INSTITUTE DIGITAL MANAGEMENT

Title   **Leadership styles and virtual team performance: Guidelines for gamification-based team simulation approaches**

Authors   **Maria Hennicke*, Jonas Schug**, Roland Böttcher****

Abstract   In the age of technologies, managing Digital Business Transformation has become critical for organizational survival and performance. At present, leadership research provides only limited insights into the effectiveness of certain leadership styles in virtual working contexts, has little consensus on its' measurement and little relation to business reality. A solution to alleviate those limitations is using simulation-based approaches, that allow to observe, analyze and manipulate leaders' behaviors in virtual (business) contexts. We develop guidelines on how adaptive simulation tools should be applied to analyzing leadership behaviors to achieve high degree of realism and participants' commitment.

* Institute for Digital Management, Bochum University of Applied Sciences; Frankfurt School of Finance and Management

** Institute for Digital Management, Bochum University of Applied Sciences

Correspondence to: Maria Hennicke, Institute for Digital Management, Bochum University of Applied Sciences, Lise-Meitner Allee 2, 44801 Bochum. Email: maria.hennicke@hs-bochum.de

1. Introduktion

The rapid development of Information and Communication Technologies (ICT) and new organizational concepts during the last decades has changed the business world and the challenges, executives and employees must deal with. To cope with a tougher competition, higher pressures on firm efficiency and a growing geographical distance between employees and stakeholders (partners, suppliers, and consumers), organizational leaders need to be able to effectively lead virtual teams. Leadership research has reacted to the changing environment by developing and testing theories which relate leader's personality traits, leadership styles and behaviors to leader's effectiveness (Gordon & Yukl, 2004; Jacobsen & Hause, 2001; Eva et al., 2019).

To date, leadership research has accumulated substantial knowledge on the organization of virtual teams (e.g., Avolio et al., 2000; O'Leary & Cummings, 2007; MacDonnell et al., 2009). However, the literature lacks evidence on direct links between leader's characteristics and individual, team or organizational performance (Hambley et al. 2007; Klus & Mueller, 2019) as well as on the processes underlying these relationships (Gordon & Yukl, 2004). It heavily relies on survey-based evaluation of individuals' thoughts, attitudes, behaviors which is often criticized for its' use of perceived variables and outcomes. Experiment-based evidence on leaders' actual actions is sparse, lacks realism and is difficult to reproduce outside the laboratory (Antonakis et al., 2019; Fischer et al., 2020; Podsakoff & Podsakoff, 2019).

Gamificated team-based simulation-based methods elaborate on the advantages of both approaches and alleviate their limitations. Their main advantage is high degree of realism. Business simulations offer participants challenges and constraints that are comparable to that in the real work life and are thus perceived as realistic. This causes individuals to behave authentically, increases their engagement (e.g. Buil et al., 2019) and allows researchers to observe, manipulate and to analyze their behaviors in realistic digital business contexts.

The growing application of simulations in teaching, leadership research and professional training demonstrates high interest in academic and business communities to this method (Ryan et al., 2006). Literature on business simulations also highlights their positive influence on the subsequent outcomes (e.g. Lovin et al., 2021). Lohman et al. (2019) find a positive link between learning leadership from simulations and the subsequent management-related perceived outcomes. However, most of business simulations are not sufficiently complex to be perceived as realistic (e.g. because they offer tasks and challenges to participants in a linear sequence), do not provide feedback possibilities or objective performance measures.

We develop guidelines for a novel gamification-based team simulation approach that due to its competitive nature results in a high degree of participants' engagement and genuine commitment. Those guidelines enable to assess, develop and study multiple facets of leadership related to an objective measure of leader's effectiveness in a virtual business context under realistic conditions. By doing this, the present work follows recent calls (e.g. Fischer et al. 2020) to develop novel experimental designs. Simulation-based tools have high practical relevance as they can be used within leadership research and – in modified versions - act as training tools.

2. Virtual team leadership

Businesses and organizations are undergoing changes. Rapid development of information and communication technologies additionally contributes to the organizational change, as it reduces costs and cycle-time within organizations, improves decision-making and problem-solving skills, and enables maximizing organizational expertise without having to physically relocate individuals (DasGupta, 2011). However, in the digital age organizations also face a number of challenges. Thus, their stakeholders become "more complicated, more eloquent, and more noisy" (Bennis, 2013, p. 635), hierarchies lose their importance (Dess & Picken, 2000), routinized solutions no longer work (Castillo & Trinh, 2018), and increasing complexity makes understanding of the complete set of factors which have influence on a specific situation or a decision almost impossible (Yarger, 2006). Traditional concepts of organizing work become superseded by new organizational and leadership concepts

across all professional fields. Self-organization, teamwork, participation, and agility are some of the buzzwords of this change.

Until recently, leadership research has mostly been focused on leaders and their followers interacting personally (Lord et al., 2017; Klus & Mueller, 2019). But the growing literature on Digital Business Transformation has highlighted the importance of technological knowledge of leaders, their active participation concerning the implementation of IT solutions, and the high level of (organizational) innovation for achieving business goals and a sustainable competitive advantage (Velten et al., 2015; Reddy, 2018). The use of digital tools to lead geographically dispersed teams is increasingly coming into focus in the leadership research (Westerman et al., 2014: 156). However, even the literature on one of the most studied leadership theories – the transformational leadership (TFL) theory (Bass, 1985; Burns, 1978; Hildenbrandt et al., 2016; Avolio et al., 2009) – has only gradually taken the new digital work[1] reality into account (Hoch & Kozlowski, 2014; Klus & Mueller, 2019).

The existing literature on leadership in virtual teams focuses on leaders' skills and capabilities (their digital competence/literacy, adaptive capacity, dynamic capabilities and social intelligence), the organization and outcomes of virtual teamwork and collaboration, empowerment and shared leadership as well as the development and support of vision, trust and of open error culture (e.g., Bennis, 2013; Sasmoko et al., 2019; Bolte et al., 2018; Kirkman et al., 2004; Breuer et al., 2016; Liao, 2016). Empirical studies provide a few insights into indirect leader and followership effects on organizational culture (Schaubroeck et al., 2012), market performance (Sousa-Zomer et al., 2020), dynamic capability (Sasmoko et al., 2019) or business model innovation (Mihardjo & Sasmoko, 2019). Still, this research field has not accumulated a sufficient empirical evidence on leadership styles and behaviors, work organization and communication and their effects on virtual team performance. In addition, this literature often uses surveys based on subjective assessments of individual/team/organizational outcomes, and within an organizational context, simulation-based

---

[1] The term "digital work" does hereafter not imply changes in the context of digital transformation but refers to digital formats of collaboration (online conferences, digital collaboration tools, geographically dispersed teams, flexible working hours, etc...).

studies are rare.

3. Leadership styles and team performance

Leadership is enacted and transmitted through social relationships and influences a broad range of mediators, such as team potency, cohesion, and trust (Lord et al., 2017; Pillai et al., 1999; Schaubroeck et al., 2007), which are critical for the resulting team performance (Breuer et al., 2016; Sosik et al., 1997). Leadership styles[2] are effective in predicting follower attitudes and behaviors (Avolio et al., 2009).

Particularly surprising is that this frequently and multi-perspectively studied topic of leadership research (leadership styles) remains understudied in the context of leading virtual teams and in relation with leader's effectiveness. The few available exceptions, for instance, on transformational leadership (Hambley et al., 2007; Purvanova & Bono, 2009; Hoch & Kozlowski, 2014), do not measure team and leader's performance in terms of direct financial outcomes (e.g. profits), which implies a significant gap in leadership research.

Most of research on leadership styles tests their effects on qualitative virtual group outcomes, such as groups' potency and efficacy (Sosik et al., 1997; Kahai et al., 2003), creativity and solution originality (Sosik et al., 1998; Kahai et al., 2003, 2004), satisfaction with the leader and with the task (Kahai et al., 2003; Purvanova & Bono, 2009), ethical behaviors in a group (Kahai & Avolio, 2006) as well as perceived or expert-rated leader's and team performance (Howell & Hall-Merenda, 1999; Eisenberg et al., 2019; Hoogeboom & Wilderom, 2019). Only a few studies measure quantitative performance, for example, the number of correct or unique solutions produced by a group (Hoyt &

---

[2] Most here described findings operate with the widely accepted distinction between transformational leadership theory (TFL) and transactional leadership theory (TSL), as they have been shown "to impact virtual teams in meaningfully different ways" which can accurately be measured using the MLQ (Hambley et al., 2007: 2). TSL implies building an exchange relationship with subordinates and gaining compliance by either offering rewards or threatening punishment. Both can take material (e.g. promotions or financial bonus withdrawal) or immaterial form (e.g., gratitude, praise, or criticism). Contingent reward and management by exception are characteristic for TSL. In contrast, TFL focuses on inspiring and motivating employees to perform beyond simple transactions as well as on activating their higher-order values (e.g., altruism) (Xiao et al., 2019). It comprises idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass & Avolio, 1993). Particularly TFL has been shown to increase followers' level of motivation, the effectiveness of team interaction processes (Kearney & Gebert, 2009; Zhang & Peterson, 2011) as well as the performance of individuals and teams (e.g., Judge & Piccolo, 2004; Avolio et al., 2009; Keller, 2006; Walumbwa et al., 2007).

Blascovich, 2003; Kahai et al., 1997).

Surprisingly, relatively little research has explored this topic in business-like virtual project team settings. One exception is Hambley et al. (2007) who investigate the effects of transformational and transactional leadership styles on the constructive interaction style and virtual team performance, depending on the degree of media richness. Authors find that neither of these leadership styles significantly outperforms the other with respect to both outcomes. Other research on leadership styles and team performance in a non-virtual context has outlined different correlations between (virtual) leadership styles and team performance (e.g. Judge & Piccolo, 2004; Avolio et al., 2009). Research on leadership in virtual context highlights its' suitability in turbulent and uncertain environments (Vera & Crossan, 2004).

4. Experimental and simulation approaches

Dynamic simulations imitate processes of interest by other processes (Hartmann, 1996, 83) that are defined by an experimenter and consist of "a time-ordered sequence of states a system takes in a given time period" (Guala, 2002, 3). Guala (2002, 3-4) describes the most important features of simulations as follows: 1) the system must be capable to take different states; 2) the agent, taking part in a simulation, belongs to the simulation device itself, he/she sets the initial state and starts the process; 3) simulation is always constructed with respect to the purposes defined by experimenter (experimenter decides what is to be included in or excluded from the simulation system); 4) it includes a built-in mechanism, which once triggered will make the system go through the series of states.

Simulations (and experiments) stand apart from standard quantitative and qualitative approaches (Thaler, 1992; Camerer, 2003). This may be caused by the lack of a clear classification of simulation-based analyses as quantitative (although they work with statistical methods) or qualitative analysis (since no reconstruction of meaning is possible). Simulations differ from experiments as well, although this distinction is less precise. Similar to experiments, simulations can be used to generate new knowledge and to study causal relationships. The high degree of control over various parameters in simulations reduces the number of alternative explanations of specific relationships and increases

internal validity of research. This provides a fundament for developing leadership theories (Podsakoff & Podsakoff, 2019). However, simulations confront participants with fictitious situations (in contrast, laboratory experiments try to most accurately reproduce the target real-world system) to analyze the real behaviors and outcomes of possible conditions (Lean et al., 2006). Thus, the mapping used in simulations is more abstract and formal (Guala, 2002).

Although some studies use simulations in the sense of experiments (e.g. Lean et al., 2006) argue that simulations allow experiments to be conducted in fictitious situations), other scholars argue that both are distinct, but can complement each other, e.g. as simulated experiments or experimental simulations (Guala, 2002). Overall, simulation-based research can still be considered quite exotic in the field of management. Nevertheless, some business simulations have asserted themselves as a valid research tool. Thus, the business simulation by McCall and Lombardo (1982) has been extensively used in more recent research, for example, in studies by Santora (1996), Hough & White (2003), Stewart et al. (2008) and Truninger et al. (2020) to study various aspects of leadership and leaders' effectiveness. Despite the growth of leadership studies using experimental and simulation-based designs during the last decades, this field of research remains dominated by studies that measure team performance solely in terms of team member perceptions (Fischer et al., 2020; Podsakoff & Podsakoff, 2019; Sajons, 2020). Field experiments and quasi-experiments allow for less controlled environments and more realism, but usually on the cost of lower internal validity (Podsakoff & Podsakoff, 2019). The simulation-based design outlined below combines the advantages of experimental settings and of surveys as described below.

5. Guidelines

Based on previous research and our own experience, we identify guidelines for developing a (gamification-based) team simulation research design which can be applied to investigating different aspects of leadership (e.g. leadership styles) and of their influence on virtual team performance in a realistic digital business environment.

The possibility to analyze and manipulate real-time behaviors, reactions and communication

styles of leaders and employees (possible by design, through configuring the settings) increases the practical relevance of a developed simulation-based research design not only for leadership research, but also within other research fields (e.g. within the contexts of emotion-based, behavioral and communication research). Moreover, this research design handles leadership competence as a multifaceted construct which is placed at the intersection of multiple disciplines (e.g. economics, psychology, sociology etc.) and is thus well applicable also beyond the scope of a few classical leadership theories (and should not be limited to them).

_____

The identified guidelines are:

I.   *Defining mediators and the output variable*

Leadership competence is cross-sectional in its' nature, as it comprises a number of methodological (e.g. organizational or decision-making skills), social (e.g. conflict management) and personal (e.g., responsibility or self-reflection) competences and skills (Pastoors et al., 2019). Moreover, it cannot be directly observed and is, therefore, the result of the sense-making process, which is based on the analysis of leader's actions and behaviors (Sprenger, 2012). However, as stated in Chapter 3 of the present work, leadership has an effect on a broad range of mediators (Liao et al., 2016), that in turn influence team performance.

Endogeneity is one of the most serious concerns while explaining the observed relationships between leadership and team performance (De Cremer & van Knippenberg, 2004). Thus, to carefully establish causal inferences, team simulations should rely on the accurate construction and measurement of mediators. Among most important mediators, previous research has considered: a) leaders' attributes, e.g. leadership styles, personality, leader's ability to adapt (Verissimo & Lacerda, 2015; Hendricks & Payne, 2007; Seibert et al., 2017); b) team attributes, such as group self-efficacy (Shea & Howell, 1999), group potency and cohesion (Bass et al., 2003); collective identification (De Cremer & van Knippenberg, 2004), team trust (Podsakoff et al., 1990), followers work engagement

(Kovjanic et al., 2013); c) common vision and goal-orientation (e.g. Jing et al., 2020; Matsuo et al., 2019); d) team dispersion and the effective use of communication channels (Eisenberg et al., 2019). The output variable should be defined as a function of leaders' and of their teams' actions. This means, simulation developers should generate mechanisms which could make the influence of specific actions and behaviors on the outcome variable traceable.

II. *Increasing validity of the measurement*

The mediators, described above, are often perceived indicators which are typically measured using questionnaires. Working with them can be criticized for the lack of objectivity. Leadership scholars are aware of this problem, thus, if possible, they imply multiple measures of leadership characteristics (Liden et al., 2015), use well-established and well-validated measures of leadership (e.g. the Multifactor Leadership Questionnaire to measure transformational and transactional leadership styles; Jung & Avolio, 2000; Siangchokyoo et al., 2020) work with instrumental variables, such as physical characteristics, stable individual differences or geographical distance (Eva et al., 2019; Antonakis et al., 2010), or use methods of empirical analysis, such as experimentally randomized instrumental variable approach (Sajons, 2020) that are designed to cope with perceived measures of leadership. However, in leadership research is not always possible to completely avoid using surveys. We point to the fact that it self-assessments as well as evaluation of leadership characteristics (e.g. leadership styles) by direct subordinates is more subjective than evaluation by previously unknown group members. Thus, if it is necessary to evaluate leadership characteristics using surveys in combination with simulations, we recommend to do this within teams with the "zero"-history. Multiple perspectives in form of multi-rater surveys deliver even less subjective evaluation of leaders' characteristics.

Simulations can be designed in a way to measure quantitative (rather than perceived) performance. Thus, to measure the effect of a specific variable (e.g. of a specific leadership style) on virtual team performance, the team simulation design should provide a quantitative metric-scaled output variable, which must be clearly determined and documented. As compared to survey-based

perceived performance evaluations, this increases objectivity while assessing leadership effectiveness.

III. Virtual Collaboration

Many collective tasks do not involve actual collaboration and information exchange between the participants, as individuals can easily separate these tasks into small pieces and perform them individually. Simulations offer the possibility to design collective tasks to enhance collaboration in different ways: the roles can overlap, thus stimulating discussions in specific fields, or can be strictly separated. In the second case, individuals would perform different tasks, but if they have individual information, relevant for the solution of team tasks and indispensable for achieving higher team performance, they are forced to exchange information and withholding efforts in the group would be more difficult. Strict separation of tasks and, thus, strong interdependence on each other, has been shown to enhance collaboration in teamwork (Lohman et al., 2019). With respect to collaboration tasks, we recommend to strictly separate roles and to individualize (and thus limit) information access and the possibilities for action for every team member. This challenges leader's ability to coordinate team efforts, to enable social exchange in the team in order to achieve higher performance. Simultaneously it stimulates leaders to emerge in their roles, so that they are likely to be believed by team members and to be followed.

IV. Feedback

In order to represent the complexity of real social environments, the simulation must be adaptive and capable of feedback. The respective participants' options for action must have a direct influence on the further course of the simulation. Ryan and Deci (2000, 58) argue that the factors that conduce toward feelings of competence while performing actions (e.g. rewards, communication or feedback) can enhance intrinsic motivation for that actions. Feedback mechanisms in gamified simulations, specifically, are important for developing a sense of competence during the session, because they directly indicate how teams are performing and how their actions influence team performance (Buil et al., 2019). Other studies (e.g. Bass et al., 2003; Shea & Howell, 1999) also find positive influence of feedback on performance.

V.   Context & Framing

Framing in experiments and simulations refers to the way in which subjects are confronted with problems and the respective decision options. Laboratory experimental designs are often criticized for the lack of realism and limited generalizability of findings to real leadership environments because they are applied in artificial settings and only to a limited extent reflect the complexity of social processes (Podsakoff & Podsakoff, 2019; Zaccaro & Horn, 2003). In contrast, simulation-based leadership literature agrees that business simulations, offering high correspondence to situations and problems in real-world businesses and sufficient degree of verisimilitude (illusion of reality) are able to illustrate some of the critical features of the reality to the participants, are perceived more realistic, lead to more authentic behaviors and stimulate affective learning (e.g. Siewiorek et al., 2013; Keys & Wolfe, 1990; Saunders, 1995; Anderson & Lawton, 2009). The simulation should integrate broad organizational contexts into the decision-making process, which increases the authenticity and learning effects. However, the goal of the simulation must not be to provide a completely accurate and realistic representation of real-world phenomena, but to model specific simple behavioral principles and to enrich our understanding of key process mechanisms that explain these phenomena (Castillo & Trinh, 2018). Therefore, we recommend to find a balance between realism and meaningfulness while modeling the real world and creating the playfield for participants. Empirical literature and case studies can be used as benchmarks in designing simulations.

Simulations do not exist in the nature, they are designed by humans. Thus, simulation developers should be aware that this is their chance and responsibility to decide how the simulation should be designed, and what mechanisms should be included or excluded. Through this, simulation instructors have a high degree of control over the simulation setting and the mechanisms which are built-in. However, this should be done in a purposeful manner in order the simulation to be believed and performed authentically.

VI.   Complexity

If participants do not perceive the simulation as realistic, they may not take it seriously or may lose

motivation of taking part in it (Adobor & Daneshfar, 2006). This may increase the risk that individuals will not behave authentically, which would bias results. Socio-contextual factors, such as designing optimal challenges, are likely to enhance intrinsic motivation of individuals for actions (Ryan & Deci, 2000). Thus, to counteract this, the degree of complexity of the simulation must be chosen properly. We also recommend to not design simulations too complex, as in this case causalities will be difficult to reconstruct.

VII.   *Time dependencies*

Reverse causality is one of the most serious endogeneity concerns while explaining the observed relationships between leadership and effectiveness criteria (De Cremer & van Knippenberg, 2004). Experimental research designs are proposed to overcome this issue (Wang et al., 2014). Simulations can also be designed in the way to minimize reverse causality concerns. This could be achieved through designing built-in mechanisms in that participants' actions trigger direct reactions in the system during the whole time of the simulation. Measuring virtual team performance at the end of the simulation ensures that the final performance is directly influenced by the actions and behaviors of participants during the game.

_____

6.   Conclusion

The outlined guidelines are proposed to draw scholarly attention to business simulations as a valuable tool for research and to provide recommendations how to design simulations while studying leadership characteristics and leaders' effectiveness. Our guidelines provide an advice to scholars how to design gamification-based team simulations in order to be able to accurately investigate the effects of different leadership aspects on business/team performance indicators in a digital context. Moreover, they teach how to provide deeper insights into the leadership characteristics that emerge in dynamic business contexts, into integrating the context into simulations, and into designing the evaluation of leaders' actions and behaviors by teams if simulations are used in combination with surveys.

Finally, the guidelines developed in the present work can help to avoid common limitations of simulation- and experiment-based research designs such as undercomplexity, artificial settings and limited transferability to real-world settings. Our goal is to provide advice how to design simulations in the way they would help to promote authentic behaviors (in contrast to just "playing" a certain role as in the theatre) and investing effort for higher achievement by participants. Time dependencies, changing priorities, new challenges in the simulation as well as virtual communication with team members are some of the instruments that can be configured to generate specific environments and to vary the necessity of adjustment to the changing conditions. These guidelines respond to the recent call by Fischer et al. (2020) to develop new methodologies which, as compared to surveys, offer more objective evaluation of leadership effectiveness.

7. References

Adobor, H. & Daneshfar, A. (2006). Management simulations: determining their effectiveness. *Journal of Management Development*, 25 (2): 151–168.

Anderson, P. H., & Lawton, L. (2009). Business simulations and cognitive learning: Developments, desires and future directions. *Simulation & Gaming*, 40(2): 193-216.

Antonakis, J., Banks, G. C., Bastardoz, N., Cole, M. S., Day, D. V., Eagly, A. H., ... & Weber, R. (2019). The Leadership Quarterly: State of the journal. *The Leadership Quarterly*, 30(1): 1-9.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly*, 21: 1086–1120.

Avolio, B. J., Kahai, S., & Dodge, G. E. (2000). E-leadership: Implications for theory, research, and practice. *The Leadership Quarterly*, *11*(4): 615-668.

Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, *60*: 421-449.

Bass, B. M. (1985). *Leadership and performance beyond expectations*. New York: Free Press.

Bass, B. M., & Avolio, B. J. (1993). Transformational leadership and organizational culture. *Public Administration Quarterly,* 17(1): 112-121.

Bass, B.M., Avolio, B.J., Jung, D.I., & Berson, Y. (2003). Predicting unit performance by assessing transformational and transactional leadership. *Journal of Applied Psychology*, 88: 207–218.

Bennis, W. (2013). Leadership in a digital world: Embracing transparency and adaptive capacity. *Management Information Systems Quarterly*, *37*(2): 635-636.

Bolte, S., Dehmer, J., & Niemann, J. (2018). Digital leadership 4.0. *ACTA TECHNICA NAPOCENSIS-Series: Applied mathematics, mechanics, and engineering*, 61 (4): 637-646.

Breuer, C., Hüffmeier, J., & Hertel, G. (2016). Does trust matter more in virtual teams? A meta-analysis of trust and team effectiveness considering virtuality and documentation as moderators. *Journal of Applied Psychology*, 101(8): 1151-1177.

Buil, I., Catalán, S., & Martínez, E. (2019). Encouraging intrinsic motivation in management training: The use of business simulation games. *The International Journal of Management Education* 17(2): 162-171.

Burns, J.M. (1978). *Leadership*. New York: Harper & Row.

Camerer, C. (2003). Behavioral game theory: Experiments in strategic interaction. Princeton University Press.

Castillo, E. A., & Trinh, M. P. (2018). In search of missing time: A review of the study of time in leadership research. *The Leadership Quarterly*, *29*(1): 165-178.

DasGupta, P. (2011). Literature Review: e-Leadership. *Emerging Leadership Journeys,* 4(1): 1- 36.

De Cremer, D., & van Knippenberg, D. (2004). Charismatic leadership, collective identification, and leadership effectiveness. *Organizational Behavior and Human Decision Processes*, 95: 140-155.

Dess, G. G., & Picken, J. C. (2000). Changing roles: Leadership in the 21st century. *Organizational dynamics*, *28*(3), 18-34.

Eisenberg, J., Post, C., & DiTomaso, N. (2019). Team dispersion and performance: The role of team communication and transformational leadership. *Small Group Research*, *50*(3): 348-380.

Eva, N., Robin, M., Sendjaya, S., van Dierendonck, D., & Liden, R. C. (2019). Servant leadership: A systematic review and call for future research. *The Leadership Quarterly*, 30(1): 111-132.

Fischer, T., Hambrick, D. C., Sajons, G. B., & Van Quaquebeke, N. (2020). Beyond the ritualized use of questionnaires: Toward a science of actual behaviors and psychological states. *The Leadership Quarterly*, *31*(4): 1-3.

Gordon, A., & Yukl, G. (2004). The future of leadership research: Challenges and opportunities. *German Journal of Human Resource Management*, *18*(3): 359-365.

Guala, F. (2002). Models, simulations, and experiments. In: *Model-based reasoning* (pp. 59-74). Springer, Boston, MA.

Hambley, L.A., O'Neill, T.A., & Kline, T.J.B. (2007). Virtual team leadership: The effects of leadership style and communication medium on team interaction styles and outcomes. *Organizational Behavior and Human Decision Processes,* 103 (1): 1-20.

Hartmann, S. (1996). The world as a process: simulations in the natural and social sciences. In: *Modelling and Simulation in the Social Sciences from the Philosophy of Science Point of View*, R. Hegselmann, U. Mueller, and K. Troitzsch, eds., Kluwer, Dordrecht, pp.77-100.

Hendricks, J. W., & Payne, S. C. (2007). Beyond the big five: Leader goal orientation as a predictor of leadership effectiveness. *Human Performance*, *20*(4): 317-343.

Hildenbrand, K., Sacramento, C. A., & Binnewies, C. (2018). Transformational leadership and burnout: The role of thriving and followers' openness to experience. *Journal of Occupational Health Psychology*, *23*(1): 31-43.

Hoch, J. E., & Kozlowski, S. W. (2014). Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. *Journal of Applied Psychology*, 99(3): 390-403.

Hoogeboom, M. A., & Wilderom, C. P. (2019). Advancing the transformational–transactional model of effective leadership: Integrating two classic leadership models with a video-based method. *Journal of Leadership Studies*, 13(2): 23-46.

Hough, J. R., & White, M. A. (2003). Environmental dynamism and strategic decision-making rationality: an examination at the decision level. *Strategic Management Journal*, 24(5): 481-489.

Howell, J. M., & Hall-Merenda, K. E. (1999). The ties that bind: The impact of leader-member exchange, transformational and transactional leadership, and distance on predicting follower performance. *Journal of Applied Psychology*, 84(5): 680-694.

Hoyt, C. L., & Blascovich, J. (2003). Transformational and transactional leadership in virtual and physical environments. *Small Group Research*, 34(6): 678-715.

Jacobsen, C., & House, R. J. (2001). Dynamics of charismatic leadership: A process theory, simulation model, and tests. *The Leadership Quarterly*, *12*(1): 75-112.

Jing, F. F., Avery, G. C., & Bergsteiner, H. (2020). Leadership variables and business performance: Mediating and interaction effects. *Journal of Leadership & Organizational Studies*, *27*(1), 80-97.

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: a meta-analytic test of their relative validity. *Journal of Applied Psychology*, 89(5): 755-768.

Jung, D. I., & Avolio, B. J. (2000). Opening the black box: An experimental investigation of the mediating effects of trust and value congruence on transformational and transactional leadership. *Journal of Organizational Behavior*, 21(8): 949-964.

Kahai, S. S., Sosik, J. J., & Avolio, B. J. (1997). Effects of leadership style and problem structure on work group process and outcomes in an electronic meeting system environment. *Personnel Psychology*, 50(1): 121-146.

Kahai, S. S., Sosik, J. J., & Avolio, B. J. (2003). Effects of leadership style, anonymity, and rewards on creativity-relevant processes and outcomes in an electronic meeting system context. *The Leadership Quarterly*, 14(4-5): 499-524.

Kahai, S. S., Sosik, J. J., & Avolio, B. J. (2004). Effects of participative and directive leadership in electronic groups. *Group & Organization Management*, 29(1): 67-105.

Kahai, S. S., & Avolio, B. J. (2006). Leadership style, anonymity, and the discussion of an ethical issue in an electronic context. *International Journal of e-Collaboration*, 2(2): 1-26.

Kearney, E., & Gebert, D. (2009). Managing diversity and enhancing team outcomes: The promise of transformational leadership. *Journal of Applied Psychology,* 94: 77–89.

Keller, R. T. (2006). Transformational leadership, initiating structure, and substitutes for leadership: a longitudinal study of research and development project team performance. *Journal of Applied Psychology,* 91: 202–210.

Keys, B., & Wolfe, J. (1990). The role of management games and simulations in education and research. *Journal of Management*, 16(2): 307-336.

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of Management Journal*, *47*(2): 175-192.

Klus, M. F., & Müller, J. (2019). *The digital leader: What one needs to master today's organisational challenges [Die digitale Führungskraft: Was man benötigt, um die heutigen organisatorischen Herausforderungen zu meistern]* (No. 11/2019). University of Münster, Institute for Organisational Economics.

Kovjanic, S., Schuh, S. C., & Jonas, K. (2013). Transformational leadership and performance: An experimental investigation of the mediating effects of basic needs satisfaction and work engagement. *Journal of Occupational and Organizational Psychology*, *86*(4): 543-555.

Lean, J., Moizer, J., Towler, M., & Abbey, C. (2006). Simulations and games: use and barriers in higher education. *Active Learning in Higher Education*, 7(3): 227–242.

Liao, C. (2017). Leadership in virtual teams: A multilevel perspective. *Human Resource Management Review*, 27(4): 648-659.

Liden, R. C., Wayne, S. J., Meuser, J. D., Hu, J., Wu, J., & Liao, C. (2015). Servant leadership: Validation of a short form of the SL-28. *The Leadership Quarterly*, *26*(2): 254-269.

Lohmann, G., Pratt, M. A., Benckendorff, P., Strickland, P., Reynolds, P., & Whitelaw, P. A. (2019). Online business simulations: authentic teamwork, learning outcomes, and satisfaction. *Higher Education, 77*(3): 455-472.

Lord, R. G., Day, D. V., Zaccaro, S. J., Avolio, B. J., & Eagly, A. H. (2017). Leadership in applied psychology: Three waves of theory and research. *Journal of Applied Psychology*, 102(3): 434-451.

Lovin, D., Raducan, M., Capatina, A., & Cristache, N. (2021). Sustainable Knowledge Transfer from Business Simulations to Working Environments: Correlational vs. Configurational Approach. *Sustainability*, *13*(4), 2154: 1-16.

MacDonnell, R., O'Neill, T., Kline, T., & Hambley, L. (2009). Bringing group-level personality to the electronic realm: A comparison of face-to-face and virtual contexts. *The Psychologist-Manager Journal*, *12*(1): 1-24.

Matsuo, M., Arai, K., & Matsuo, T. (2019). Empowering leadership and meaningful work: the mediating role of learning goal orientation. *International Journal of Training and Development*, *23*(4): 328-338.

McCall Jr, M. W., & Lombardo, M. M. (1982). Using simulation for leadership and management research: Through the looking glass. *Management Science*, 28(5): 533-549.

Mihardjo, L. W. W., & Sasmoko, S. (2019). Digital transformation: Digital leadership role in developing business model innovation mediated by co-creation strategy for telecommunication incumbent firms. In: *Strategy and Behaviors in the Digital Economy*. IntechOpen.

O'Leary, M. B., & Cummings, J. N. (2007). The spatial, temporal, and configurational characteristics of geographic dispersion in teams. *Management Information Systems Quarterly*, 31(3): 433-452.

Pastoors, S., Becker, J. H., Ebert, H., & Auge, M. (2019). *Praxishandbuch werteorientierte Führung*. Berlin: Springer.

Pillai, R., Schriesheim, C. A., & Williams, E. S. (1999). Fairness perceptions and trust as mediators for transformational and transactional leadership: A two-sample study. *Journal of Management*, *25*(6): 897-933.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., & Fetter, R. (1990). Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *The Leadership Quarterly*, *1*(2): 107-142.

Podsakoff, P. M., & Podsakoff, N. P. (2019). Experimental designs in management and leadership research: Strengths, limitations, and recommendations for improving publishability. *The Leadership Quarterly*, 30(1): 11-33.

Purvanova, R. K., & Bono, J. E. (2009). Transformational leadership in context: Face-to-face and virtual teams. *The Leadership Quarterly*, 20(3): 343-357.

Reddy, P. (2018). A critical review on leadership in the digital age. *Institutional Journal of Academic Research and Development,* 3(1): 467–468.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1): 54-67.

Sajons, G. B. (2020). Estimating the causal effect of measured endogenous variables: A tutorial on experimentally randomized instrumental variables. *The Leadership Quarterly*, 31(5): 1-17.

Santora, J. C. (1996). Looking Glass, Inc.: A Classroom Experience. *Journal of Leadership Studies*, 3(1): 158-165.

Sasmoko, S., Mihardjo, L., Alamsjah, F., & Elidjen, E. (2019). Dynamic capability: The effect of digital leadership on fostering innovation capability based on market orientation. *Management Science Letters*, 9(10): 1633-1644.

Saunders, D. (1995). Introducing simulations and games for business. In D. Saunders (Ed*.), The simulation and gaming workbook volume 3: games and simulations for business* (pp. 13–20). London: Kogan Page.

Schaubroeck, J., Lam, S. S., & Cha, S. E. (2007). Embracing transformational leadership: Team values and the impact of leader behavior on team performance. *Journal of Applied Psychology*, 92(4): 1020-1030.

Schaubroeck, J., Hannah, S., Avolio, B. J., Kozlowski, S. W., Lord, R. L., Trevino, L. K., … Peng, A. C. (2012). Embedding ethical leadership within and across organization levels. *Academy of Management Journal,* 55*:* 1053–1078.

Seibert, S. E., Sargent, L. D., Kraimer, M. L., & Kiazad, K. (2017). Linking developmental experiences to leader effectiveness and promotability: The mediating role of leadership self-efficacy and mentor network. *Personnel Psychology*, *70*(2), 357-397.

Shea, C. M., & Howell, J. M. (1999). Charismatic leadership and task feedback: A laboratory study of their effects on self-efficacy and task performance. *The Leadership Quarterly*, *10*(3): 375-396.

Siangchokyoo, N., Klinger, R. L., & Campion, E. D. (2020). Follower transformation as the linchpin of transformational leadership theory: A systematic review and future research agenda. *The Leadership Quarterly*, *31*(1): 101341.

Siewiorek, A., Saarinen, E., Lainema, T., & Lehtinen, E. (2012). Learning leadership skills in a simulated business environment. *Computers & Education 58*(1): 121-135.

Sosik, J. J., Avolio, B. J., & Kahai, S. S. (1997). Effects of leadership style and anonymity on group potency and effectiveness in a group decision support system environment. *Journal of Applied Psychology*, 82(1): 89-101.

Sosik, J. J., Kahai, S. S., & Avolio, B. J. (1998). Transformational leadership and dimensions of creativity: Motivating idea generation in computer-mediated groups. *Creativity Research Journal*, 11(2): 111-121.

Sousa-Zomer T., Neely A., & Martinez, V. (2020). Digital transforming capability and performance: A microfoundational perspective. *International Journal of Operation and Production Management,* 40(7-8): 1095-1128.

Sprenger, R. K. 2012. *Radikal führen*. Frankfurt am Main: Campus Verlag.

Stewart, A. C., Black, S. S., Smith-Gratto, K., & Williams, J. A. (2007). Learning from experience: Creating leadership capabilities through computer simulated leadership challenges. *International Journal of Learning and Change*, 2(3): 250-268.

Thaler, R. (1992). The Winner's Curse. New York: Basic Books.

Truninger, M., Ruderman, M. N., Clerkin, C., Fernandez, K. C., & Cancro, D. (2020). Sounds like a leader: An ascription–actuality approach to examining leader emergence and effectiveness. *The Leadership Quarterly*, 101420.

Velten, C., Janata, S., Hille, M., & Michel, J. (2015). *Digital Leader: Leadership im digitalen Zeitalter. Ergebnisse einer empirischen Studie in Kooperation mit Dimension Data Deutschland*. Data Deutschland: Kassel.

Vera, D., & Crossan, M. (2004). Strategic leadership and organizational learning. *Academy of Management Review*, 29(2): 222-240.

Veríssimo, J. M., & Lacerda, T. M. (2015). Does integrity matter for CSR practice in organizations? The mediating role of transformational leadership. *Business Ethics: A European Review*, 24(1), 34-51.

Wang, D., Waldman, D. A., & Zhang, Z. (2014). A meta-analysis of shared leadership and team effectiveness. *Journal of Applied Psychology,* 99(2): 181–198.

Walumbwa, F.O., Lawler, J.J., & Avolio, B.J. (2007). Leadership, individual differences, and work-related attitudes: A cross-culture investigation. *Applied Psychology: An International Review,* 56(2): 212–230.

Westerman, G., Bonnet, D., McAfee, A. (2014). *Leading digital -Turning technology into business transformation*. Boston, Massachusetts: Harvard Business Review Press.

Xiao, Y., Zhang, X., & de Pablos, P. O. (2017). How does individuals' exchange orientation moderate the relationship between transformational leadership and knowledge sharing? *Journal of Knowledge Management*, 21(2): 1622-1639.

Yarger, H. R. 2006. *Strategic theory for the 21st century.* The little book on big strategy No.12. Carlisle Barracks PA: Strategic Studies Institute U.S. Army War College.

Zaccaro, S. J., & Horn, Z. N. (2003). Leadership theory and practice: Fostering an effective symbiosis. *The Leadership Quarterly*, *14*(6): 769-806.

Zhang, Z., & Peterson, S. J. (2011). Advice networks in teams: The role of transformational leadership and members' core self-evaluations. *Journal of Applied Psychology,* 96(5): 1004 –1017.