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Article

A perspective on embracing emerging technologies research for organizational behavior

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A perspective on embracing emerging technologies research for organizational behavior

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Abstract

Purpose – Emerging technologies are capable of enhancing organizational- and individual-level outcomes. The organizational behavior (OB) field is beginning to pursue opportunities for researching emerging technologies. This study aims to describe a framework consisting of white, black and grey boxes to demonstrate the tight coupling of phenomena and paradigms in the field and discusses deconstructing OB's white box to encourage data-driven phenomena to coexist in the spatial framework.

Design/methodology/approach – A scoping literature review was conducted to offer a preliminary assessment of technology-oriented research currently occurring in OB.

Findings – The literature search revealed two findings. First, the number of published papers on emerging technologies in top management journals has been increasing at a steady pace. Second, various theoretical perspectives at the micro- and macro- organizational level have been used so far for conducting technology-oriented research.

Originality/value – By conducting a scoping review of emerging technologies research in OB literature, this paper reveals a conceptual black box relating to technology-oriented research. The essay advocates for loosening OB's tightly coupled white box to incorporate emerging technologies both as a phenomenon and as data analytical techniques.

Keywords Emerging technologies, Artificial intelligence, Machine learning, Organizational behavior, Black box

Paper type Viewpoint

Introduction

Emerging technologies such as artificial intelligence (AI), blockchain, virtual reality (VR), robotics, Internet of Things (IoT) and quantum computing powered by data analytics, machine learning (ML) algorithms and automations enhance organizational- and individual-level outcomes (Alpaydin, 2020). Management literature appreciates the significant advancements in firm performance that emerging technologies can bring (Eggers & Kaul, 2018) and encourages scholars to use them in research for theory development (George, Osinga, Lavie, & Scott, 2016). Incorporating data science in management research enables scholars to develop better answers to old research questions by establishing causal relationships (Tonidandel, King, & Cortina, 2015). Even with such and more thrilling opportunities for research using these technologies, organizational behavior (OB) is only just beginning to pursue this area.



Existing challenges in conducting OB research pertaining to emerging technologies may stem from limited training on data science and machines (Barnes *et al.*, 2018) and the technicality involving coding and mathematical modeling. Moreover, current OB research programs are heavily theory-driven and deductive. A theory-focused approach is more influenced by the gaps and perplexities in a theory or phenomenon and less by the actual experiences of individuals (Weick, 1992). With the vast amounts of data and enhanced algorithmic capabilities available today, an appropriate balance and integration of theory and data can help reveal the intricate complexities in employee behaviors. Weick (1992) recognized technology as a concept at the psychological-level that would benefit from a revisited research agenda in theory-heavy OB scholarship. In offering a discussion on this topic for OB, this essay poses the research question – *How can the prevalent theory-driven mindset in OB be revised to conduct more technology-oriented research?*

For the purposes of this essay, technology-oriented research in OB is defined as comprising of two aspects. The first involves researching various emerging technologies within the OB context such as in decision-making, identity, trust, bias, leadership and so on, while the second aspect entails incorporating advanced data analysis techniques. Subsequent to a review of pertinent literature, this essay describes a framework consisting of white, black and grey boxes and offers guidance to help condense the conceptual black box.

Literature review

As the goal of this literature review is to offer a preliminary understanding of technology-oriented research currently occurring in OB, a scoping review was conducted. Unlike structured or systematic reviews, which are done to produce interdisciplinary assessment of a topic or to answer a review-based research question and offer practical implications, a scoping review is conducted when researchers are interested in providing an overview of the evidence of a topic being investigated in a given field (Munn *et al.*, 2018). Moreover, a scoping review was deemed suitable for the current paper as the use of emerging technologies is a relatively nascent area, just at the cusp of OB and human resource management (HRM) research.

Inclusion criteria

The search was performed on a select list of journals. To find papers on both aspects of technology-oriented research, journals in the OB field that publish theoretical as well as theory-anchored empirical papers were searched. To generate the list of journals, I first included the top 10 journals in I/O psychology and management sciences offered by Zickar and Highhouse's (2001) impact analysis. Next, following existing practice of adding and/or replacing certain journals based on the topic area of the literature review (c.f. Anderson, De Dreu, & Nijstad, 2004), I arrived at the journals listed in Table 1. With the date range for the search set from 2005 (year of big data emergence, Oracle, n.d.) to present, the abstracts of the listed journals were searched for the names of top emerging technologies and related terms (CompTIA, 2020). No other search criteria were set and any paper that mentioned the technology terms in the abstract was included in the database. Upon searching all journals for each technology term, the compiled list was further refined by only retaining papers that discussed a specific OB, management, or organizational theory in the context of that technology. This resulted in a list of 88 papers, consisting of 78 research articles, 5 editorials and 5 book reviews.

Table 1.
Literature search:
Management
journals, key terms
and findings

Management journals	Terms	Theory categories	Theories
<p><i>Academy of Management Annals</i> <i>Academy of Management Discoveries (AMD)</i> <i>Academy of Management Journal (AMJ)</i> <i>Academy of Management Learning and Education (AMLE)</i> <i>Academy of Management Perspectives (AMP)</i> <i>Academy of Management Review (AMR)</i> <i>Administrative Science Quarterly (ASQ)</i> <i>Human Resource Management Journal (HRMJ)</i> <i>Human Resource Management Review (HRMR)</i> <i>Journal of Applied Psychology (JAP)</i> <i>Journal of Business and Psychology (JBP)</i></p>	<p>Algorithm Artificial Intelligence Augmented Reality Automation Big Data Blockchain Quantum Computing</p>	<p>Organizational Behavior (Micro-level) Organization (Macro-level)</p>	<p>Leadership theories, Justice theory, Network effects theory, Psychological contract theory, Fit theory, Organizational support theory, Minnesota Theory of Work Adjustment Knowledge and learning theories, Diffusion theory, Paradox theory, Machine theory, Game theory, Media richness theory, Social presence theory, Labor process theory, Adaptive structuration theory, Algorithmic accountability theory, Theory of organizational intractability, Transaction cost theory, Moral theory, Event system theory, Categorization theory, Complex systems theory</p>
<p><i>Journal of Business Ethics (JBE)</i></p>	<p>Data Analytics</p>		
<p><i>Journal of Business Research (JBR)</i> <i>Journal of Management (JOM)</i> <i>Journal of Management Studies (JMS)</i> <i>Journal of Managerial Psychology (JMP)</i></p>	<p>Deep Learning Internet of Things Machine Learning Natural Language Processing Robotics Virtual Reality</p>		
<p><i>Journal of Organizational Behavior (JOB)</i> <i>Journal of Vocational Behavior (JVB)</i> <i>Organizational Behavior and Human Decision Processes (OBHDP)</i> <i>Organizational Research Methods (ORM)</i> <i>Personnel Psychology (PP)</i> <i>The Leadership Quarterly (LQ)</i></p>			

Notes: Beyond Zickar and Highhouse's (2001) journal list, 4 Academy of Management journals (Annals, AMD, AMLE, AMP), 2 high impact HRM journals (HRMJ, HRMR), and 5 OB-relevant journals with an impact factor of at least 3.00 (JBP, JBE, JBR, JMS, LQ) were included. JMP was included as it had a special issue on technology in 2020

Reported findings of the literature search

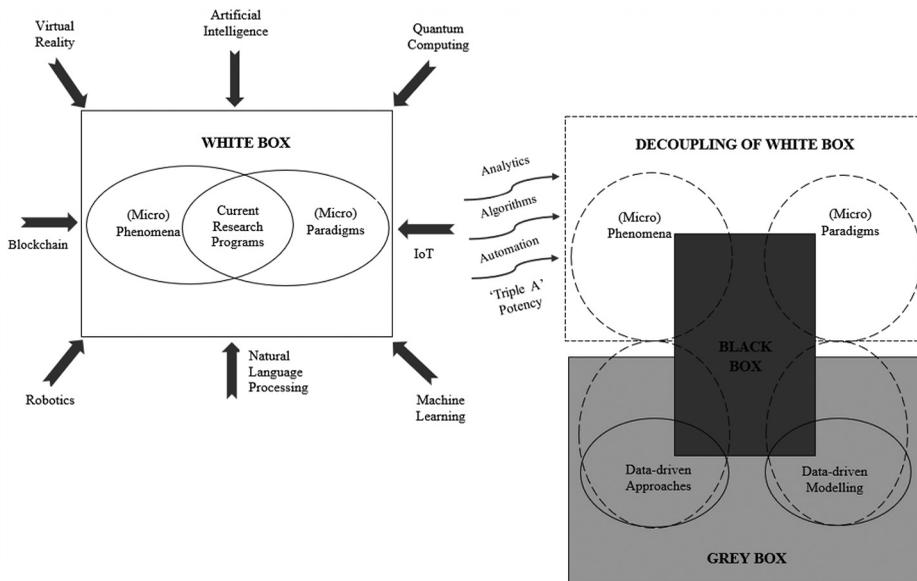
The scoping search revealed two crucial findings. First, the number of published papers that either conceptually discuss or apply the technology terms listed in [Table 1](#) has been increasing at a steady pace. While averaging under 5 papers a year until 2018, a steep rise is seen from then on, going up to 16 in 2019, 31 in 2020 and 14 papers published by mid-2021. Second, various organizational theoretical perspectives at the micro- and macro-level ([Table 1](#)) have been used so far to conduct technology-oriented research. Two instances are [Newman, Fast, & Harmon's \(2020\)](#) article that extends procedural justice theory by discussing the role of algorithmic decision-making in HRM and [Doornenbal, Spisak, & van der Laken's \(2021\)](#) application of ML models (like random forest) to conduct a predictive study for leader traits. These findings reveal that scholars are attempting to integrate behavioral topics and emerging technologies. The somewhat slower pace of progress of technology-oriented research occurring in OB, however, warrants further discussion.

The box framework

[Figure 1](#) displays the framework consisting of white, black and grey boxes.

The white box

This essay credits current research programs in OB – where phenomena and paradigms are viewed and interpreted by offering theory to answer research questions – in the white box. Such a depiction and understanding of a white box is borrowed from computer science and software model testing as a space where there is sufficient conceptual knowledge ([Khan & Khan, 2012](#)). The white box model has also been used by scientists in biology



Notes: 1) The hard-line boundary and circles in the first white box and circles represent the rigidity of current research programs leading to impermeability of data-driven approaches and modelling. 2) The dashed-line boundary and circles in the second white box represent the decoupling of the box and the need to expand the white box circles and grey box circles to condense the black box

Figure 1.
The box framework:
white box, black box
and grey box

(Lo-Thong, 2020), ocean research (Leifsson, 2008) and cryptography (Bock, 2019). In behavioral science, the white box was employed to depict the observer's depth of knowledge regarding the internal functioning of a system (Glanville, 1982). Consistent with these framings, the white box in OB research would consist of existing theoretical models and conceptual understanding of various management phenomena. The OB white box is tightly bound by theory, largely adheres to the positivist paradigm and consists of strong relationships and interdependencies between phenomena and paradigms (Wardlow, 1989). As loosely coupled systems are advantageous in complex environments due to their weak interdependencies (Orton & Weick, 1990), strong underpinnings of core phenomena and conceptualizations in OB lead to rigid mindsets that hinder newer approaches from being considered and explored. In Figure 1, the solid line boundaries around the white box and circles depict the tight coupling of OB's current research programs.

As new technological phenomena emerge in the workplace and affect employee attitudes and behaviors, a revision of the current theory driven agendas in behavioral research may be useful. Scholars advocate for renewed research programs to advance theory when studying technological innovations in firms (Carter, 2020), like applying abductive reasoning in studying AI-based decision-making (von Krogh, 2018). Contemporary phenomena affecting management including open innovation, AI, ML, IoT, VR, robotics and quantum computing (Makadok, Burton, & Barney, 2018) stand to benefit from the proposed decoupling that facilitates the infusion of new paradigms. To advance technology-oriented research in OB, loosening of existing interdependencies - that fuel conventional phenomena-based theorizing - is justified. Scholars have previously encouraged conducting unconventional management research in new and varied contexts that focus on phenomena outside of management, thereby, setting fresh paradigms for the field (Bamberger & Pratt, 2010). For example, Becker, Cropanzano, & Sanfey (2011) discuss organizational neuroscience as a new paradigm for exploration, providing directions to assimilate OB theories in the neural black box. As micro-organizational scholars continually advocate for addressing the research-practice gap in behavioral management (Fisher, 1989; Tenhialä et al., 2016) and for the integration of micro- and macro-level theories, paradigms and methodologies for scientific advancement (Aguinis, Boyd, Pierce, & Short, 2011), it is an opportune time for OB scholarship to embed AI and related technology research within its white box.

The black box

When prominent scholars promote non-traditional research as a means to advance the field, it signals an implied recognition that a black box exists within the white box, and that that black box would potentially expand if the principles of the field's prevailing paradigms were not relaxed to encourage fresh perspectives. Applying the same understanding of the white box from computer science, the black box[1] in OB would comprise of a space with low granularity in which there is limited to no subject knowledge. In ML, the black box relates to highly complex algorithms that generate through repeated data feeds and learning cycles, which eventually become too complicated for the human brain to comprehend. After numerous data loops, the human coder is only capable of reading the input and output codes - what happens inside the machine is a mystery, hence the need to decode the black box (Castelvecchi, 2016). By the same token, this essay posits that OB's black box is implicit, unapparent, and not readily visible to OB scholars until they engage in some form of research that requires exploration of new approaches, methods, and techniques. In other words, so long as OB scholars continue to study traditional micro-organizational phenomena using fundamental paradigms (i.e. engage in tightly coupled research), they would not likely realize that a black

box exists or be forced to understand what is inside it. That said, with companies investing in AI and other technologies to improve business processes and performance, corresponding discussions of these technologies should occur in scholarly investigations to better understand organizational and individual outcomes. To begin decoupling the white box – and subsequently condensing the black box – a flexibility and appreciation for studying phenomena surrounding AI and other technologies through varied paradigms is critical.

In [Figure 1](#), the black box is shown as encompassing some portion of OB's white box, thereby illustrating the suffusing of emerging phenomena like AI in the field. The placement of the black box inside of the white box is consistent with [Glanville's \(1982\)](#) prognostic integration of cybernetics and psychological concepts. To emphasize the decoupling of conventional phenomena and paradigms in OB, [Figure 1](#) displays the white box boundary and circles in dashed lines rather than solid lines.

The grey box

Alongside attempting decoupling efforts for the white box, a parallel endeavor should be undertaken - when necessary - towards adopting a digitally driven mindset and encouraging diverse data analytical techniques in OB research. When illustrated pictorially, we find from [Figure 1](#), that the size of the black box could be reduced by extending the two white bubbles towards the grey box. While OB research engages in paradigm continuity, incorporating contemporary phenomena would facilitate “paradigm extension”. One way to do so is by using advanced research methodology paradigms ([Qiu, Donaldson, & Luo, 2012](#)) to progress conventional organizational theory ([Donaldson, 2010](#)). Advances in data science have enabled data-driven phenomena and paradigms to become increasingly normalized in today's digital age. Thus, this essay regards advanced data-driven approaches as constituting the paradigm of research methodology. As displayed in [Figure 1](#), extending the dashed circles of data-driven phenomenon and paradigms (grey box) towards the white box will overlap OB's black box, and consequently shrink the black box.

To elaborate further, the grey box in this context comprises of approaches in data science such as data-driven modelling (DDM), ML algorithms (like neural networks and deep learning) and other nuanced data-driven methods. Because DDM represents advances achieved through AI, ML and data mining, where relationships between the input and output variables can be drawn without detailed knowledge regarding the system's behavior ([Solomatine, See, & Abrahart, 2009](#)), applying such methods in congruence with established conceptual knowledge produces refined understanding of constructs and relationships in a field. As examples, big data can capture patterns in a construct in real-time and social media data - like those from Twitter – can reveal the existence of socially sensitive behaviors like biases and discrimination in workplaces. Such theory extension, propelled by data, can occur through multiple nested-levels of analyses ([Barnes et al., 2018](#)). In taking these initiatives, OB research would be aligning itself with and drawing a page from advances in its sister field of psychology, where scholars are engaged in decoupling their white box. [Jack, Crivelli, & Wheatley \(2018\)](#), for example, advocate for using data-driven methods alongside relaxing Darwin's theoretical constraints when studying facial expressions associated with various emotions. Advanced methodologies have shown to improve researchers' understanding of how people in different cultures use facial expressions during verbal communication.

A preliminary course of action for methodology paradigm extension could involve narrowing the research question ([Makadok et al., 2018](#)) toward quantitative precision. With much attention being presently given to AI's ability to enhance managerial decision-making,

a sample open-ended question could be, “How can AI blend with human reasoning to advance managerial decision-making?” The empirical approaches employed to answer such a research question should appropriate the technology being studied. This is emphasized through [Figure 1](#), which illustrates that in order to shrink the black box, we must include some portion of the grey box. Hence, using decision-making theory would encompass the white box and applying ML algorithms as the methodology to answer the research question in real-time in a variety of managerial settings suggests inclusion of the grey box. Furthermore, we might even propose a close-ended question like, “Can AI blend with human reasoning to advance managerial decision-making?” This could be sufficiently answered through ML-based decision tree and clustering algorithms. Machine learning techniques can help reveal under what specific situations which manager(s) in the organization are able to effectively integrate their own reasoning abilities with algorithmic recommendations offered to them. Such research questions offer even personality researchers an avenue for exploration. These attempts represent theory extension by identifying highly specific boundary conditions for human decision-making theory in the age of machines. If the ML algorithm provides a positive recommendation, a follow-up research question, “*To what degree* can AI advance managerial decision-making?” could be asked. In doing so, we are not only framing a theory-driven research question in a distinct and specific context, but also utilizing real-time data to quantifiably answer it, thereby extending OB’s white box and using the data-driven grey box to condense the black box.

The “Triple A” potency

With emerging technologies reshaping management practices and changing the nature of work at all hierarchies in the organization ([Manyika, Chui, Madgavkar, & Lund, 2017](#)), this essay recognizes that the influential combined driving force of analytics, algorithms and automation serves as a catalyst to initiate a decoupling of OB’s white box.

Moving forward with a boundary condition

In acknowledging that a black box exists, we can begin to consider how we move forward to advance the field. The simplest visualization of condensing the black box involves two steps – first, separating the white box circles, and second, expanding the areas of these circles to approach and converge with the grey box. As a guide to conducting technology-oriented research in OB, an initial item on the black box reduction checklist could involve identifying which OB theories have strong potential for decoupling and expansion within the white box and then, subsequently applying varied approaches to expand those theories to fit within the emerging technologies context. [Nelson \(2020\)](#) combines interpretive and inductive approaches through ML techniques to suggest a three-step process to generate computational grounded theory. [McAbee, Landis, & Burke \(2017\)](#) recommend integrating interpretivist and positivist approaches in grounded theory and the latest computational techniques to break away from epistemological conventions like deductivism. We should begin revising some of our existing deductive research programs and start by first observing and asking research questions from practice ([Mathieu, 2016](#)). Researchers in the hard sciences and humanities assert that big data and emerging technologies are leading us to renew our epistemology and make paradigm shifts ([Kitchin, 2014](#)). Similarly, it is timely for OB scholars to encourage a mindset that creates opportunities for data-driven phenomena and paradigms (the grey box) to coexist alongside OB’s white box. In doing so, we augment both phenomenon-based DDM’s and data-driven theorizing.

The black box in ML is being tackled by scientists using “explainable AI” ([Zednik, 2019](#)), where experts develop rules to make the opaque box of unknown codes as transparent as

humanly comprehensible. A similar approach could be taken in OB as a way to condense our black box, where we generate a set of guiding principles for researching emerging technologies. Categorizing projects based on the interrogative word of the research question, such as the *what*, *why*, *how*, *how much*, and *when* of open- and close-ended questions (Rajagopalan, 2020) and offering researchers a layout of OB phenomena and paradigms that complement data-driven approaches (i.e. specifying what parts of the white box combine with what parts of the grey box) might be helpful. AI and related technologies can aid research methods by offering nuance and improving predictability. Using ML in data analysis in behavioral studies would help build better predictive models and enable scholars to conduct more predictive style research alongside engaging in conventional hypothesis-driven research (Doornenbal *et al.*, 2021). AI would also allow us to answer research questions quantitatively with high precision (e.g.: by how much, to what degree).

In recommending so, this essay identifies a boundary condition in the methodological application of AI technologies in OB. As ML techniques are capable of enriching our understanding of intricate variable relationships, DDM and conventional methods should thrive simultaneously for methodological rigor in OB. Methodological monism in ML results in the loss of dialogue among paradigms (Lindebaum & Ashraf, 2021). Hence, in keeping with the perspectives of positivism and interpretivism and in adopting methodological pluralism for OB research programs, this essay argues that while conventional quantitative and qualitative methods continue to be utilized to *explain* and *understand* behaviors (Buchanan, 1998; Bryman & Bell, 2003), applying ML-based algorithms is recommended when the goals are exploration of patterns, investigation of complex relationships among variables, and precision (in research models and in answers to research questions). Using AI in research methodologies adheres to abductive inquiry, wherein unexpected observations made by ML add value for inductive theorizing and subsequent hypothesis generation (Doornenbal *et al.*, 2021). In acknowledging concerns relating to the lack of transparency in decision-making in ML (Lindebaum & Ashraf, 2021), the conditional applications of grey box techniques would enrich and complement existing core methodologies rather than competing with them (Leavitt, Schabram, Hariharan, & Barnes, 2020).

In conclusion, this essay revealed a conceptual black box relating to technology-oriented research in OB by conducting a scoping review. From the findings of the review, opportunities for OB scholarship to engage in technology-oriented research are discussed. In answering the research question, the essay advocates for loosening OB's tightly coupled white box so that emerging technologies could be incorporated both as a phenomenon and as data analytical techniques.

Note

1. The usage of the term *black box* in this essay is intended to reflect the common understanding of the black box as it is used in computer programming, data science, neuroscience, and more recently in management research (Castelvecchi, 2016; Becker, Cropanzano, & Sanfey, 2011; Doornenbal, Spisak, & van der Laken, 2021). While consideration was given to developing alternate terminology to data "boxes," the goal of this essay was not intended to rename, but to draw attention to these technologies. Therefore, this essay adheres to the widely recognized terms.

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