that all employees unconsciously consider errors as a matter of course and not as problems and that they face them openly (Zapf et al., 1999; Guchait et al., 2016). Employees need to be self-reflective and willing to question their actions to deal better with errors. These unconscious beliefs should be integrated into corporate principles (espoused beliefs and values; Zapf et al., 1999). In this way, an organization offers environment for effectively coping with errors by an continuously learning from oneself and others. To promote this kind of error-friendly workplace, organizational practices, resources, and tools are needed (artifacts; Guchait et al., 2016). enhancing communication about errors Practices are indispensable to ensure a collective knowledge base and a better understanding of erroneous events (van Dyck et al., 2005; Chen et al., 2020). Hence, employees are more likely to help others in similar situations (van Dyck et al., 2005). Besides, it is important to offer practices and tools to quickly detect, report, analyze, and effectively and efficiently handle errors (Frese, 1991, 1995; van Dyck et al., 2005; Chen et al., 2020). In addition, accountabilities need to be defined to avoid blaming each other (Marquardt, 2019). Through such measures, errors are better handled, negative error consequences are diminished, and, at best, https://ijbassnet.com/

performance is im- proved (Frese, 1991, 1995; van Dyck et al., 2005).

### 2.2 Individual and Organizational Performance

Since individual performance is necessary to ensure team, organizational, and economic performance, the construct is of high relevance in research (J. P. Campbell; 2012; J. P. Campbell & Wiernik, 2015). However, there is no universal definition yet (Sonnentag & Frese, 2002; K. R. Murphy, 2008; Smither, 2012; Carlos & Rodrigues, 2016). Authors disagree on whether individual performance belongs more to behavior or outcomes (J. P. Campbell et al., 1990; Sonnentag & Frese, 2002). Behavior refers to actions employees take at work (Motowidlo et al., 1997; Carlos & Rodrigues, 2016). Outcomes mean the results employees achieve. Individual performance is a specific type of behavior that contributes to these outcomes and the attainment of organizational objectives (Motowidlo et al., 1997). Hence, individual performance is characterized as behavioral (C. H. Campbell et al., 1990; J. P. Campbell et al., 1990; Motowidlo et al., 1997; Smither, 2012). In addition, it is defined as a multidimensional, episodic, evaluative, and dynamic concept (Motowidlo et al., 1997; Carlos & Rodrigues, 2016). Referring to multidimensionality, individual performance comprises a variety of behavioral expressions that are merged into one construct (C. H. Campbell et al., 1990; J. P. Campbell et al., 1990; Motowidlo et al., 1997; Sonnentag & Frese, 2002; Cheng et al., 2007; J. P. Campbell, 2012; Landy & Conte, 2019). Motowidlo et al. (1997) introduced the episodic characteristic because individual performance is related to behavioral episodes that target organizational goals. Besides, it is an evaluative concept. It is necessary to differentiate between desirable and undesirable performance, i.e., whether it promotes or hinders the organizational goal achievement (Motowidlo et al., 1997). Further, individual performance varies due to learning processes and other changes, reflecting dynamics (Motowidlo et al., 1997; Sonnentag & Frese, 2002; Carlos & Rodrigues, 2016). Consequently, individual performance is defined as observable goal-oriented behavior that is under the employee's control and adds value to the organization (J. P. Campbell et al., 1990, 1993; Viswesvaran & Ones, 2000; J. P. Campbell & Wiernik, 2015; Carlos & Ro-drigues, 2016).

Borman and Motowidlo (1993) specified two dimensions of individual performance that are valuable to an organization in different ways: task performance and contextual some performance. Task performance relates to the execution and maintenance of organizational key processes (Motowidlo et al., 1997; Carlos & Rodrigues, 2016). These activities formally belong to the job (Landy & Conte, 2019). The contextual performance focuses on organizational, social, and psychological components in work, such as strengthening the employer image, supporting colleagues, and improving climate and processes (Podsakoff et al., 1997; Motowidlo et al., 1997; Sonnentag & Frese, 2002). This proactive and voluntary behavior is not part of the job itself but is carried out because it is characterized by enthusiasm, initiative, and effort (Motowidlo et al., 1997; Sonnentag & Frese, 2002; Landy & Conte, 2019).



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As previously stated, individual performance is indispensable for organizational success, i.e., it is highly related to organizational performance. Understanding organizational performance depends on individual performance (Carlos & Rodrigues, 2016). Or-ganizational performance is measured with financial performance, product market performance, and shareholder return, e.g., with profit, sales, and economic value added (Richard et al., 2009). According to Sonnentag and Frese (2002), organizations can analyze three performance perspectives to improve their performance: The *individual* differences perspective studies motivational and personality factors that improve performance. The situational perspective explores the work environment and job characteristics to learn about situations that facilitate high performance. The *performance* regulation *perspective* analyzes the performance process and how it needs to be designed (Sonnentag & Frese, 2002). In this study, the previously described EMC is assessed as a situational factor. Work motivation and IWL serve as individual factors that are explained in the following.

### 2.3 Work Motivation

Work motivation is a multidimensional construct frequently discussed in the literature (Gagné et al., 2010, 2014; Ryan & Deci, 2017; Howard et al., 2020). It refers to the guestion of what moves employees to act and decide on specific tasks among others (Ryan & Deci, 2000a, 2017; Kanfer et al., 2008). A variety of definitions exist with most of them having three key factors in common: First, work motivation relates to the direction of actions (Atkinson, 1964; J. P. Campbell & Pritchard, 1976; Ryan & Deci, 2000a, 2017; Kanfer et al., 2008; Pinder, 2008). It is the employee's decision on which work-related behavior is initiated (Vroom, 1995; Ryan & Deci, 2000a, 2017; Pinder, 2008). For this, it is important to take into account where employees focus their attention (Tremblay et al., 2009). Second, work motivation concerns the intensity of actions, i.e., the effort an employee puts into a task (Kanfer et al., 2008; Pinder, 2008; Tremblay et al., 2009). Other authors refer to the employee's vigor (Atkinson, 1964), amplitude (J. P. Campbell & Pritchard, 1976), or energy (Ryan & Deci, 2000a, 2017; Steers et al., 2004). Third, the *persistence* of actions refers to the time employees spend on a task (Atkinson, 1964; J. P. Campbell & Pritchard, 1976; Steers et al., 2004; Pinder, 2008; Kanfer et al., 2008; Tremblay et al., 2009).

To examine the multidimensionality of work motivation, this study focuses on the self-determination theory (SDT) by Deci and Ryan (1985). SDT distinguishes three categories of work motivation (Gagné et al., 2014; Ryan & Deci, 2017). First, motivation is the lack of motivation, i.e., having no intention to act (Ryan & Deci, 2000a; Gagné et al., 2014). Second, extrinsic motivation means taking actions to receive instrumental positive outcomes (e.g., approval) or to avoid negative ones, such as criticism. Third, intrinsic *motivation* refers to engagement in interesting, challenging, and funny activities. The activities are carried out for their own sake

because pure enjoyment leads to the satis-faction of individuals (Ryan & Deci, 2000a; Gagné et al., 2014; Cerasoli et al., 2014).

Intrinsic motivation is further explained in the cognitive evaluation theory (CET) of the SDT (Deci & Ryan, 1985). CET addresses factors that increase or decrease intrinsic motivation (Ryan & Deci, 2000b). Individuals have needs for competence, autonomy, and relatedness that should be satisfied to promote intrinsic motivation (Deci & Ryan, 2000). Another influencing variable is the social environment which needs to be designed in respect of psychological needs (Ryan & Deci, 2000b). Activities should trigger intrinsic interest by being exciting and enjoyable, and by having an aesthetic value (Deci & Ryan, 2000; Ryan & Deci, 2000b). Concerning other activities designed differently, CET does not explain the underlying motivation to act (Ryan & Deci, 2000b).

The organismic integration theory (OIT) of the SDT explains the motivation of these other activities (Deci & Ryan, 1985; Ryan & Deci, 2000b). OIT refers to extrinsic motivation and highlights different types varying in their internalization (Ryan & Deci, 2000b; Gagné et al., 2014). Internalization means the adoption of a goal-oriented activity previously regulated by external factors, i.e., actions become more internally regulated (Deci & Ryan, 2000; Ryan & Deci, 2000b). To internalization, four types of extrinsic motivation are distinguished (Deci & Ryan, 1985; Ryan & Deci, 2000b). Exter-nal regulation is entirely noninternalized and refers to the satisfaction of external demand, such as receiving rewards. Introjected regulation is slightly internalized but without a complete adoption of the values (Deci & Ryan, 2000; Ryan & Deci, 2000a, 2000b). Actions are regulated by internal pressure like striving for ego-involvement (e.g., pride) or avoiding anxiety, shame, or guilt (Ryan & Connell, 1989; Ryan & Deci, 2000a, 2000b). Identified regulation means that an individual start to accept and consciously value an externally regulated activity as personally important. It is more internalized but still re-lated to the instrumental value of an activity. The last type of extrinsic motivation is integrated regulation. Integration means that an externally regulated activity fully aligns with its values and needs. It is congruent with the own sense of self and close to intrinsic motivation but not completely since it is done because of instrumental outcomes rather than for inherent pleasure (Deci & Ryan, 2000; Ryan & Deci, 2000a, 2000b).

All types of work motivation relate to a certain degree of autonomy and control (Deci & Ryan, 2000; Ryan & Deci, 2017). Autonomous motivation is characterized by a voluntary engagement in an activity because of the congruence with own values and needs. Controlled motivation concerns external or internal pressure that drives individuals to execute tasks (Ryan & Deci, 2017). External and introjected regulation belong to controlled motivation. The first consists of external pressure and the second of internal pressure to act. Identified and integrated regulation, as well as intrinsic motivation, are autonomous types of motivation (Ryan & Connell, 1989; Ryan & Deci, 2000a; Gagné et al., 2010, 2014; Howard et al., 2020). Some researchers



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aggregate the different types of motivation into controlled and autonomous motivation, depending on the research question (Gagné et al., 2010, 2014). In this study, the specific types of motivation are used to identify their concrete impact within the relationship between EMC and performance, together with IWL.

### 2.4 Informal Workplace Learning

Workplace learning means the process of gaining additional knowledge, skills, abilities, and other characteristics (KSAOs) to improve human capital (Noe et al., 2014). The key is to not only make their own experiences but learn from them (Jarvis, 2012). For this, the dimensions of action and reflection need to be considered (Watkins & Marsick, 1992). Action refers to the degree to which employees initiated the situation. Thinking about the experiences gained in this situation and discovering new insights relates to reflection (Watkins & Marsick, 1992; Jarvis, 2012). Looking at figure 2, four types of workplace learning are distinguished: IWL, FWL, incidental, and

no workplace learning. As this study focuses on IWL, the other types are only briefly addressed. Neither acting nor re-flecting implies no workplace learning. Random learning grounded in the action itself and without reflection is called incidental workplace learning. However, reflection on experiences is indispensable to consciously engaging in workplace learning (Watkins & Marsick, 1992). Hence, the research emphasizes FWL and IWL (Kyndt & Baert, 2013). FWL is highly structured and takes place during planned events (Marsick & Volpe, 1999; Kyndt & Baert, 2013). The learning context and objectives are pre-defined to support the learner in acquiring new KSAOs (Kyndt & Baert, 2013; Cerasoli et al., 2018; Wolfson et al., 2018). FWL is instructor-led and has a fixed learning time (Watkins & Marsick, 1992; Kyndt & Baert, 2013; Cerasoli et al., 2018). Thus, learners mostly respond to established structures and not to their interests (Watkins & Marsick, 1992; Jarvis, 2012).





In contrast to FWL, IWL is embedded in daily business, i.e., in less formal settings (Watkins & Marsick, 1992; Marsick & Volpe, 1999; Kyndt & Baert, 2013). It is less planned and less structured in terms of learning context, learning support, time frame, and learning objectives (Watkins & Marsick, 1992; Kyndt & Baert, 2013; Lohman, 2006). Consequently, IWL is defined as those actions striving to acquire KSAOs through a natural way of learning outside of formal learning events (Wolfson et al., 2018; Cerasoli et al., 2018). It arises from personal needs, preferences, and intentions in work-related situations (Marsick & Volpe, 1999; Kyndt & Baert, 2013). It often takes place spontaneously and unconsciously (Watkins & Marsick, 1992; Marsick & Volpe, 1999; Noe et al., 2010; Kyndt & Baert, 2013). However, many authors assume a certain degree of intentionality (Watkins & Marsick, 1992; Tannenbaum et al., 2010; Kyndt & Baert, 2013; Wolfson et al., 2018; Cerasoli et al., 2018). A general willingness to learn is a prerequisite for IWL (Watkins & Marsick, 1992; Kyndt & Baert, 2013). Therefore, it is characterized as self-directed, self-initiated, intrinsically motivated, and autonomous learning

(Watkins & Marsick, 1992; Noe et al., 2010; Kyndt & Baert, 2013; Cerasoli et al., 2018).

Several approaches operationalize IWL (e.g., Noe et al., 2013; Nikolova et al., 2014; Wolfson et al., 2018). The octagon model of IWL by Decius et al. (2019) based on the dynamic model of informal learning by Tannenbaum et al. (2010) properly describes IWL by reflecting on eight IWL components. Tannenbaum et al. (2010)already discussed four components: experience/action, feedback, reflection, and intent to learn. Decius et al. (2019) distinguished each component into two subcomponents as explained in the following.

Experience/action refers to all work-related activities through which new experiences arise (Tannenbaum et al., 2010). It is divided into *trying and applying own ideas* and *model learning* (Decius et al., 2019). The former addresses the degree of learning through own actions, experimentation, and reflection. Model learning means interacting with others to learn from them, e.g., through observations and imitations (Bandura, 1986, 1990;



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Marsick & Volpe, 1999; Lohman, 2006; Noe et al., 2013; Kozlowski, 2008; Frese & Keith, 2015). An error-friendly mindset Nikolova et al., 2014).

Feedback is the recognition of a work-related activity by colleagues, supervisors, or others (Boud & Middleton, 2003; Decius et al., 2019). Communicating with others and actively striving for feedback is indispensable to engaging in IWL (Lohman, 2006; Nikolova et al., 2014; Decius et al., 2019). There is a distinction between direct feedback and vicarious feedback (Decius et al., 2019). Direct feedback straightly refers to the employee's performance. Vicarious feedback relates to the previous experiences of others serving as indirect feedback Hypothesis 2 (H2): An EMC promotes the employees' work (Tannenbaum et al., 2010).

Reflection as another IWL component means thinking about own actions and experiences as well as evaluating them (Marsick & Volpe, 1999; Lohman, 2006; Tannenbaum et al., 2010; Nikolova et al., 2014). Reflection takes place before, during, and after a task (Schön, 1991). The subcomponents anticipatory *reflection* and *subsequent reflection* assess the thoughts about an upcoming task (e.g., obstacles) as well as about a finished task. Reflection during a task is already covered with the component of experience/action (Decius et al., 2019).

The intent to learn refers to the motivation to enhance the own performance by gaining new KSAOs (Tannenbaum et al., 2010). According to SDT by Deci and Ryan (1985), extrinsic and intrinsic motivation exist which are operationalized in chapter 2.3. Extrinsic motivation is used synonymously with extrinsic intent to learn, as are intrinsic motivation and intrinsic intent to learn. In general, both have a positive impact on performance and often complement each other (Cerasoli et al., 2014). However, it is necessary to differentiate between extrinsic and intrinsic intents. As an example, an employee can be highly interested in personal growth but does not want to promote while another employee is interested in both (Decius et al., 2019).

### 2.5 Derivation of Hypotheses

This study aims at confirming existing research on the relationship between EMC and performance as well as building on it. Many authors agree that dealing constructively with errors influences organizational outcomes (Edmondson, 1996; van Dyck et al., 2005). Some referred to lower turnover intentions (Guchait et al., 2016), improved innovativeness (S. Fischer et al., 2018), to leader career success (Maurer et al., 2017), or to organizational citizenship behavior (Chen et al., 2020). These constructs are related to performance (Maurer et al., 2017). In addition, a variety of studies found performance improvements through an EMC no matter if in routine or new situations (Edmondson, 1996; van Dyck et al., 2005; Loh et al., 2013; Frese & Keith, 2015; Dimitrova et al., 2017). Consequently, the following hypothesis arises:

Hypothesis 1 (H1): An EMC has a positive effect on performance.

Van Dyck et al. (2005) assumed that the relationship between EMC and performance is mediated by constructs promoting positive error consequences. This study investigates the mediator's work motivation and IWL. First, an EMC is assumed to positively influence work motivation (Bell & https://ijbassnet.com/

promotes work motivation (Frese & Keith, 2015). Errors impair actions. As humans tend to strive for task completion, they are more engaged to act when errors occur (Homsma et al., 2009; Shepherd et al., 2011; Frese & Keith, 2015). Other authors indicated a positive impact of work motivation on performance (Steers et al., 2004; Bell & Kozlowski, 2008; Tremblay et al., 2009). Work motivation was described as a requirement for performance (Pinder, 2008). Consequently, work motivation is hypothesized to mediate the relationship between EMC and performance.

motivation which leads to an increase in performance.

Among the types of motivation within the SDT by Deci and Ryan (1985), intrinsic motivation as autonomous motivation is assumed to be a concrete mediator. On the one hand, employees working autonomously tend to make more errors because they do not follow strict guidelines (Bell & Kozlowski, 2008; Frese & Keith, 2015). On the other hand, they feel responsible for their actions and are concerned with their work outcomes (Bell & Kozlowski, 2008; Oldham & Hackmann, 2010; Frese & Keith, 2015). An EMC helps to reflect and question actions openly (Zapf et al., 1999). Consequently, an EMC is assumed to support employees in knowing their work outcomes and to give them opportunities to learn. According to Oldham and Hackmann (2010), this is personally relevant to intrinsically motivated employees. Therefore, an EMC is supposed to foster intrinsic motivation to perform. In turn, intrinsic motivation is associated with greater work outcomes (Oldham & Hackmann, 2010). Consequently, an increase in performance is expected. In summary, intrinsic motivation is assumed to mediate the relationship between EMC and performance. Since the same applies to the intrinsic intent to learn, the hypothesis is formulated along with the other IWL components in the next sections.

EMC is assumed to positively relate to IWL (Frese, 1995; van Dyck et al., 2005; Frese & Keith, 2015). Conducting errors is necessary to enable IWL (Edmondson, 1996; Tannenbaum et al., 2010; Shepherd et al., 2011; Marquardt, 2019). Since error prevention strategies impede learning, many authors advocate organizational cultures promoting constructive error management to improve IWL (Edmondson, 1996; van Dyck et al., 2005; Homsma et al., 2009; Noe et al., 2010; Loh et al., 2013). Thus, making errors is a natural way to learn (Noe et al., 2010). Therefore, an EMC supports the IWL process (van Dyck et al., 2005; Homsma et al., 2009). Further, IWL enhances KSAOs which makes work more comfortable (March 1991). As a result, performance increases which implies that IWL improves performance (March 1991; Sonnentag & Frese, 2002; Wolfson et al., 2019). Altogether, these aspects indicate that IWL mediates the relationship between EMC and performance. Hence, the following hypothesis arises:

Hypothesis 3 (H3): An EMC promotes the employees' IWL which leads to an in- crease in performance.



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Out of the eight IWL components of the octagon model by Decius et al. (2019), three IWL components stand out. Some authors argued that an EMC fosters exploration, trial, and initiative (van Dyck et al., 2005; Frese & Keith, 2015; S. Fischer et al., 2018). The more important the error is, the more likely an employee will generate new ideas for improvement (Homsma et al., 2009). This relates to the trial and application of own ideas (Decius et al., 2019). Consequently, it is hypothesized that especially trying and applying own ideas serves as a mediator, as described in the following hypothesis:

Hypothesis 3a (H3a): An EMC fosters trying and applying own ideas which lead to an increase in performance.

Moreover, an EMC enhances IWL, especially through open error communication (van Dyck et al., 2005; Homsma et al., 2009). It ensures the detection of errors quickly and the understanding of them collectively (Frese, 1991, 1995; van Dyck et al., 2005). Understanding how an error arose is also key to subsequent reflection (Marsick & Volpe, 1999; Tannenbaum et al., 2010). Since subsequent reflection refers to looking back on actions, employees will better understand the connection between their actions and the outcome (Marsick & Volpe, 1999). Offering opportunities for interaction and open discussions improves subsequent reflection which leads to an adaptation in the way of thinking (Homsma et al., 2009; Shepherd et al., 2011). In this way, employees are more likely to learn from their errors (Marsick & Volpe, 1999). Consequently, it is assumed that especially subsequent reflection mediates the relationship between EMC and performance, as described in the following hypothesis:

Hypothesis 3b (H3b): An EMC fosters subsequent reflection components. which leads to an in-crease in performance.

influence of the employees' intent to learn. The IWL component 3 visualizes all hypotheses.

intent to learn directly refers to work motivation (see chapter 2.4). The same reasoning as in the specification of H2 can be used to argue for mediation by the intrinsic intent to learn. The following hypothesis arises:

Hypothesis 3c (H3c): An EMC fosters the employees' intrinsic intent to learn which leads to an increase in performance.

Based on the close connection between work motivation and IWL, the question arises whether they mediate the relationship between EMC and performance together. Frese and Keith (2015) assumed positive effects of EMC on work motivation and learn-ing. However, learning is not only influenced by the social job dimension (like EMC) but also by the motivational dimension (Oldham & Hackmann, 2010). Learning is based on the learner's motivation (Noe et al., 2010). Employees need to have task interest, a learn- ing desire, and be willing to engage in learning processes (Bell & Kozlowski, 2008; Noe et al., 2010; Frese & Keith, 2015). Thus, motivated employees engage more in IWL be-cause they can learn entirely at their own pace and use methods that suit them and that are adapted to their own developmental needs (Noe et al., 2010). This leads to better acquisition of KSAOs and successful task completion (Noe et al., 2010; Frese & Keith, 2015). Hence, IWL is positively related to performance (Bell & Kozlowski, 2008; Frese & Keith, 2015). The fourth and final hypothesis arises assuming a serial mediation:

Hypothesis 4 (H4): An EMC promotes the employees' work motivation which in turn enhances IWL, leading to an increase in performance.

All types of motivation are assessed with all IWL specific in-fluence Still, а of intrinsic motivation/intent to learn, try and apply own ideas, and Further, Noe et al. (2010) argued for a particular subsequent reflection is assumed, as previously described. Figure



H = Hypothesis. + means a positive relationship.

### 3. Methods

#### 3.1 Participants

In total, 284 participants started to fill out the online survey. 194 people completed the survey, leading to a response rate of 68.31%. As the declaration of consent for the use of personal data and current employment was a prerequisite to participate in the survey, eight people were sorted out. This led to data from 186 people that could be used for further analysis.

On average, the participants were 31 years old (M =31.14, SD = 11.93). The gender of sample comprised 55.9% https://ijbassnet.com/

female, 43% male, and 1.1% diverse participants. More than half of the participants were employees, followed by working students at 21%, and managers at 11.3%. The average tenure of the participants was six years (M = 6.39, SD = 9.29). The study reached a variety of industries, in particular, about 20 different industries. Most of the participants worked in finance, insurance, and real estate (13.4%). But also, technology telecommunications (10.2%), pharmaceuticals and health (8.6%), public service (8.6%), services and craft (7%), and commerce and consumption (7%) were represented the most. In general, the

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participants' companies were all based in Germany with 54.3% of an average company size of 144,900 employees (M =them operating nationally and 45.7% operating internationally. On 144,889.24, SD = 401,177.61, N = 85). Table 1 embeds more average, 10,400 employees were working in Germany (M = detailed demographic data. 10,397.19, SD = 31,055.79). Worldwide, the organizations had

**T** 1 1 1

Demograph	ic charac	Die I	s of the sample		
Characteristics	n n	<u>%</u>	Characteristics	n	%
Industry			Gender		
Agriculture	3	1.6	Female	104	55.9
Automotive	9	4.8	Male	80	43.0
Chemistry & RM	4	2.2	Diverse	2	1.1
Services & craft	13	7.0	Position		
Energy & environment	8	4.3	Manager	21	11.3
Finance, insurance & RE	25	13.4	Employee	96	51.6
R&D	7	3.8	Temporary employee	6	3.2
Consulting	9	4.8	Intern	9	4.8
Society, education & SA	6	3.2	Working student	39	21.0
Commerce & consumption	13	7.0	Apprentice	12	6.5
Internet & media	5	2.7	Other	3	1.6
Culture, entertainment & event	2	1.1	Internationality of company	ıy	
Pharmaceuticals & health	16	8.6	Yes	85	45.7
Law & taxes	2	1.1	No	101	54.3
T&T	19	10.2			
Tourism & gastronomy	8	4.3			
Traffic, transport & logistics	7	3.8			
Advertising & Marketing	2	1.1			
Public Service	16	8.6			
Other	12	6.5			

*Note.* N = 186; RM=Raw materials; RE=Real estate; R&D = Research & development;

SA = Social affairs; T&T = Technology & telecommunications.

### **3.2 Measures**

### 3.2.1 Structure

The entire online survey was in German and comprised ten pages. After an introduction to the questionnaire, information about data collection and a declaration of consent for the use of personal data followed. Only participants who accepted the declaration of consent could proceed with the questionnaire. The same applied to the next question about employment status. Since the questionnaire referred to the work context, participants must be currently employed. The four main constructs followed: First, the EMC of a company was evaluated by the EMC scale (EMCS) by van Dyck et al. (2005). Second, performance on the feedback. On the last page, participants were informed about this https://ijbassnet.com/

individual and organizational level was assessed by the selfcreated individual and organizational performance scale (IOPS). Third, the multidimensional work motivation scale (MWMS; Gagné et al., 2014) measured the type of motivation of the employees. Fourth, the individual learning process was assessed by the IWL scale (IWLS) by Decius et al. (2019). In the end, the control variables were highlighted. Personality was measured by the big five inventory (BFI-10; Rammstedt et al., 2014). Demographic data such as age, gender, position, company size, and industry were collected. As a final step, there was the opportunity for participants to provide further comments and

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study's purpose and got contact details to request the results. There were no benefits to completing the questionnaire. *3.2.2 Error Management Culture Scale* 

The 17-item EMCS created by van Dyck et al. (2005) is a reliable and frequently used questionnaire to evaluate how errors are managed on an organizational level. The instrument is based on the error orientation questionnaire by Rybowiak et al. (1999) which measures how individuals cope with errors at work. It had been adapted to assess organizational error management practices and the behavior of employees (van Dyck et al., 2005). The rating scale ranges from 1 (*does not apply at all*) to 5 (*applies completely*). In 2005, van Dyck et al. reached both an excellent alpha coefficient with  $\alpha$  =.92 in the Netherlands and with  $\alpha$  =.93 in Germany. For this study, the EMCS was translated into German. A professional English-speaking person translated the EMCS back into English. Afterward, the new English version was compared with the original English items to identify substantial deviations.

### 3.2.3 Individual and Organizational Performance Scale

In all conscience, there is no appropriate scale to measure performance as needed in this study. In practice, performance relates to actions and outcomes. The contributions of employees need to be relevant to organizational goals. Hence, it is crucial to simultaneously assess the behavioral individual performance and outcomes in form of organizational performance (Motowidlo et al., 1997; Sonnentag & Frese, 2002). This means the scale should question the performance construct itself and corporate figures (Richard et al., 2009). Since the entire questionnaire relies on self-assessment, a subjective measure is required.

Within the self-created 15-item IOPS, participants assessed statements on them in-dividual and organizational performance on a rating scale ranging from 1 (does not apply at all) to 5 (applies completely). The first ten items relate to individual performance and are derived and adjusted from three earlier scales: the performance measure by Williams and Anderson (1991), the individual work performance questionnaire by Koopmans et al. (2013, 2014), and the high-performance team survey by J. A. Fischer et al. (2020). Items 11 to 15 emphasize organizational performance. On the one hand, items are based on the firm performance measure by van Dyck et al. (2005). On the other hand, they refer to the organizational performance scale by Green and Inman (2005) derived from the financial performance measure by Claycomb et al. (1999). Items include comparisons with past figures and the industry (Richard et al., 2009). Besides, several rules of item formulation were considered (Thomas, 2004; Iarossi, 2006; Porst, 2014). Items are brief and contain only the most relevant information. There are neither underlying stereotypes, biases nor leading questions. Items are kept simple and specific so that all participants with different backgrounds understand their content. They contain familiar and no foreign words. Neither double negations, acronyms nor abbreviations are used to avoid confusion. Further, the scale contains positively and negatively worded items. Items 5 and 9

are negatively keyed to detect participants not answering the questions carefully (Thomas, 2004; Iarossi, 2006; Porst, 2014). Through a pretest with 17 participants from different industries, adjustments concerning grammar, spelling, and wording were integrated. Since it was difficult for some participants to score items 11 to 15, the possibility to select "no answer possible" was added. The pretest re-vealed a good alpha coefficient of  $\alpha = .84$ . Concerning the item-total correlation, there was no critical item below .2 that needed to be eliminated (Kline, 2015).

3.2.4 Multidimensional Work Motivation Scale

According to Howard et al. (2020), scales measuring work motivation need to rely on the subscale approach. This enables us to assess the multidimensional construct, leading to a better understanding of work motivation and its facets (Howard et al., 2020). The MWMS by Gagné et al. (2014) assesses the different types of motivation of the SDT by Deci and Ryan (1985). Other scales include fewer subtypes or face reliability problems, such as the motivation at work scale by Gagné et al. (2010) or the work extrinsic and intrinsic motivation scale by Tremblay et al. (2009). The MWMS asks to evaluate 19 items concerning the following question: "Why do you or would you put efforts into your current job?" Items are categorized into five subscales. Motivation is measured by the first three items. External regulation is assessed by items 4 to 9. Introjected regulation follows with items 10 to 13 and identified regulation with items 14 to 16. Lastly, intrinsic motivation is measured by items 17 to 19. The rating scale consists of seven steps: 1 (not at all), 2 (very little), 3 (a little), 4 (moderately), 5 (strongly), 6 (very strongly), and 7 (completely). In 2014, Gagné et al. reached satisfactory to excellent internal consistencies with the English MWMS ranging from  $\alpha = .70$  to  $\alpha = .90$ . The internal consistency of the

German MWMS was comparable. However, the alpha coefficients of identified regulation ( $\alpha = .65$ ) and introjected regulation ( $\alpha = .55$ ) were questionable to even worse. There- fore and because of the lacking access to the German items, the MWMS was translated into German by using again the translation/back-translation procedure.

#### 3.2.5 Informal Workplace Learning Scale

The IWLS by Decius et al. (2019) comprises 24 items assessing eight IWL components. Other scales have fewer subscales resulting in an incomplete measurement of IWL (e.g., Nikolova et al., 2014; Wolfson et al., 2018). Although the IWLS by Decius et al. (2019) targeted blue-collar workers, general items were selected to support transferability to white-collar areas. As a consequence, the current study used this scale to measure the IWL process on a 4-point scale with 1 (*totally disagree*), 2 (*rather disagree*), 3 (*rather agree*), and 4 (*totally agree*). The items were originally German, i.e., no adjustments were needed. The scale-covered the eight IWL components by Decius et al. (2019) achieved for all subscales in both studies satisfactory to excellent internal consistencies with alphas ranging from  $\alpha =$ 



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first study to the second one (Decius et al., 2019). 3.2.6 Control Variables

To control for other influences, personality traits, age, organizational tenure, and company size were used as control variables. First, individual personality differences were assumed to affect the four main constructs (Gagné & Deci, 2005; Bell & Kozlowski, 2008; Gagné et al., 2010; Loh et al., 2013; Noe et al., 2013; Frese & Keith, 2015). The personality traits extraversion, agreeableness, conscientiousness, emotional stability, and openness were measured with the BFI-10 (Rammstedt et al., 2014). The rating scale ranged from 1 (strongly disagree) to 5 (strongly agree). Extraversion refers to the preference to interact in social situations (Costa & McCrae, 1992; McCrae & Costa, 1999). It was assessed with items 1 and 6 (Rammstedt et al., 2014). Employees reacting friendly to conflicts and tending to comply with others show a high level of agreeableness which was rated with items 2 and 7. Conscientiousness, assessed with items 3 and 8, means a strong willingness to achieve own goals (Costa & McCrae, 1992; McCrae & Costa, 1999; Rammstedt et al., 2014). Emotional stability (contrary to neuroticism) is characterized by calm and self-satisfied behavior (Costa & McCrae, 1992). It was assessed with items 4 and 9 (Rammstedt et al., 2014). Last, openness, assessed with items 5 and 10, refers to the need to experience new things and a diversity of interests (McCrae & Costa, 1999; Rammstedt et al., 2014).

Past research also found the effects of the other control variables. In other studies, age and organizational tenure affected motivation and learning (Colquitt & LePine, 2000; Ng & Feldman, 2012). The company size was a frequently used control variable, too (van Dyck et al., 2005; Kyndt & Baert, 2013; S. Fischer et al., 2018). For this, the current study assessed the number of employees in Germany as well as worldwide. Supporting other researchers (e.g., van Dyck et al., 2005; S. Fischer et al., 2018; Cerasoli et al., 2018), this study used gender, position, and industry as demographics to describe the sample.

### **3.3 Procedure**

As a quantitative research project, this study collects and analyzes data using a standardized questionnaire to identify a statistical relationship between the described constructs (Raithel, 2008; Häder, 2019; Reinecke, 2014). Since quantitative research works with large samples, these relationships are intended to be representative of the population (Baur & Blasius, 2014). Before conducting the survey, a pretest was carried out to reduce method errors (Campanelli, 2008; Reinecke, 2014). Two exemplary employees read the questionnaire and gave feedback on comprehensibility and wording. This kind of informal review has proven its effectiveness (Campanelli, 2008). As a result, adjustments in formulations, spelling, and grammar were done. The survey itself was conducted online. Even though some participants could be excluded because they do not have access to the Internet, barriers of time and space were overcome. In this way, a broader group of participants was addressed, and the results were more in line with the population. In addition, errors caused by manual data entry were prevented, as the data transfer https://ijbassnet.com/

.76 to  $\alpha = .92$ . The alpha coefficients tended to increase from the takes place automatically in an online survey (Wagner & Hering, 2014). In this case, the questionnaire was embedded in the tool SociSurvey. The platform provided a link with which the participants could take part in the survey. The link was distributed through various media channels like LinkedIn, Xing, Facebook, and Instagram. Besides, colleagues, family, friends, and fellow students received the questionnaire and shared it. Further, Prof. Dr. Nicki Marquardt spread the link within the Rhine-Waal university. The whole data collection period lasted 63 days, from July 20 to September 20, 2021. Afterward, data was prepared and analyzed as described in the following section.

### 3.4 Data Analysis

Data analysis was conducted with the program IBM SPSS Statistics (SPSS). For the mediation analyses, the PROCESS macro was used (Hayes, 2018). As explained in chapter 3.3, the data of 284 participants were automatically transferred into SPSS. 90 participants were excluded because they did not complete the survey. Replacing missing values did not make sense, since the main constructs were not always answered completely. To avoid confounding the data, these cases were eliminated. The next step was to recode the negatively poled items and to summarize the items to the corresponding (sub-)scales. Then, the internal consistencies for the (sub-)scales of the four constructs were calculated. Since each subscale of the BFI-10 only had two items, the calculation of alpha coefficients was not useful (Eisinga et al., 2013). For the first validation of the self-created IOPS, an exploratory factor analysis (EFA) was conducted. Further, the descriptive statistics for the constructs and control variables were calculated. The results of the control variables were used to describe the sample. Afterward, it was tested whether the data were normally distributed. For this, the Shapiro-Wilk test and a graphical test with a histogram were used (Shapiro & Wilk, 1965). As normal distribution was only found for the EMCS, all variables were z-standardized (M =0; SD = 1) to make data more comparable (Kelava & Moosbrugger, 2020b; Goldhammer & Hartig, 2020). In addition, two-sided correlations according to Pearson were calculated for the main constructs and the interval-scaled control variables. Based on this, (multiple) linear regressions were calculated. In the last step, mediation analyses were conducted with the PROCESS macro (Hayes, 2018).

### 4. Results

#### 4.1 Reliability of Measures

In this study, the German EMCS reached a good internal consistency of  $\alpha = .88$ . However, it is a slightly lower alpha compared to the study by van Dyck et al. (2005). Concerning the self-created IOPS, a good alpha coefficient of  $\alpha = .80$  similar to the pretest was reported. The item-total correlation of item 9 was near zero and negative, i.e., it needs to be reconsidered, adjusted, or maybe deleted (Kline, 2015; Kelava & Moosbrugger, 2020a). Deleting item 9 may lead to a greater alpha of  $\alpha = .82$ . Since the scale is self-created, it is not validated yet. For the conducted EFA, items 3 and 9 could not be used because the measure of sampling adequacy was below .5 (Cleff, 2019).



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coefficients ranging from  $\alpha = .80$  to  $\alpha = .93$ . The internal consistencies increased compared to the study by Gagné et al. (2014). Although introjected regulation showed a satisfactory alpha coefficient of  $\alpha = .79$ , it was considerably better than in the previous German MWMS (Gagné et al., 2014). Within the IWLS, six out of eight IWL components revealed satisfactory to good alpha coefficients ( $\alpha = .71$  to  $\alpha = .87$ ) similar to the study by Decius et al. (2019), although they achieved some excellent alpha coefficients in their second study. Model learning ( $\alpha = .66$ ) and anticipatory reflection ( $\alpha = .67$ ) showed questionable reliability values, i.e., they need to be interpreted with caution.

### **4.2** Descriptive Statistics

The EMCS and IOPS were rated similarly high. This indicates that the companies of the sample generally possess an EMC (M = 3.78, SD = 0.55). In addition, participants rated both their performance and that of the company as high (M =4.02, SD = 0.46). Concerning the types of motivation, identified regulation received the highest score (M = 5.32, SD = 1.21), followed by intrinsic motivation (M = 5.17, SD = 1.34), introjected regulation (M = 4.28, SD = 1.31), and external regulation (M =3.28, SD = 1.24). The sample did not evaluate themselves as motivated (M = 1.69, SD = 0.94). Further, all IWL components achieved rather high values. The sample mostly had an intrinsic intent to learn (M = 3.38, SD = 0.55). They also learned a lot through vicarious feedback (M = 3.28, SD = 0.62). Model learning was another much-used IWL source (M = 3.06, SD =participants informally learned through 0.54). Besides, reflection (M = 3.04, SD = 0.55),subsequent anticipatory reflection (M = 2.99, SD = 0.59), as well as trying and applying their ideas (M = 2.96, SD = 0.38). In comparison, the extrinsic intent to learn (M = 2.56, SD = 0.72) and learning through direct feedback (M = 2.32, SD = 0.82) were not as well exposed. Looking at the BFI-10 as control variables, participants were rather conscientious (M = 3.99, SD = 0.74), extraverted (M =3.66, SD = 0.97), agreeable (M = 3.43, SD = 0.70), open (M =3.32, SD = 1.00), and emotionally stable (M = 3.30, SD = 0.92).

### 4.3 Correlations

EMC and performance were significantly and positively associated with each other (r = .425, p < .001). EMC and motivation identified regulation, and intrinsic motivation revealed significant correlations. The former showed a negative relationship with EMC (r = -.345, p < .001). EMC positively correlated with identified regulation (r = .282, p < .001) and

Hence, both items need to be reconsidered. Concerning intrinsic motivation (r = .353, p < .001). Looking at EMC and the MWMS, this study reached well to excellent alpha IWL, six out of eight IWL components were significantly and positively associated with EMC: model learning (r = .289, p < .289.001), direct feedback (r = .167, p = .023), vicarious feedback (r =.263, p < .001), anticipatory reflection (r = .313, p < .001), subsequent reflection (r = .393, p < .001), and intrinsic intent to (r = .302, p < .001). Among the control learn variables. conscientiousness (r = .210, p = .004), agreeableness (r = .241, p = .001), the German company size (r = .153, p = .037), as well as the international company size (r = .297, p = .006), significantly and positively correlated with EMC.

> Looking at performance and work motivation, motivation (r = -.342, p < .001) and external regulation (r = -(.153, p = .037) significantly and negatively correlated with performance. Identified regulation (r = .467, p < .001) and intrinsic motivation (r = .466, p < .001) revealed a significant positive relationship with performance. Except for direct feedback, all IWL components were significantly and positively associated with the performance: Among them, trying and applying own ideas (r = .422, p < .001), subsequent reflection (r = .348, p < .001), and intrinsic intent to learn (r = .328, p < .001).001) showed the highest correlations. As control variables, conscientiousness (r = .374, p < .001), emo-tional stability (r =.249, p = .001), and the international company size (r = .284, p =.008) revealed significant positive correlations.

### 4.4 Regressions

To test H1, two linear regression analyses with performance as the dependent variable were conducted (see table 2). In the first step, a linear regression analysis was executed with EMC as the independent variable. Then, the analysis was extended to include the control variables where multicollinearity was ruled out. The two analyses were significant with increasing effect sizes. While the first one revealed a medium effect size with the explanation of 18% of the variance, the other one showed a high goodness of fit explain- ing more than 35% of the variance (Cohen, 1977). The first linear regression analysis revealed a significant positive main effect of EMC on performance, i.e., participants who experience an EMC at work rated performance higher (b = .425, p < .001). This effect remained when adding all control variables (b = .390, p < .001). Further, a significant positive influence of conscientiousness, emotional stability, and age on performance was found. Agreeableness and organizational tenure were negatively related to performance.

Table 2
Regression analyses
Individual and organizational performance

	Step 1			Step 2 (adding control variables)							
	b	S.E.	beta	t	р	b	S.E.	beta	t	р	VIF
Intercept	.000	.067		.000	1.000	.000	.060		.000	1.000	
EMC	.425	.067	.425	6.363	.000	.390	.064	.390	6.052	.000	1.146



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.046	.062	.046	.743	.459	1.055
.281	.064	.281	4.417	.000	1.115
.029	.063	.029	.459	.647	1.107
.175	.063	.175	2.758	.006	1.107
127	.063	127	-2.002	.047	1.113
.228	.100	.228	2.272	.024	2.778
305	.099	305	-3.076	.002	2.713
 077	.062	077	-1.248	.214	1.060
	.046 .281 .029 .175 127 .228 305 077	.046 .062 .281 .064 .029 .063 .175 .063 127 .063 .228 .100 305 .099 077 .062	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

*Note*. EMC = Error management culture; Conscient = Conscientiousness; ES = Emotional stability;

Agree = Agreeableness; OT = Organizational tenure;

CS = Company size. b equals beta because variables were z-standardized.

### 4.5 Mediations

Mediation analyses with EMC as independent and performance as the dependent variable, as well as with all control variables, were conducted using models 4 and 6 of the PROCESS macro (Hayes, 2018). According to Holmbeck (1997) and Baron and Kenny (1986), four conditions prove mediation: EMC significantly influences performance and the respective mediator. In turn, the respective mediator significantly impacts performance. To prove complete mediation, the effect of EMC on performance declines when including the respective mediator (Baron & Kenny, 1986; Holmbeck, 1997).

To test H2 and H3, simple mediation analyses were performed (model 4) to examine whether work motivation or IWL mediate the relationship between EMC and performance. The significance of their relationship was again proven (b =.390, p < .001). When entering each of the five types of work motivation (H2), the mediators identified regulation and intrinsic motivation reached significance. As illustrated in figure 4, EMC predicted identified regulation significantly and positively (b =.268, p < .001) which was significantly and positively associated with performance (b = .277, p < .001). Also, the indirect effect of indicating a mediation (95%-CI[.006, .094]). The relationship identified regulation was significant (95%-CI[.026, .144]), between EMC and performance remained significant (b =indicating a mediation. However, the relationship between EMC 349, p < .001), i.e., a partial mediation by intrinsic intent to learn and performance remained significant (b = 316, p < .001). was found. Consequently, a partial mediation by identified regulation was

found. Moreover, EMC predicted intrinsic motivation significantly and positively (b = .340, p < .001) which significantly improved performance (b = .271, p < .001). Again, the indirect effect of intrinsic motivation was significant indicating a mediation (95%-CI[.038,.160]). As the relationship between EMC and performance remained significant (b = 298, p < .001), a partial mediation by intrinsic motivation was found.

When including each IWL component into the mediation (H3), subsequent reflection and intrinsic intent to learn showed significant effects. As illustrated in figure 5, EMC significantly fostered subsequent reflection (b = .349, p < .001) which was significantly and positively associated with performance (b =.159, p = .018). Also, the indirect effect of subsequent reflection was significant (95%-CI[.009,.113]) which indicated a mediation. However, the relationship between EMC and performance remained significant (b = 334, p < .001). This proved a partial mediation by subsequent reflection. Moreover, EMC predicted intrinsic intent to learn significantly and positively (b = .247, p < .001) which significantly enhanced performance (b = .165, p = .012). Again, the indirect effect of intrinsic intent to learn was significant



Figure 4



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identified. As displayed in figure 6, EMC significantly in- creased identified regulation (b = .268, p < .001) which significantly promoted trying and applying own ideas (b = .222, p = .002). In associated with performance (b = .185, p = .003). Taken together, ideas was found.

To test H4, serial mediation analyses were conducted the indirect effect reached significance (95%-CI[.003, .026]). with the types of motivation as the first mediator and the IWL However, the direct effect again staved significant (b = .333, p < .100components as the second. Three partial serial media-tions were .001). Hence, identified regulation and the extrinsic intent to learn partially mediated the relationship between EMC and performance.

Looking at figure 7, EMC also significantly and turn, this was significantly and positively re-lated to performance positively influenced intrinsic motivation (b = .313, p < .001). In (b = .223, p = .001). The indirect effect of this interplay was also turn, a higher intrinsic motivation significantly promoted trying significant (95%-CI[.002, .032]). As the relationship between and applying own ideas (b = .238, p = .001) which were EMC and performance remained significant (b = .313, p < .001), significantly and positively related to performance (b = .223, p =a partial mediation by identified regulation and trying and .001). The indirect effect of this interplay was also significant applying own ideas was found. Further, a higher identified (95%-CI[.002, .032]). As the relationship between EMC and regulation also enhanced the extrinsic intent to learn (b = performance remained significant (b = .300, p < .001), a partial .245, p = .002) which was again significantly and positively mediation by intrinsic motivation and trying and applying own

> Figure 6 Path model results of serial mediation with identified regulation



Note. N = 186; EMC = Error management culture; All reported coefficients are standard-ized and significant; dotted lines indicate insignificant relationships. p < .05. p < .01. p < .001.

### 5. Discussion

The study's purpose was to determine the impact of work motivation and IWL on the relationship between EMC and performance. As a basis, EMC was proven to be positively associated with performance, supporting H1. In companies that support positive and constructive error management employees perform better. This confirms earlier studies that already found a connection between EMC and performance (e.g., Edmondson, 1996; van Dyck et al., 2005; Frese & Keith, 2015). The employees' personality traits are also associated with performance. In particular, conscientious and emotionally stable employees

perform better whereas agreeable individuals perform worse. This indicates that employees need to strive for their own goals while operating rather rationally, arguing their own opinions, and engaging in constructive discussions (Costa & McCrae, 1992; McCrae & Costa, 1999). Besides, this study implies that older employees as well as those who recently joined a company perform better. Ng and Feldman (2012) also found these opposite effects. Hence, organizations need to maintain the willingness to perform in the long term. For this, it is important to understand that organizational practices may be ideal for some but not for



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others (Loh et al., 2013). According to Loh et al. (2013), companies need to consider the individuality of their employees.

To further understand the relationship between EMC and performance, work motivation and IWL were examined in more detail. Looking at work motivation, two types of motivation influence the relationship between EMC and performance. As expected, in-trinsic motivation is one influencing factor explaining how an EMC leads to increased performance. An EMC enables employees to question their actions (Zapf et al., 1999). Besides, within an EMC, accountabilities need to be defined (Marquardt, 2019). This leads to feeling more responsible for own actions and errors (Bell & Kozlowski, 2008; Frese & Keith, 2015). Both aspects are relevant to intrinsically motivated employees (Oldham & Hackmann, 2010; Frese & Keith, 2015). Consequently, intrinsic motivation is fostered within an EMC which was also proven in this study. In line with Oldham and Hackmann (2010), this study showed that intrinsically motivated employees perform better. This proved the fact that intrinsically motivated employees are concerned with their work outcomes (Oldham & Hackmann, 2010).

In addition, identified regulation as one of the most selfregulated types of extrinsic motivation was proven to impact the relationship between EMC and performance. In this case, an employee is externally regulated but also evaluates the activity as personally relevant (Ryan & Deci, 2000a, 2000b). As the task is accepted and internalized, the employee starts engaging in it voluntarily which is described as autonomous motivation. Therefore, identified regulation is comparable to intrinsic motivation, since both belong to autonomous motivation (Ryan & Deci, 2017). Consequently, this study indicates that autonomous motivation influences the relationship between EMC and performance. However, controlled motivation does not influence this interplay. As a result, H2 was partially confirmed. Only certain types of motivation, in particular, autonomous motivation, explain part of the relationship between EMC and performance.

Moreover, two IWL components influence the relationship between EMC and performance. As expected, subsequent reflection is one of them. Results indicate that an EMC enables employees to rethink their actions which in turn leads to learning. This supports existing research focusing on the relevance of errors to learning (e.g., Edmondson, 1996; Tannenbaum et al., 2010; Noe et al., 2010). In line with van Dyck et al. (2005), an EMC was proven to promote the IWL process, in particular, by reflecting on own actions and the connection to outcomes and errors (Marsick & Volpe, 1999). Besides, subsequent reflection improves performance. This confirms that employees thereby adapt their way of thinking to learn and perform better (Marsick & Volpe, 1999; Shepherd et al., 2011). As this impact only partly explains the relationship between EMC and performance, H3b was partially confirmed.

The second IWL component influencing the relationship between EMC and performance is the intrinsic intent to learn. This aligns with prior results of this study concerning intrinsic

motivation (see H2). Feeling responsible for own actions and questioning them through an EMC improves performance (Oldham & Hackmann, 2010; Frese & Keith, 2015). Again, H3c was partially confirmed. Contrary to the expectation, trying and applying my ideas were not proven to influence the relationship between EMC and performance. Exploration, trial, and initiative seem not to be important to foster performance through an EMC. Consequently, H3a could not be accepted.

However, looking at the further results, trying and applying own ideas gains in importance. An EMC itself does not lead to an increased likelihood of trying and applying own ideas. According to Oldham and Hackmann (2010), learning is influenced by a motivational dimension. This study indicates that this is the case for the trial and application of own ideas which are not grounded in an EMC but in intrinsic motivation and identified regulation. As already shown, an EMC enhances autonomous motivation, in particular, intrinsic motivation and identified regulation. Ryan and Deci (2000b) related exploring, extending KSAOs, and exercising ideas to intrinsic motivation. Besides, they described intrinsic motivation as a basis for learning (Ryan & Deci, 2000b). Other authors also claimed the relevance of task interest, personal learning desire, and willingness to learn (Bell & Kozlowski, 2008; Noe et al., 2010; Frese & Keith, 2015). These aspects refer to intrinsic motivation. Hence, past research assumptions align with the current results stat- ing that an EMC fosters intrinsic motivation which in turn increases the likelihood of trying and applying own ideas, leading to improved performance. This explains why many researchers call IWL intrinsically motivated and autonomous learning (Watkins & Marsick, 1992; Noe et al., 2010; Kyndt & Baert, 2013; Cerasoli et al., 2018).

The same influence was found for identified regulation as another form of autonomous motivation. However, identified regulation is still a form of extrinsic motivation. On the one hand, the instrumental value of an activity is still important. On the other hand, the task gains in personal value (Ryan & Deci, 2000a, 2000b). Therefore, it is mostly aggregated to autonomous motivation (Gagné et al., 2010, 2014). Nevertheless, externally regulated motivation is still present. This was also proven in the results. An EMC enhances identified regulation which in turn does not only increase the likelihood of trying and applying own ideas but also fosters the extrinsic intent to learn. Both factors lead to performance improvements. Consequently, receiving instrumental positive outcomes, such as rewards, or avoiding negative ones is also needed to improve performance through an EMC. This confirms that both intrinsic and extrinsic motivation positively affect performance and complement each other (Cerasoli et al., 2014). H4 was partially confirmed. Autonomous motivation with trying and applying own ideas (and in one case the extrinsic intent to learn) affect the relationship between EMC and performance to-gether. There was no evidence of the effects of the other types of motivation and IWL components.

In summary, this study proved that companies having an EMC show elevated per-formance. This relationship is partly explained by work motivation and IWL. On the one hand, http://dx.doi.org/10.33642/ijbass.v9n2p2



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autonomous motivation is an influencing factor within this interplay. An EMC enables employees to work autonomously motivated. Autonomous motivation enhances the trial and application of own ideas, leading to better performance outcomes, or directly improving performance. On the other hand, IWL through subsequent reflection also showed an impact. An EMC facilitates the reflection on own actions to learn and to perform better.

### 6. Strengths, Limitations, and Future Research

This study dove deeper into the relationship between EMC and performance and extended existing research. It combined several scales from different sources to acquire new insights. The self-created IOPS added further value to the study by providing a reliable self-assessment scale. In addition, this study achieved considerably better internal consistencies within the subscales of the German MWMS than the study of Gagné et al. (2014). Hence, findings showed high goodness of fit, leading to strong explanations of the relationship between EMC and performance (Cohen, 1977). Moreover, the results approximated reality relatively closely. Since a cross-level model was used to analyze the research question, the issue was not simplified. This provided a better representation of the complexity of organizations (Klein et al., 1994). Besides, this study reached a variety of employees working in national and international organizations from 20 different industries. Consequently, results are easier to generalize to derive implications for organizations.

Nevertheless, some limitations need to be acknowledged. First, the survey was answered by individuals who were currently available, i.e., a convenient sample was used which could reduce representativeness (Lohr, 2021). Second, the scales only allowed self-assessment, i.e., they were fully subjective. According to Richard et al. (2009), those kinds of measures are impaired by psychological biases. As an example, individuals tend to evaluate themselves more positively (Taylor & Brown, 1988). In this study, this could mean that participants saw themselves as more motivated or better-performing employees than they are. In the past, there have always been difficulties in assessing performance as well as in identifying significant relationships (March & Sutton, 1997; Richard et al., 2009). Although this study revealed significant results, there is further potential to validate the IOPS. Item-total correlations and EFA already indicated to deletion of items 3 and 9 (Kline, 2015; Cleff, 2019). Moreover, EFA suggested three subscales that focus on contextual performance and goal achievement, financial organizational performance, and de-velopment-related performance. Since the results of the EFA were difficult to interpret, future research should adjust and further validate the IOPS. In this way, subscales will be identified (Martens, 2003). Besides, the impact of the individual on organizational performance needs to be further examined. This study only highlighted individual and organizational performance together but not their exact interplay. Discrepancies between individual and organizational performance are possible.

Similar applied to the EMCS and MWMS translated into German. Although a translation/back-translation approach was used, further validation is required to rule out common method variance. Future research needs to ensure that results represent the actual construct relationship and that they are not erroneous due to the survey method (D. T. Campbell & Fiske, 1959). Another limitation concerning the MWMS is the absence of an integrated regulation subscale. As a result, extrinsic motivation was not fully assessed. However, Gagné et al. (2014) argued that no significant differences between identified regulation and intrinsic motivation could be found. This supports the aggregation of these three types of motivation into autonomous motivation (Gagné et al., 2010, 2014). In future research, the aggregated types of motivation should be tested in the same context. This enables proving the indicated differences between autonomous and controlled motivation.

Moreover, the IWLS showed questionable reliabilities within the subscales model learning and anticipatory reflection. Related results and interpretations need to be treated with caution. The observed lack of influence could only be due to poor reliability. One reason for the lower reliability values may be that the IWLS was developed for blue-collar workers (Decius et al., 2019). Generally, learning scales are context-bound, i.e., generalization to a more diverse audience may not be reliable (Nikolova et al., 2014; Decius et al., 2019). Nevertheless, Decius et al. (2019) formulated items more generally to pro- mote future transfers. The transferability of six out of eight subscales was proven. How- ever, it needs to be further examined for different industries. Frese and Keith (2015) al- ready questioned whether different errors cause different learning processes. Besides, Oldham and Hackmann (2010) suggested a motivational and social job dimension of learning. Consequently, it is assumed that employees learn differently depending on the context (e.g., organization, industry). Future research might examine differences in the IWL process in more detail. In summary, future research is needed to overcome the limitations described as well as expand the understanding of the relationship between EMC and performance and the influences of work motivation and IWL.

### 7. Practical Implications for Organizations

The current study implies that organizations need to establish an EMC to enhance performance. Supporting van Dyck et al. (2005), errors need to be quickly detected, analyzed and communicated followed by effective and coordinated error handling. To ensure those organizational practices, an error-friendly mindset anchored in corporate principles is indispensable (Zapf et al., 1999). The key is to create a collective understanding and acceptance of errors (Edmondson, 1996; S. Fischer et al., 2018). In this way, the error-friendly mindset becomes part of the employees' personalities (Schein, 2010; Schneider & Barbera, 2014). However, error management does not replace error preven-tion but complements it (Frese, 1991; van Dyck et al., 2005). Consequently, the design of an EMC in addition to the traditional error prevention strategy is useful to improve per-



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EMC is explained by the influence of work motivation and IWL. Autonomous motivation, subsequent reflection as well as trial and application of own ideas impact the level of performance improvements. Hence, an ideal EMC aims at fostering these three influencing factors.

To enhance autonomous motivation, independence at work is necessary to enable self-guided and self-organized working modes. Accountabilities need to be defined (Marquardt, 2019). In addition, employees should get more accountability and freedom to work. For this, guidelines and instructions need to be reduced. One approach could be to use flat hierarchies and leaders who delegate to promote the employees' participation (Preußig & Sichart, 2018). Combined with interesting and challenging tasks, autonomous behavior is fostered, leading to performance improvements. Nevertheless, within auton-omous motivation, the instrumental value of a task is still important (Ryan & Deci, 2000a, 2000b). Hence, an organization additionally should provide incentives for its employees. Some ideas will be discussed later.

To reflect subsequently on a task, organizational practices promoting open error communication are indispensable (van Dyck et al., 2005; Homsma et al., 2009). There are several possibilities to foster open discussions, such as discussion groups and forums. Another recommended approach is to establish socalled dailies within teams or departments. Dailies are short meetings to update each other, place current issues, and exchange views briefly (Goll & Hommel, 2015; Preußig & Sichart, 2018). Hence, they support reflection. The same applies to networking events like organized lunch breaks with colleagues from other departments. This encourages cross-departmental thinking and changes in perspective to critically reflect on own actions. Another implication is to de- find an evaluation process of work tasks or projects within a company. One idea is to use reflection sheets or bullet journals to note thoughts on own actions. In addition, organizational members can put up posters with thought-stimulating questions (e.g., "How can I improve the way I achieve my work goal?"). When employees discover these, for example, during a break with colleagues, they may start to share ideas about the topic which encourages reflection.

Besides reflection, the trial and application of own ideas need to be encouraged. Explo- ration is only possible when employees get the time and resources they need to experiment (Weis, 2015; Preußig & Sichart, 2018). There are different ways to foster explora-tion and experimentation. An idea management approach may increase the likelihood of proposing own ideas.

formance (van Dyck et al., 2005). The particular design of an For this, a mailbox can be used to collect ideas that are evaluated by one responsible department. Implementable ideas are pursued and, at best, rewarded if successful. This is an example of a kind of incentive (Weis, 2015). Further, innovation workshops could be offered to develop, prioritize, and concretize ideas. The another approach is to organize innovation events. In many companies (e.g., within the software industry), it is common practice to conduct a so-called hackathon to create a new software component during the event. Other industries may use such an event format to advance ideas or innovation on a particular topic (Kohne & Wehmeier, 2020). However, not only those approaches but also the daily work needs to be adjusted. Another implication is to continuously offer new and challenging tasks to employees. In this way, employees keep embedding their ideas. Moreover, cross-functional and cross-departmental work teams need to be promoted (Weis, 2015). This widens the perspective which in turn may support coming up with new ideas.

#### 8. Conclusion

This study's purpose was to emphasize the influence of work motivation and IWL on the relationship between EMC and performance. Empirical results proved that com-panies having an EMC show increased performance. Work motivation and IWL partially explain this relationship. In particular, autonomous motivation, subsequent reflection as well as trial and application of own ideas are influencing factors. First, autonomous motivation is enhanced by an EMC through more independence at work. For autonomously motivated employees, their actions and respective outcomes are important. Hence, they are continuously striving to improve their performance. Second, subsequent reflection arises through an EMC. The overall aim of an EMC is to question and think about executed tasks. In this way, employees identify errors and perform better the next time. Consequently, reflection is key to learning through an EMC. Third, the trial and application of own ideas influence the relationship between EMC and performance, too. However, an EMC itself does not lead to the trial and application of own ideas. It is autonomous motivation that leads to this. An EMC fosters autonomous motivation which in turn motivates employees to try out and apply their ideas. Hence, autonomous motivation is a prerequisite for IWL along with EMC. To sum up, organizations need to design an EMC while emphasizing autonomous motivation, subsequent reflection as well as trial and application of their ideas. This enables employees to perform better and, at best, improves organizational performance.

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### List of Abbreviations

BFI	Big five inventory
CET	Cognitive evaluation theory
EFA	Exploratory factor analysis
EMC	Error management culture
EMCS	Error management culture scale
FWL	Formal workplace learning
Н	Hypothesis
IOPS	Individual and organizational performance scale
IWL	Informal workplace learning
IWLS	Informal workplace learning scale
KSAOs	Knowledge, skills, abilities and other characteristics
MWMS	Multidimensional work motivation scale
OIT	Organismic integration theory
SDT	Self-determination theory
SPSS	IBM SPSS Statistics