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RESEARCH ARTICLE

Decoding technological frames: a qualitative inquiry into business analytics perspectives

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ABSTRACT

Technological frames, examined through the lenses of social construction of technology (SCOT) and social cognition, are pivotal in organisational research. This study presents a comprehensive literature review from SCOT and social cognition perspectives, offering nuanced insights into how individuals perceive and interpret technology. Employing an exploratory qualitative approach, we conducted semi-structured interviews with professionals from diverse industries, chosen for their varied expertise. Through content analysis, we identified eight technological frame domains: affective and cognitive dimensions, application value, personal attitude, job-related factors, managerial and organisational influence, and colleagues' impact. Our inquiry delves into the intricate factors shaping these frames, highlighting influences at both individual and organisational levels. Crucially, this study underscores the relevance of its findings for business analytics and technology management, illuminating cognitive and affective dimensions that significantly impact technology adoption and organisational outcomes.

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1. Introduction

The concept of "organizing mental schemata" in organisational behaviour literature, originating from cognitive psychology, has been expounded in distinctive terms such as "paradigms" (Kuhn, 1970; Sheldon, 1980), "frames" (Goffman, 1974), "cognitive maps" (Bougon et al., 1977), "interpretive frames" (Bartunek & Moch, 1987), "interpretative schemes" (Giddens, 19841984), and "mental models" (Senge, 1990). Post-1990, the term "frame" or "framing" began to refer to these concepts (Gash & Orlikowski, 1991), positioning itself as a progressive construct in management and organisation literature.

In the context of business analytics (BA), frames play a pivotal role in guiding and attributing meaning to organisational phenomena. BA research, focusing on developing insights for organisations to make timely and accurate decisions, draws on the full spectrum of descriptive/diagnostic, predictive, and prescriptive analytics (Aydiner et al., 2019; Bayraktar et al., 2023; Delen & Ram, 2018; Janiesch et al., 2022). The aim is to create value through data-driven and evidence-based decision-making (Bayraktar et al., 2023; Scheibe et al., 2019).

Frames, in a broader sense, simplify individuals' information search processes, offering a sense of consistency or acceptability within a specific context, and consequently, guiding their actions. These mechanisms of framing align with the fundamental objectives of business analytics, which involve interpreting complex data sets to provide actionable insights for organisational decision-makers.

When viewed as subcultures, conflicting interpretations within frames can be seen as common beliefs and meanings emerging as an "implicit organizational paradigm" (Gash & Orlikowski, 1991, p. 189), significantly influencing organisational members' attitudes towards information processing. This holds particular relevance in the realm of BA, where shared understanding and interpretation of data are crucial for effective decision-making (Kakhki & Shrivastava, 2023).

The interplay between individual frames and collective framing, resulting from the blend and rivalry of frames at a particular point in time (Baumgartner & Mahoney, 2008), is vital for comprehending and quantitatively tracing the effects of framing. In the context of BA, where collaborative efforts are often required to interpret and act upon data, understanding the collective impact of framing becomes imperative.

Organisational frame studies, unfortunately, have often neglected technological frames. Recognising this gap, W. J. Orlikowski and Gash (1994) proposed the

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concept of a "technological frame" based on the study of Pinch and Bijker (Bijker & Pinch, 1987) in the social construction of technology (SCOT) literature. This intersection of technology and frames becomes particularly relevant in the BA domain, where technology is a central enabler of data-driven decision-making. The technological frames, collectively held by a group or community, significantly influence how a social reality is enacted through mutual understanding among people. This social cognition perspective on technological frames is highly pertinent to BA, as it underscores the social nature of interpreting and acting upon data insights within organisational contexts.

Understanding how individuals and groups influence changing processes, both individually and collectively, is essential in the context of BA. Collaboration to innovate, a common practice in the field, necessitates a shared understanding of technological frames. Technological frames become a crucial analytical instrument for comprehending "how groups interpret technology and how group distinctions affect innovation processes" (MacLeod & Davidson, 2007, p. 2) within the BA landscape. Despite the appeal of collective cognition to organisational researchers, studies on collective cognition of technology remain limited in management and organisational literature (W. J. Orlikowski & Gash, 1994). This gap underscores the need for more research at the intersection of collective cognition and technology within the BA field.

Moreover, prior studies on technological frames, while providing context-specific interpretations, often fall short in accumulating empirical data or conducting cross-case analyses. These limitations highlight the necessity for research that contributes to a general technological frame of reference (TFR) theory (E. Davidson, 2006), a need particularly salient in the evolving landscape of BA.

Therefore, both frames in general and technological frames, in particular, have become captivating research areas within organisational studies, holding direct implications for the dynamic and evolving field of BA. The aim of this study is to provide insight into the concept of technological frames, adopting perspectives from both SCOT and social cognition within the realms of management and organisational studies. Additionally, we aim to identify technological frame domains through an exploratory qualitative analysis, utilising both deductive and inductive approaches. Our study, firmly rooted in empirical findings, offers valuable insights into the nuanced dimensions of technological frames within the BA landscape, contributing both theoretically and practically to the field of BA.

2. Theoretical background

The term "frame" has been conceptualised across various social disciplines, encompassing cognitive psychology (Kahneman & Tversky, 1979), communication and media effects (De Vreese, 2005; Drake & Donohue, 1996; Entman, 1993; Tewksbury & Scheufele, 2019), linguistics (Hymes, 1974), and social-movement research (Snow & Benford, 19881988). However, its prominence surged notably after the influential works of Gregory Bateson, *Steps to an Ecology of Mind*, published in 1972, and Erving Goffman's *Frame Analysis: An Essay on the Organization of Experience*, published in 1974. Proposing that "the major problems in the world are the result of the difference between how nature works and the way people think", Bateson regarded the collection of messages designed to "order or organize the perception of the viewer" as a picture frame (Bateson, 1972, pp. 187–188). He explored the relationship between "frames" and "interpretive premises", suggesting that the "picture frame" directs the viewer to interpret the image differently from perceiving the "wallpaper" outside the frame, making the frame a component of the "premise system" (Bateson, 1972, pp. 187–188).

Adopting a symbolic interactionism and structuralism approach, Goffman (1974) delved into how conceptual frames structure individual sense-making. Observing social interactions, he sought to understand the meaning in interactions that participants might not realise. Emphasising the importance of focusing on the context of interaction shaping meaning rather than the interaction itself, Goffman's use of the term "frame" illustrated the relational dimension of meaning. The picture frame, representing the structure holding together an individual's social life experience and the context of their life experience, acts as a cognitive tool aiding people in comprehending, understanding, and explaining their environment (Eddy, 2003; Goffman, 1974; Lin & Silva, 20052005).

The constructs of "framing", "frame", or "frame of reference", frequently used interchangeably, have found extensive application in management and organisation theory. These constructs, embedded in various cognitive, linguistic, and cultural processes, subtly guide interpretations and perceptions of organisational phenomena in multiple organisational and institutional settings (Cornelissen & Werner, 2014). Frames play a crucial role in helping individuals find information, limiting the extent of their search, providing a sense of what information is reliable or acceptable in a given context, and guiding behaviour. As these interpretations and perceptions become widely held throughout the organisation, they contribute to the formation of organisational culture.

In the dynamic landscape of BA, where data-driven decision-making is paramount, the influence of these organisational frames becomes particularly pronounced. However, traditional frames often fall short in addressing the intricacies related to the design and

utilisation of information technologies (IT), crucial components in modern analytics practices. Recognising this critical gap in understanding the unique challenges posed by technology, Gash and Orlikowski (1991) underscored the imperative to distinguish the concept of technological frames specifically within the context of the organisational frame concept. This distinction becomes increasingly relevant as businesses strive to harness the power of advanced technologies to derive meaningful insights and foster innovation in the realm of BA.

2.1. Technological frames

Technological frames, initially conceptualised by W. J. Orlikowski and Gash (1994, p. 174), are commonly defined as "that subset of members' organizational frames that concern the assumptions, expectations, and knowledge they use to understand technology in organizations". This definition encompasses not only the "nature and role of the technology itself" but also the "specific conditions, applications, and consequences of that technology" in certain contexts (W. J. Orlikowski & Gash, 1994, p. 178). Technological frames play a crucial role in shaping decisions about the design and application of technologies, especially in the context of BA (Noble 19861986; Bijker & Pinch, 1987). This influence arises from people's presumptions, expectations, and knowledge regarding the nature, context, significance, and role of technology. As technologies are regarded as "social artifacts", the goals, values, interests, and technical expertise of their sponsors and developers are reflected in their material shape and function (W. J. Orlikowski & Gash, 1994, p. 179).

In the domain of BA, characterised by the central role of data-driven decision-making, individuals' perceptions, interpretations, and utilisation of technologies to extract meaningful insights are notably influenced by technological frames (Noble 1986; Bijker & Pinch, 1987). The understanding of the "nature and role of technology" extends to its specific conditions, applications, and consequences, becoming crucial in harnessing the power of advanced technologies for effective decision-making.

Studies in management and organisational research explore technological frames of reference either from the SCOT perspective (Allen & Kim, 2005; Bijker & Pinch, 1987; McGovern & Hicks, 2004; Olsen & Engen, 2007) or the social cognition perspective (E. Davidson, 2006; E. J. Davidson, 2002; Gash & Orlikowski, 1991; Kaplan & Tripsas, 2008; MacLeod & Davidson, 2007; Mishra & Agarwal, 2010; W. Orlikowski & Gash, 1992; W. J. Orlikowski & Gash, 1994).

The SCOT perspective, in contrast to technological determinism, argues that almost every technological characteristic is influenced by social groups. Researchers studying SCOT have investigated how the shared knowledge among members of a social group, such as scientists, inventors, users, and manufacturers, affects how they construct artefacts and comprehend the characteristics and applications of a technology in a social setting (Bartis, 2007). In the dynamic landscape of BA, this perspective becomes crucial as technological innovations are shaped by collaborative efforts to meet the evolving needs of the field.

The concept of technological frames in SCOT refers to how individuals within a social group understand technological artefacts. In the context of BA, different social groups may interpret technology differently, creating unique technological frames depending on their encounters with the technology. These technological frames are not time and context-specific and may change as the needs and requirements of social groups alter over time. For instance, data scientists and business analysts may have different technological frames when interpreting analytics tools, impacting how they collaborate for effective decision-making (Bijker & Pinch, 1987).

SCOT research shares ontological assumptions with cognitive research on technological frames but varies in that it focuses on technology innovation rather than organisational applications of IT. SCOT research theorises technological frames as "a social rather than a socio-cognitive phenomenon" (E. Davidson, 2006, p. 26). In contrast to SCOT studies that focus on technological artefacts, social cognition studies are interested in the socio-cognitive processes individuals undergo to perceive, understand, sensemake, and interpret the technology they encounter. The study of information system (IS) deployment has increasingly turned to socio-cognitive methods. According to the basic premise of this research, organisational members' adoption, deployment, and behaviours towards IS are influenced by their shared interpretations of these technologies. Therefore, the success of implementation efforts may be significantly affected by various interpretations. In the context of BA, shared interpretations of technologies can shape the adoption and deployment of analytics tools, influencing the success of data-driven decision-making efforts. In line with this, to provide insight into these shared interpretations, W. J. Orlikowski and Gash (1994) presented a socio-cognitive viewpoint on technological frames of reference in IS research.

2.2. The conceptualization of technological frame

In technology management and IS research, embracing SCOT and social cognition studies, technological frames have been studied at the individual (E. J. Davidson, 2002; Gash & Orlikowski, 1991;

McGovern & Hicks, 2004; Olesen, 2014), group (Azad & Faraj, 2008; Olsen & Engen, 2007; W. Orlikowski & Gash, 1992; W. J. Orlikowski & Gash, 1994), and collective level (Gal & Berente, 2008; Mazmanian, 2013). Most studies are qualitative research designed specifically for a particular technological context (Azad & Faraj, 2008; E. J. Davidson, 2002; Furr et al., 2012, Hoppmann et al., 20202020; Leonardi, 2011; MacLeod & Davidson, 2007; Mazmanian, 2013; McGovern & Hicks, 2004; W. Orlikowski & Gash, 1992; Vaccaro et al., 2011; Young et al, 2016). Researchers have mainly investigated the organisational outcomes of technological frames, including technological change (E. Davidson, 2006; Furr et al., 2012; Gash & Orlikowski, 1991; Mazmanian, 2013; W. Orlikowski & Gash, 1992; W. J. Orlikowski & Gash, 1994; Young et al, 2016), technology implementation (Allen & Kim, 2005; Azad & Faraj, 2008; E. J. Davidson, 2002; Guenduez et al., 2020; McGovern & Hicks, 2004; Olesen, 2014; Young et al, 2016), new product or technology development (Leonardi, 2011; W. J. Orlikowski & Gash, 1994; Seidel et al., 2020; Vaccaro et al., 2011) and innovation (Arnold et al., 2022; MacLeod & Davidson, 2007; R. Raffaelli et al., 2019).

W. J. Orlikowski and Gash (1994) conceptualised technological frames as the knowledge and expectations that influence actors' interpretations and actions confronted with IT. They propose that investigating people's shared cognitive models about IT and its role in their organisations is a useful means of understanding and assessing organisational transformation around IT. They argued that social groups have shared cognitive frames, and variations in these frames can prevent a technology's effective implementation. In this context, they introduced the notion of "technological congruence", defining as "alignment of frames on key elements or categories", and describing congruent frames as not "identical, but related in structure and content" (p. 180). Since technological frames are social constructs, different people can have different perspectives on a technology's purpose, resulting in similar objects being interpreted in various ways and facilitating alternative behaviours (Pinch & Bijker, 19841984). Therefore, for a successful implementation of technological transformation, technological frames must be shared among organisational actors to a particular degree. When frames allow for the understanding of ambiguous situations, they lessen uncertainty in the face of complexity and change and give us a solid foundation on which to operate. They can also act as restraints when they support uncritical reliance on received wisdom and assumptions, falsify data to match pre-existing cognitive frameworks, and prevent original thought (W. J. Orlikowski & Gash, 1994).

Technological frame principles have been extended in future studies to provide useful insights into IT-related transformation, and the framework has been mentioned in a wide range of research publications (E. Davidson, 2006), focusing different aspects of the concept. E. J. Davidson (2002) provided a socio-cognitive model to investigate how frame shifts affect R&D process, particularly the sub-process of requirements determination. In the framing process, technological frames serve as "socio-cognitive filters" to focus on the attention of IS delivery participants, and filter contextual data that conflicts with pre-existing frames (p. 333). Additionally, frame salience may change as a result of change triggers, which could result in new insights for requirements. Shifting frame salience may make it impossible for project definitions to persist and may interfere with R&D activities if frames are extremely sensitive to change triggers. On the other hand, extremely rigid frames could make it difficult to recognise significant cues, leading to systems with restricted business value. Additionally, it is important to understand how individuals affect changing process both at the individual and collective level, since they collaborate in innovation initiatives. Technological frames of reference guide for understanding "how groups view technology and how variations among groups affect the processes of innovation" (MacLeod & Davidson, 2007, p. 2). Kaplan and Tripsas (2008) explained how technological frames of a variety of factors influence the technology trajectory over the course of its life cycle. They suggest that various technological frames serve as a source of variation in the era of ferment. Framing activities aid in the achievement of a dominant design. The interaction between technological frames and organisational architecture in the era of incremental change may be the reason transitions why are so challenging.

Gal and Berente (2008) adopted a social representation approach to explain technological frames since research on technological frames to date is "technologically centered, temporally bounded, and individually focused" (p. 134). The theory of social representations offers a more comprehensive perspective to explain the sense making processes within social groups when compared to technological frames. The theory criticises technological frames studies for providing cross-sectional research models, preventing making comparisons among different research contexts. The underlying premise of the theory is that people's interactions with the outside world are always mediated through socially constructed and constantly changing symbols, or representations, which make the outside world meaningful for social actors. The theory offers a broad explanation to investigate the creation, evolution, content, and connection between these representations and people's behaviour.

Research on technological frames focused on the notion of frame incongruence and dominant frames. According to McGovern and Hicks (2004), the

dominant frame is probably what decides on the kind of system that will be put into place since technologies are social artefacts that reflect the goals, values, and interests of both the designer and the consumer. This encompasses the power to make decisions, the organisation of processes, the appropriate division of labour, and the level of employee autonomy. Stakeholders may understand the new technology differently during transitional periods, resulting in incongruence between their respective frames. This could impede learning, particularly if some of the stakeholders interpret a technology using frames connected to an older technology. The "configurational intrapreneur" or change agent's role is to question the accepted ideologies and technological norms in order to establish new operational configurations with the justification that they are participating in political processes rather than merely implementing technology. However, because the implementation of change is "subject to social shaping", it is impossible to predict the whole scope of change and the potential effects in advance (p. 246). However, even when incongruence exists, a new technical system can still be put into place by creating a set of shared understandings that are acceptable to all parties. In theory, interventions to eliminate incongruence lead to frame alignment and enhance organisational outcomes (E. Davidson, 2006). Additionally, the incongruence between frames of senior managers and other social groups is caused by the dominant frames of the senior manager. Frames of social groups are dominated by the frames of senior managers although social groups attempt to communicate and change frames of senior manager (Olesen, 2014).

Some scholars, focusing on evolving frames, looked for how frame content turns into alignment. For example, Azad and Faraj (2008) explained how frame evolution process in terms of frame differentiation, frame adaptation, and frame stabilisation assists competing frames turn into truce frame. Frame differentiation is a process where different sets of perceptions and interpretations interact ending up with opposing frames, which result in obstacles technological change or transformation. In frame adaptation, social groups choose among the opposing frames compatible with the assumptions, concerns, and appraisal criteria of their groups, but in time, through negotiations and adjustments, their frames are modified towards a truce frame. Finally, during the process of frame stabilisation, each social group tries to align the truce frame to their initial frames attempting to convince the opposing parties so that the truce frame becomes relatively stable. On the other hand, Mazmanian (2013) distinguished technological frame congruence and the content of those frames. She argued that individuals within a group could come to share an assumption of heterogeneous behaviour. In other words, frames of reference are consistent, but their substance implies that people would react to various technologies in different ways.

Despite this progressive work on technological frames in the literature, the affective dimension of framing is undermined. The theoretical foundations of the structural- cognitive research have neglected the role of emotions. The effect of emotions on technological frames and how organisations are able to manage these emotions have not been studied sufficiently (Arnold et al., 2022). Additionally, employees' assessing a digital technology their feeling about the adoption of technology are other future research areas (Spieth et al., 2021). Based on this, this study aims to highlight the affective aspect of the construct of technological framing.

2.3. Emotional framing

Researchers have studied organisations as systems whose components handle information in an "affect-free manner", mainly disregarding the possibility that different organisation members may have varying feelings about the information they use or may respond to it in distinct ways. Information that individuals are in process arouses emotions when individuals realise that the information has significant consequences for them, that is, if that information is relevant for them, they have emotions for the information. Similarly, since innovation is highly relevant for individuals participating in the innovation process, they may have powerful emotional experiences in relation to the information they process and may also affect the emotions of one another as they pass through a variety of significant situations (Vuori & Huy, 2016, p. 11).

According to Giorgi (2017), emotional resonance, which "derives from a felt alignment of a frame with the audience's passions, desires, or aspirations" (p. 721), is an essential element in the framing process. She discusses that identification with the frame or framer fosters emotional resonance.

Past research pointed out the importance of the emotional component in strategic framing. According to R. Raffaelli et al. (2019), the adoption of the top management team's innovation (TMT) requires not only cognitive but also emotional framing of innovations and organisational capacities. Additionally, members of the extended team must be emotionally engaged for the TMT cognitive framing to be more adaptable. This emotional involvement aids organisational members in understanding the innovation in light of the firm's history since many cognitive frameworks coexist when incumbent firms implement non-incremental innovation. This type of emotional involvement is essential to the adoption process because it enables the extended leadership team and

staff to take pleasure in the past even as they start to imagine a new future.

The way people feel about something personally can be a good predictor of how they will feel about a digital technology and whether or not they will use it. The affective component must be taken into account while evaluating a particular technological frame. In explaining actor interactions with and their evaluations of digital technology, the significance of the undermined affective aspect becomes especially evident. By employing their technological frames, this advances our understanding of how actors in pre-digital firms view, analyse, and value digital technology (Arnold et al., 2022).

2.4. The operationalization and measurement of technological frames

There is a variety of measurement scales for technological framing. Based on the argument of W. J. Orlikowski and Gash (1994) that "frames are likely to be both time- and context-dependent, and are always more valid when examined in-situ rather than assumed ahead of time" (W. J. Orlikowski & Gash, 1994, p. 184), most studies conducted research on a single organisation, measuring technological frames of employees in response to a newly established technology (Leonardi, 2011; Mazmanian, 2013; McGovern & Hicks, 2004). The researchers frequently conduct interviews and field studies and, then, develop measurement scale items specific to their research context to identify technological frame domains. Researchers have used two methods proposed in the literature to identify those relevant to a particular context (Mishra & Agarwal, 2010). The first method is to specify a set number of frame categories and seek empirical validation to support their categorisation. The second one is to let these categories develop naturally in the context (Tan & Hunter, 2002). Despite the fact that theoretical reasoning can be used to build frames in the first approach (Tan & Hunter, 2002), it has been suggested that the latter approach is better founded in reality and managerial perceptions (W. J. Orlikowski & Gash, 1994).

Past research identified a number of technology frame domains. Despite differences in terminology, they mostly share similar coverage. Examples of such domains are given in Table 1 below.

As observed in Table 1, past research primarily has used theme content analysis, qualitative analysis, and biographical proxies rather than operationalising technological frames as latent constructs. The empirical findings of those studies merit further validation since they were found as a result of research methodology designed specifically for the research context (Spieth et al., 2021). On the other hand, criticising the previous research for not "using explicit scale-development procedures" (p. 1970), Spieth et al. (2021) developed a scale to measure "variety in technological frames on an individual level" (p. 1984) to address the need for a reliable and validated measurement scale that can be applied to any organisation

Table 1. Technological frame domains identified in past research.

Author	Research method	Technological frame dimensions
W. J. Orlikowski and Gash (1994)	Inductive: Case study (coding of interviews, observations, and archival data) on a groupware technology.	• Philosophy towards technology • Issues around initiation • Issues around implementation • Issues around use • Criteria of success • Impact • Relations with other players in the computing social world
E. J. Davidson (2002)	Inductive: A longitudinal case study (coding of interviews, observations, and archival data).	• IT delivery strategies • IT capabilities and design • Business value of IT • IT-enabled work practices
McGovern and Hicks (2004)	Inductive: Case study (coding of interviews, observations, and archival data).	• Type of partnership • Nature of technology • Technology structure • Technology in use
Allen and Kim (2005)	Content analysis (analysis of secondary sources on the PC and video game industries).	• Use vision: intended goals, key problems, and solution requirements of a technology • Industry practices: A technology, including the design and use practices of producers and consumers • Technology performance: Exemplary artefacts
Mishra and Agarwal (2010)	Interviews & cross-sectional survey	• Benefits frame • Threat frame • Adjustment frame
Olesen (2014)	Inductive: Longitudinal case study (coding of interviews, observations, and archival data).	• Technology in-use • Technology strategy
Spieth et al. (2021)	Interviews & cross-sectional survey	• Personal attitude • Organisational influence • Experience with digital technologies • Industrial influence • Application value • Influence of the supervisor

from any industry. Their scale may be useful for decision-makers in choosing between various technologies and determining which is best suited for the organisation. Although their work is a precious contribution to the literature, how employees evaluate and feel about a digital technology is still an undermined research question in the technological frame literature.

3. Research design

In crafting our research design, we meticulously followed the methodological insights proposed by Grant and Davis (1998) and Hinkin (1998), employing both deductive and inductive methods to comprehensively identify technological frame domains. To initiate this process, an extensive review of existing literature was undertaken to elucidate the intricate features characterising technological frames. This literature review served as the foundation for our subsequent methodological steps.

The deductive phase involved the formulation of interview questions. Drawing from the insights gained during the literature review, we developed a set of questions designed to guide participants in reflecting on their experiences with technological artefacts in the workplace. This approach allowed us to leverage existing theoretical frameworks while providing participants with the flexibility to express their unique perspectives.

Subsequently, the inductive phase unfolded through semi-structured interviews. This approach provided the necessary flexibility to delve into the nuanced and diverse aspects of participants' technological frames. The interviews aimed not only to validate existing theoretical constructs but also to uncover emergent themes that might not be fully captured by established frameworks.

3.1. Sample and unit of analysis

Our sample selection process adhered rigorously to the principles of purposive sampling, as outlined by Lincoln and Guba (1986). This approach allowed us to intentionally select participants who could offer crucial information not easily obtained through alternative choices. Specific selection criteria were applied, including a requisite minimum of three years of organisational experience to ensure participants possessed a nuanced understanding of technology's impact.

Moreover, the research was conducted in the context of Turkish businesses, adding a distinctive feature to the sample. The Turkish business landscape presents a unique amalgamation of traditional and modern practices, making it an intriguing setting for investigating technological frames. This context is particularly relevant to BA and technology management research, given the increasing global significance of emerging economies in shaping technological adoption patterns (Bayraktar et al., 2023; Sivri & Ustundag, 2023).

Furthermore, diversity was paramount. Participants were chosen from various backgrounds, fields of expertise, and industries, ensuring a comprehensive exploration of technological frames across different contexts. This diversity extended to the tech intensity of industries, encompassing both high-tech (e.g., software) and lower-tech sectors (e.g., textile).

To capture this diversity, we selected 23 MBA candidates and 6 senior managers from different sectors, including manufacturing (29%), insurance and financial services (37%), and IT/IS (34%). The inclusion of participants with varying work experiences, ranging from 3 to 18 years, further enriched the dataset. The varied industry representation within the sample aligns with the diverse landscape of Turkish businesses, offering insights that can be extrapolated to different organisational contexts and contributing to the broader discourse in BA and technology management research.

3.2. Data collection

Our data collection strategy was designed to be thorough and nuanced, employing semi-structured interviews as the primary method. Before the interviews, participants were provided with a comprehensive introduction to the concept of technological frames. Definitions and common frame domains derived from the literature ensured a shared foundation for subsequent discussions.

The interview protocol consisted of five key questions strategically crafted to elicit diverse aspects of participants' experiences with technological frames. Probing questions such as "What does that mean?" and "Can you elaborate on that?" were interspersed to encourage detailed responses and ensure a comprehensive exploration of each participant's perspective.

Interviews were concluded based on the principle of data saturation, where no new information or themes emerged. Each interview, lasting approximately 40 minutes, was meticulously voice-recorded to capture nuances and facilitate accurate transcription.

During the interviews, we first explained the notion of technological frames, providing definitions and common frame domains earlier discussed in the literature. Then we conducted interviews using a semi-structured form including five key questions:

(1) Affective and cognitive experiences: Participants were prompted to reflect on their emotional and

cognitive responses when encountering a new technology in the workplace.
(2) Perception, understanding, sense-making, and adaptation: This set of questions aimed to uncover the participants' experiences throughout the stages of perceiving, understanding, sense-making, and adapting to new technologies.
(3) Feelings about technology: Participants were encouraged to articulate their feelings regarding technologies encountered for the first time in their workplace.
(4) Affective experiences during technology use: This set of questions focused on participants' emotional experiences during the actual use of technology in their work context.
(5) Factors influencing perception: Exploring both individual and organisational factors, participants were asked to reflect on the elements shaping their perception, assumptions, knowledge, and expectations concerning new technologies in their workplace.

3.3. Data analysis

Our data analysis process was systematic and thorough, employing a multi-stage coding approach to derive meaningful insights from the qualitative data obtained through semi-structured interviews. This rigorous approach aimed to enhance accuracy and minimise biases inherent in the analysis process.

The initial phase involved independent analyses of each transcript. Through this process, codes were generated to capture the essence of participants' responses. To ensure the validity of these codes, collaborative discussions were conducted to resolve any discrepancies in transcripts and codes. This initial coding phase covered broad topics such as emotions, cognitions, organisational aspects, culture, structure, norms, and values.

Building on this foundation, we adopted a flexible coding procedure, incorporating codes obtained from both the semi-structured interview texts and the initial literature review. This iterative approach allowed for the inclusion of inductive codes as themes emerged from the data.

To further enhance the reliability of our analysis, a field expert was consulted. The expert cross-checked the data obtained from transcribed interviews, contributing valuable insights and ensuring inter-rater reliability. The subsequent phase of the analysis involved a meticulous review of transcripts, during which quotations were organised into a temporary pool of interpretations. Each interpretation was assigned a temporary label, facilitating a nuanced understanding of the emerging themes. This process was refined through iterative readings of transcripts, confirming the allocation of transcripts to various thematic groups. Finally, the initial codes were discussed and refined with the field expert. This collaborative process ensured the rigour and credibility of our analysis. To verify inter-rater reliability, the expert cross-checked the data obtained from the transcribed interviews. The analysis concluded with the establishment of distinct technological frame domains and clarified domain descriptions, providing a solid foundation for subsequent interpretation and discussion.

4. Findings

After the evaluation and interpretation process described above, we identified eight different technological frame domains. The results of the qualitative research study are summarised in Table 2 below.

4.1. Affective dimension

Our interviews revealed a spectrum of emotions experienced by employees when encountering new technology in the workplace, encompassing curiosity, excitement, happiness, and enthusiasm. Simultaneously, participants expressed negative emotions, including anxiety, stress, fear, and nervousness. Notably, many emphasised experiencing both negative and positive feelings concurrently.

For instance, an employee from the informatics sector articulated, "*A new technology means to me pure excitement*." Similarly, an employee from a low-tech industry provided insight:

> *I feel both enthusiastic and nervous at the same time. I feel enthusiastic because it is something new, and I want to learn about it. I get nervous since I doubt whether I will be able to learn it easily or if it will make my job more difficult and become more of a burden on me.*

Interviewees frequently associated excitement and curiosity with the prospect of learning a new technology. Positive sentiments were linked to the belief that new technology would streamline their job roles and reduce the time spent on tasks. However, participants also acknowledged the potential challenges associated with embracing new technology in the workplace. Some expressed fear of job displacement, perceiving technology as a substitute for human labour. A public library employee conveyed this concern, stating,

> *Digital databases have been substituting traditional libraries, so I feel fear of losing my job when I encounter a new technology at the workplace.*

Furthermore, interviewees indicated feelings of anxiety and stress, particularly when stepping out of their comfort zone:

> *When we first encounter a new technology at the workplace, we get out of our comfort zone, leaving our*

Table 2. Different aspects of technological frame domains.

Domain	Summary	Distinguishing features
Affective dimension	Affective dimension refers to emotional attitudes and experiences towards new technology employees initially encounter at the workplace.	• Emotional reactions and feelings to a newly established technology at the workplace.
Cognitive dimension	Cognitive dimension refers to the cognitive process in which employees try to perceive, understand, and sense make what the new technology is and how to use it.	• Understanding to which purpose the technology serves. • Assessing performance and effectiveness issues. • Making predictions on the probable outcomes.
Application value	Application value refers to a judgement based on positive and negative consequences of using a new technology.	• Evaluating benefits and losses associated with using a newly establishing technology. • Concluding whether it is worth the effort or loss of time.
Personal attitude	Personal attitude refers to individual factors affecting feelings, perceptions, assumptions, knowledge, and expectations for a new technology.	• Personality • Past experience with similar technology • Technology skills and competencies • Keeping abreast of technological developments Preconceptions and expectations regarding new technology • Affective commitment to and trust in the organisation
Job-related factors	Job-related factors refers to job characteristics and role requirements affecting feelings, perceptions, assumptions, knowledge, and expectations for a new technology.	• The nature of the job • Personal attitude towards job • Employee roles, status and position • Employee department • Industry type
Managerial influence	Managerial influence refers to understanding and assessment of managers' relationships with their subordinates, managerial characteristics, attitudes towards and experience with a new technology.	• Perceptions on the managerial goals, objectives, and expectations for a new technology • Perceived managerial support • Managers' past experience with similar technologies • Managers' personality
Organisational influence	Organisational influence refers to understanding and assessment of organisational resources and capabilities for adapting to a newly established technology.	• Organisational culture and structure • Organisational norms, routines, and practices • Effective communication of organisational goals, objectives, and expectations for a new technology • Providing training for the new technology
Colleagues influence	Colleagues influence refers to understanding and assessment of colleagues' attitudes towards a newly established technology.	• Colleagues' feelings, perceptions, assumptions, knowledge, and expectations for a new technology • Motivation to "speak the same language"

ordinary system to adapt to different things. It can be stressful sometimes since we doubt if we would be able to adapt to this system, causing anxiety and stress.

Our findings underscored the significance of employee department and industry in shaping emotions towards new technology. Employees in high-tech industries tended to express more positive sentiments, whereas those in relatively lower-tech firms leaned towards negative feelings.

4.2. Cognitive dimension

Employees articulated their thought processes when faced with new technology in the workplace, reflecting on whether it would streamline their job roles and enhance performance

or complicate their tasks. One participant shared the nuanced reality:

When confronted with a new technology, I think that as I get used to the new technology, I would do my job faster and more effectively and obtain good results. However, it is not always the case. Sometimes, my job becomes tougher with a new technology.

Interviewees emphasised the importance of questioning their established approaches to tasks and understanding the purpose of the new technology. An employee from a high-tech industry explained:

I first think about which needs the technology aims to serve. In other words, I wonder whether that technology will really meet my needs. I consider whether it will make my job easier or harder and whether it will be worth my efforts.

Some interviewees perceived the introduction of new technology as an opportunity for personal skill and competency development:

A new technology at the workplace makes me think that I should work more to adapt to it. On the other hand, I believe that this will create an opportunity for me to develop myself.

However, challenges were acknowledged, with some employees expressing concerns about the time investment required to learn a new technology. A procurement and process development professional in the textile sector explained:

When a new technology is established, we are dictated to change our programs and transfer old databases to the new system. These interruptions affect our work progress. However, as I get used to the new system, I realize that it facilitates my work processes.

Many participants believed that confronting a new technology related to their job would enhance their effectiveness:

> *I think that I will be able to improve and do my job with better quality.*

Moreover, some considered the potential transformative impact on their identities, roles, and status at work in the future:

> *I wonder how much experience I can gain and how I can transfer it to others after getting used to the new technology.*

4.3. Application value

While most interviewees expressed that adapting to new technology at the workplace allows them to gain new skills and abilities, a few noted the potential loss of some skills during the transition. One employee in an archive-based role highlighted the initial apprehension:

> *Since my work is archive-based, a new technology always seems bad and risky for me in the first place. After copying and transferring my database to the new system, trying the system and making sure that it works properly, I try to use the new one and explore its features. After getting used to the new technology, I am surprised at how I had used the old one. My job actually gets easier with new technology, but, on the other hand, I realized that I lost my old skills that I used for the old technology.*

Additionally, interviewees commonly expressed that after adapting to new technology, they could perform their job roles with increased efficiency and creativity, breaking away from monotony. An employer emphasised that dealing with new technology at the workplace influenced his problem-solving abilities:

> *Trying to learn and use a new technology affects my perspective on the problems I might encounter in the future. If I had dealt with certain things in my job-related to that technology, and if I had solved problems associated with it in the past, I am able to produce a direct solution in my mind when I face similar problems. This gives me confidence and courage to struggle with new technologies.*

4.4. Personal attitude

Interviewees highlighted various individual factors that influence their feelings, perceptions, assumptions, knowledge, and expectations when encountering a new technology in the workplace. Personality emerged as a significant factor shaping attitudes towards new technology, as one respondent noted:

> *" . . . if we weren't brought up very open to such new things from childhood, then we may not be very open to the new. It can scare us". Another participant highlighted the role of a creative mindset: "If I am a person who can dream a lot and produce new ideas in my mind, then I perceive and understand a new technology easily, maybe even I can produce a new technology."*

Past experiences with similar technologies, preconceptions, and expectations regarding new technology, as well as skills and competencies in technology usage, were identified as factors influencing employee perspectives:

> *The fatigue I felt in the past about the old technology affects my feelings and attitude towards the new technology. I think at first whether this technology will facilitate or sabotage my job or extend the work processes.*

Another interviewee emphasised the importance of a proactive attitude:

> *If we do not have an ability for learning new things about technology, if we are not inclined to technology usage, it will affect our experience with the new technology negatively.*

Moreover, affective commitment to and trust in the organisation, self-confidence, and keeping abreast of technological developments related to tasks were identified as additional factors influencing employees' understanding of new technology and their ability to adapt and use it effectively in their job roles:

> *When a new technology is established, I know that this new technology will produce positive outcomes on both my job efficiency and my organization because I trust in my organization and believe that whatever my organization does always works in my favor.*

4.5. Job-related factors

In the interviews, the nature of the job, employee roles, status, and positions emerged as the most frequently cited factors influencing the understanding and use of a new technology when

initially introduced in the workplace. One participant noted:

> *The calculation of payroll and the payment of salaries are critical as it will affect the entire business. Then, a new technology for those job roles will have an organization-wide effect. That's why roles have a big impact.*

Moreover, the departments in which employees work and the strategic importance of those departments for the business value of the organisation, along with the industries in which the organisations operate, were identified as other job-related factors. An interviewee explained:

> *Attitudes of human resources (HR) and IT employees towards technology tend to be affected more compared to other employees since the nature of their job roles.*

For example, HR employees use video recording for hiring new employees. Technology is already nested in the job roles of IT employees. Intimate relations with technology obviously change the attitudes of the people working in those departments.

Additionally, employees' personal attitudes towards their jobs and their expectations from a new technology were found to be influential in adapting to a new technology. One respondent expressed:

I think what I expect from that job, that is, my attitude towards my job, also affects how I perceive and understand a new technology. For example, someone who doesn't want to learn new things, does not want to use new technologies either, but I think someone who enjoys his/her job, who is happy when s/he goes to work, and who likes his/her job, also has positive attitudes toward new technologies related to his/her job. In other words, our job description actually affects our perception of a new technology related to our jobs.

Some interviewees also highlighted that the level of busyness in an employee's daily routine affects their feelings, perceptions, assumptions, knowledge, and expectations of a new technology: "If we have an extremely busy day at work, it seems like a burden to spend extra time on learning a new technology".

4.6. Managerial influence

Employees' perceptions of the managerial goals, objectives, and expectations for a new technology significantly impact their understanding and adaptation to this technology. One participant highlighted:

I think about what the managers aim to achieve with that new technology and what they want to impose on us. I also think about the aspects in which they want to enable us to develop or convey information to them. I then try to frame the new technology. In other words, I focus on how I learn, how I understand, how I use it. I give feedback as I find the deficiencies and think about whether they will be fixed, how soon they will be fixed. As I realize that it facilitates my job, I actually try to understand what our managers want from us and try to use the new technology in that manner.

Furthermore, employees' perception of managerial support, managers' ability to make their subordinates feel valued, and managers' past experiences with similar technologies were identified as significant factors influencing employee attitudes towards a new technology. An interviewee shared:

A short time ago, in my company, a team was formed for the establishment of a new technology. I was given responsibility for the head of this team. Even though I did not know anything about that new technology, this responsibility made me happy and I had no fear to fail. From a psychological point of view, my managers' suggesting my name for this responsibility gave me extra self-confidence, and I became more motivated.

Additionally, managers' personalities were acknowledged as influential on the feelings, perceptions, assumptions, knowledge, and expectations of employees regarding a new technology initially confronted in the workplace. Another participant noted:

If your manager supports you or if you know that your manager will support you in case of any error, then you have more courage to learn more and try. However, if your manager has a very negative and harsh personality, this time you are afraid of making mistakes, and then you do not want to try new things.

4.7. Organisational influence

Interviewees consistently highlighted organisational culture and structure as the most influential factors affecting their understanding and use of a new technology in the workplace. One participant emphasised:

If the organization has a dynamic structure, if I work in a company that is very open to technological developments, then this encourages me to engage in new things. However, if there is a very traditionalist and never-changing structure, this time our desire to learn and use new things becomes dull, and we have to keep up with the environment we are in.

Furthermore, organisational architecture, encompassing factors such as office layout, design, decoration, lighting, and heating, was noted by one interviewee as influencing learning and adaptation to a new technology. The participant explained:

We work in an open office where there are no doors, no rooms. In other words, our managers sit at the same table with us. When a new technology is established and only one or two people in the office know how to use it, I can ask easily for help from my colleagues or managers with the self-confidence provided by the environment in which I work.

Additionally, an employee from the textile industry shared that organisational norms, routines, and practices significantly impact how she perceives, learns, and adapts to a new technology at the workplace. She stated:

In our firm, there are pages of directions and instructions for each job, regardless of how simple it is. In other words, there are instructions for even the smallest tasks. Each organizational member reads them when s/he first starts to work since s/he is curious. These are sometimes very useful. For example, when we forget how to do some tasks, we can look back at the software in which those instructions are stored. However, it is also tiring looking for what we need in the pages of instructions even for such very small tasks.

Moreover, effectively communicating organisational goals, objectives, and expectations for a new

technology, clarifying the purpose the new technology serves, and providing training for the new technology were identified as crucial factors influencing learning and adaptation to the new technology.

4.8. Colleagues influence

Several employees acknowledged that their motivation to learn a new technology at the workplace, initially encountered, stems from the desire to "speak the same language" as their colleagues. One participant explained:

> *When a new technology comes to the workplace and is supported by both the employees and the corporate culture, I try to keep up with it. If I choose to stay out of it, after a while, other people start to speak the same language among themselves, and I am left behind, and I have both an obligation and a desire to catch up with my colleagues. I have to speak the same language with my colleagues to continue my job. Even though I don't want to, the new technology somehow adapts me to those novelties.*

Moreover, interviewees consistently expressed that the attitudes, responses, and behaviours of their colleagues towards a new technology initially confronted at the workplace significantly impact their feelings, perceptions, assumptions, knowledge, and expectations of this new technology. One participant shared:

> *. . . if my colleagues with whom I use the same technology, for example, constantly complain about the new system, I am inevitably negatively affected.*

Another participant added:

> *. . . if my colleagues are willing to share information and help one another, then my attitudes towards a new technology become positive. However, if they see their colleagues as a threat to losing their job and they are not willing to help others and keep information confidential to get ahead in the eyes of managers, this affects me negatively.*

5. Discussion and implications

The exploration of technological frames unfolds multifaceted dimensions crucial for understanding the cognitive and affective processes associated with the introduction of new technologies. In light of the theoretical implications, our study calls attention to the scarcity of empirical research elucidating the cognitive mechanisms shaping technological frames. It advocates a shift in focus from context-specific frame content to the universal characteristics and outcomes of frame structure, emphasising its comparability across diverse research contexts. This perspective is vital in the dynamic landscape of BA, where the effective integration of advanced technologies is paramount for informed decision-making. Our findings advocate for future research that delves into the cultural and institutional origins of technological frames, offering a broader contextual framework for organisational studies, especially relevant in the context of BA, where the alignment of technology with organisational goals is critical.

The subsequent subsections further elaborate on the theoretical implications, managerial insights, and avenues for future research emerging from our study's findings.

5.1. Theoretical implications

The literature on technological frames underscores the pivotal role of cognitive framing and collective identity in strategic decision-making (Gilbert, 2006; Kaplan & Tripsas, 2008; Nadkarni & Narayanan, 2007) and in shaping responses to technological change (Kaplan & Tripsas, 2008; R. L. Raffaelli et al., 2017; Tripsas, 1997). While these emerging research streams have captivated scholars interested in technological change and industry evolution, empirical studies on the cognitive mechanisms explaining the formation of technological frames remain scarce. Moreover, there is a lack of universally accepted frame domains, as technological frames are context-specific and researchers derive them for their specific conditions. To overcome this limitation, shifting the focus from frame content to the characteristics and outcomes of frame structure is beneficial. Frame content is inherently context-specific, but frame structure allows for comparison across research contexts. By delving into framing as an interpretive process, research on technological frames can move beyond frame incongruence to address issues with frame structure and interpretive power. Investigating the cultural and institutional origins of technological frames would offer a more comprehensive contextual framework for organisational studies of IT-related organisational change (E. Davidson, 2006).

The shared cognitive structures among social groups become institutionalised and externalised over time. Institutionalised frames tend to create cognitive inertia, a conservatism that defends the organisational status quo but also hinders organisational adaptability. The concept of technological frames can be valuable in assessing the institutionalising effects of shared cognitive structures, a facet undermined by IS research (W. J. Orlikowski & Gash, 1994).

Moreover, a generally accepted, reliable, and valid measurement scale for technological frames is currently lacking. Instead, the operationalisation of the technological frame construct relies on scale items specifically tailored to individual research contexts. The absence of general frame areas and a valid technological frame scale complicates the accumulation and interpretation of results across studies, hindering

theoretical development. Additionally, the affective aspect of technological frames has been neglected in existing studies (Arnold et al., 2022). Thus, a crucial avenue for future research is the establishment of a reliable and valid measurement scale for technological frames encompassing both cognitive and affective processes. This is particularly pertinent in the context of BA, where understanding the emotional and cognitive dimensions of technology is essential for successful implementation and utilisation.

Our findings carry significant implications for the BA field. In the realm of BA, where the effective use of technology is paramount, understanding both the cognitive and affective dimensions of technological frames becomes crucial. As organisations increasingly rely on BA for decision-making, acknowledging the emotional responses and cognitive processes of employees towards new technologies is vital. Integrating these insights can lead to more effective technology adoption, improved user experiences, and enhanced organisational outcomes. This study underscores the need for tailored approaches in the BA domain that consider the unique cognitive and affective dimensions shaping employees' responses to technological change. By addressing these aspects, organisations can optimise their BA initiatives, fostering a more favourable environment for technology integration and utilisation.

5.2. Managerial implications

Our findings carry significant implications for managers, especially those responsible for BA, technology management, and IS/IT. Recognising the value of the development of technological frames when introducing new technology is crucial for effective management. Managers should leverage this understanding by guiding employees' technological frames, initially developed individually, towards a collective alignment throughout the organisation.

Firstly, managers need to excel in effectively communicating their expectations from the newly introduced technology and the goals and objectives they aim to achieve with it. This proactive communication strategy helps alleviate employees' anxiety and fear stemming from uncertainty surrounding the emergence of new technology in the workplace. In the context of BA, where technology plays a pivotal role, clear communication becomes even more critical. Managers should articulate how the technology aligns with the organisation's analytics strategy, emphasising its potential benefits and addressing concerns to foster a positive reception.

Secondly, managers should actively encourage employees to share their emotions and feelings regarding the newly encountered technology. Creating an open dialogue where employees can express their concerns, apprehensions, or positive sentiments fosters a healthy organisational environment. This is particularly pertinent in the BA domain, where the emotional and cognitive dimensions of technology use significantly impact decision-making processes. Managers should proactively address negative feelings, provide support, and inquire about employees' perceptions of the technology's potential impact on their roles. By doing so, managers can prevent the development of negative biases and motivate employees to embrace learning and adaptation. In the context of BA, where user acceptance is paramount, understanding and addressing emotional responses is key to successful implementation.

Moreover, given that colleagues influence an employee's assumptions, knowledge, and expectations of a new technology, creating open environments for discussions is crucial. Regular meetings or forums where employees can openly discuss their attitudes towards technology help build a common view on the new technology. In the dynamic field of BA, fostering collaboration and shared perspectives among team members enhances the effectiveness of analytics initiatives. Managers should facilitate an open exchange of ideas and experiences, creating a culture that values continuous learning and adaptation. The support of management in utilising BA strengthens the culture of analytical decision-making within an organisation (Szukits & Móricz, 2023) and shapes its values, norms, and culture, facilitating the adoption of new BA technologies by organisational members (Chen et al., 2015). Therefore, it is imperative for managers to recognise the strategic importance of BA and support BA initiatives. Hiring and retaining employees with analytical skills is crucial. Furthermore, the integration of BA tools into organisational norms, policies, practices, and routines is essential, with all members encouraged to demonstrate commitment to BA use and applications. Managers must also address ethical and legal concerns arising from BA use and applications and be prepared to tackle associated workplace challenges. For instance, they should be mindful of potential productivity loss among employees who feel uneasy about their data privacy being compromised under the surveillance of big data. Finally, managers need to take proactive initiatives during the establishment of a new technology at the workplace. Providing clear directives and support during the implementation phase facilitates employees' understanding, adaptation, and use of the new technology. In the realm of BA, where the integration of advanced technologies is common, proactive managerial involvement is essential. Managers should champion the adoption of analytics tools, offer training programmes, and demonstrate the strategic importance of the technology. This

involvement not only accelerates the adoption process but also ensures that employees are aligned with the organisation's broader analytics goals.

In conclusion, our study highlights the importance of managerial actions in shaping employees' responses to new technology, particularly in the dynamic landscape of BA and technology management. By implementing the suggested managerial strategies, organisations can enhance the successful integration of technology, ensuring that employees embrace and utilise new tools effectively.

5.3. Limitations and future research

While this study contributes valuable insights, it is not without limitations, pointing towards avenues for future research. First, although we identified general technological frame domains through an exploratory qualitative study, the absence of a valid and reliable measurement scale for technological frames is a limitation. Future studies should aim to develop specific measurement scale items aligned with the technological frame domains identified in this research. This is particularly relevant in the context of BA and technology management, where precise measurement of technological frames is crucial for understanding employees' responses to new technologies.

Secondly, future research should delve into the antecedents and consequences of technological frames through empirical studies. Exploring potential moderating and mediating effects and proposing and testing a conceptual model would advance our understanding of the intricate relationships within technological frames. This approach becomes especially pertinent in the realm of BA, where the impact of technological frames on decision-making processes and organisational outcomes is significant. For instance, future researchers may explore the impact of technological frames on specific BA tools or investigate the role of organisational culture in shaping these frames, yielding valuable insights. Organisational culture significantly influences information processing by either enabling or constraining individual behaviour (Stoica et al., 2004). Decision-makers are encouraged to systematically use and analyse data in their decision-making processes (Kulkarni et al., 2017). In a similar vein, decision-making culture shapes individual processes, while an analytical culture assists actors in making rational decisions (Szukits & Móricz, 2023).

Conversely, the adoption and implementation of BA tools raise various concerns, particularly concerning artificial intelligence (AI) and big data, which may engender human-centred and ethical dilemmas. For instance, the use of big data is poised to revolutionise companies' HR practices, evolving towards electronic HR (e-HR) integration since the 1980s, particularly in areas such as performance and talent management (Van den Heuvel & Bondarouk, 2017). HR analytics applications today analyse data such as CVs, skills, and educational information of job applicants, subjecting them to preliminary evaluations through algorithms. Furthermore, it is conceivable that location data, call records, emails, and social media connections will be scrutinised within HR domains, posing ethical and legal considerations (Angrave et al., 2016).

Moreover, recruitment interviews may eventually be conducted entirely by AI, potentially mitigating discrimination based on race, gender, or socio-cultural factors. However, imperfect algorithms may inadvertently discriminate based on individual traits such as tone of voice. Similar concerns extend to AI managers, as they may prioritise efficiency over social interests, especially concerning matters of life safety. Thus, the growing influence of AI and big data in organisations may introduce ethical, legal, and human-centred dimensions to the concept of technological frames.

Thirdly, this study focused on the frames of employees about a new technology without differentiating the technological frames of managers. Given the growing importance of BA in decision-making processes, investigating the technological frames of managers in profit-seeking organisations regarding integral components of BA, such as AI and big data, emerges as a promising future research avenue. Research in IT has underscored the significant impact of managers' perceptions and interpretations on the acceptance and investment in new technologies (Harrison et al., 1997; Leonard-Barton & Deschamps, 1988). Particularly in profit-seeking organisations, where competitive advantage is paramount for sustainability, managers' perceptions and interpretations hold strategic importance. To navigate the complexities of technology-induced organisational change, managers must possess the ability to comprehend, evaluate, and select the appropriate digital technologies (Spieth et al., 2021). As elucidated in this study, managerial knowledge, assumptions, and expectations regarding new technologies are fundamental factors shaping employees' technological frames. Furthermore, understanding how managers interpret digital technology within the context of industrial digitalisation is crucial for designing organisational capacities. Establishing a shared understanding of the rationale behind adopting digital technology and the organisational structures conducive to resource sharing is essential for strategically planning organisational capabilities (Carlsson, 2023). Therefore, differentiating between the technological frames of managers and employees offers valuable insights for both scholars and practitioners. Moreover, in the domain of BA, management literature has provided evidence that BA mitigates the informational

advantage of local or functional managers (Sharma et al., 2014). With BA generating outcomes that are typically more objective, quantifiable, and easily communicable to headquarters, top management is no longer compelled to delegate decisions to prevent information overload (Labro et al., 2023). Consequently, BA enhances information processing capabilities, potentially shifting decision-making authority from local to upper management and fostering data centralisation. Hence, it is imperative to delineate the technological frames of managers, especially top managers, from those of other organisational members.

Past research has examined technological frames of managers about AI (Criado & de Zarate-Alcarazo, 2022) and big data (Guenduez et al., 2020) in public administration. Extending this inquiry to the realm of BA in profit-seeking organisations would provide valuable insights into managerial perceptions and attitudes towards advanced analytics tools and procedures.

Moreover, the study's methodological restrictions must be acknowledged. The sample size, limited by the specific national setting with Turkish businesses, raises concerns about the generalisability of findings across diverse cultural contexts. Caution is warranted when applying these findings to varied cultural situations. Furthermore, the study conducted in-depth interviews with a group of professionals, including managers, from organisations of varying sizes and operating across diverse industries. To enhance the robustness of the findings, future research should aim to validate these insights with larger and more diverse samples. This approach ensures broader applicability and relevance, especially in the context of BA and technology management research, extending to other pivotal emerging markets.

National culture exerts a profound influence on shaping individuals' perceptions of new technologies. For nascent technological sectors to gain traction and spur relevant stakeholders to action, it is essential for the technology to acquire meanings that resonate with and are relevant to the local context. The cultural resonance of a novel technology, defined as the "coherence and alignment between the meanings associated with a technology" (Lempiälä et al., 2019, p. 1), significantly influences whether the local context perceives it as appropriate and relevant. When individuals rooted in specific (national) cultures navigate daily life events and messages, they heavily rely on frames to assess what is meaningful and relevant (Diehl & McFarland, 2010). A culturally specific meaning system emerges from the shared values, attitudes, and assumptions of individuals within the same national culture (Smith et al., 2009), suggesting that certain framing techniques are more likely to resonate within a particular culture. However, the implicit nature of the cultural repertoire of frames renders the framing process challenging to manage, even though actors can – and often do – adapt their framing activities to align with a culture's meaning system (Lempiälä et al., 2019). Conversely, some emerging technologies may encounter resistance in certain cultural contexts while gaining widespread acceptance in others. For instance, countries with higher technological expertise tend to adopt new technologies more readily than those with lower expertise levels. Additionally, companies in developing nations may encounter challenges when implementing IT due to factors such as expertise, infrastructure, culture, and education (Jarvenpaa & Leidner, 1998). Similarly, employees in firms operating in technologically advanced countries are more predisposed to understanding, adapting to, and utilising new technologies in the workplace. For example, certain technological frame domains identified in this study might be invalidated, or new dimensions of the technological frame construct might emerge in future studies conducted in diverse national contexts. Moreover, a cross-cultural investigation comparing employees' technological frames across organisations operating in different national contexts could offer valuable insights into the theory of technological frames. Cultural differences also influence the use of BA tools. Earlier research (Yeoh et al., 2014) suggested that disparities between China and North America regarding the value of analytics-based decision-making may impact an organisation's ability to harness the benefits of BA-related systems. Examining these differences is crucial because economic and cultural contexts in different countries may either facilitate or hinder an organisation's adoption of BA technology (Wang et al., 2019), thereby influencing individual perceptions of BA tool usage. Hence, future studies could expand on the findings of this study by investigating employees' technological frames towards BA technologies in comparative cross-cultural studies.

Additionally, this study acknowledges the importance of innovation orientation in shaping organisational behaviour and responses to new technologies. However, this aspect was not explicitly addressed in the current research. Therefore, future research endeavours should incorporate specific questions aimed at capturing insights into innovation orientation, thereby providing a more comprehensive understanding of the factors influencing technology adoption and organisational outcomes.

6. Conclusion

In conclusion, this study adds a crucial layer to the understanding of technological frames by incorporating an affective perspective alongside its cognitive dimensions. By unravelling the emotional responses

of individuals, our research not only builds upon existing knowledge but also identifies new technological frame domains applicable across diverse organisational settings and industries. This is particularly relevant in the context of BA and technology management, where the integration of advanced technologies is reshaping the landscape of organisational decision-making and operations.

Through in-depth semi-structured interviews with employees across various organisations and industries, our study defines technological frames as *complex mental schemas influencing emotions, cognitions, assumptions, knowledge, and expectations when encountering a new technology in the workplace*. The multi-faceted nature of this construct is intricately woven with factors such as past experiences, personality traits, talents, competencies, job roles, organisational culture, structure, architecture, relationships with colleagues, and managerial influence.

The significance of our findings extends into the realms of BA and technology management. In the era of rapid technological advancements, organisations are increasingly relying on sophisticated analytics and technology solutions to inform strategic decisions. Our study sheds light on the diverse dimensions that shape how employees perceive and respond to these new technologies. This understanding is crucial for managers and organisations seeking to navigate the complexities of technology adoption, ensuring a more informed and effective integration of tools like AI and big data analytics.

While technological frames have been explored for over three decades, our study emphasises the continued relevance of this research area. The ever-evolving nature of technology and its profound impact on organisational processes underscores the need for ongoing exploration. As such, our findings contribute not only to theoretical advancements but also offer practical insights for professionals in the fields of BA and technology management.

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