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Technology and 21st Century Fiction: Resisting/ Embracing an Impending Irrelevance

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This article considers the ways the technological devices and achievements that hold unmistakable status in contemporary life are represented in contemporary fiction. I suggest three levels of engagement with which to define and analyse the presence of technology in contemporary texts. These are: the reference to technology within fiction, the representation of a digital environment by fiction, and the creation of digital fiction. A variety of literary works are considered in this analysis, including fiction by Don DeLillo, Jennifer Egan, Else Fitzgerald, A.M. Homes, Lucy Kellaway, Ruth Ozeki, and Richard Powers. Wendy Hui Kyong Chun's work on obsolescence is utilised as a consistent frame in analysis of each literary example, to question the effects and issues in engaging with digital culture. The relentless cycle of digital upgrading is noted as a potential threat to engagement and legacy; however, my analysis observes the creative methods used by authors to maintain relevance and effect for future readers. Attention is paid to literary heritage in assessing fiction's engagement with technology and its depiction of the contemporary moment.

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Introduction

It may seem self-evident and perhaps even redundant to pinpoint technology as a defining feature of the twenty-first century, given the unmistakable grasp that digital technologies have on almost every aspect of contemporary life. Yet, it seems that technology does not have as dominant a presence in discussions of twenty-first century fiction. Zara Dinnen goes so far as to claim that 'literature today is barely interested in its digital conditions' (2018: 166), observing that the everyday experience of contemporary digital culture is missing critical attention. Of course, there have been discussions of the impact of digitisation on fiction, largely focused on 'potential antagonisms of old and new media' (Dinnen 2018: 166) and typically in response to both the threatened death of the novel and then the retaliatory resurgence of materialism (both developments discussed in Pressman 2009). However, when it comes to the way that contemporary fiction describes and holds technology, much less has been said. This is due to technology's rapid evolution, which leaves fiction playing a constant game of catch-up and causes hesitation when drawing attention to technologies that may soon feel outdated. This article draws together examples from the past 25 years to consider how authors are engaging with these problems, and analyses the creative and effective approaches taken to reflect contemporary digital conditions within fiction.

Wendy Hui Kyong Chun argues that technologies exist in 'cycles of obsolescence and renewal' and suggests that to call something new is to 'guarantee its obsolescence' (2011: xii). Within fiction – which is not a spontaneous product and so falls slightly behind in these cycles – this means that, as soon as a literary depiction of a current technology is released, the text is immediately dated. Simply eradicating technology from fiction might seem to be an answer to this dilemma, however, as Allison K. Gibson (2012) writes, 'when it's absent from contemporary novels, a big white elephant appears on the page and starts ambling around'. Technology's absence is particularly noticed following the close literary attention to developing devices in the previous century; the 'modernist and postmodernist forebears, who embraced new machines and their attendant new perspectives' (Manshel 2020: 53). We may have assumed fiction would carry this inheritance from modernism and postmodernism quite easily into the digital century, however, the overwhelming escalation of digital production inhibits such simple succession. Alexander Manshel (2020) observes the beginnings of such tensions in the countdown to the millennium, where novels seeking longevity attempt to balance contemporaneity with a sense of timelessness. It may be that this is the enduring literary inheritance: an anxiety over legacy that has resulted in a prioritisation of timelessness, somewhat disguised as the contemporary.

These intertwined anxieties can encourage an avoidance of the depiction and critical discussion of the way that digital devices are used in and by contemporary fiction. However, if we are to appropriately conceptualise this quarter-century, then the experience of technology's ubiquitous presence – coupled with the cycle of expiration and renewal – should be included. This is also vital to a truthful depiction of the twenty-first century as the digital cycle of upgrading has come to, in part, define the twenty-first century experience. Individuals can chart their youth by naming long defunct sites and devices, and confront time's relentless passing in expressing an unfamiliarity with their current editions. As Walter Benjamin criticises the illusory film's 'equipment-free aspect of reality [... as] the height of artifice' ([1968] 2010: 1064), a contemporary fiction void of everyday devices would be an illusion erasing reality for mass appeal.

This article examines how contemporary authors are tackling the challenges of describing and utilising technologies within their texts by analysing notable examples, comparing approaches, and considering the enduring reception of such depictions. I argue that both prominent and effaced portrayals of technology are effective in capturing and critiquing contemporary realities, while noting various issues and consequences that occur when readerly attention is drawn to the details of specific devices. In doing so, this analysis proposes three levels of literary engagement with technology. First is the reference to technologies within the pages of fiction. The majority of the analysis is spent here, considering the different techniques and effects used by various authors in referencing digital devices within their narratives. The second level considers the representation of digital tools through the textual form, asking how fiction can move from mentioning to showing the features of digital technologies within the printed page. Finally, attention is turned to digital born fiction, that which uses a 'non-literary' digital platform to publish and engage with a text. This analysis focuses on social and communication technologies – phones, computers, and the forms of communication they enable, including calls, email, texting, and use of social media – as these are especially prevalent and consistently evolving technologies within the 21st century, and because their function for communicating and crafting narratives allows for fruitful comparison with, and use in, fiction.

The selected examples highlight key patterns and notable experimentations in order to elucidate the possibilities, and problems, of engaging with technologies in fiction. The primary examples are authored by Don DeLillo, Jennifer Egan, Else Fitzgerald, A.M Homes, Lucy Kellaway, Ruth Ozeki, and Richard Powers, with publication dates ranging throughout the studied period to best offer an account of fiction within this time frame. Attention is paid to authors with a history of engaging with themes of

technological progress and experimentation with the devices named above, such as DeLillo, Powers, and Egan, and the selection also includes works by younger authors and relevant individual publications from those without consistent engagement with such themes. This is by no means a comprehensive or global account; an approach with wider scope might also analyse the devices, digital communication, and technological futures depicted in works by Dave Eggers, Sally Rooney, Kazuo Ishiguro, Patricia Lockwood, Ted Chiang, and Rebecca F. Kuang – to name just a few. A central thread in this article is that of literary heritage; particularly for this special issue characterising the first 25 years of the 21st century, this handover between the 20th and 21st century is a key informing event. This is prioritised in the selection of texts, which includes recent publications by key postmodern authors DeLillo and Powers, as well as works by authors often characterised as the descendants of postmodernism: Egan and Homes (Kelly 2011: 393, Holland 2012). While this analysis attends to a range of texts and authors, consistent attention is paid to works by Jennifer Egan. The timeline of Egan’s texts nicely tracks this new century from infancy through adolescence to the current twenty-five-year mark. Further, Egan’s writing is notable for its engagement with all three topics – referencing and representing technology within the pages of her books, and experimenting with technology as a mode for producing and reading.

Digital References

To frame this analysis of how contemporary fiction refers to technology, let us first turn to the question of literary inheritance and the key juncture of the millennium. As Manshel asks, ‘How can two periods—modernism and postmodernism—in which tremendous technological innovation inspired tremendous literary innovation be followed by another period in which technological innovation inspires literary silence?’ (2020: 41). It is not that all technology was suddenly purged from the pages of books, but that further innovations have not been equally depicted or taken as inspiration for contemporary fiction. This creates an imbalance between established and evolving technologies, in which telephones and typewriters are acceptable, but computers and contemporary digital devices have become ‘unliterary’ (Manshel 2020).

The former category seems to be ‘settled’ technologies, with clear edges we can grasp and describe without fear that new incarnations will make our depictions unrecognisable. It is when technologies are still somewhat malleable, with their borders at risk of redistribution, that this literary aversion occurs. While ‘settled’ technologies are still updatable, common understanding of their use and design means readers do not need definitions or intricate descriptions to understand their purpose in a text.

Furthermore, the representation of these established technologies and devices is *part* of their ‘settled’ status; they become recognisable through the description of their form and use. There is thus a paradox – as lack of literary depiction denies new technologies the opportunity to reach this status through reference and dissemination, yet it is this lack of status that causes hesitation to depict them. While avoidance is motivated by the fear of irrelevance to a future audience, literary reference in fact serves to record a potentially fleeting moment and provide one of the only opportunities to remember and revisit ‘dead’ technologies. In turning to specific examples of contemporary fiction that does reference technology, I explore the methods used by authors willing to incorporate devices that characterise the current moment into their fiction. Doing so illuminates the value of recording details of devices that oscillate in popularity and form and reveals this as a method of accurately capturing specific moments in time.

It is key to observe here that the presence of technology in fiction does not have to result solely in fiction *about* technology. Rather, references to devices can be in some sense, unremarkable, with no more or less status than any other action a character performs or object they hold. This concept is developed in Zara Dinnen’s ‘digital banal’, in which ‘the embedded-ness of digital media in everyday life [...] effectively block[s] the affective novelty of new media’ (Dinnen 2018: 163). This embeddedness aids in accurately depicting the way things work in the contemporary digital world, attending to the frustration Gibson (2012) notes when reading texts where technology would easily solve the problem at hand. An excellent example of fiction that attends to these concerns is A.M. Homes’s *May We Be Forgiven* (2012). Technology in this novel is simply part of the lives of its characters and used without particular significance or weight. As Dinnen puts it:

The novel is about digital media to the extent that it continually references digital net-works and devices, but it also does so no more frequently than the networks and devices are used in everyday life and, ostensibly, with no more interest or knowledge than most everyday users might possess. (2018: 2–3)

While bizarre things occur in the novel – a wilderness ‘tag-and-release’ prison with microchipped inmates (2012: 283), and a South-African safari bar mitzvah to name a few – the devices of the text operate simply as tools enabling everyday communication. This serves to maintain the grounded character of Homes’s writing, keeping the more sinister and satirical plot elements from seeming outlandish. A main feature of technology in Homes’s novel is enabling and depicting a constant stream

of communication, highlighting the various relationships and stresses the central character, Harry, is navigating. In three back-to-back phone calls, we see him firstly discussing the discovery and procurement of letters by Richard Nixon, then engaging in an unexpected episode of phone sex, and finally taking a call from his nephew, Nate, at school – which then morphs into a video-chat after instructions from Nate. Indeed, this is how communication works in the twenty-first century; conversations happen with immediacy, sometimes overlapping, with distinctly different content inhabiting the same space. Here, technology allows this immediacy, replacing set-ups to conversations and journeys between locations with the simple click of a button bringing in each new character and issue for Harry to face.

In defining the digital banal, Dinnen emphasises effacement, observing that ‘books work best when we forget they are there’ (2018: 4) and that the same is true of all media. This claim that a medium disappears from view when it is working is complex to apply to literary depictions of digital media. In order to reference a technology, it must in some way be brought to attention; a character checking their phone for messages does not bypass the reader’s brain activity in the same way that checking their own phone might. Homes leans into this fact – noting the reflexes and impulses connecting to uses of technology rather than simple descriptions of physical movement and mechanical operation. Stress, boredom, lust, and guilt are all impulses leading to and evoked by technology. While Harry is on the phone to a doctor discussing his brother’s head injuries, he deals with his discomfort and guilt (his affair with George’s wife led to her murder and George’s injury and imprisonment) by searching for hookups online: ‘While the doctor is talking, I’m on George’s computer. Like a reflex, I automatically start Googling [...] without thinking I type in “Sex+Suburbs+NYC,”’ (2012: 80). The devices are the locations for expressions of these impulses, and act as vehicles or gateways enabling diversions from the central task.

While Homes includes technology’s presence through these frequent embedded references, other novelists choose to spotlight reliance on technology through its sudden absence. In *The Keep* (2006), Egan places a character who is entirely reliant on his phone into a technologically abstinent environment and observes his inability to relinquish the benefits of digital culture. This predicament is illustrated in the book’s opening, where Danny clumsily makes his way through a forest to a nine-hundred-year-old castle, weighed down by the samsonite suitcase and satellite dish he carries as necessary appendages. Danny is so accustomed to the constant, global connectedness brought by his cell phone that he rented the satellite dish ‘guaranteed to provide not just cell phone service but wireless internet anywhere on planet earth’ (2006: 11) and brought it through airport security and a dark forest. ‘Danny needed this’ (2006:

11), despite desire from his cousin Howie, owner and renovator of said nine-hundred-year-old castle, to keep the grounds free of technology. Egan details Danny's dedication to maintaining this global connection when it comes time to set up the satellite:

Danny was no engineer, but he could follow a manual and get a job done. He set up the physical contraption, a long folded-up umbrella that was the actual disc, plus a tripod, plus a keypad, plus the phone itself, which was heavy and fat like cell phones ten years ago. Then he started in on the programming, backing up after each dead end: wrong country codes, foreign operators, recordings in languages he didn't know. It didn't matter. He was hearing *something*, he was connected to *someone*, and the joy of that after almost seventy-two hours of total isolation got Danny through the snags with a smile.

An hour later he was punching in the password to his New York voice mail [...] Each new message starting up made Danny's heart stretch like it was reaching out for something. (2006: 64)

The effort needed to engage with this technology brings a reminder of the material details of devices that are typically skimmed over by marketing in favour of their sleek intuitiveness. Looking at this example in 2025 highlights the risks of referencing technology within fiction as the then contemporary references – namely, Danny's addiction to the cutting-edge technology of mobile phones and voicemail – do now feel outdated. However, the details Egan includes somewhat erase the need for the reader to perfectly understand and identify with the precise technology described. In drawing attention to these material details, Egan conversely erases the distinction between human and machine; as Danny deftly puts together the contraption, machine and human language barriers are overcome by an instinctual ability to navigate this technology. Elsewhere, Egan refers to the desire to use his phone as primal, 'like an urge to laugh or sneeze or eat' (2006: 6). This frustration over the inability to use a function that the body and brain are used to and turn to like other bodily urges again effaces the boundary between human and machine. While these references at first appear to make technology quite distinct, through these material and emotional interactions Egan instead indicates the embeddedness of technology within Danny's own life and personhood.

Don DeLillo's 2020 novel *The Silence* also makes notable use of technology through referencing its absence. Rather than moving individual characters to a specifically marked space, this text literally pulls the plug on technology – as global electronic systems all go offline. This takes Gibson's observation about the problematic absence

of technology into a new direction – confronting this notable absence head on. Depictions of crisis are a returning interest for DeLillo, and indeed technology’s place in representing or, perhaps more accurately, controlling, public response to crisis. First thoughts go to the role of radio and television in *White Noise* (1984), particularly in informing characters about the ‘airborne toxic event’ (DeLillo 1984: 117) and maintaining a state of panic and media dependence. A notable progression in *The Silence* is that technologies remain in control despite their loss of power. We see individuals unable to fathom their life without technology:

“No e-mail,” she said, leaning back, palms up.

“More or less unthinkable. What do we do? Who do we blame?”

[...]

“E-mail-less. Try to imagine it. Say it. Hear how it sounds. E-mail-less.” (DeLillo 2020: 61)

While some characters attempt to make sense of the catastrophe, applying Einstein’s theory of relativity to technological surveillance, the novel ends with a description of a man who ‘is not listening [...] understands nothing’ (2020: 116) and sits in front of the television, staring at the blank screen. In this reference to absence, DeLillo records and critiques the contemporary relationship with technology. This effort refocalises literary attention onto the materiality of devices by emptying them of their functions. A similar event occurs in *The Keep*, where after a period of forced technological abstinence Danny’s phone becomes an unfamiliar ‘hunk of precious metal’ (2006: 166–7), just as DeLillo’s television becomes only a blank screen. The devices referenced thus lose productivity, and rather than moving the narrative further cause it to halt. This depicts an incomplete enactment of Chun’s formula ‘Habit + Crisis = Update’ (2016: 63), which highlights the crucial role played by crises in the emergence of new media, leaving characters in a suspended state of crisis without providing an update. Yet, DeLillo’s text is *about* the crisis, it is the break in the cycle of production that creates notable events. Again, these overt references to the absence of technology only serve to highlight the embeddedness of digitality within the world of the text.

In contrast to this suspension after crisis, Egan’s *A Visit from the Goon Squad* (2010) utilises references to technology alongside temporal disruption to emphasise the cycle of continual updates that characterises contemporary digital culture. In this text, a collection of thirteen chapters from various character perspectives and times which spans six decades (Moran 2021: 81–84), references to technology help to locate the precise period of each chapter. The non-linear structure clearly marks the cycle of obsolescence as, rather than subtle update and progress, devices abruptly appear

and disappear from the page. For instance, in chapter two of the novel, music producer Bennie mourns the authentic ‘muddiness’ (2010: 23) that digitisation has removed from the recording process. Chapter three then jumps back from 2006 to 1979, depicting the days of cassette tapes and corded telephones and the home garage rehearsals of punk band ‘The Flaming Dildos’, exhibiting the visceral experience of music mourned in the previous chapter. David Cowart comments that ‘the novel offers no solution to the central mystery of time’s arrow’ (2015: 249); indeed, the non-linearity of the novel does not serve as the basis of narrative discovery, it is simply that the jumbled timeline echoes each character’s displacement from a longed-for era they can no longer, or not yet, access. The technology referenced anchors each chapter in its time organically, providing appropriate *mise-en-scène* to characterise each era.

A Visit from the Goon Squad is distinctly interesting when considering references to technology, as Egan both accurately describes past and present devices, and necessitates invention for the future chapters. Published in 2010, the novel ends sometime in the early 2020s (no earlier than 2022, according to Moran 2021: 84), detailing an entire decade of unknown developments. The choices Egan makes in what technologies to advance and transform are significant. Music, which had become ‘too clean’ (2010: 24), makes a triumphant return as Scotty’s final concert is a visceral, physical encounter. Rather, it is in language that we see technology’s advancements most clearly in the development of ‘T-ing’: ‘an abbreviated texting code that seeks to free communication from ambiguity’ (Moling 2016: 66). ‘Can I just T you?’, Lulu asks Alex, as she finds this communication easier, and less energy draining: ‘It’s pure—no philosophy, no metaphors, no judgements’ (Egan 2010: 328, 29). In the process of Lulu explaining T-ing to Alex, and misunderstandings that occur along the way (‘nyc’ is assumed to mean ‘nice’ rather than ‘New York City’), Egan observes the technological divide that exists between co-existing generations. While Alex soon sends and receives Ts with ease, even thinking in its shorthand ‘*Im invsbl*, he thought’ (Egan 2010: 340), other characters in *Goon Squad* adapt less successfully to the new tools they encounter, like Bennie’s frustration with digital recording. This reflects my earlier comments about fiction’s ability to grapple with fleeting technologies, as Egan emphasises this inevitable expiration date by forcing characters to confront the unfamiliar, current technological incarnations in states of discomfort and ignorance. Each advancement requires a reassessment of the established norm, creating moments of ‘crisis’ – in Chun’s usage of the word, where habit is disturbed by some form of an update. Egan’s novel clearly highlights the value of literary references to technology, emphasising their transience and inevitable expiration not as a border to understanding but as an access point to certain temporalities.

Another example of using technology as temporal disruption is Richard Powers's *Orfeo* (2014), which follows avant-garde composer Peter Els, who combines his love of music and chemistry in an act of bioterrorism. Digital devices are not a prominent feature of this novel, however the text includes frequent interruption by short statements later revealed to be tweets, such as, 'I did what they say I tried to do. Guilty as charged' (2014: 3). The act of writing and posting tweets is not described until quite late in the novel, adding a retroactive understanding of the events:

A few hours earlier, over lunch—a sack of steaming ground meat picked up at a drive-through off the interstate—he began to tweet. Figuring out the system gave him childish pleasure. He created an account and chose a username—@Terrorchord. He spent a few tweets proving that he was this year's fugitive. Then he moved from exposition into the development section.

I did what they say I tried to do. Guilty as charged. (Powers 2014: 349–350)

The final line, the first tweet, repeats the line from page three of the text. It is not until this reference to technology that the dual temporalities of the novel are realised and clearly aligned; all tweets read throughout the novel are from this future point onwards. This is emphasised by the layout and formatting of the text as, before reaching this description of use, the tweets are separated by a line above and below each one; this turns them into narrative interruptions and draws the reader's attention to their distinctness. By doing away with these lines between tweets, Powers signals two distinct timelines becoming reconciled. In contrast to Egan's use of various devices to move between timelines, Powers here uses one technology to reestablish temporal cohesion. Obsolescence is not a particular concern in this depiction; in fact, the cycle of updating is the pathway to narrative development. In the above extract Peter learns how to use the platform with a sense of childish play; this engagement with a previously unknown technology is a source of pleasure, allowing him the chance to tell his story to the world. The technology in this novel thus does have major narrative impact, serving as Peter's public announcement of guilt, as well as serving to establish and reconcile temporal disruption.

The above examples have highlighted technology as narrative tool. An advancement of this is seen in Ruth Ozeki's *A Tale for the Time Being* (2013), where devices become a new location for narrative discoveries:

Dad and I were still sharing the computer, and one day when I was searching his browser cache, I happened to find his links to an online suicide club. He had made some friends, it seemed, and they were chatting and making plans (2013: 304)

The shared computer becomes a new location in the family home, echoing something from Mark Nunes's assessment that network societies create 'lived spaces in which the network interface marks a set of material and conceptual relations that place "a world of information" at a user's fingertips' (2006: 160). Teenager Nao views the computer as a place she can inhabit and access information freely; it is a physical setting that intersects with digital data informing and exceeding the limits of the family home. This draws on a notable theme of Ozeki's novel, which is the erasure of the divide between private and public – in which technology is a key agent. Nao intentionally seeks out information her father did not intend to share with her, displaying something from Chun's analysis of how social media questions 'what is allegedly public and private' (2016: xi). Paul A. Youngman's discussion of literary representations of technology considers 'how the Internet has reconstructed Enlightenment conceptions of public versus private space' (2013: 25); Ozeki's text reveals this sentiment in this physical space within the family home which erases privacy boundaries. In a reversal of Homes's novel, where devices emphasise communication between characters, here the technology bypasses confrontation with the individual and enables information to be obtained without their permission or knowledge. Ozeki's novel contains many further examples of this breach of privacy through digitality, including a shocking example of assault filmed and disseminated online, all of which amplify this disregard for the person rather than their data. Further inverting previous examples — rather than digitality affording individuals ownership over their stories (as in *Orfeo*), here Ozeki tracks the growing sense of collective ownership within the digital space, leading to the invasion of individual privacy.

These references to digital devices share a larger responsibility or effect; whether temporal, spatial, or thematic, they amplify concerns of their texts – such as nostalgia, cultural critique, and personal privacy – regardless of their overt or effaced depiction. This first level to embracing technology in contemporary fiction can thus be seen, not as a gimmick or an expiration date, but a fruitful step in recording and remembering the cycles of contemporary digital life.

Digital Representation

Fiction has a long history of adapting its form in experimentation with and reflection of the newest tools. The immediately preceding periods of postmodernism and modernism particularly contain such ventures. The typography and artwork of *Blast* magazine, Sterne's visual experimentation in *Tristram Shandy*, and the 'cut up' techniques of postmodernists like Burroughs epitomise this experimentation with texts and printing technologies. This engagement steps beyond reference and engages with technologies to alter the form and layout of the text itself, thus representing the

technologies on the printed page. Moving focus to the contemporary period, Jessica Pressman speaks of ‘the power of the print page [to] draw attention to the book as a multimedia format, one informed by and connected to digital technologies’ (2009); while going on to address the ‘aesthetic of bookishness’, Pressman’s observation highlights the variety of ways fiction can respond to and represent the contemporary digital moment. For fiction to represent technology it must go beyond mere reference within the prose of the text, and work to display the form of the device within the arrangement of the text itself. Thus, something of the environment inhabited when utilising the device is translated to the printed page. This can disrupt banality by prioritising technology rather than placing it on equal value with other actions and concepts, an inversion of the embedded effacement observed in fiction like Homes’s novel. Conversely, including technology in the contextual details of the page can reduce overt narrative reference to the working and handling of technologies within the narrative itself, thus in a sense becoming more embedded. There is a fine border on this other side of this definition, whereby representations do not veer into full incarnations of digital fiction; this crossing will be addressed in the final segment of my analysis.

In analysis of Powers’s *Orfeo*, I argued that the use of space and lines works to separate the tweets from the rest of the page, interrupting the narrative and the chronology of the novel. Yet, this separation is not specific to the form that is being referenced – nothing about *how* the page is arranged reflects the actual environment or aesthetic of Twitter. Thus, this arrangement of the page, while holding great effect, does not specifically represent the details of the referenced technology. In contrast, Lucy Kellaway’s *Who Moved My Blackberry* (2005) is an example of fiction that replicates the framing details of technologies to represent digital communication strategies. The novel is entirely composed of emails sent to and from the central character Martin Lukes, an executive at a Fortune 500 company seeking to climb the corporate and social ladder. In a manner, this is a contemporary version of the long-established epistolary novel, adapted for a new form of communication. Every message begins with a ‘From:’ and ‘To:’ line, and those sent from the titular device end with the tag ‘*Sent from my BlackBerry Wireless Handheld*’. Recipients sometimes appear as individual’s full names, and at other times email addresses or mailing lists: ‘Pandora@CoachworX’, ‘*All Staff*’. The content of the messages is thus informed by these details evoking the platform described.

Kellaway creates a satirical depiction of corporate life focalised through these key communication technologies of the early 2000s. The lack of contextualising narrative and focus only on messages to and from Martin reflects the single-mindedness and self-obsession of the central character. Martin has genuinely very little interest

in any conversations that do not include or benefit him, ignoring these in his life just as they are omitted from the text. In contrast to the previous examples, which made active reference to character interactions with devices, in this representation, such engagement with technology may be entirely absent from the text. Martin does reference his devices within the emails at times – most notably, when discovering his son has stolen his BlackBerry and forwarded incriminating emails to his wife: ‘Have you seen my BlackBerry anywhere?’, ‘JAKE DID YOU JUST SEND ME A MESSAGE FROM MY BLACKBERRY??’, ‘Can you disable my BlackBerry now???’ Urgent’ (Kellaway 2005: 269, 277). However, we do not ever ‘see’ him composing an email in the way that we see Harry answer the phone in *May We Be Forgiven* or Nao search the computer browser history in *A Tale for the Time Being*. Instead, this engagement is implied through context and further description is rendered unnecessary. This enmeshment of narrative and technology is particularly effective for this text that emphasises how the characters’ lives are run by and through corporate systems. Further, as it means to depict a specific moment in time, the expiring popularity of the BlackBerry in some ways amplifies the depiction as a caricature of this figure in this particular era.

There are choices and exceptions made in this representation. The date and time stamps typically accompanying any email are missing, and instead all messages from each day are gathered under one heading. The representation is also entirely limited to the text of emails, rather than any inclusion of the additional icons or specific layout involved when viewing emails on a computer or BlackBerry. There is thus a compromise made between technological and literary forms, in order to best ‘narrativise’ these messages and to represent the technology without including so many details that this becomes a barrier. This begins to indicate a tension of representation I will later return to, the inability of the printed page to truly represent a digital environment.

In *Who Moved My Blackberry*, the representation is a consistent feature of the novel, never varying in form. This constant presence eventually allows the technology to disappear, blending into the background of the text. In this way, Kellaway displays the effacement discussed by Dinnen when technologies become unremarkable. Dinnen’s definition continues: “‘the digital’ is a reification of the effacing condition of all media. When we watch YouTube, we watch “videos”; social media is social life; when code runs properly, we don’t see it.’ (2018: 4). Effacement thus does not require the digital to hide or disguise itself, but rather the digital condition enacts effacement through exposure and consumption. Digital life becomes synonymous with everyday interactions. In this case, when we (and Martin) read emails, we simply read text; digital communication is just communication.

In contrast to this consistency and effacement, Egan's *Goon Squad* utilises technology as a narrative disruption in representation as in reference, as discussed previously. Signalling changes in time and environment, changes in technological representation surprise the reader and redefine each new chapter. Where Egan most clearly moves from reference to representation is chapter 12, 'Great Rock and Roll Pauses', in which PowerPoint slides are printed on each page. This presentation is a kind of diary entry by 12-year-old Alison Blake, who uses the medium to chart her family dynamics, daily activities, and key conversations. As with *Who Moved My Blackberry*, there is no informing text before or between the slides, and in this case the narrative is focalised even more tightly through only one character's point of view – with no 'replies'. Where other characters are included, their speech is transcribed by Alison herself and thus brought under her 'authorship'. As well as headings and speech, the slides include bullet points, diagrams, and use of shapes to separate and connect ideas. These components are native to the represented technology, allowing for an incorporation of shape and abbreviated text that suits the environment it is presented within. Rather than capturing complete conversations or describing scenes in detail, Alison drops in quotes and uses shape and space arrangement to draw connections and elucidate meaning. For example, a slide titled 'Ways It Can Be When Dad Comes Back' (2010: 274) depicts a tipping scale by drawing a triangle and a line, with actions describing her father in two columns on each side of the scale. The 'negative' actions outweigh the positive, with the scale dipping on this side, conveying that this is the most frequent outcome.

Again, Egan's keen embracement of current technologies does highlight potential issues. While PowerPoint was a relatively new tool at the time – and certainly new in use in fiction – the style and shapes used instantly indicate a certain era of the application to the contemporary reader. The issue here is that chapter 12 is one of the future-most points of the novel, falling either just before or just after the final chapter. The second slide contains the date mark of 'May 14th & 15th, 202-', notably focusing on the landmark of the 2020s rather than a particular year. The chapter provides key insights to the state of the planet at this time (at least a decade on from the release of the novel), indicating an energy shortage through the thousands of solar panels that capture even moon light: 'it's weaker, but we use it' (2010: 301), and in the transformation from lush to barren landscapes as remnants of a golf course are seen while Alison walks through the desert (2010: 297, 299). Coming to this chapter in 2025, at the approximate time it is set, the technology feels rather dated in comparison to the future it depicts. Yet this is an imagined future, rather than a predicted one, in which Egan describes a decade characterised by technological developments that seep into everyday habit and communication. Thus, this chapter can be seen as 'the intraface through which

the novel can register the affective novelty of becoming-with media' (Dinnen 2018: 151); a teenage girl used to represent the changes in digital preferences and languages – a theme already highlighted in the novel's digital references, here amplified in representation.

The PowerPoint chapter requires the reader to physically recalibrate their relationship with the novel. This is notable considering my previous observation that representation erases the character's handling of technology; as with Martin and his BlackBerry, we do not see Alison using a computer and crafting her slides. However, while the character's engagement with technology is minimised, the reader's physical handling of the text is increased. Furthermore, the physical handling of the text evokes the paradox of digital representation mentioned earlier. The act of turning the page between slides reminds the reader that this is not a digital experience, resisting full effacement. The end of the chapter is also a recalibration, returning to traditional written prose rather than ending in this place of so explicitly 'becoming-with media'. In both examples discussed here, these representations inhabit a hesitant space between reference and reality. This creates a paradox of authenticity within any literary representation of technological devices – relying on the printed page to incompletely convey the abilities and actions of a digital device.

Digital Fiction

In referencing and representing technology, fiction can bring external technologies into the materiality of the novel. As noted, this presents challenges through limitations and authenticity given the distinct differences between digital and material forms. David Callahan and Anthony Barker comment that the advent of new convergent digital platforms enables texts to 'move in any direction and take up any configuration' (2019: 4–5), somewhat removing these restrictions. Indeed, N. Katharine Hayles's work on digitality and embodiment claims that 'digital media have given us an opportunity we have not had for the last several hundred years: the chance to see print with new eyes' (2008: 33). This first quarter of the twenty-first century is characterised particularly by the founding and growth of online spaces. Beyond specific technological devices, this new century operates socially and corporately in rapidly expanding and evolving digital communities. Fiction is not exempt from this development, and authors are able to utilise such platforms in publishing their work. Some resistance to fictional partnership with technology is based on fears of 'the computer as the ultimate solvent that is dissolving all other media into itself (Hayles 2005: 31), resulting in 'wholly remaking or undoing the novel' (Reina 2019: 76). However, analysis of key fictional partnerships with technologies reveals that these fears have not been realised.

This analysis focuses less on digital reading platforms – such as ebooks or audiobooks – as, while an interesting development in the contemporary era, these methods often seek to recreate the environment of the text and can transform any text, from contemporary to classic alike. Thus, these are digitised rather than ‘digital born’ texts (Hayles 2008: 3). Digital born texts are made to inhabit a specific environment and are inherently paired with the technology they are formed for. These fictions ‘would lose something of [their] aesthetic and semiotic function if [...] removed that medium’ (Ciccoricco 2012: 256). This characteristic amplifies the risks and realities of obsolescence for digital fiction. Not only are textual references or representations of technology subject to becoming out of date, but the fiction itself is at risk of sudden death if the platform hosting it disappears. Digital fiction therefore most clearly illustrates the ‘crisis’ point in Chun’s formula of updating. This is clear within Chun’s writing on the false belief in digitality as stable:

users save things digitally, if they do, by making what is stable ephemeral. They perversely take what is more lasting – what can remain and still be read for a long duration, such as paper – and make it more volatile. This digital ‘version’ is more volatile not simply because magnetically stored data decay more quickly than paper, but also because software and hardware constantly change, manically upgrade. (2016: 78)

Chun’s above analysis pinpoints two key components of time and decay, both of which provide excellent access points to discussing the effects and issues of digital fiction. First regarding time, Sarah Brouillette, Mathias Nilges and Emilio Sauri refer to ‘living in the moment [as] the slogan of the perfect neoliberal subject’, and discuss assumptions of the contemporary as singular, timeless and homogeneous (2017: xvii). In this absence of attention to past or present we can identify the opportunity for the dangers Chun speaks of, forgetting the permanence offered by stable materiality and ignoring the oncoming decay brought by upgrading. While Brouillette, Nilges and Sauri refer to Snapchat as an example of the radical present, many of these observations can be applied to the publication and consumption of digital fiction. Twitter fiction in particular carries a sense of immediacy, pinpointing the reader in the contemporary moment. Each segment of fiction, in its inception limited to 140-characters, enters the digital space in isolation. The tweet is tied, not to the rest of the text, but to everything else published at that moment by all users who ‘wander into, consider, and quickly abandon’ fragments of narrative all ‘broken off from their context[s]’ (Cobb 2013: 202).

Here I turn to Egan’s ‘Black Box’ (2012) as a case study in considering the effects of obsolescence discussed throughout this article. Published at the mid-point of the period

this special issue of *C21* addresses, this text is particularly well situated for examining the type of experimentation with new platforms occurring in the first decade of the new century. Further, the 13 years that have passed post-publication offer the opportunity to examine the legacy of both the text and its hosting platform. 'Black Box' sees Lulu from *A Visit from the Goon Squad* become a citizen agent with surveillance technology embedded within her body; a chip in her brain records her 'Mission Log', every tweet representing an entry in this log. The story was published in one-hour periods over the course of ten days via *The New Yorker's* Twitter account. Here Egan adopts the sense of immediacy described by Brouillette, Nilges and Sauri for narrative effect, as using Twitter to publish these thoughts gives an impression of real time dissemination. Brendan Dooley's (2010) work associates the terms contemporary and contemporaneity with the emerging of mass media and newspapers, noting that these enabled a shared experience of the present by the readers, all of whom share a collective, common time. This association has continued relevance, with social media as the newest version of media dissemination, characterised by increased fragmentation and immediacy. Rather than a daily newspaper, users can refresh constantly and every minute have access to a new feed informing the present moment. 'Black Box' clearly evokes this, as Lulu uploads a live 'news-feed' of her mission, informing her superiors, loved ones, and readers, of her survival.

When discussing effacement in *Who Moved My BlackBerry*, I noted that the consistent presence of the framing details allowed the technology to disappear. The same may be true of digital fiction, as in Twitter fiction attention is focused on parsing the digital screen for the context of each fragment, rather than observing the digitality within the text. The text is encased in digitality, rather than digitality present within a material text. This demonstrates something of Dinnen's assessment that the 'digital banal is the condition by which the embeddedness of digital media in everyday life is visible only as an expectedness of technological progress' (2018: 163). When technology becomes the larger context in which fiction is present, it is no longer the technology that is notable or distinct. In considering the fragmentation and immediacy of digital fiction, these components collaborate in an interesting inversion of the fiction-technology relationship explored previously.

Earlier analysis observed that literary reference to and representation of technology resists obsolescence through materialising digital memory, while still being subject to obsolescence in legacy. Digital born fiction in fact increases its own risk of obsolescence by enacting the false belief in permanence described by Chun, leading to potential erasure due to the lack of a more stable incarnation. This process

has already occurred within the development and decline of digital platforms in these twenty-five years of the twenty-first century. I have elsewhere analysed in detail the difficulties of accessing 'Black Box' due to the inability to experience the live unfolding of the narrative after the publication period, and the difficulty of reading each tweet in order due to the fragmentary and un-linked nature of the publication style (Power 2023). This means that the text is predominantly read on other platforms, rather than the one it was designed for. Since this previous analysis, the sale of Twitter and rebranding to 'X' complicates this even further. If the tweets can be found, they will no longer appear in the environment they were planned for. Beyond the platform's name, layout, and branding, engagement with 'X' is most drastically impacted by controversy surrounding its new owner. After the site's sale in 2022, many users – including a large community of academics, artists, and activists – exited the site. Therefore changes in readership of the original iteration of 'Black Box' have very little to do with the text or author and are instead consequences of a business deal that Egan had no role in. It seems that the legacy and access to 'Black Box' became a concern for Egan herself, as she has since released the text in a new format. Egan published a 'sibling novel' to *A Visit From the Goon Squad* in 2022 called *The Candy House*, in which Chapter 10, 'Lulu the Spy 2032' replicates 'Black Box' almost exactly. Aside from a few small edits, the narrative remains identical. What is strikingly different, is the format. All fragments are collected and read chronologically without any interruptions, and of course the digital format is entirely absent – no longer read on a screen. The narrative is, however, formatted differently than the rest of the novel, with the pages divided into two columns and the fragments grouped into 53 sections (rather than 606 tweets). This displays a lingering echo of the digital disruption to form for those in the know, yet this will be lost on readers unaware of 'Black Box'.

The publication of two versions of this story ten years apart raises a few questions. Should readers see 'Black Box' as a draft version of 'Lulu the Spy, 2032'? An experiment with form that took on its final incarnation in the 2022 novel? This could downplay the esteem of experimental forms like Twitter fiction, taking away their value as a unique product. Further, the effect of Twitter fiction in forcing the reader to parse the digital environment to distinguish and connect the fragments of fiction is entirely lost. This transplantation erases the formal qualities of the Twitter fiction where technology is used as a skeleton for the text to latch onto, amongst many other fragments from different sources and contexts. Egan is not the only author to turn Twitter fiction into a novel; David Mitchell, for instance, turned 2014 Twitter fiction 'The Right Sort' into 2015 novel *Slade House*, and John Roderick's *Electric Aphorisms* (2010) is composed of 365 transmissions, first posted individually on Twitter and later published together

in a print book. These usages in some ways perpetuate the belief in digital media as ‘unliterary’, establishing the print book as the end goal, the ‘official’ version of the text. However, these outputs clearly combat the issues of access and permanence discussed previously. Further, in many cases the experimentations with digital platforms shape the final form of the texts, reflecting Hayles’s work on the embodied, material effects of collaboration between literature and digital media (1999; 2005).

As digital fiction is characterised by a commitment to the space and design of the digital environment, it is difficult to create a hybrid digital-material text. As illustrated above, one option taken by authors is to publish two versions, one digital and one more traditional – often seen as the more ‘official version of the text’. Yet, there are some examples of authors attempting to negotiate and stitch together these forms. One such example is Else Fitzgerald’s *Everything Feels Like the End of the World* (2022); a collection of short fictions exploring possible futures in a dystopian Australia. Engaging heavily with themes of technological advancement – featuring hybrid beings and AI companions – the text is predominantly written in traditional print, with some exceptions. The penultimate chapter, ‘Final Broadcast’, describes a message sent back in time to instruct those on earth on how to save their planet:

This is our final broadcast

01110111 01100101 00100000 01110111 01100101 01110010 01100101 00100000 01110111
01110010 01101111 01101111 01101110 01100111 [...]

All we can hope is that it reaches you in time (2022: 235, 240)

The message is written in binary code and not decoded, aligning with the fact that the message is not successfully received within the text. Yet, the acknowledgements of the book ends with: ‘To decode the Final Broadcast, go to elsefitzgerald.com/final-broadcast’ (2022: 252). If typed into an internet browser, this leads the reader to the author’s webpage, where a decoded version of the message can be read. In encountering these details, the reader is confronted by the inaccessibility of the digital language due to the clear distinction and lack of compromise between forms. In one manner, this multiplicity of languages – textual and digital – creates narrative disruption and resists collaboration between forms by maintaining clear boundaries between each. Yet, in another turn, these inclusions question the end of the narrative by requiring additional actions from the reader to access the translation. However, relegating the link to the acknowledgements, rather than the main text, feels half-hearted and hesitant. Again, the printed text is safeguarded as the official format, and commonplace technologies deemed ‘unliterary’ (Manshel: 49).

The varied examples of reference and representation attended to earlier established effective methods for authors to incorporate technology into their work. Even where now out-of-fashion technologies were utilised, these depictions maintain impact due to the authors' careful handling and incorporation into narrative. It seems that digital fiction is in a less secure position; the analysis of 'Black Box' showcases the many factors limiting access and altering the experience of reading this text. The instability of digital platforms – subject to sale, rebranding, and even extinction – embeds digital fiction with the same instability. This mode of literary engagement with technology may be a less reliable output, but it still offers fruitful experimentation – showcasing an enduring literary engagement with new modes of publication, and a use of new technologies to reconsider the structure and packaging of fiction. While many fear digital fiction might lead to a situation where the 'very conception of the book as a fixed object is giving way to the hyperreality of letters floating on a screen' (Tabbi 1995), this risk is not fully realised in the experiments analysed. Indeed, these examples illustrate Kathleen Fitzpatrick's claim that 'the digital may be more prone to a material obsolescence than is print' (2008: 720). Fitzpatrick observes that, as technological formats upgrade, existing platforms must degrade, thus posing a threat to the future of digital text. This analysis has pinpointed not only this danger in effect, but the interesting shared response of authors to return to materiality as a mode of preservation and narrative development.

Conclusion

Each author discussed in this analysis engages intentionally with digital devices – whether in reference, representation, or the creation of digital fiction. Using Chun's theory of obsolescence as a critical lens has revealed, not the guarantee of irrelevance, but a creative engagement with digital devices. Obsolescence itself is used as a technique to play with temporality, evoke nostalgia, and to establish and disturb embedded banality. Further, what Chun argues matters most is not the threat of obsolescence but rather 'what and how things linger' (2016: 171). As argued earlier in this analysis, fiction is not passive in determining what lingers and is not tasked simply with recording what lingers once this is concluded. Rather, literary depictions of and experimentations with digital culture and technologies are part of determining what lingers, recording volatile digital memory in a more stable and accessible format. A second takeaway from this analysis is a quelling of the fear that the book is at risk due to advancements of digital culture. Continuous attention was given to the established history of literary experimentation with technology, establishing both a precedent and pathway for fictional engagement with contemporary digital culture. The experiments

considered display Joseph Tabbi's view that 'new technological achievements do not have to mean the forceful displacement of older media' (1995); as with experimental Twitter fiction providing a new pathway to, rather than simply replacing, the novel. This analysis has not ignored the justified anxieties around engaging with technology, concerning the authenticity and relatability of depictions, and the permanence of texts tied to platforms at risk of deletion. Yet, these identify interesting tensions for critical consideration, such as the paradox of material representations of digitality. These concerns require authors to assess the value and risks of incorporating technology into their work; a reflection which results in careful embedding of digital culture within fiction and creative experimentation with new, or imagined, platforms and devices. Further, update culture and the risks of obsolescence are realities of contemporary life, not merely optional topics for contemporary fiction. By addressing and representing these realities, fiction is able to create a truer record and analysis of this developing century.

Competing Interests

The author has no competing interests to declare.

References

- Benjamin, Walter. [1968] 2010. 'The Work of Art in the Age of Its Technological Reproducibility.' In *The Norton Anthology of Theory and Criticism*. 2nd ed, edited by Vincent B. Leitch, 1051–1071. USA: W.W. Norton & Company.
- Brouillette, Sarah, Mathias Nilges and Emilio Sauri, eds. 2017. *Literature and the Global Contemporary*. Palgrave Macmillan. doi: <https://doi.org/10.1007/978-3-319-63055-7>
- Callahan, David and Anthony Barker, eds. 2019. *Body and Text*. Springer. Doi: <https://doi.org/10.1007/978-3-030-25189-5>
- Chun, Wendy Hui Kyong. 2011. *Programmed Visions: Software and Memory*. Massachusetts: The MIT Press.
- Chun, Wendy Hui Kyong. 2016. *Updating to Remain the Same: Habitual New Media*. Massachusetts: The MIT Press.
- Ciccoricco, David. 2012. 'Focalization and Digital Fiction.' *Narrative* 20(22): 255–277.
- Cobb, Michael. 2013. 'A Little Like Reading: Preference, Facebook, and Overwhelmed Interpretations.' *PMLA* 128(6): 201–207.
- Cowart, David. 2015. 'Thirteen Ways of Looking: Jennifer Egan's Goon Squad.' *Critique* 56(3): 241–254.
- DeLillo, Don. 1984. *White Noise*. New York: Viking Penguin Inc..
- DeLillo, Don. 2020. *The Silence*. UK: Picador.
- Dinnen, Zara. 2018. *The Digital Banal*. New York: Columbia University Press.
- Dooley, Brendan, ed. 2010. *The Dissemination of News and the Emergence of Contemporaneity in Early Modern Europe*. Abington: Ashgate.
- Egan, Jennifer. 2006. *The Keep*. Great Britain: Abacus.
- Egan, Jennifer. 2010. *A Visit from the Goon Squad*. New York: Random House.
- Egan, Jennifer. 2012. 'Black Box.' *The New Yorker* (28 May): <https://www.newyorker.com/magazine/2012/06/04/black-box>
- Egan, Jennifer. 2022. *The Candy House*. London: Corsair.
- Fitzgerald, Else. 2022. *Everything Feels Like the End of the World*. NSW: Alex & Unwin.
- Fitzpatrick, Kathleen. 2008. 'Obsolescence.' *MLA* 123(3): 718–722.
- Gibson, Allison K.. 2012. 'He Hit Send: On the Awkward but Necessary Role of Technology in Fiction.' *The Millions* (8 August): <https://themillions.com/2012/08/he-hit-send-on-the-awkward-but-necessary-role-of-technology-in-fiction.html>

- Hayles, N. Katherine. 1999. *How We Became Posthuman*. Chicago: University of Chicago Press.
- Hayles, N. Katherine. 2005. *My Mother Was a Computer*. Chicago: University of Chicago Press.
- Hayles, N. Katherine. 2008. *Electronic Literature*. Indiana: University of Notre Dame.
- Holland, Mary. 2012. 'A Lamb in Wolf's Clothing: Postmodern Realism in A. M. Homes's Music for Torching and This Book Will Save Your Life.' *Critique*, 53(3): 214–237.
- Homes, A.M. 2012. *May We Be Forgiven*. London: Granta Books.
- Kellaway, Lucy. 2005. *Who Moved My Blackberry?* London: Penguin.
- Kelly, Adam. 2011. 'Beginning with Postmodernism.' *Twentieth-Century Literature* Fall/Winter 2011: 391–423.
- Manshel, Alexander. 2020. 'The Lag: Technology and Fiction in the Twentieth Century.' *PMLA* 135(1): 40–58.
- Mitchell, David. 2015. *The Right Sort*. London: Hodder & Stoughton.
- Moran, Alexander. 2021. *Understanding Jennifer Egan*. South Carolina: USC Press.
- Nunes, Mark. 2006. *Cyberspaces of Everyday Life*. Minnesota: University of Minnesota.
- Ozeki, Ruth. 2013. *A Tale for the Time Being*. Edinburgh: Canongate Books.
- Power, Mairi. 2023. 'Jennifer Egan and Digital Fiction after Postmodernism.' In *Weaving Tales*, edited by Paula Garcíá-Ramírez, Beatriz Valverde, Angélica Varandas and Jason Whittaker, 98–113. New York: Routledge.
- Powers, Richard. 2014. *Orfeo*. London: Atlantic Books.
- Pressman, Jessica. 2009. 'The Aesthetic of Bookishness in Twenty-First-Century Literature.' *Michigan Quarterly Review* XLVII(4). <http://handle.net/2027/spo.act2080.0048.402>.
- Reina, Bradley. 2019. 'Digital Print in the Material World: Paratext in Service of Narrative.' *Word & Image* 35(1): 76–88.
- Roderick, John. 2010. *Electric Aphorisms*. Portland: Publication Studio.
- Tabbi, Joseph. 1995. 'A Review of Books in the Age of Their Technological Obsolescence.' *The Electronic Book Review*: <https://www.altx.com/ebr/tabbi.htm>
- Youngman, Paul A. 2013. *We are the Machine: the computer, the Internet, and information in contemporary German literature*. Rochester: Camden House.

