



Beyond visuals: Advancing inclusion for blind professionals through information collaboration

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ARTICLE INFO

Keywords:

Blind professionals
Collaborative information practices
Multilevel theorising
Representational materialities of information
Visual and non-visual information practices
Workplace inclusion

ABSTRACT

The ubiquitous productivity software for information-sharing and collaboration activities has been designed mainly for a sighted organisational environment. This ingrained assumption inevitably leads to normative and habitual information sharing and collaborative practices that accentuate the ‘visual’ nature of information, consequently excluding blind professionals from workplace participation. By acknowledging the interconnectedness between exclusion and inclusion as socially embedded processes and considering the entanglement between visual information representations and visual information practices, this study examines how blind and sighted professionals use digital tools to overcome the challenges of working in a predominantly visual information context. We examine email messages, office documents and PowerPoint slides as they are commonly used information objects in organisations. Our multilevel analysis pays attention to the enabling and constraining roles of representational materialities of information and scrutinises the individual actions of blind professionals, their dyadic interactions with sighted colleagues and the emerging collective actions with other sighted individuals. Drawing on our analysis, we develop a workplace inclusion framework that articulates carefully orchestrated collaborative processes between sighted and blind professionals to overcome constraints imposed by visuals. These processes reveal how *ambiguity*, *imperfection* and *complexity* in information representations trigger the reframing of visuals and deliberate actions of disconfirmation, enquiry and remaking of habitual ways of working with information, thereby evolving collaborative information practices, namely *de-visualising*, *re-visualising*, and *co-visualising*, that shape workplace inclusion.

“Humans are so fundamentally visual in their understanding and experience that blindness requires its own domain”.

Leland (2023, p. xv)

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1. Introduction

In the beginning, it was a love story. In 1808, the Italian inventor Pellegrino Turri built a typewriter machine for his blind lover, Countess Carolina Fantoni da Fivizzano. The newly created tool became the first known artefact that allowed blind people to communicate in writing. Soon after, sighted people widely adopted the versatile device and turned it into a tool that mediated communication settings for the next two centuries. More importantly, the typewriter became a central tool that radically transformed office work at the end of the 19th century (Gardey, 2001), shaping the trajectory of collaborative information-oriented tasks in the workplace. The introduction of digital technology in the workplace in the last decades of the 20th century signalled another turning point; it made the office “the primary locus of information work” (Giuliano, 1982, p. 149).

Unlike the typewriter, originally conceived to facilitate written communication for blind people, digital technologies in general and productivity software in particular are primarily designed for information sharing and collaboration among sighted people in the workplace (Gomez, Langdon, Bichard, & Clarkson, 2014). This ingrained assumption inevitably leads to normative and habitual information sharing and collaborative practices that accentuate the visual nature of information; Consequently, blind professionals are portrayed as outsiders at risk of being excluded, as a blind participant in Branham and Kane's (2015, p. 169) study illustrates:

What sometimes happens is “Oh, well, you can't do this task or use this software, so you don't have to”. And everybody else does it ... It's actually kind of benevolent. “We'll just take you off of that task”, maybe they'll give you another task.

Assistive technologies, designed to “deliver functional capabilities by addressing some of the limitations that individuals experience because of their disadvantaged status” (Pethig & Kroenung, 2019, p. 1413), could alleviate the exclusion that people with visual impairments encounter. Previous studies have shown encouraging evidence of the benefits of assistive technologies¹ that help people with visual impairments process information, but they also report persistent challenges that these technologies cannot overcome (Branham & Kane, 2015; Tang, 2021). The most significant challenges for people with visual impairments in the workplace include inaccessible documents and graphics (McDonnall, 2023). We use three examples to illustrate the challenges blind professionals face. Firstly, some MS Word collaborative features (e.g. comments and track changes that indicate who comments or edits what, where and when) are difficult to access via screen reader software (Das, Gergle, & Piper, 2019; Schoeberlein & Wang, 2014). Secondly, a blind professional may occasionally come across an inaccessible document and must decide whether to seek a technical solution to make it accessible or ask a colleague to read it for her (Branham & Kane, 2015). Thirdly, blind professionals find it challenging to manage two independent audio streams in a PowerPoint presentation meeting: one from screen readers to read out the slides being presented and the other from the presenter speaking (Tang, 2021). These challenges can be exacerbated when sighted colleagues do not understand how blind people interact with technology or perceive making information accessible to blind coworkers as extra work (Das et al., 2019). These examples highlight the problematic role of visual representations of information, which is central to understanding how to evolve the mainstream information practices in the workplace toward inclusion. It is worth noting that newly developed artificial intelligence tools are better at helping blind people with orientation and navigation (e.g. WeWALK Smart Cane, Microsoft's AI-powered backpacks, Seeing AI app) than processing visual information (e.g. a colourful diagram with a combination of pictures and text). For this task, the intervention of sighted individuals is still required because human heuristics is faster and more precise than the ‘brute-force calculation’ power of computers (Gigerenzer, 2022).

Therefore, despite the benefits of assistive and mainstream technologies, realising workplace inclusion for blind professionals remains an enduring challenge due to the deep-rooted interplay between visual information representations and their associated practices. Against this background, we study how blind and sighted professionals use digital tools collaboratively to overcome the challenge of working on predominantly visual information in a way that advances inclusion. The following question encapsulates our research objective:

How do blind and sighted professionals collaborate to overcome visual constraints and advance workplace inclusion?

Scholarship in visual and multimodal organisational research highlights the ubiquity of visual representations and their effects on organising processes and outcomes (Boxenbaum, Jones, Meyer, & Svejnova, 2018; Meyer, Höllerer, Jancsary, & van Leeuwen, 2013). A core insight from this literature is that visual artefacts enable the construal of meaning by appealing to individuals' cognition, perceptions and emotions through simplifications of information and concrete representations of abstract ideas (Arjaliès & Bansal, 2018; Meyer, Jancsary, Höllerer, & Boxenbaum, 2018). In more recent work, scholars have shifted their perspectives from associating visuals with fixed meanings to recognising the unfolding possibility of visual representations characterised by “a dynamic space that contains never-ending contests for defining common norms of appropriate behavior” (Quattrone, Ronzani, Jancsary, & Höllerer, 2021, p. 1211). In addition, growing evidence from multimodal research suggests that visuals also present themselves as an interpretive space endowed with a condition of possibility that invites organisational actors to engage in the process of consideration, enquiry and reflection (Barry & Meisiek, 2010; Giovannoni, Begkos, Mouritsen, & Kornberger, 2025; Quattrone, 2022), which may help cultivate inclusive solutions in the context of our study. Hence, to develop a theoretical understanding of the dynamic and emergent constitution of representations in actions, we build on and extend a dual perspective of *visual and non-visual information representations* and *practices* for fostering workplace inclusion. We elaborate on how an encompassing and constitutive stance of

¹ Screen reader software interprets and reads text to users. Job Access with Speech (JAWS) is widely used for MS Windows, while VoiceOver and Speak Selection are built-in accessibility features available on Apple products. Refreshable braille displays allow users to input and read text, and control programmes by using braille characters in the form of refreshable round-tipped pins.

information as both visual and non-visual representations of information reveals the collaborative work needed to shape inclusiveness for blind professionals in organisations. We scrutinise the individual actions of blind professionals and their dyadic interactions with their sighted colleagues, from which inclusive information collaboration emerges as a collective phenomenon at the group level. In doing so, we foreground the representational materialities of digital information and their consequential role in expanding or constraining ways of working with information.

The next section reviews the relevant literature on workplace inclusion, adopts concepts from visual and multimodal research in organisations and introduces our interpretive lens on the representational materialities of information and collaborative information practices. Section 3 explains the methodological procedures and multilevel theorising approach. Section 4 presents the findings and Section 5 discusses our workplace inclusion framework that explains three collaborative processes between sighted and blind professionals. These processes explain how the ambiguity, imperfection and complexity in information representations trigger deliberate actions of disconfirmation, enquiry and remaking of habitual ways of working with information, thereby contributing to emergent and finely tuned practices to de-visualise, re-visualise and co-visualise information representations that shape inclusiveness. This section closes by highlighting our contributions to theory and practice and suggesting avenues for future research. Section 6 presents the conclusions of our study.

2. Theoretical background

To theorise the emergence of workplace inclusion from an information perspective, we review the literature on workplace inclusion for people with impairments to establish a conception of exclusion and inclusion as socially embedded processes. We adopt concepts from visual and multimodal research in organisations² to establish the link between *visual and non-visual information representations and practices*. The linkage allows us to theorise possibilities and mechanisms for evolving from visual information as dominant representational materialities of information and its associated practices that exclude blind professionals toward an inclusive information practice encompassing both visual and non-visual representations through collaborative actions between blind and sighted professionals.

2.1. Navigating workplace inclusion and exclusion for individuals with impairments

A recent stream of information systems (IS) research focuses on workplace inclusion by analysing digitally enabled practices that promote inclusion (Tarafdar, Rets, & Hu, 2023). Our work extends this line of inquiry by investigating digitally enabled information collaboration processes between blind professionals and their sighted colleagues in the workplace.

The workplace inclusion literature portrays inclusive organisations as an ideal workplace that welcomes and encourages marginalised individuals to participate in organisational activities (Shore, Cleveland, & Sanchez, 2018), who, in turn, can maintain their unique selves (Chung et al., 2020), feel valued and develop a sense of belonging (Mor Barak & Cherin, 1998). An inclusive work environment creates a pluralistic space where respectful dialogues and actions are encouraged (Mor Barak & Daya, 2013). This pluralistic approach is linked with several beneficial outcomes, such as higher job satisfaction (Mor Barak et al., 2016), lower levels of conflict (Nishii, 2013) and better work group functioning (Ely & Thomas, 2001).

However, the emphasis on inclusion as a desirable workplace often ignores the social construction of disabilities. In particular, the emphasis on disabilities (what individuals are *not able to do*) instead of abilities (what they *are able to do*) that characterises organisational practices often results in the exclusion of individuals with impairments in the workplace (Beatty, Baldrige, Boehm, Kulkarni, & Colella, 2019). Some studies report that exclusion can be attributed to, among other causes, inaccessible office space (Branham & Kane, 2015), job design (Tang, 2021) and standard digital technologies (Mäkipää, Norrgård, & Vartiainen, 2022). As a response, managers might be tempted to introduce discrete organisational interventions (e.g. inclusive hiring policies) or special technical solutions (e.g. assistive technology) to reduce or eliminate exclusion. Despite their benevolent intentions, these actions in isolation are insufficient to make the workplace inclusive (Mor Barak, 2015).

Critical scholarship on impairments in the workplace argues that existing conceptualisations of inclusion tend to overlook that inclusion and exclusion are deeply intertwined and fail to notice the assumptions implicit in universal norms that favour employees with no impairments (Dobusch, 2014). Instead, conceptualising inclusion as a socially embedded process makes evident that materialisations and attempts to promote inclusion depend on the socially constructed nature of who should be included and under what conditions (Foster & Wass, 2013). Since impairments are often defined by those without impairments, a lack of impairments is treated as “both the positive and the universal experience” (Morris, 1993). Contrarily, impairments symbolise the emblematic negative exclusively construed by limitations that cast employees with impairments as less capable and less productive (Jammaers, Zanoni, & Hardonk, 2016; Zanoni, 2011). Consequently, employees with impairments are under additional pressure, making them struggle against organising principles and ensuing practices. Yet, they are often expected to fit institutionalised patterns of behaviours that are considered the natural way of doing things as conditions of inclusion (Alvesson & Willmott, 2002). For example, Jammaers and Zanoni (2021) report how the arrangements made in an organisation to erase traces of impairments created exclusionary effects because not many workers with impairments can “live up to a norm that was not written on a disabled body” (p. 440). Referring to employees with

² We distinguish between ‘doing multimodality research’ and ‘adopting multimodal concepts’ (Jewitt, Bezemer, & O’Halloran, 2025). The former entails framing the line of enquiry as a multimodal research problem (e.g. the effect of multimodal devices on meaning-making) and espousing multimodality methods (e.g. discourse analysis of news videos). Our study, which adopts the latter, uses information representations and practices to theorise workplace inclusion for blind professionals.

impairments as ‘different’ while downplaying their impairments is also a manifestation of exclusion. The unwillingness to articulate the specific impairments points to the complexities of inclusion in practice, because openly talking about impairments “may be construed as ... being non-inclusive” (Mik-Meyer, 2016, p. 1358).

By rejecting the conceptualisations of an inclusive workplace as an ideal entity that welcomes employees with impairments, critical studies reveal multiple mechanisms underlying the persistent challenges in facilitating the inclusion of people with impairments in the workplace. Following this line of inquiry, we view inclusion as a socially embedded process that involves various actors and practices as a foundation to develop a deeper understanding of workplace inclusion for blind professionals.

2.2. Information and visualisation

A sociocultural view of information is helpful in establishing insights into dominant organisational information practices and why they create challenges for people with visual impairments. In this view, information is grounded in cultural practices that delineate a shared understanding of how information should be expressed and interpreted (Boell, 2017). Therefore, information constitutes a cultural object with “shared *significance* embodied in *form*” (Griswold, 1987, p. 3; our emphasis), one that constitutes “cognitive (i.e. significance – ideas embodied schematically) and material (i.e. form – ideas embodied in a medium)” instantiations of information (McDonnell, 2023, p. 198). The dynamic relation between cognitive and material instantiations shapes the convergence of meanings among people that emerge through their shared experience with these objects.

Visuals have increasingly shaped various organisational practices, such as financial reporting (Arjaliès & Bansal, 2018), management control and decision making (Quattrone, 2017), performance measurement (Ronzani & Garzweiler, 2022) and institutionalisation of novel ideas (Meyer et al., 2018). Visual and multimodal research in organisations stresses the significance of visuals as material representations of information and the shared meaning that emanates from them (Quattrone et al., 2021). Contextual conditions regulate the creation and adaptation of modes of representation to convey and interpret meaning (Kress & van Leeuwen, 2021). For example, Kaplan (2011) explains how PowerPoint slides and their organisationally prescribed template became the only object used to organise collaborative work and reports an employee's failed attempt to move his project forward simply because his slides did not follow the prescribed template.

Visuals as representations in the context of our study include texts, numbers, images and other visuals used for aesthetic purposes (e.g. colour, italics, layout), among others. Previous studies argue that visuals, with their appealing and persuasive power, play a central role in organisational communications and rhetorical approaches by rendering abstract ideas or numerical values into concrete forms to convey meaning, elicit emotions and trigger actions. For example, Arjaliès and Bansal (2018) show that the use of emojis that embodied environmental, social and governance criteria in financial reports highlighted social and environmental problems and reoriented managers' perspective on firms' performance as both financial and societal.

However, recent developments in organisational visual scholarship highlight the co-constitutive enabling and constraining potentials of visuals. Studies often use the notions of ‘visibility’ and ‘invisibility’ to highlight that “[e]very way of seeing something is a way of not seeing something else” (Quattrone, 2022, p. 548) and point to the drawbacks of visual approaches, such as how the reliance on visuals oversimplifies information in performance measurement (Ronzani & Garzweiler, 2022) or how selective visibility undermines transparency (Tweedie & Ronzani, 2025). This stream of research indicates that visuals are intrinsically imperfect and incomplete and, as such, often fail to capture the phenomena they attempt to represent. This observation is especially pertinent in the context of information practices where visual information (e.g. pictures, colours, visual structures), typically found in everyday organisational information objects, conceals the potential of non-visual information and practices. Moreover, we argue that the preponderance of visual practices invisibilises people with visual impairments, dismisses non-visual representations of information and ignores non-visual information practices.

To advance our understanding of inclusive information, we build on studies that not only treat incompleteness or imperfection of representations as a rupture but take one step further and argue that a gap in representation opens up and supports organisational actors' imagination and unfolding actions to address the incompleteness and imperfection that visuals entail (Barry & Meisiek, 2010; Busco, Granà, & Izzo, 2024; Giovannoni et al., 2025). This perspective suggests that *visual information representations* and *visual information practices* are closely linked and should be analytically considered together to deepen our understanding of the relationship between the unfolding of representations and social reality (Quattrone et al., 2021). As Busco et al. (2024) convincingly argue, despite the inherent imperfection of visuals to capture the complexity of how organisations address social and environmental challenges, these same visuals can prompt spaces for reflecting on the ambiguous dimensions of sustainable value and facilitate an unfolding process to generate new understandings of the meaning of sustainable value creation. In this sense, thanks to their imperfection, visuals present themselves as an interpretive space endowed with the condition of possibility that invites organisational actors to engage in the process of considerations, inquiry and reflection in search of solutions (Quattrone, 2022). Correspondingly, Barry and Meisiek (2010) suggest that workarts as visuals can provoke organisational actors to ‘see more’ by questioning habitual ways of doing things and ‘see differently’ by changing one's perspective through comparative understandings across contexts. Considering our empirical setting, encountering blind colleagues and their information world may help sighted professionals challenge the unquestioning nature of typified organisational information practices and draw new distinctions around what constitutes exclusive and inclusive information contexts. These considerations and reflections can potentially lead to necessary actions to change the status quo and transition toward a more inclusive information environment for blind professionals.

2.3. Representational materialities of information

We use the concept of representational materialities of information to explore the transition from information exclusion to inclusion and scrutinise the negotiation process between blind professionals and their sighted colleagues. Representational materialities of information are “those properties of representations and formats that *constrain, enable, limit, and shape* the ways in which those representations can be created, transmitted, stored, manipulated and put to use” (Dourish, 2017, p. 6; our emphasis). By scrutinising representational materialities of information, we can discern how collaborative ways of working between blind and sighted professionals emerge and continuously evolve. Extant literature has mainly focused on the enabling power of representational materialities of information, foregrounding how they shape and change work practices (cf. Kaplan, 2011) and even elicit emotions (cf. Barberá-Tomás, Castelló, de Bakker, & Zietsma, 2019). However, less is known about the undesirable consequences of a socially limiting view of representational materialities that may exclude blind individuals from participating in information practices in a predominantly sighted work environment.

Compared to sighted people, blind people are known to have much stronger verbal-auditory encoding abilities (Baldwin, Mankoff, Nardi, & Hayes, 2020). Screen readers, which read text on a screen sequentially, are often a primary way for blind individuals to acquire information from their digital devices (Babu, Singh, & Ganesh, 2010). However, graphics are inaccessible to blind individuals because screen readers and braille displays “cannot parse pixel visualizations” (Chundury et al., 2022, p. 1084).³ Similarly, formatted textual content (e.g. font colour) and visual structure (e.g. indentation) are inconsequential for blind users (Das et al., 2019; Morales, Arteaga, & Kurniawan, 2013). Moreover, information navigation is cognitively demanding for blind users because they must form a mental model of the structure from linearly presented audio information of navigation items (Mäkipää et al., 2022), while highly visual interfaces (e.g. track changes features in MS Word) are particularly challenging to navigate via a screen reader (Das et al., 2019). Thus, blind professionals often take longer to complete collaborative editing activities and may introduce mistakes that sighted users rarely make (e.g. misplacing text in a document). In sum, blind professionals do not have “the benefit of ‘using vision to think’ that visualizations offer” (Jung, Mehta, Kulkarni, Zhao, & Kim, 2022, p. 1095). Consequently, an overemphasis on visual information excludes blind individuals from fully participating in work activities, including remote work using video calling or screen sharing (Tang, 2021), collaborative writing (Das et al., 2019) and office communication (Mäkipää et al., 2022).

In this study, we focus on the representational materialities of information embodied in widely used objects in organisations that support articulating, formatting, storing and sharing information in the workplace: email messages, documents and PowerPoint slides. Indeed, a recent survey among blind and low-vision workers reveals that email (95%), word processing (92%) and presentation tools (38%) are commonly used in the workplace (Silverman, Rosenblum, Bolander, Rhoads, & Bleach, 2022). Appendix A shows a depiction of the representational materialities of information in email messages (Fig. A1), documents (Fig. A2) and PowerPoint slides (Fig. A3).

2.3.1. Email messages

Research identifies three main purposes for using email: (1) work and social communication, (2) coordination, discussion and information request, and (3) task management, such as distributing documents and keeping track of tasks (Bellotti, Ducheneaut, Howard, Smith, & Grinter, 2005). Our examination of the visual features of email messages reveals two representational materialities of information that shape blind professionals' actions and interactions with their sighted colleagues: *email header* and *email content* – see Table 1.

Email headers precede email content and display information, organised by fields, about the sender, the recipient(s), including those carbon copied (Cc) and blind carbon copied (Bcc), the date and time the message was delivered (or received) and the subject of the message (Soe & Markus, 1993). This information allows email users to manage their inboxes – e.g. reading, classifying, responding, archiving or deleting incoming messages (Wainer, Dabbish, & Kraut, 2011). Email headers usually offer visual markers that help users prioritise messages (Bellotti et al., 2005; Wainer et al., 2011). The representational materialities of information in email headers facilitate the somewhat stable routine of email use, such as users clearing inboxes at home so they would not be overwhelmed by messages when they arrive at the workplace (Barley, Meyerson, & Grodal, 2011). Visually scanning email headers is a common practice (Soe & Markus, 1993); email users frequently glance at their inbox “to determine whether something needs to be read” (Wainer et al., 2011, p. 3440).

The corpus of the message constitutes the email content. It typically includes a greeting line, the message's body, a closing line and a signature line. Some messages can be lengthy, especially when complex information needs to be conveyed (Markus, 1994). Besides figures and tables, email content may display typographical elements, such as asterisks and capital letters (e.g. *PLEASE READ UNTIL THE END*) to emphasise the message, emojis (e.g. ☺) to convey personal cues and abbreviations to save keystrokes (e.g. FYI) or to mimic oral communication (e.g. ur for your) – Jung and Lyytinen (2014); Panteli (2002). These ostensibly visual enhancements assume that those others interacting with email can interpret these visual clues. Also, email content can include a discussion thread that makes visible the original message and subsequent replies in a single format (Rohall, Gruen, Moody, & Kellerman, 2001), and adding new recipients and tasks (Tarafdar, Wenninger, & Stich, 2023).

Effective email use presupposes that both the sender and the receiver can comprehend the norms around the creation and interpretation of symbols to reach a mutual understanding (Lee, 1994). This observation is particularly relevant when blind individuals participate in email exchanges.

³ The damaged neural structures controlling the object-properties processing system prevent blind individuals from seeing shapes, but their spatial-properties processing system still allows them to convert shape-based imagery into spatial-based imagery – e.g. drawing letters in the air with their hands (Kosslyn, Thompson, & Ganis, 2006).

Table 1

Representational materialities of information in email messages.

	It facilitates email management by providing:
Email header*	– Essential information
	o Recognising the sender, subject and time of the message
	o Making inferences to decide how to proceed (e.g. reply, delete, etc.)
	– Visual markers
	o Prioritising messages through symbols (e.g. exclamation marks)
	o Using colour-coded flags to distinguish between pending from completed replies
	o Glancing at inbox repeatedly to check whether new messages have arrived
	Its meaning-making power, visibility and reach can be enhanced through:
Email content	– Rich information
	o Providing complex content while observing professional communication norms
	o Inserting images, tables, videos, hypertext
	– Unique forms of communication
	o Adding graphical expressions to convey personal cues or typographical elements to stress ideas
	o Using abbreviated words as convenient shortcuts, especially in informal communication
	– Conversation thread
	o Visualising the status of a conversation in progress with multiple individuals
	o Adding new recipients and tasks to a conversation thread

* Sound effects, pop-ups and icons, although not part of the email header, are common features of email applications intended to notify users about incoming messages (Wajcman & Rose, 2011).

2.3.2. Documents

A document is a storage and retrieval device containing information (Buckland, 1997). Documents are signifying devices because “behind their production is an intent to store and communicate meaning” (Allen-Robertson, 2018, p. 1735). Research recognises documents as the preeminent organisational artefact that makes possible intra- and inter-organisational collaboration (Heath, Knoblauch, & Luff, 2000). As Hull (2012) argues, “the document has remained the very image of formal organizational practice, the central semiotic technology for the coordination and control of organizations and the terrains on which they operate” (p. 256).

Documents were originally considered material repositories of thought consisting of written signs only, but nowadays they contain non-textual elements (Buckland, 2018). That said, we treat documents as two-dimensional artefacts with textual content only in this study. Still, the representational materialities of textual information in documents typically incorporate two types of visual cues that are problematic for blind individuals: the *visual structures* intended to facilitate the reading of a document (Wright, 1999) and the *visually emphasised text* intended to draw the reader's attention to parts of the document (Fukui, Nakata, & Kato, 2016) – see Table 2. The former are the “readily observable features” (Orlikowski & Yates, 1994, p. 544) that constitute the arrangement of “work and thought behind the text [that] influences how readers, in turn, structure their thinking” (Bishop, 1999, p. 257). The latter constitute the paralinguistic features in written information, such as text formatting (Hull, 2012) and, in the case of collaborative work, include visual markers that make changes visible to other co-authors, such as the track changes function in MS Word (Kirschenbaum, 2016).

These visual cues allow the sighted reader to explore a document layout and identify prominent information at the blink of an eye; they are ineffectual for blind individuals.

2.3.3. PowerPoint slides

Since its launch in 1987, the PowerPoint software, initially called Presenter, has experienced profound changes. It has evolved from a software package for producing static black-and-white overhead transparencies (Gaskins, 2007) to an application that allows embedding objects, creating animated presentations and playing videos directly from the web. Its diverse functionalities, combined with the spreading of computer technology and the development of inexpensive data projectors, contributed to the wide adoption of PowerPoint as the default software package for creating and delivering presentations.⁴ As such, PowerPoint comprises two semiotic artefacts: the software for producing representational materialities of information and the slideshow for presenting them (Zhao, Djonov, & van Leeuwen, 2014). Our analysis focuses on how the graphic representational materialities of information in PowerPoint slides shape collaborative work between blind and sighted professionals.

A PowerPoint slide deck typically contains a combination of text in different forms (fonts, sizes and colours), graphics (pictograms, charts and tables) and multimedia (audio and video recordings). Slides consist of an arrangement of visual elements, including text and graphics, “depicted and to be perceived usually in a square format” (Knoblauch, 2013, p. 72). Furthermore, slides can contain ‘builds’ if these visual elements appear, move and/or disappear in sequence thanks to the animation functionality (Stark & Paravel, 2008). These representational materialities of information underscore the essentially visual nature of PowerPoint. The composition and design of text, graphics and multimedia in PowerPoint slides are invariably intended to influence meaning-making on an audience, be it for teaching (Smith-Peavler, Gardner, & Otter, 2019) or strategy formulation (Knight, Paroutis, & Heracleous, 2018).

⁴ While we acknowledge other presentation software packages, PowerPoint is the world's most ubiquitous presentation tool. Approximately 30 million PowerPoint presentations are delivered every day (Becker, 2024).

Table 2
Representational materialities of information in documents.

	It facilitates the reading of a document:
Visual structure	– Assembled arrangement of information – e.g. headings, paragraphs, lists - o Adding visible attributes that reflect how the writer organised their ideas and influence how readers interpret them It draws the reader's attention to parts of the document:
Visually emphasised text	– Paralinguistic features in written information - o Formatting text – e.g. font face, font size, font style – Visual markers to highlight changes in collaborative text production - o Highlighting changes or adding comments

Pötzsch (2007, cited by [Knoblauch, 2013](#)) classifies the representational materialities of information in PowerPoint slides into three categories – see [Table 3](#). The first one corresponds to text slides, where the visual elements are exclusively made of text using a combination of typographic choices ([Meyer et al., 2013](#)) that often contain a formatted heading ([Stark & Paravel, 2008](#)) followed by paragraphs and/or bullet lists with words or sentence fragments ([Schnettler, 2006](#)). The second category of slides displays a combination of text and pictures to support different purposes: ornamental text-picture slides, where figures simply adorn the text ([Meyer et al., 2013](#)); metaphorical text-picture slides, where figures allegorically supplement the meaning of a text ([Meyer et al., 2013](#)); emblematic text-picture slides, which combine text and organisationally sanctioned design figures ([Zhao et al., 2014](#)); and representative text-picture slides, where figures are part of the meaning of the words ([Stark & Paravel, 2008](#)). Pictorial slides, whose content is essentially graphic, constitute the third category: purely pictorial slides with no text ([Kaplan, 2011](#)); slides with diagrammatic elements used as multimodal resources ([Kaplan, 2011](#); [Meyer et al., 2013](#)); and slides with a combination of pictures and text, but the pictorial elements dominate the content ([Kaplan, 2011](#); [Meyer et al., 2013](#)).

This review corroborates the eminently graphic nature of PowerPoint slides to convey meaning ([Knoblauch, 2013](#)).

2.4. Workplace inclusion through collaborative information practices

As a central building block for accomplishing work in organisations, collaboration is “an evolving process whereby two or more social entities actively and reciprocally engage in joint activities aimed at achieving at least one shared goal” ([Bedwell et al., 2012](#), p. 130). The IS literature adds the technology component to this definition: “the interaction and the technology among two or more people in pursuit of a common goal or work deliverable” ([Bélanger, Markham, Cefaratti, & Carte, 2014](#), p. 629). Taken together, these definitions highlight three characteristics of collaboration relevant to our study. Firstly, collaboration is an emergent process rather than a prescribed state ([Gray, 1989](#)). While collaboration involves interaction among two or more entities to achieve desired outcomes, the outcomes themselves do not constitute collaboration. Secondly, the collaborative process can generate both individual and collective outcomes. Thirdly, collaboration is a collective concept that inherently recognises the multilevel nature of work ([Bedwell et al., 2012](#); [Bélanger et al., 2014](#)).

As a collective phenomenon, collaboration through digital technology in organisations unfolds at multiple levels ([Venkatesh, Weng, Rai, & Maruping, 2023](#); [Zhang, Gable, & Tate, 2019](#)) and involves a complex network of mutually dependent entities ([Burton-Jones & Gallivan, 2007](#)). Therefore, studying collective phenomena invariably focuses on “not just the individual, but ... the individual within the group” ([Klein, Danserau, & Hall, 1994](#), p. 203). More importantly, collaboration observable at a higher level is more than just the simple sum of cooperative tasks at lower levels ([Kozlowski & Klein, 2000](#)). As individuals transition from solo tasks to dyadic interactions to broader team connections, interdependent links form within organisational structures ([Kozlowski, Gully, Nason, & Smith, 1999](#)). Although much of the digitally mediated collaboration in organisations transpires through information sharing ([Beynon-Davies & Wang, 2019](#)) or information co-production ([Barki, Titah, & Boffo, 2007](#)), the centrality of information as a common ground for mutual understanding in practice and for developing a deeper understanding of collaboration has been persistently overlooked ([Mingers & Standing, 2018](#); [Petter, Carter, Randolph, & Lee, 2018](#)). In a predominantly visual environment, where the aesthetic component of information is as important as its content, blind and sighted professionals need to work collaboratively on visual and non-visual representational materialities of information. We build on and expand an emerging body of work that suggests that collaborative practices between people with visual impairments and sighted individuals have the potential to promote inclusion for the former ([Branham & Kane, 2015](#); [Das et al., 2019](#); [Peng, Wu, Bigham, & Pavel, 2022](#)).

3. Research methods

This research was conducted in New Zealand, a country recognised as a progressive society that promotes inclusiveness, individual rights and freedoms ([AlTi Tiedemann Global and Social Progress Imperative, 2025](#)). New Zealand played an active role in the formulation of the United Nations' ([UN, 2006](#)) *Convention on the rights of persons with disabilities* and has increasingly enhanced the participation of people with impairments since the inception of the *Disability strategy* and its periodically updated action plans ([Ministry of Social Development, 2016](#)).

Between August 2014 and July 2015, we applied an intensity sampling approach ([Patton, 2002](#)). We spoke with eight persons with visual impairments, ranging from those who are blind since birth to those whose vision has deteriorated over time, resulting in partial

Table 3
Representational materialities of information in PowerPoint slides.

Text slides	The visual elements of the slides are exclusively made using typographic choices of text with formatted headings, paragraphs and/or bullet lists with words or sentence fragments
	A combination of text and pictures that support different purposes:
Text-picture slides	– Ornamental text-picture slides: figures adorn the text – Metaphorical text-picture slides: figures supplement the text – Emblematic text-picture slides: recognisable figures (i.e. logos) and text – Representative text-picture slides: figures signify the text Visual elements are essentially pictorial:
Pictorial slides	– Purely pictorial slides – e.g. figures, videos – Slides with diagrammatic elements – e.g. organigrams – Slides where the pictorial elements dominate the content

vision or blindness, working under different contractual arrangements. The reliance on digital technology for producing and consuming information in collaboration with their sighted co-workers was salient.

3.1. Data collection: Research setting

By early 2015, we concluded that the Community Safety and Development Unit (CSDU), with 101 full-time positions at Aroha Council,⁵ was the most suitable research site for a fully-fledged investigation since it employed two full-time blind professionals: Mia and Parker. Although growing, employment opportunities for blind people remain limited (McDonnall & Sui, 2019); an organisation employing two blind individuals offers an exceptional opportunity (Siggelkow, 2007) to investigate workplace inclusion by scrutinising how they collaborate on information-oriented tasks with their sighted colleagues. The CSDU produces and maintains policy documents; as such, it exhibits the traces of a complex group since its core activity is highly structured, which requires individuals with specialised roles from different areas to work in a coordinated fashion (Kozlowski et al., 1999).

Mia and Parker provide professional advice on delivering accessible services to Aroha citizens. Their job responsibilities include liaising with external stakeholders about community funding and accessibility issues through face-to-face and virtual meetings. Exchanging emails, drafting policy documents, and attending and delivering formal presentations are tasks particularly relevant to this study.

Mia was born with Leber congenital amaurosis and keratoconus. She lost the little sight she had when she was affected by glaucoma at a young age. She has a reminiscence of herself as a sighted girl: “I miss seeing colours. I can still remember colours”. Mia attended a blind school; she obtained an honours degree in psychology and a post-graduate diploma in secondary education. Her involvement with support groups and contributions to the visually impaired community earned her many accolades. She exudes energy when reflecting on her journey: “My life is so full. I read a lot; I travel a lot; I got a job that I enjoy mostly”. Mia uses digital tools every day: “I would not be able to think of a day that would go by, whether I am at work or not, that I do not use technology ... If you are totally blind, [it is] a great advantage”.

Parker is blind by birth. He describes his condition: “I see dark and light; that is about that. No sight”. He attended a blind school, where he learned to read braille at five. He later obtained a political science and social policy degree and completed an MA in disability studies. Parker considers digital technology essential for his work:

I use a number of bits of technology. I have a laptop computer, which has voice as a screen reader, and a braille display. That is how I access emails ... write messages and access the Internet ... I also have a braille notetaker; I tend to use it at meetings [to] access minutes and papers and stuff ... I have an iPhone ... Apple are the only people who built in a screen reader, so you do not need to purchase anything additional ... Anyone can switch VoiceOver on an iPhone and have it talk.

Despite his mastery of digital technology, Parker recognises the difficulties of a blind person: “It is challenging ... playing [games] on a flat-screen ... There is no question about that, but ... I have got to get to grips with it”. He also describes his challenges with organisational systems: “There are still things at work that are problematic. We have a thing called SAP ... It is where we have all our policies and procedures ... where you apply for leave ... It is really quite inaccessible”.

At the time of the fieldwork, Mia had been working as a disability advisor in the CSDU for over four years and Parker for over three years. We conducted semi-structured interviews with them and their sighted colleagues with whom they interact the most: Sally (manager), Susan and Jenny. We developed interview guides covering aspects of their responsibilities, focusing on their use of digital technology for collaborative work on information-oriented tasks, but were flexible in following up on issues that emerged during the interviews (Myers & Newman, 2007). The interviews were audio-recorded. We also video-recorded Mia's and Parker's use of mainstream and assistive software applications on different hardware (e.g. laptops, refreshable braille displays, smartphones) to work on email messages, documents and PowerPoint slides. The data in these video recordings allowed us to re-live the fieldwork experience

⁵ We use a disguised name for the organisation and pseudonyms for individual participants.

with an inquisitive mind during the analysis (Díaz Andrade, Urquhart, & Arthanari, 2015). Fig. 1 presents an overview of the data collection techniques we applied.

3.2. Data analysis: Multilevel theorising

A multilevel theorising approach guided our analysis. Rooted in general systems theory (von Bertalanffy, 1968), a multilevel theorising involves discerning the distinctiveness of individuals, dyads and teams, where teams are constituted by “two or more individuals who socially interact, have one or more common goals, exist to perform task-relevant functions, exhibit workflow interdependencies, and are embedded in an organizational context” (Kozlowski et al., 1999, p. 245). Our theorising cuts across three levels: from the individual actions blind professionals perform through their dyadic interactions with sighted colleagues to team activities.

We analysed the data in three phases, as depicted in Fig. 2. In the first phase, we inductively identified the challenges blind professionals face in handling information in email messages, documents and PowerPoint slides. For example, screen readers help blind professionals read the textual content of email messages with audio outputs but cannot interpret graphics. Similarly, documents with charts (e.g. tables) and visually complex effects (e.g. track changes), and images without text alternatives in slides are inaccessible to blind professionals. These challenges highlight the limitations of assistive technology in helping blind individuals interpret certain forms of information, particularly those involving images, visual structures and visual effects. In such cases, assistance from sighted colleagues becomes necessary. In the second phase, we inductively scrutinised the individual actions of blind professionals on digital technology (e.g. listening to emails) and interactions at the dyad level between blind and sighted professionals supported by digital technology (e.g. converting a table into plain text) that culminated in an inclusive information collaboration phenomenon at a collective level (e.g. adding ‘dings’ to signal the transition of slides in a public presentation). We paid special attention to the distinctive contributions blind and sighted individuals make when working collaboratively on different forms of information by combining their knowledge, actions and preferences through workflow interdependencies that result in a “congruent whole” (Kozlowski & Klein, 2000, p. 74). This collaborative process follows a compilation mechanism characterised by heterogeneous individual contributions to achieve collective performance – e.g. GP, surgeon, anaesthetist and nurses working together to treat a patient – as opposed to a composition mechanism, which assumes homogeneous individual contributions to achieve collective performance – e.g. customer service specialists at a call centre. Since detecting the emergence of a collective phenomenon entails “an effort to capture or freeze the result of a dynamic process [and] how it all fits together” (Kozlowski & Klein, 2000, p. 64), we adopted an iterative analytical move between zooming in and zooming out (Nicolini, 2009). We zoomed in to scrutinise Mia’s and Parker’s individual actions, followed the transition to coordinated interactions with their sighted colleagues and scrutinised the continuous adjustments in the ad-hoc dyads to handle different information objects. We zoomed out to examine how the multiplicity of ephemeral dyadic interactions materialised in information collaboration at the team level, thereby advancing workplace inclusion for blind professionals.

In the third phase, we engaged in a recursive movement between our empirical observations and the notion of representational materialities of information (Dourish, 2017) to provide a theoretical explanation of the phenomenon under study. Throughout the research journey and our interaction with blind participants, as well as our observations of how they work with information, we were constantly reminded that various forms of complex visuals (e.g. visually emphasised text, visual structure and visual effects associated with track changes and comment features, graphs and images) create significant challenges for blind individuals that cannot be overcome by assistive and mainstream technologies. As explained earlier, blind individuals ‘see’ the world differently; they mainly rely on their hearing and tactile senses to process information. We came to comprehend their need for alternative ways to represent information beyond visuals, especially in the workplace, where complex visual representations are the norm. For instance, Parker questions the rationale behind publishing health and safety information only on a pinboard since this content “is typed up by someone, probably in a Word file”; he expects the original ‘Word file’ to be shared with him and Mia so that they can access the same information that is only available to their sighted colleagues. Mia also questions the need for relying on printed material while stressing the advantages of digital information over computer printouts: “[My colleagues ask] me, ‘What do you think of my email?’ I would open the email ... but they would go, ‘Hang on. I have got to go to the printer’ ... and the printer ran out of ink”. These instances constitute vivid illustrations that alternative ways of representing information are not only desirable but possible. As we progressed in the analysis, the notion of representational materialities of information, broadly classified as visuals and non-visuals, provides an important conceptual

Audio recorded interviews			Video recorded observations*		
Mia	→	86 min			
Parker	→	68 min	Mia	→	44 min
Sally	→	59 min	Parker	→	22 min
Susan	→	32 min			
Jenny	→	26 min			

*Focused on email, documents and PowerPoint use

Fig. 1. Overview of data collection

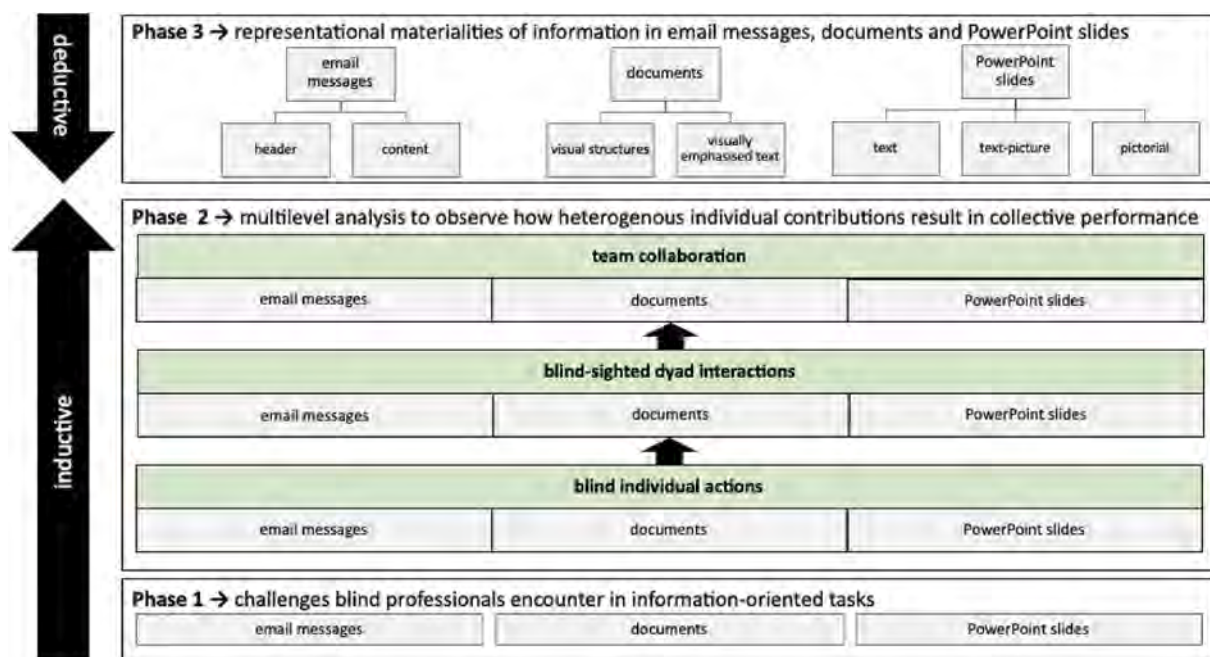


Fig. 2. Schematic representation of the analytical procedures.

infrastructure for understanding the experiences of exclusion and inclusion of blind individuals. While the review of previous studies allowed us to identify the visual representational materialities of information present in email messages, documents and PowerPoint slides, our time in the fieldwork revealed the conversion of visual information representations into non-visual information representations and vice versa, and the ensuing visual and non-visual practices that contribute to workplace inclusion – see Fig. 3.

4. Findings

This section is organised into three sub-sections: email messages, documents and PowerPoint slides. It presents the multilevel analysis of how our participants work on the representational materialities of information in each of these information objects, accompanied by screen captures from the video recordings.

4.1. Email messages

We scrutinise two activities – retrieving information from email messages and inscribing information into email messages – to analyse how our blind participants and their sighted colleagues work on the representational materialities of information in email messages. Appendix B shows a schematic depiction of this analysis.

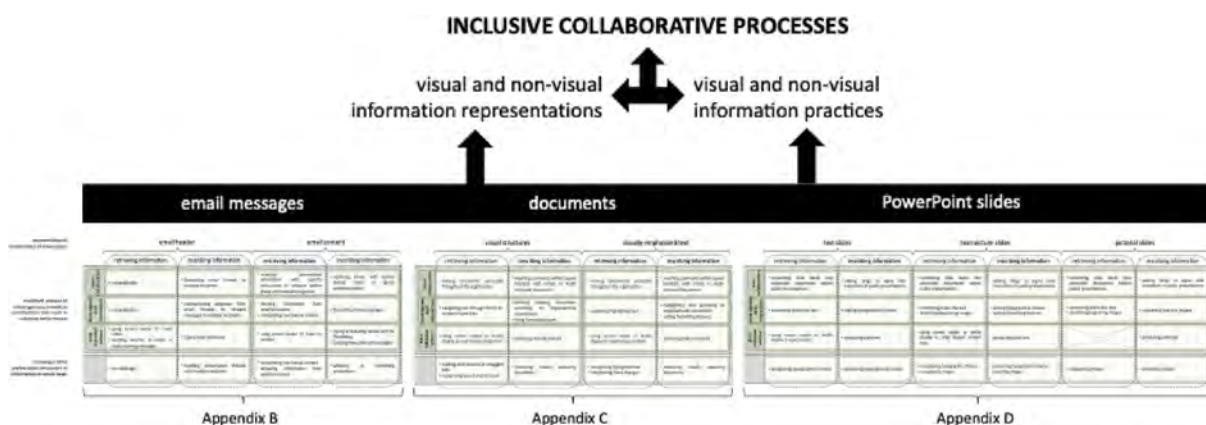


Fig. 3. Theorising inclusive collaborative processes

4.1.1. Retrieving information from email messages

Mia and Parker can neither rely on the email header's visual markers (e.g. coloured flags) nor glance at their inbox. Mia accesses her email through her iPhone's speech functionality: "Whatever is on the screen, the phone will speak up to me". When she touches the email icon (Fig. 4), VoiceOver says, "Forty-two unread messages". If she wants to go through these messages, she taps the icon: "It is very much a mixture of picking, tapping and hearing".

After opening the email app, VoiceOver reads the information displayed on the email header (i.e. sender, subject and time stamp). Her incoming emails are chronologically organised from the newest to the oldest. Mia handles a large volume of messages: "I receive about 100 messages a day ... I generate fewer because most of the email traffic is me collecting information and being informed rather than me sending it out". The representational materialities of information in email headers allow Mia to manage her email inbox during the morning commute to work: "I could hear the email [headers] ... By the time I am at work, I have basically read them all [and deleted those that are no longer needed]". If she wants to listen to a specific message, she taps on it. To illustrate this process, she selects a message for which VoiceOver reads its subject line: "Blind Foundation meeting and proxy form" (Fig. 5). After opening the selected message, Mia can "scroll up or down" to listen to its content.

Although the speed of her phone's speech is almost unintelligible to us, retrieving information from email using speech output is a straightforward task for Mia. She smirks, "It is like reading for you". However, Mia often encounters situations where the email content points to information physically displayed – e.g. "Please look at the health and safety notice boards [for emergency procedures]". It could also be that the message refers to another digital source. For instance, Mia was collecting data about international travel with dogs via email:

All the survey responses come back by email ... I will read them all together, basically to get an impression of what are the main topics ... If they say to me, "Oh! An example of good policies may be the ADA, the Americans with Disabilities Act" ... If I think it is going to be long, I can ask admin support and say, "Look, I am looking for summaries of the ADA ... that refers to international travel or accessible travel" because they can visually scan it quicker.

In this instance, Mia resorts to her sighted colleagues to access external content. Their sighted colleagues are happy to assist. Furthermore, CSDU staff actively avoid stigmatising Mia and Parker. For instance, Sally, mindful that her messages go not only to them but to a larger audience, takes an additional step to avoid hurting feelings:

I have in an email, "We have got to do this, this and this. Mia and Parker, you might have to think about different something, something, something" ... They do not like being singled out ... That is delicate because sometimes there are things that they do need to know, in which case ... I will go the extra mile ... I might give them a heads up ... "Hey, I am about to send an email out. It is going to have a couple of implications for you. I am letting you know", so I am not announcing it to the world.

Sometimes, email exchanges include graphical expressions. For example, smiley faces (☺) are commonly used in email communication at Aroha Council; however, screen reader software cannot always interpret emojis. Moreover, if the email system does not support wingdings, the smiley face will appear as a letter 'J' in the text; a dangling letter 'J' conveys no meaning. To overcome the limitation that this representational materiality of information imposes on her blind colleagues, Sally resorts to creative and considerate ways for conveying expressions by establishing ad-hoc communication codes to ensure inclusiveness:

For example, I want to send an email to the team: "Awesome team. You did a great job!" I will put in a ☺ and describe a smiley face in my email to the team ... So, I write a 'bracket', 'smiley face', and close the 'bracket'. So, [Mia and Parker] are not missing out on the smiles. You know what I mean? This is good! It feels good.

Sally emphasises that she "put[s] the ☺ and the 'squared [brackets] smiley face' ... Both!" This tactful approach that combines graphical expressions and textual equivalent formats to convey personal gestures shows the inclusive collaborative approach practised in the CSDU.

4.1.2. Inscribing information into email messages

Mia and Parker also respond to or generate emails. For instance, even though the bulk of Mia's email use involves handling incoming messages, she "probably send[s] out 20 messages a day ... especially on Monday ... answer[s] a lot of emails". After listening to emails on her phone, she decides "to either respond by speaking ... or by typing it back". However, she concedes that typing emails on a small screen could be cumbersome, especially if she needs to produce a formal reply: "If I really want to ... write back meaningfully, I will wait until I am at the computer, because to me, that makes more sense". Susan adds that she often helps "reformatting official emails". This action reveals how the representational materialities of information in email messages foster collaboration between blind and sighted professionals to observe communication standards in both content and format.

Beyond formatting issues, Mia and Parker need assistance manipulating the representational materialities of information when handling conversation threads. Susan explains that they "struggle to find things, especially in chain emails" and shares an occasion when she helped Parker forward an email thread to many recipients:

There were a lot of people involved in this email chain, and he wanted to take that big lump of people and Bcc everyone in the email. But for some reason, just copying and pasting all the email addresses did not work ... So, I [asked him] to forward me the emails and I had a look through them. What basically happened is whoever initiated this email chain had some people saved in their address book. So, instead of [displaying] their email addresses, it was just their names ... Trying to copy and paste all of



Fig. 4. Mia opens the email app on her smartphone.

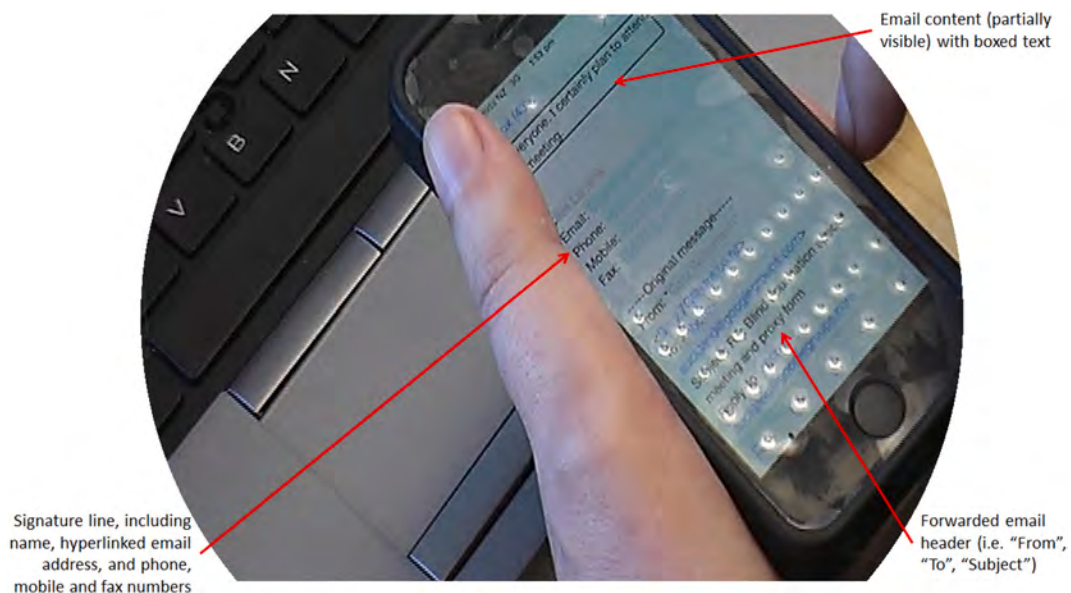


Fig. 5. Mia 'reads' an incoming email message.

that could not read the command. I had to identify those names and go back ... "Do you have these contacts?" Then, I switched out their names for that email address forwarded in the list, and then he could Bcc it to send it on.

To conclude, email use, when blind professionals are involved, requires working creatively with the representational materialities of information that compile upwards across individual, dyad and team levels (see Fig. 6). At the individual level, blind professionals independently retrieve and inscribe information from and into email headers and email content using assistive technology (blind individual row, columns 1, 2, 3 and 4). However, the need to work closely with their sighted colleagues to retrieve information arises when incoming email messages contain pictorial elements (blind-sighted dyad row, column 2). In the case of inscribing information, sighted professionals assist their blind colleagues in reconstructing email addresses from email threads (blind-sighted dyad row, column 3) and reformatting messages according to organisational standards (blind-sighted dyad row, column 4). These interactions eventually transcend the blind-sighted dyad and render a caring approach that balances organisational demands and special needs at the team level (team row, columns 2, 3 and 4) – e.g. the use of ad-hoc communication codes for describing emojis or individualised, heads-up messages to blind professionals.

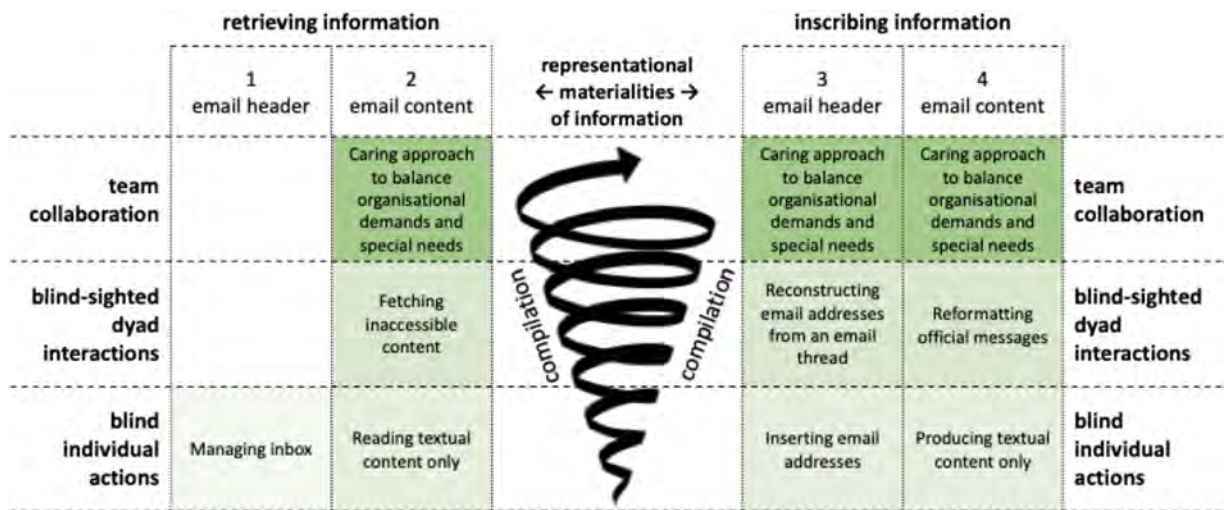


Fig. 6. Upwards compilation of inclusive information collaboration on email messages

4.2. Office documents

We now examine the blind professionals' actions and interactions with their sighted colleagues when retrieving information from and inscribing information into documents. Appendix C shows a schematic depiction of this examination.

4.2.1. Retrieving information from documents

Formulating policies requires Mia and Parker to be informed on various topics, including international and local guidelines on accessibility, assistive technologies and disability practices. Although they cannot literally 'see' information, they rely on digital technology to interpret it from documents in different formats. Still, some formats are preferred over others, as Jenny explains with a sympathetic tone: "Mia speaks out and says, 'Any documents in Word. I do not accept documents in pdf' ... Then, [she] get[s] pdf documents. It can be very frustrating ... She handles [pdf], but it is OK that she pushes back". Mia's demand is because not all pdf documents are tagged. Tags are accessibility markups that indicate the visual structure of documents (e.g. heading levels, paragraphs), which control how information is presented through assistive technology, making its content accessible to blind people. However, pdf documents could also be untagged, which can be read in a random sequence, or unstructured, which is simply an image that assistive technology cannot recognise.

Before reading documents, blind individuals need to find them first. They cannot visually locate a file on a screen and use a mouse to point to it; they memorise keystrokes and listen to their screen reader software. Mia explains: "I have to remember how to find folders and how to find file names quickly and how to scroll in them as the computer speaks back all the time" (Fig. 7a). In this case, she selects an untagged pdf document. JAWS says, "This 22-page document is untagged and must be prepared for reading", and asks her how she wants it to be read. Then, Mia sets her preferences by selecting the option "read left-to-right, top-to-bottom because I want to read it like a page, not like, say, a column" (Fig. 7b).

Once she has set her reading preferences, Mia proceeds: "Now, I am going to put it on continuous read ... This [document] is quite good ... It is actually quite readable ... If it goes 'graphic, graphic' ... it is not good". Indeed, assistive technology can only read textual

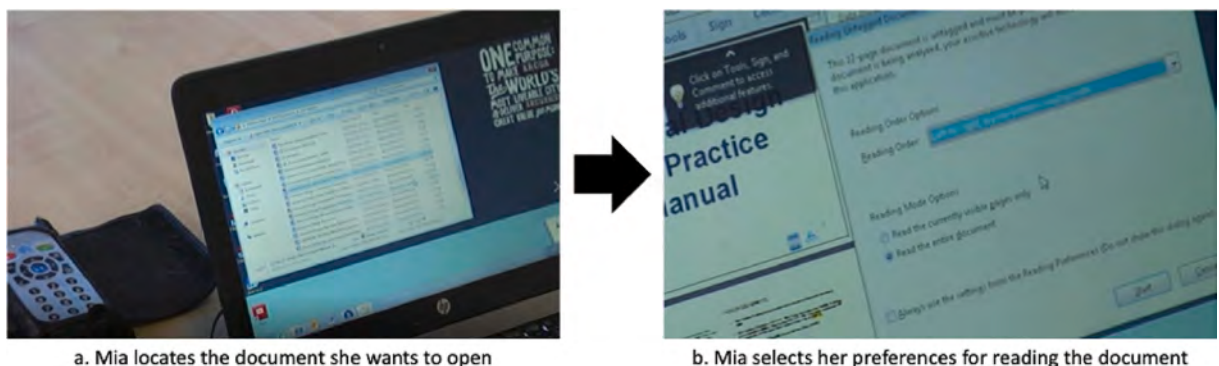


Fig. 7. Mia locates a document and chooses her reading preferences.

information; graphs remain undecipherable. However, in an organisational setting, documents seldom consist of purely plain text; they conform to a communication genre (e.g. letters, reports) saturated with visually appealing signposts (e.g. corporate letterhead, bold text). Susan considers the challenges a sighted environment imposes on Mia and Parker: “[They] will not identify if you underline, bold something. Obviously, we use that as a visual emphasis”. While sighted individuals can effortlessly recognise visual structure (e.g. headings) by scrolling up and down or spot visually emphasised text (e.g. italics) to locate relevant information without reading sequentially, blind individuals have no option other than continuously going through the text (via auditory signals or haptic outputs) until they find the information needed. Mia reflects: “If I want to look up something, it will take me quite some time”. Yet, blind professionals operate in a sighted environment and need to navigate the visual complexity of organisational documents. Susan explains the limitations of assistive technology and how she makes the visual effects of texts accessible to Mia and Parker:

[Assistive technology] does not understand the different types of headings. So, I have to make sure that I have got a hierarchy of headings to emphasise titles or subtitles ... Bullet points can be a struggle, depending on how far they are tabbed in ... It does not like reading those [either]. So, I have to make sure that it is all in a format that [the screen reader can interpret] ... easily, accessible information.

Susan reasons that her biggest challenge is converting documents “into an accessible Word format”, which inevitably involves working on the document’s representational materialities of information. To make the visual structures of documents accessible, they need to be broken down into sections, with a navigation guide that is friendly to assistive technology (e.g. headings, sub-headings, hyperlinked headings in a table of contents, return-to-contents hyperlinks, etc). Susan explains, “If it is a very long document, I always break it down with hyperlinks and create a content page at the beginning”, so that her blind colleagues can follow the narrative. However, it is not always a matter of merely recreating a heading hierarchy and providing return-to-contents hyperlinks. Often, some nuances require Susan to decide on the best way to make information accessible. With experience, she learned that “more than three heading types should not be used, otherwise the hierarchy gets a bit confusing ... If there are already three headings, I will make a judgement call”. The same reasoning applies when she encounters visually emphasised texts:

[If there are] any bolded words, I make a judgement call on whether I think that is, in fact, a vital piece of information or whether the point is emphasised enough just through the text. If I think that it does need further emphasis, I will write in brackets afterwards the text in bold.

Yet, a note in the document is not always enough. The variety and combination of visual structures and visually emphasised text require Susan to create innovative approaches to make information accessible. Whenever such a situation arises, Susan seeks Mia’s and Parker’s acceptance: “[I] write ... a warning that I have tried something new, something a bit different. ‘Let me know how it works. If it is not working, then let me know and I will try again’”. This instance illustrates Susan’s approach to accommodating her blind colleagues’ idiosyncratic needs in making information accessible. Making non-accessible documents accessible requires more than a high degree of coordination to transform the representational materialities of information; it demands an empathetic approach toward blind colleagues. Susan prioritises their requests “because I sympathise with their situation ... I can always negotiate a timeline with [sighted staff] ... for Parker and Mia, there is no other alternative. I give them priority”. She acknowledges: “People with impairments often need to give themselves more time to achieve a task, even if it is something silly ... [our] organisation goes a long way [to support them]”. Along the same lines, Mia reflects on the dichotomies organisational vicissitudes create but concludes on a positive note:

Unfortunately, or fortunately, there is quite a high staff turnover because staff go on to other departments ... I must say, in a way, it is frustrating because you feel you have to educate people ... In another way, I think every time someone goes on, if that person works for someone who has the same ICT needs as me, it is more people in the organisation becoming educated.

Efforts in educating people require sighted individuals to not only understand how blind individuals ‘read’ information but also cultivate a mindset that information should be accessible to all. Thus, inclusive information collaboration entails micro-coordination at the dyadic level and a caring approach reverberating across the organisation.

4.2.2. *Inscribing information into documents*

Producing a formatted document with visual structures and visually emphasised text can be a relatively straightforward task for a sighted person. However, inscribing information into documents according to the conventions of a sighted world could be an elusive task for a blind person. Mia reflects on the challenges she faces compared to her sighted colleagues:

I am not doing it quickly or just that fast because ... I am blind ... I get a bit paranoid. After writing something, I would think, “Yes, I can check where the heading is so that it did not accidentally go to the right alignment or that the fonts, when I copied and pasted, did not change”.

Sally oversees and is ultimately responsible for the quality of the documents the CSDU produces. She commends her blind colleagues’ writing style: “Content-wise, it is top of its notch ... well-constructed and beautiful grammatical paragraphs”. Yet, she needs to ensure that these documents are professionally presented and visually appealing:

We are required to produce reports. The reports fit a template [that] is a little bit pedantic ... I would say to my staff, “This is a report, and I need beautifully crafted paragraphs” ... For some of my staff, I would push back and say, “Look, you got three bullet points [but] one of them is out of alignment. Sort it out”.

Sally takes this firm stance with ‘some of her staff’, not with Mia and Parker. She recognises that pressing them to observe

formatting aspects is unnecessary: “That is one area I do compromise”, as she illustrates,

Parker had to write a report ... and Mia had to supplement it with information. Depending on the nature of MS Word and depending on where they cut-and-paste information from, I will have five different fonts, three different sizes. Some have bullet points, and some have dashes; some in capital letters, some in lowercase ... It is not a pretty-looking document. It is messy looking ... I have to give it to somebody else actually to make the text look pretty.

Susan corroborates Sally's account: “Often the format can jump between fonts and sizes”. Susan intervenes to make the document visually appealing and “to ensure that what you, non-visually impaired people, get looks like a normal document”.

Before official documents are released, they go through a peer-review process, which entails more than fixing formatting inconsistencies. This process often involves using ‘track changes’ and ‘comment’ features available in MS Word. Since the representational materialities these features offer (e.g. strikethrough, colour, pane in the right-hand margin) are impractical for blind individuals, Sally conceived an ad-hoc communication code:

Every time I make a change in a paragraph, I put a bracket⁶ around it. I type in my initials and what I have changed and close the bracket. It is a communication code. They still have to keep tabbing until they find my initials.

Fig. 8 illustrates this process. The left-hand side figure reproduces a fragment of the text Mia drafted. The right-hand side figure shows the same text with Sally's comments. We highlight Sally's remarks in red to facilitate their visualisation here.

This ad-hoc communication code reveals a paradoxical situation. Track changes and comments, features intended to enable collaborative work, hamper the collaboration between blind and sighted professionals. To circumvent this limitation, the team developed a convention that adapts and repurposes other designed materialities of information available in MS Word. This convention allows Mia and Parker to collaborate on documents with their sighted colleagues. Assistive technology converts the inserted text from pixels on the screen into auditory signals or haptic outputs that Mia and Parker can interpret.

In summary, handling the various representational materialities of information contained in office documents, arguably the life-blood of organisations, also reveals the upwards compilation of collaborative processes that advance inclusion (Fig. 9). For retrieving information, blind professionals use assistive technology to read plain text independently (blind individual row, column 1) and documents with visual structures only if they are MS Word files or tagged pdf files (column 2). However, documents with visually emphasised text are inaccessible (column 3). For inscribing information, blind professionals have no problems in producing textual content (blind individual row, column 4) but often struggle to add visual structures consistently (column 5) and cannot format visually emphasised text (column 6). When retrieving information from documents, blind professionals form dyads with their sighted colleagues to break down the document's visual structures into sections (blind-sighted dyad row, column 2) and clarify the intended message of visually emphasised text (column 3) through close coordination. Sighted professionals empathetically adapt to their blind colleagues' preferences by constantly validating their judgement calls. For inscribing information into documents, the blind-sighted professional dyad creatively interacts to produce documents with proper visual structures (blind-sighted dyad row, column 5) and visually emphasised text whenever needed (column 6). The multiplication of these dyadic interactions engenders a caring approach that balances organisational demands and special needs at the team level (team row, columns 2, 3, 5 and 6) – e.g. using ad-hoc communication codes to highlight changes and comments on jointly produced documents.

4.3. PowerPoint slides

Lastly, we scrutinise the blind professionals' actions and interactions with their sighted peers on the representational materialities of information in PowerPoint slides on two activities: retrieving information from slides and inscribing information into slides. Appendix D shows the details of this scrutiny.

4.3.1. Retrieving information from slides

Whenever Mia or Parker needs to read slides, they convert them into a document, whose text can be read using JAWS or a braille display.⁷ However, slide decks seldom consist of text slides only; they often contain text-picture and pictorial slides. Mia describes, “Sometimes people put the jpegs into a PowerPoint presentation. I can read PowerPoint, but I would need help with anything that got a picture or a logo”. Neither screen readers nor refreshable braille displays can interpret images. Sally explains, “There is a whole process whereby we [convert a] PowerPoint ... into Word. And then, there is a whole process with that in terms of it being user-friendly”. That is, the representational materialities in the form of text-picture and/or pictorial slides must be converted into textual content that assistive technology can read.

Converting non-accessible representational materialities of information into something that Mia and Parker can interpret through auditory signals or haptic outputs requires a great deal of coordination and cooperation. Mia describes this intensive collaborative process: “I would have an initial meeting with [Susan] and discuss the examples of help that I require [and] provide her with guideline documents”. Adjusting to Mia's and Parker's preferences did not happen overnight; it was a gradual process. Susan explains: “It was learning-by-doing ... As I got to know them a little better, I have a bit of a better understanding of what their requirements were”.

⁶ JAWS, among other screen reader software packages, is the most likely to read brackets aloud.

⁷ The built-in screen reader feature of the most recent version of Microsoft 365 was not available during the fieldwork. Still, objects in a slide can be read in a random sequence unless the order has been defined in the Reading Order pane.

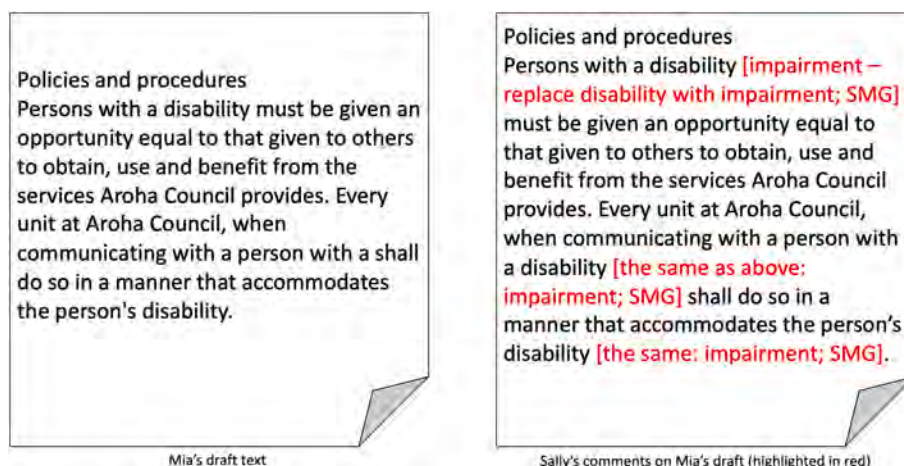


Fig. 8. Ad-hoc communication code to highlight changes and comments.

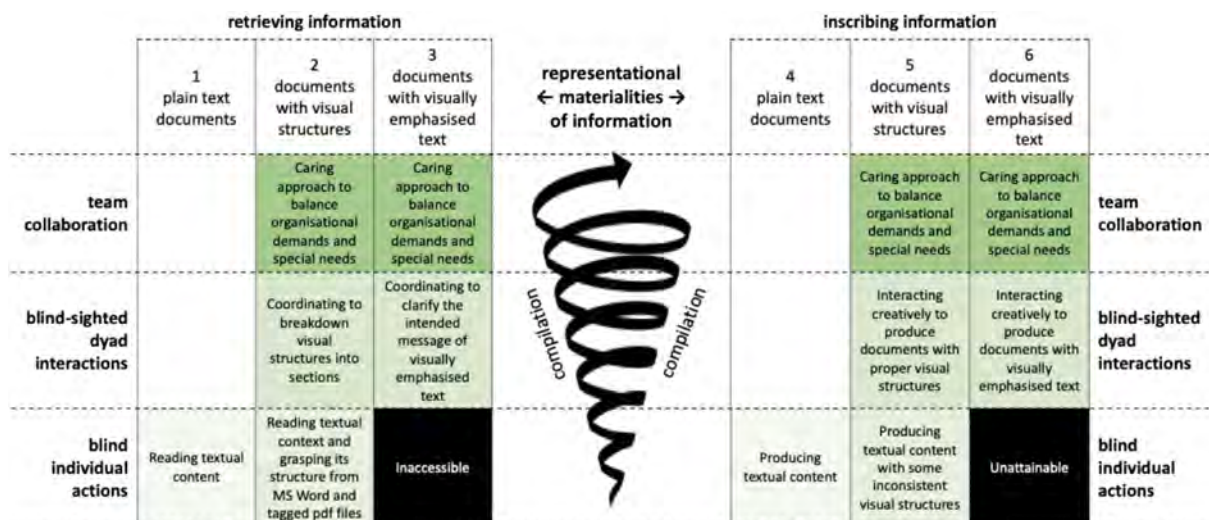


Fig. 9. Upwards compilation of inclusive information collaboration on office documents

However, the collaboration transcends the Susan-Mia or Susan-Parker dyads. Susan sometimes needs to reach out to the creators of PowerPoint slides to ensure that her conversion is faithful:

It becomes quite problematic when you are dealing with presentations where images are meant to be representative of something ... It could just be a picture of a family sitting down at a table; obviously, that has a purpose for the presentation ... I ask for more input from the writers of the presentations just to give a little bit of an idea of what they are intending to show ... I can take it from there.

Susan explains how converting textual and pictorial materialities of information contained in PowerPoint slides into textual materialities involves reconstructing content:

Tables can be an issue ... Instead of trying to match a table layout, you have to describe the table. The [screen] reader cannot read across the lines in the table. You've got to try to work out which way it is going to be best understood ... It is just using a bit more initiative. It is not just blanket copying-and-pasting stuff out.

The reconstruction process often entails breaking down diagrammatic elements into sections accompanied by textual descriptions. Susan illustrates: "I change [the table] into a Word document with specific structures ... I always break it down with hyperlinks and create a content page ... so that [Mia and Parker] can follow per slide ... and write down the information accordingly". Fig. 10 shows

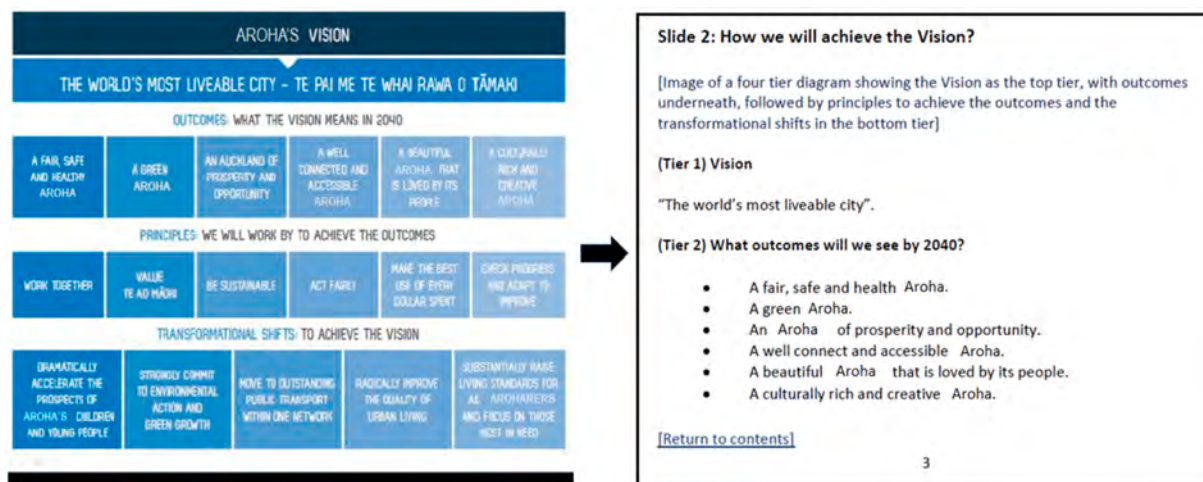


Fig. 10. Transforming a slide's textual and pictorial materialities of information into mostly textual content.

how Mia and Susan collaboratively convert the textual and pictorial materialities of information from a PowerPoint slide into a Word document. The left-hand side shows the original, colourful slide that depicts Aroha Council's vision at the top, followed by the content presented in a tabular format with three levels: "Outcomes", "Principles" and "Transformational shifts". The right-hand side of the figure presents the textual version of the information contained in the slide that Susan reconstructed for Mia: an identifier of the slide (i.e. "Slide 2"), a description of its diagrammatic structure and content in square brackets, its content hierarchically organised (i.e. "Tier 1", "Tier 2") and a "Return to contents" hyperlink. It is worth noting that the textual version is not a replica of the information contained in the slide. For instance, instead of the title "Aroha's vision", the slide identifier reads "How we will achieve the Vision". Also, the Māori text in the slide has not been reproduced in the document. However, these alterations do not affect the message; most importantly, they conform to Mia's preferences. Once the diagrammatic elements have been converted into textual information, Mia can read the slide by listening to her screen reader software or by haptically interpreting the rounded pins on her refreshable braille display. The same process is applied to every slide in a deck.

This example illustrates that when blind professionals encounter non-accessible representational materialities of information, assistive technology offers no help. They need the support of their sighted colleagues, who accommodate their needs and preferences through an empathetic collaboration. Blind professionals can only interpret the textual translation of the diagrammatic elements contained in a slide using assistive technology.

The empathetic collaboration often goes beyond the boundaries of the CSDU. Whenever external stakeholders deliver presentations, Sally asks them to provide the slide deck in advance, so that it can be converted into accessible textual information, and requests that they insert auditory signals so that Mia and Parker can follow the presenter's delivery:



Fig. 11. Mia produces textual information that will be the basis for her PowerPoint slides.

We have just come from training that had 110 slides ... Administration helped by putting all the data into a Word document. We asked them to break it down and label it 'slide 1', 'slide 2' ... I will ask [the presenter] to put dings every time they change the slide ... I will also have a conversation ... "Have you worked with people who are blind before? Are you aware of these language issues that you need to be mindful of? Pointing to things, your description of what you are talking about. You do need to go the extra mile and think and be conscious about how you are presenting to make sure that it is accessible ... [so] my [blind] staff can understand what you are saying".

4.3.2. Inscribing information into slides

Inscribing information into PowerPoint slides also requires a great deal of coordination between blind and sighted professionals. Blind professionals produce a text-only document, organised by slide identifiers (e.g. slide 1, slide 2, etc.) and their corresponding content, which constitutes the basis for their slideshow. Mia explains, "It is quicker for me to write every slide's information on an MS Word document... Then, I ask [Susan] to format it for me into an MS PowerPoint presentation" (see Fig. 11).

Susan transfers the textual information onto a slide deck, where she adds the stylistic elements of PowerPoint (e.g. graphically designed text, pictures, etc). Susan's help is crucial to producing well-formatted and visually attractive content intended for a sighted audience. This collaborative undertaking demonstrates how textual information can be converted into visually appealing representational materialities that characterise the norms of PowerPoint slides. Mia walked us through the first five slides (her quotes are in bubbles) in a slideshow Susan produced according to her preferences: slide 1 is a text slide (Fig. 12), slide 2 is a metaphorical text-picture slide (Fig. 13), slide 3 is a text slide with graphically designed text and plain text (Fig. 14), slide 4 is a metaphorical text-picture (Fig. 15) and slide 5 is a pictorial slide with picture-text combination (Fig. 16).

Once Susan has created a slideshow, Mia uses her screen reader software to locate (Fig. 17a) and open (Fig. 17b) the PowerPoint file. She reads the textual information contained in the slides through round-tipped pins in her braille terminal to rehearse her presentations: "If I am on my way to do a presentation, I would have copied my slides onto [my braille terminal]. I can just put it on my lap and read it through braille". While rehearsing her presentation, Mia can edit the textual content of the slides if needed (Fig. 17c).

In sum, the ostensibly rich visual representational materialities of information in PowerPoint slides make the upwards compilation of collaborative processes that advance inclusion particularly conspicuous (Fig. 18). At the individual level, blind professionals use assistive technology to read text slides (blind individual row, column 1) and create plain text slides (column 4) independently. However, if the task involves working on text-picture slides, blind professionals can only read (column 2) and produce (column 5) textual information. They can neither independently interpret (column 3) nor produce (column 6) picture slides. To deal with text-picture slides, they form dyads and establish a synergetic interaction with their sighted colleagues to render the pictorial elements of these slides (blind-sighted dyad row, column 2) or picture slides (column 3). Working closely with their sighted colleagues, they can co-produce visually appealing pictorial elements in text-picture slides (column 5) or picture slides (column 6). Making the content of slides accessible to blind professionals and supporting the production and delivery of PowerPoint presentations contribute to advancing inclusion in the workplace, characterised by a caring approach that balances organisational demands and special needs at the team level (team row, columns 2, 3, 5 and 6).

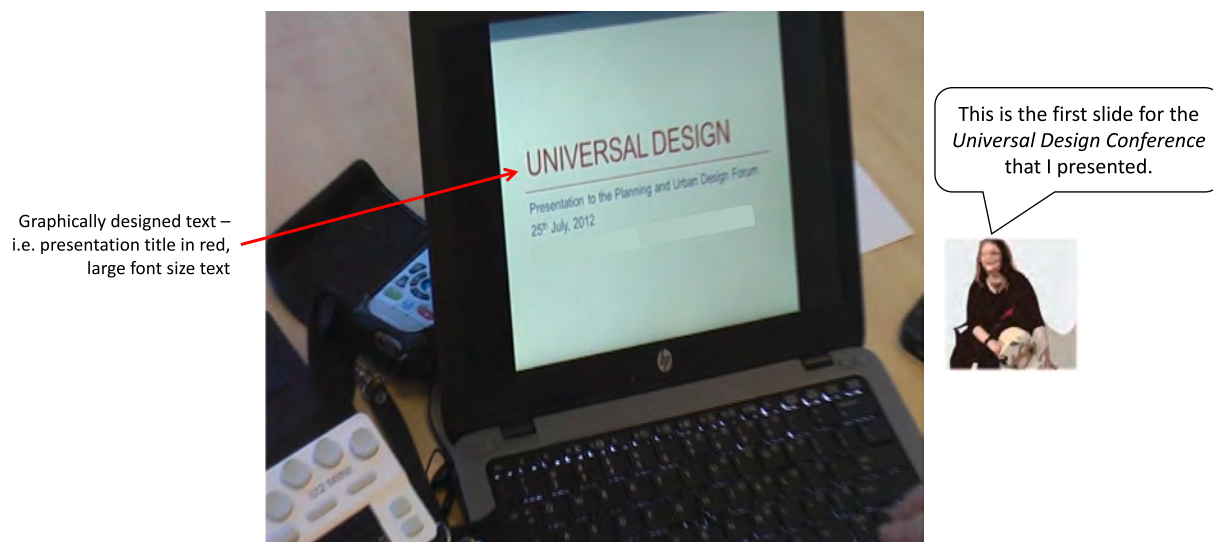


Fig. 12. Text slide (1).

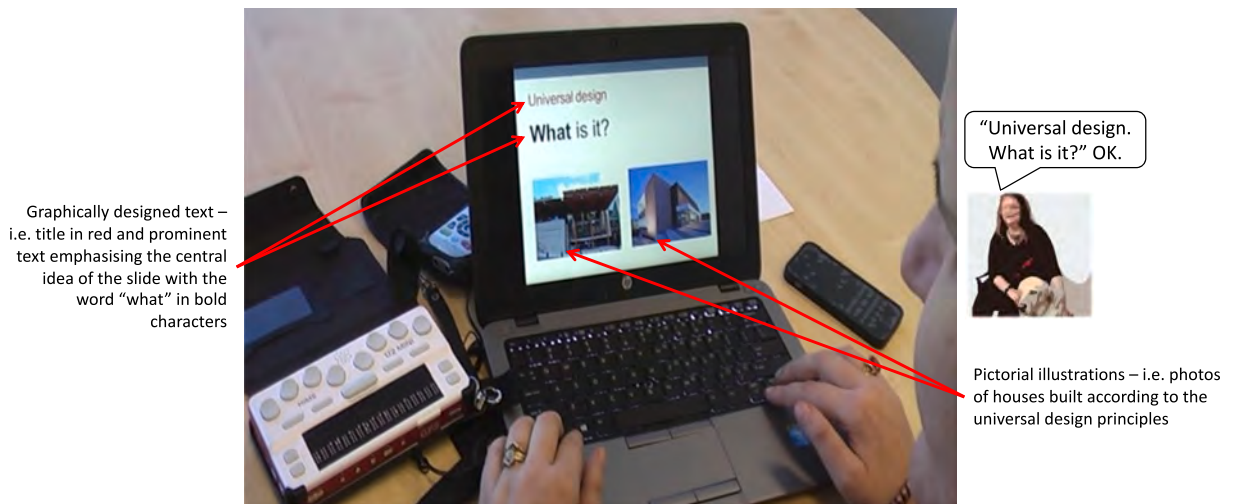


Fig. 13. Metaphorical text-picture slide (2).

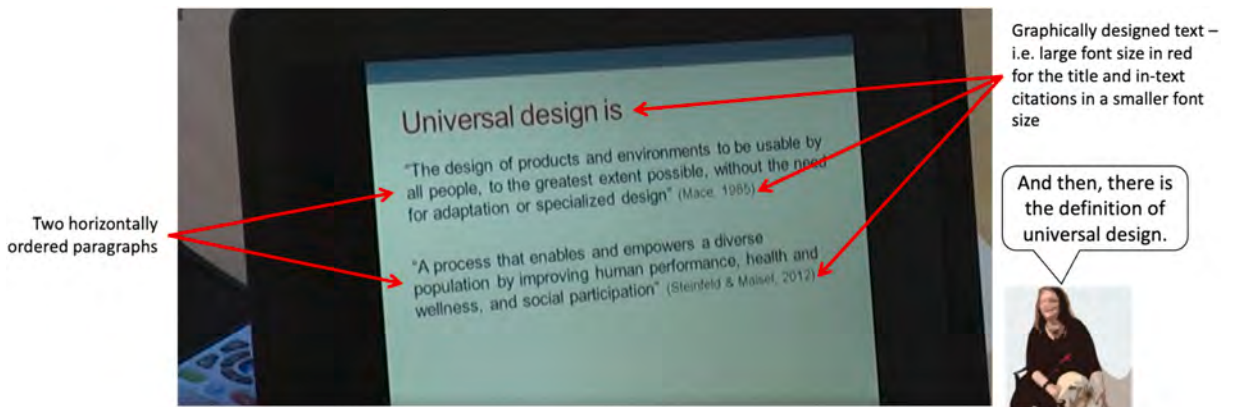


Fig. 14. Text slide (3).

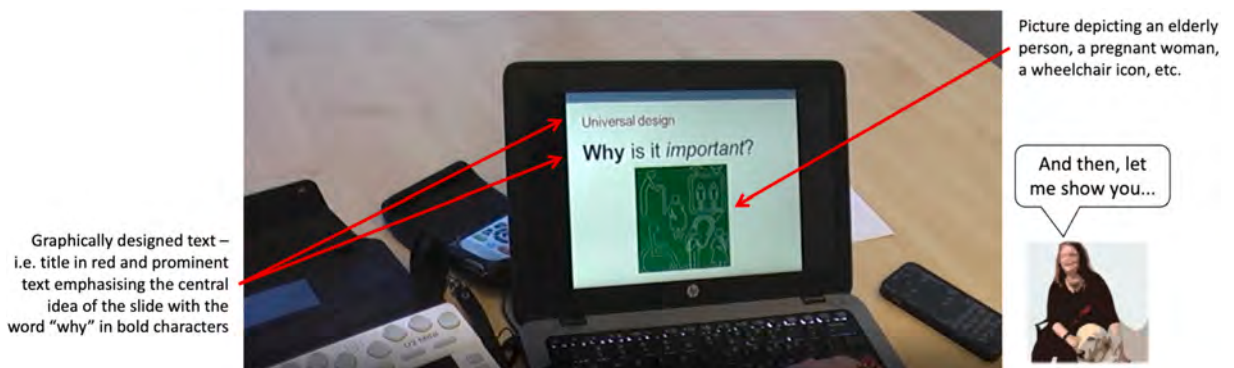
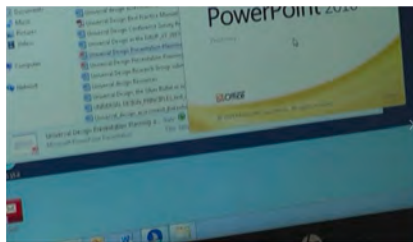


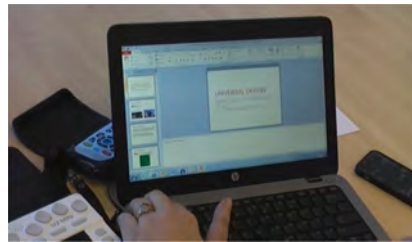
Fig. 15. Metaphorical text-picture slide (4).



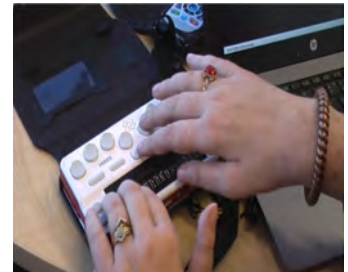
Fig. 16. Pictorial slide (5).



a. Mia locates the PowerPoint file by following audible cues



b. Mia opens the PowerPoint file by pressing 'Ctrl+O'



c. Mia edits the PowerPoint file using her braille display, if needed

Fig. 17. Locating, opening and editing a PowerPoint slideshow.

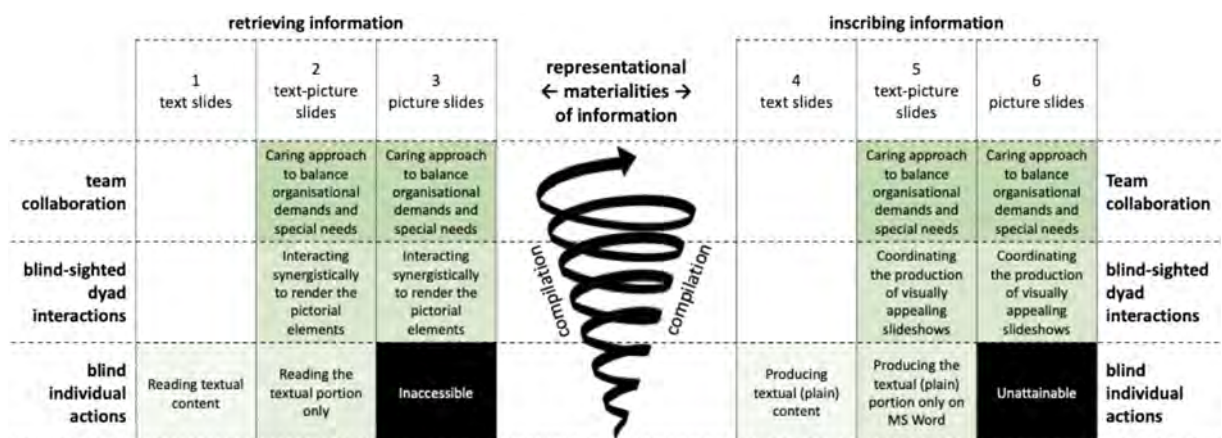


Fig. 18. Upwards compilation of inclusive information collaboration on PowerPoint slides.

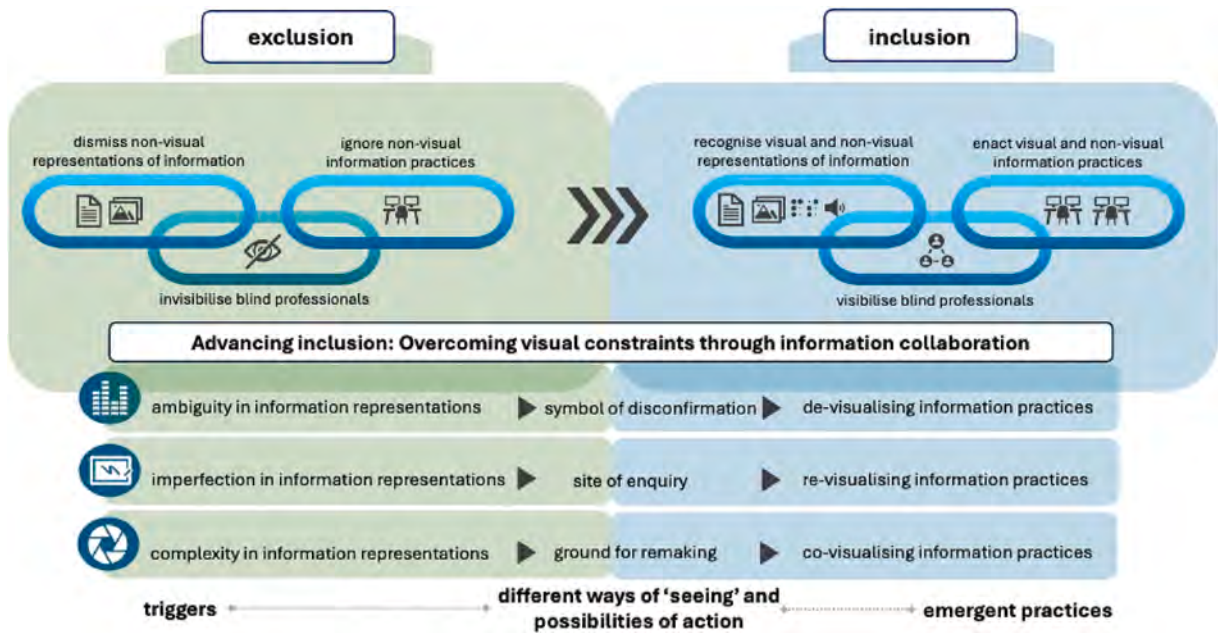


Fig. 19. Advancing inclusion: From contesting visual information representations to collaborative information practices

5. Discussion

We have examined how to advance workplace inclusion for blind professionals, who often experience ongoing exclusion in mainstream workplaces that treat visual information representations and their practices as standard norms. In our analysis, we focused on three commonly used information objects: email messages, documents and PowerPoint slides, which allowed us to elaborate on the nuanced and complex dynamics involved in transitioning from exclusion toward inclusion in the workplace.

5.1. Advancing inclusion: Overcoming visual constraints through collaborative information practices

To theoretically generalise our insights, we develop a workplace inclusion framework that articulates multiple collaborative processes required to transform the prevailing 'visual' norm and affirm the co-existence of 'visual' and 'non-visual' information representations and practices (Fig. 19). Given the entanglement between information representations and practices, the normative organising principle of aesthetically compliant visual information simultaneously dismisses non-visual representations of information and ignores non-visual information practices, thereby excluding blind professionals by casting them as outsiders. To advance inclusion, the framework conceptualises three carefully orchestrated collaborative processes between blind and sighted professionals. These processes trace how visual information representations, despite their seemingly uncontroversial perfection, trigger different ways of 'seeing' that open up possibilities for action and change through emergent collaborative information practices, namely *de-visualising*, *re-visualising*, and *co-visualising*, involving the dynamics of visual and non-visual information representations.

De-visualising information practices emerge from the realm of *ambiguity* in information representations, prompting the reframing of visual information constituted in information objects as a *symbol of disconfirmation* that invites re-imagination and situated action. Rather than focusing on the ostensibly unproblematic nature of visual information representations, sighted professionals who work with blind professionals choose to interpret visual information from the blind professionals' perspective and treat it as ambiguous and problematic. This alternative way of seeing visual information representations enables sighted professionals to explore and engage in proactive, mindful and creative actions that reconstruct their concealed meaning through *de-visualising* information practices. *De-visualising* primarily entails deliberate, situated transformations of visual information into plain text. This process occurs across three types of information objects in our study. In the case of emails, emojis (e.g. 😊), which are increasingly used as shorthand to express emotions, are de-visualised into plain text (e.g. [smiley face]) and placed alongside the emojis to ensure inclusiveness by recognising the presence of blind professionals in email communication. For documents, the visual effects associated with track changes and comment features in MS Word, such as red underlining for newly added text, ~~red strikethrough~~ for deletion and author name with comments displayed in margin balloons, are designed for sighted people to easily notice changes in a document. However, these features pose challenges for blind professionals who rely on assistive technologies. To reconstitute meaning, sighted professionals

de-visualise these visual features by inserting plain text, where changes were made, and the initials in brackets of those who added comments or made changes. As for visuals used in PowerPoint slides, particularly diagrams and pictures, they often need to be de-visualised according to the surrounding context and purpose to reconstruct an approximate meaning that reflects the originally intended meaning.

Re-visualising information practices emerge from the realm of *imperfection* in information representations, which serve as a *site of enquiry* where meaning can be revealed through ongoing negotiation between blind and sighted professionals. Imperfections in information representations manifest as challenges for blind professionals when navigating aesthetically pleasing content, thereby contributing to their exclusion from work activities. Recognising the imperfection in information representations simultaneously dismisses their uncontroversial consensus through the breakdown of meaning for blind professionals and creates opportunities for action through the involvement of both blind and sighted professionals in meaning-making processes. In the case of documents, the aesthetic appearance and stylistic formatting of reports (e.g. multi-level headings with varying font faces, sizes or colours, and the use of bold or italics for emphasis) make it convenient for sighted professionals to process information organised by sections while drawing attention to highlighted texts. However, blind professionals are not able to perceive layout, colour or visual navigation cues. Often-times, too many headings clutter their navigation and prevent them from using a screen reader to access the content they need. In the worst case, they may need to spend additional time reading everything sequentially from start to finish, which can reinforce the stigma associated with their impairment. In the case of PowerPoint slides, the multiplicity of possible arrangements of typographical elements and images in a slide deck poses difficulties for blind professionals. Compared to the relatively straightforward transformation of visuals into plain text in de-visualising, re-visualising often requires an iterative process of enquiry involving questioning and answering between sighted and blind professionals. In practice, this close coordination entails sighted professionals first developing an understanding of their blind colleagues' idiosyncratic needs, particularly their navigation preferences and the capabilities and limitations of assistive technologies. This is followed by the reproduction of documents or slide decks, typically in Word format with an appropriate hierarchy of headings, basic bullet points, minimal use of visually emphasised texts, along with a table of contents and periodic 'return-to-content' hyperlinks as an alternative means of communicating information contained in documents or slides.

Co-visualising information practices emerge from the realm of *complexity* in information representations, which serve as a *ground for remaking* habitual ways of working with information where meaning is co-constructed by both blind and sighted professionals. The complexity of information representations points to the ubiquitous expectation that professional communication and information sharing be presented in visually appealing formats, which blind professionals cannot avoid in the workplace. Nonetheless, asking blind professionals to produce aesthetically pleasing emails, documents or PowerPoint slides is an insurmountable task, contributing to their exclusion by reinforcing 'what they are not able to do'. Without the ability to perceive visual cues, blind professionals may produce information content using a mix of capitalisation, font faces and font sizes, which could be deemed unacceptable in the eyes of sighted professionals. In the case of PowerPoint slides, which are far more visually intensive, the problem is exacerbated, as blind professionals may be unable to produce, select or appropriately position tables and images on slides. Rather than excluding blind professionals entirely from these tasks, the complexity in information representations can be understood as an opportunity for interventions that redefine the routine ways of producing acceptable information in the workplace. In practice, these interventions involve the co-construction of meaning between blind and sighted professionals to meet the norms of workplace information presentation. Through their micro-coordination and consecutive fine-tuning, blind professionals contribute plain-text content, while sighted professionals format these materials and, in some cases, transform the plain text into tables and images, resulting in visually appealing email messages, reports, and PowerPoint slides.

In sum, our framework construes workplace inclusion as a digitally mediated collective engagement between blind and sighted professionals who collaboratively work on both visual and non-visual information representations. De-visualising, re-visualising, and co-visualising collaborative information practices acknowledge blind professionals' unique information needs and shift the focus from 'what they cannot do' to 'what they can do'. By equally recognising visual and non-visual representations of information, they result in enacted visual and non-visual information practices, thus contributing to the visibilisation of blind professionals. Despite its significance in advancing inclusion, the co-constitution of dynamic representations and evolving information practices is sustained by organisational members' commitment, generative insights and imaginative actions (Barry & Meisiek, 2010; Busco et al., 2024; McDonnell, 2023; Quattrone, 2022). Therefore, workplace inclusion through information collaboration is always in a perpetual process of becoming.

5.2. Theoretical contributions

Our study contributes to workplace inclusion and visual and multimodal organisational literatures.

5.2.1. Information collaboration for workplace inclusion

Scholars argue that workplace exclusion of people with impairments is deeply rooted in the notion of an *ideal worker* with a *one best way* of working as a condition for inclusion (Foster & Wass, 2013; Jammaers et al., 2016; Jammaers & Zanoni, 2021). As a result, people with impairments are often cast as the negation of the ideal worker (Jammaers & Zanoni, 2021), portrayed as deviant, unable, unproductive (Jammaers et al., 2016) and atypical (Foster & Wass, 2013). To break this persistent impasse, some scholars (Dobusch,

2014; Jammaers et al., 2016), suggest that these presumed ideals can be made permeable by shifting from one best way of working as an essential condition for inclusion toward multiple and different ways of working that reconstruct a more inclusive reality for people with impairments. Given that information is essential to the functioning of contemporary organisations, blind professionals are likely to experience exclusion on a recurring basis. By examining workplace inclusion from an information perspective, this study makes two significant contributions to the literature on workplace inclusion.

Firstly, our study extends these generalised arguments on workplace exclusion as the co-constitution of the ideal worker and the one best way of working. In particular, we develop a contextualised workplace inclusion framework for blind professionals that takes into account visuals, both as information representations and as practices, as a dominant best way of working that excludes blind professionals in the workplace. In doing so, we advance existing understanding of the nuanced and complex manifestations of the portrayal of people with visual impairments as less capable and less productive (Beatty et al., 2019; Jammaers et al., 2016; Zanoni, 2011) who are unable to do what is considered a natural way of doing things (Alvesson & Willmott, 2002). These ingrained views, with their normalising effects, contribute to the exclusion of blind professionals in the context of information, communication and collaboration in the workplace. More importantly, our study helps to conceptualise understandings of workplace exclusion of blind professionals by how they are assessed according to the normative organising principle of visuals in emails, documents and PowerPoint slides, the three most commonly used tools in the everyday workplace.

Secondly, our research sheds light on the importance of information collaboration in advancing inclusion for blind professionals. By integrating the social and relational nature of information (Boell, 2017; Dourish, 2017; McDonnell, 2023) with a conception that inclusion and exclusion are socially embedded processes involving multiple actors and practices (Dobusch, 2014; Foster & Wass, 2013), we show how the multiple processes of the contestation of visuals have led to alternative information practices that enable blind professionals to overcome the constraints imposed by visuals. In practice, these processes often entail situated and adaptive responses to the information needs of blind professionals. Our study contributes insights into the conceptualisation of information collaboration as an approach to advancing inclusion, comprising alternative ways of engaging with visuals beyond their idealised status, as well as unconventional actions and interactions between blind and sighted professionals. Taken together, our study shows that information collaboration approaches contribute to affirming visual and non-visual information representations, de-normalising visuals as the *one best way* of working, re-defining information practices, and more importantly, re-constituting blind professionals as *able* and *normal*.

5.2.2. Generative capacity of visuals for meaning re-emergence

Scholarship in visual and multimodal organisational research underscores the significant role that visuals play in meaning-making processes, thereby contributing to the reification of organisational reality (Arjaliès & Bansal, 2018; Meyer et al., 2018; Ronzani & Garzweiler, 2022). Broadly speaking, this body of work highlights two contrasting powers of visuals. On the one hand, scholars emphasise the *revealing power of visuals*, not only in conveying information but also in evoking emotions and influencing actions. For example, Arjaliès and Bansal (2018) argue that visuals embedding content such as environmental, social and governance criteria are particularly useful for shaping investment decisions that might otherwise go unnoticed in words or numbers. On the other hand, other scholars highlight the *concealing power of visuals* through invisibilities or what is not directly represented in visuals (Quattrone et al., 2021), which may create perverse effects by undermining the organisational activities they intend to depict (Ronzani & Garzweiler, 2022; Tweedie & Ronzani, 2025). For example, Ronzani and Garzweiler (2022) show how visuals, such as graphical representations, may trivialise performance measurements. By foregrounding both the revealing and concealing power of visuals in a workplace information context involving blind and sighted professionals, this study contributes to the organisational visual and multimodal literature in two ways.

Firstly, our study provides a novel perspective by demonstrating that, despite their concealing power, visuals retain a generative capacity through their interactions with the invisibilities, thereby evoking imagination and action. Previous studies frame the generative capacity of visuals as an interpretive space that invites organisational actors to engage in processes of contemplation and reflection (Barry & Meisiek, 2010; Giovannoni et al., 2025; Quattrone, 2022). Our work extends this line of thinking by arguing that the generative capacity of visuals operates both as an *interpretive space* that invites different ways of seeing visuals and as an *explorative space* that opens up possibilities for action. In our study, the revealing and concealing powers of visuals stem from the fact that visual representations of information convey meaning to sighted professionals, but not to blind professionals. Rather than treating the revealing power of visuals as unproblematic, sighted professionals focus on their concealing power and, in doing so, view them as an interpretive space for 'seeing differently' (i.e., recognising them as problematic for blind professionals) and 'seeing beyond' (i.e., uncovering meanings embedded within visuals). More importantly, their consideration and reflection lead them to undertake meaningful, collaborative and situated actions to improve organisational realities for blind professionals by valuing both visual and non-visual representations.

Secondly, our study offers insights into the undertaking required for meaning to re-emerge from what visuals conceal. While prior research (Quattrone et al., 2021) suggests that what visuals reveal and conceal can constitute a site of meaning emergence, the mechanisms through which such meaning re-emerges remain underexplored. At the outset, our research shows that the re-emergence

of meaning requires moving away from a fixation on visuals and embracing the dynamic and fluid characteristics of information practices that involve both visual and non-visual representations. Given the inevitability of visuals in contemporary organisations and the complex invisibilities they create for blind professionals, our study highlights that the processes involved in the re-emergence of meaning are neither simple nor straightforward. We propose three interrelated *de-visualising*, *re-visualising* and *co-visualising practices* that emerge from different ways of seeing visuals and how these alternative views give rise to new possibilities of actions. These evolving information practices attempt to overcome the various limitations that visuals impose on blind professionals. While *de-visualising* may require more imagination from sighted professionals and minimal involvement from blind professionals, *re-visualising* and *co-visualising* require much closer collaboration between blind and sighted professionals to overcome the significant barriers posed by visuals. Taken together, *de-visualising*, *re-visualising* and *co-visualising practices* are necessary for the re-emergence of meanings previously hidden from blind professionals, thereby enabling their participation in workplace information activities.

5.3. Practical implications

Two practical implications emerge from the outlined theoretical contributions. Firstly, it is important to cultivate a culture of understanding and accepting how blind individuals interpret and produce information using digital technology. This understanding would serve as a starting point to assess the potentially exclusionary effects of current visual information practices. Secondly, inclusive information practices should stem from recognising the imperfect and incomplete nature of visual representations of information. This recognition would induce explicit policies conducive to instilling a commitment from sighted professionals to work with their blind colleagues on information-oriented tasks.

5.4. Limitations and future research avenues

Our study has limitations that should be acknowledged. Firstly, the characteristics of the research site make it exceptional. It is a government organisation earnestly committed to inclusive practices; probably not unique, but surely noteworthy. Moreover, this organisation functions in a progressive social milieu that promotes fairness and inclusion. Therefore, caution should be exercised when projecting our findings to other contexts. Secondly, our blind participants hold postgraduate qualifications and master the use of assistive and mainstream technology. Thus, our study does not capture the experience of blind individuals with limited education or basic digital skills.

Despite these limitations, our study opens future research avenues. Firstly, conducting a similar investigation in less inclusive organisational settings and social contexts can reveal the limitations of digital technology in advancing workplace inclusion. Secondly, researchers may consider scrutinising the construction of managerial discursive practices and contrasting these against technology enactments on the ground to reveal the complexities of making the workplace inclusive. Thirdly, a multimodal affordances analysis can reveal what the multiple variations of representational materialities of information of any given mode allow to represent or not to be represented for blind professionals. Fourthly, design science can leverage our findings to propose digital solutions, including artificial intelligence, that expand the opportunities to manipulate a range of representational materialities of information for blind individuals.

6. Conclusion

Despite the support of assistive technologies, entrenched norms of visual representations and practices in workplace communication and information-related activities have continually contributed to the exclusion of blind professionals. Our study contributes insights to the workplace inclusion and visual and multimodal organisational literatures by advancing understanding of emergent, situated and collaborative information practices that involve both visual and non-visual information representations to overcome visual constraints and promote workplace inclusion. We develop a workplace inclusion framework that illustrates how ambiguity, imperfection and complexity in information representations trigger a reconsideration of visuals, prompt deliberate transformative actions and enable a reimagining of information practices involving close collaborations between blind and sighted professionals. We conceptualise these emergent practices as *de-visualising*, *re-visualising* and *co-visualising* collaborative information practices and highlight their significance in advancing inclusion. Importantly, the reimagining of information practices is rooted in a complete reorientation of visuals. Instead of viewing visuals as unproblematic, collective attention shifts to their limitations while simultaneously scrutinising their generative capacity to open up possibilities for action and positive change. Taken together, the de-normalising of visuals and the re-defining of information practices contribute to the shaping of inclusive experiences for blind professionals.

Therefore, to cultivate and sustain inclusive experiences for blind professionals, organisations should develop and refine policies grounded in new understandings of problems and solutions. Equally important is an ongoing commitment, particularly from sighted professionals, to enact inclusive information practices. We acknowledge that our study and its insights are drawn from a single-case study organisation operating in a progressive country that places a strong emphasis on inclusion. Instead of viewing this as a limitation, we contend that insights into workplace inclusion through the transformation of information practices should inspire other organisations to use the workplace inclusion framework as a guide to encourage imaginative and situated approaches to *de-visualise*, *re-visualise* and *co-visualise* information practices in action. From a research perspective, we encourage scholars to embrace what Escobar (2018) calls the *pluriverse* or “a world where many worlds fit” (p. xvi) and to pursue a pluralistic enquiry. Such an approach not only enriches our understanding and contributes to making the workplace inclusive but also transforms us as researchers through an appreciation of different ways of being in the world.

CRediT authorship contribution statement

Antonio Díaz Andrade: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualisation. **Angsana A. Techatassanasoontorn:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualisation.

Appendix A. Representational materialities in the information objects analysed in this study



Fig. A1. Representational materialities of information in email messages.

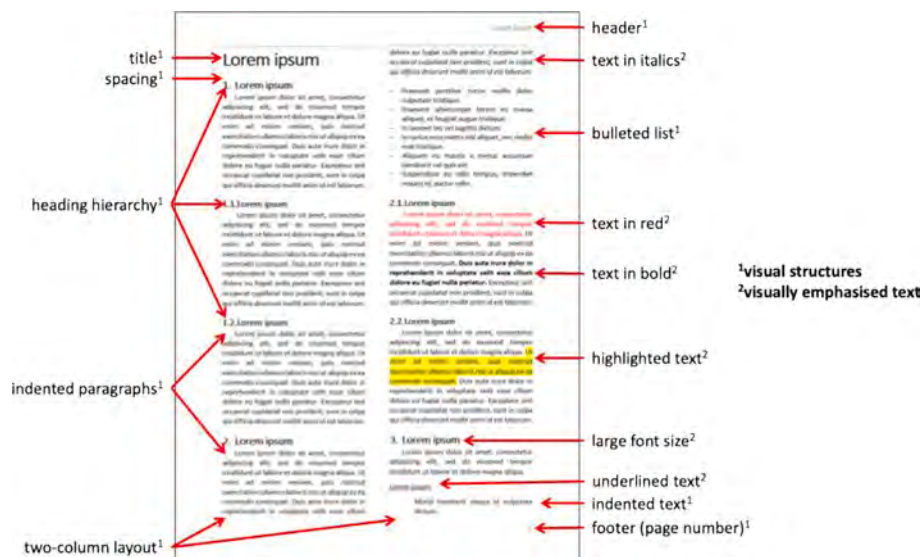


Fig. A2. Representational materialities of information in office documents.

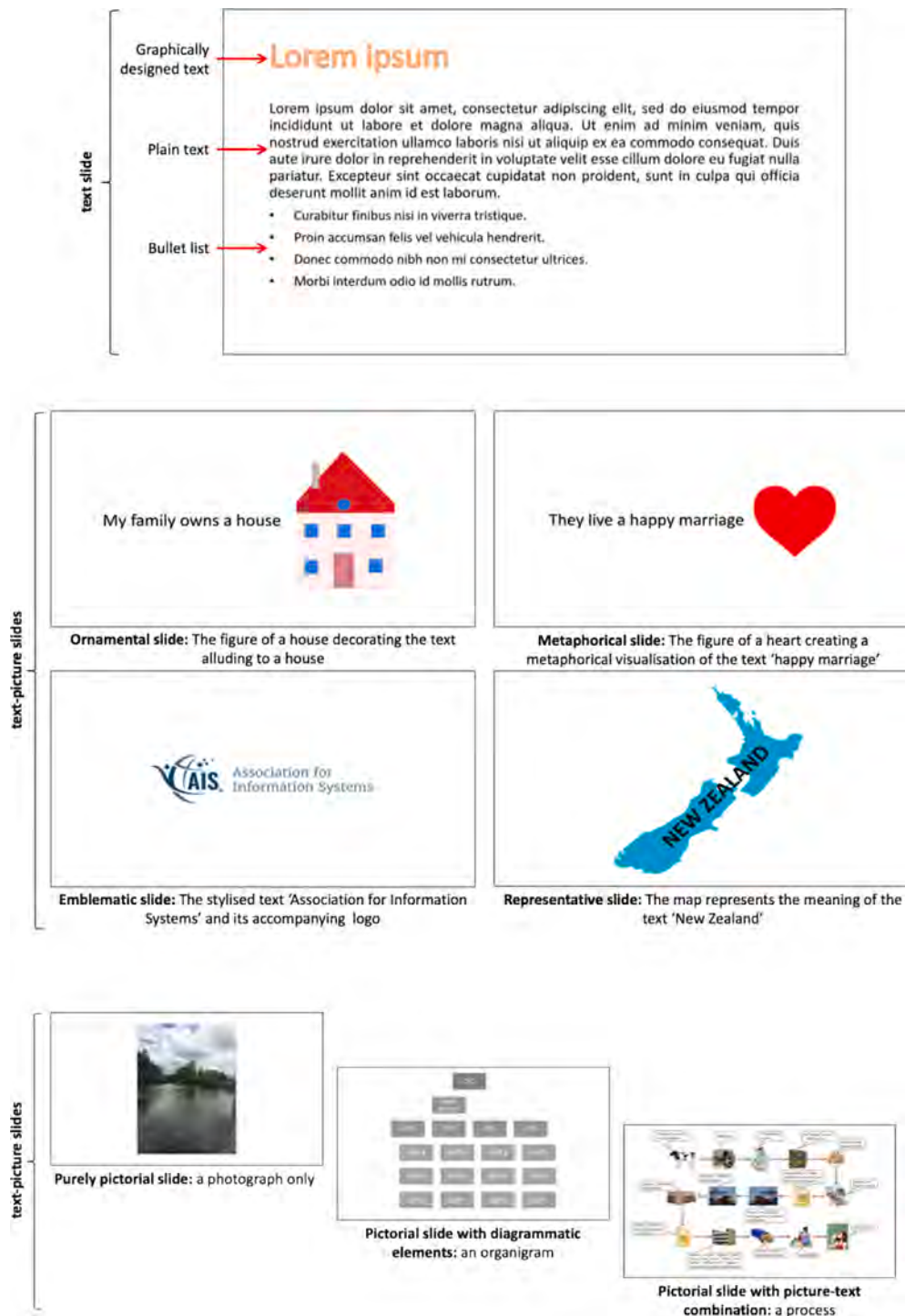


Fig. A3. Representational materialities of information in PowerPoint slides

Appendix B. Schematic representation of the analysis of email messages

representational materialities of information		email header		email content	
multilevel analysis of heterogeneous individual contributions that result in collective performance	team collaboration	retrieving information	inscribing information	retrieving information	inscribing information
	blind-sighted dyad interactions	• not applicable	• forwarding email threads to multiple recipients	• receiving personalised information with specific instructions in advance before group communications go out	• replacing emojis with ad-hoc textual codes in group communications
	blind individual actions	• using screen reader to check inbox • deciding whether to delete or reply incoming messages	• reconstructing addresses from email threads to forward messages to multiple recipients • typing email addresses	• fetching information from external sources • interpreting non-textual content • using screen reader to listen to content	• formatting formal messages • typing or dictating replies with no formatting • creating new plain text messages
challenges blind professionals encounter in information-oriented tasks		• no challenges	• handling conversation threads with multiple recipients	• interpreting non-textual content • accessing information from external sources	• adhering to formatting conventions

Appendix C. Schematic representation of the analysis of documents

representational materialities of information		visual structures		visually emphasised text	
multilevel analysis of heterogeneous individual contributions that result in collective performance	team collaboration	retrieving information	inscribing information	retrieving information	inscribing information
	blind-sighted dyad interactions	• making documents accessible throughout the organisation • navigating text through return-to-contents hyperlinks	• inserting comments within square brackets with initials in multi-authored documents • defining heading hierarchies according to organisational conventions • fixing formatting issues	• making documents accessible throughout the organisation • explaining highlighted text	• inserting comments within square brackets with initials in multi-authored documents • highlighting text according to organisational conventions • adding formatting features
	blind individual actions	• using screen reader or braille display to read to textual content	• producing textual content	• using screen reader or braille display to read textual content	• producing textual content
challenges blind professionals encounter in information-oriented tasks		• reading unstructured or untagged pdfs • recognising layout and structure	• producing visually appealing documents	• recognising highlighted text • interpreting 'track changes'	• producing visually appealing documents

Appendix D. Schematic representation of the analysis of PowerPoint slides

representational materialities of information		text slides		text-picture slides		pictorial slides	
multilevel analysis of heterogeneous individual contributions that result in collective performance	team collaboration	retrieving information	inscribing information	retrieving information	inscribing information	retrieving information	inscribing information
	blind-sighted dyad interactions	• converting slide decks into accessible documents before public presentations • converting slides into text	• adding 'dings' to signal slide transitions in public presentations • adding typographical choices	• converting slide decks into accessible documents before public presentations • converting slides into text	• adding 'dings' to signal slide transitions in public presentations • adding typographical choices • adding formatting features	• converting slide decks into accessible documents before public presentations • converting slides into text • describing/explaining images	• adding 'dings' to signal slide transitions in public presentations • converting text into images
	blind individual actions	• using screen reader or braille display to read to text	• producing plain text	• using screen reader or braille display to read textual content only	• producing plain text		• producing plain text
challenges blind professionals encounter in information-oriented tasks		• recognising typographical choices	• producing typographical choices	• recognising typographic choices • recognising images	• producing typographic choices • inserting images	• recognising images	• producing images

Data availability

Data will be made available on request.

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