

## **Magic as technological Utopia? Unpacking issues of interactivity and infrastructuring in the Potterverse**

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## **Chapter 15: Magic as Technological Utopia? Unpacking Issues of Interactivity and Infrastructuring in the Potterverse**

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### **Abstract**

Magic in the Harry Potter universe operates through a complex system of objects, mechanisms and rules. Magic underpins people's individual agency and the technological development of magical artefacts (such as wands, charmed broomsticks and remembralls) and systems (such as owl post and the Floo network), while Muggle technology and its achievements are often ignored or despised. Several authors have examined the workings of technology in the Potterverse and how it contrasts with real-world technology. Unsurprisingly, these magical forms of interaction have also inspired the field of interaction design, with the mechanisms of channelling and controlling magic often seen as a "technological utopia" where interaction is natural, intuitive, fun and embedded into familiar and tangible objects.

This chapter examines the relationship between everyday interactions with digital technologies and the depiction of technology (both magical and non-magical) in the Potterverse through the lens of human-centred computing concepts such as seamfulness and infrastructure. This focus differs from that of previous studies because it analyses the magical infrastructure in the Potterverse as a socio-technical system where tools, resources and people are all part of a complex ecology of interaction that includes breakdowns and failures. The contrast between the hopeful view of magical technologies as technomyths and the reality of imperfect and "messy" infrastructure is also discussed in light of recent developments in the field of Ubiquitous Computing.

This chapter examines the relationship between everyday interactions with digital technologies and the depiction of technology (both magical and non-magical) in the Potterverse. The mechanisms according to which magic and magical technology work will be analysed through the lens of human-centred computing concepts such as interactivity, infrastructure and seamfulness, in order to highlight how J.K. Rowling established an infrastructure for magic in the Harry Potter novels. It seeks to describe this relationship "from the ground up", without inscribing theoretical or value models into the representation of magical technology in the Potterverse, and by comparing this with optimistic visions of technological development by designers and developers in our world. It is worth noting that "technology" in this chapter only refers to devices and techniques depicted in the Potter canon, and not to the digital technologies supporting fandom, additional storytelling (such as Pottermore), and/or peer-

production communities beyond the book, which have been extensively studied and discussed by authors such as Henry Jenkins (2004).

A number of authors have proposed interpretations (mainly based on cultural theory) of the depiction of Muggle versus magical technologies in the books. One example is Teare's view of the contrast between Muggle and magical technology as a way for the reader to reflect on the limitations of our technological culture (2002). Another example is the work of Oakes who argues (despite the profound inequalities based both on blood status and on magical abilities that we can see in the wizarding world) that magic as represented in these novels puts wizards on an equal footing, while Muggle technology leads to social distance and alienation (2003). The high-tech Muggle world devalues interpersonal bonds in Oakes' view. Dudnik critiques what he considers a polarized representation of nature (i.e. innate magical power) as dangerous and threatening versus technology, which is instead presented as mostly harmless (2002).

Conversely, other authors have not contrasted magic and technology, but have argued that the Harry Potter brand of magic constitutes a technological system in itself. Ostling argues that Rowling presents magic-as-technology, thus "standardizing" and "commodifying" the idea of wonder and enchantment and presenting a secularized view of the world (2003). Chevalier (2005) also puts forward a view of magic as a technological system, arguing that magic – just like science – cannot solve moral problems and therefore has deep limitations in its ability to solve the problems of the Wizarding world. And Mitchell argues for an analogy between magic and the workings of advanced technology: for some people the inner workings of a computer are "completely mysterious and therefore a kind of magic" (2007, 40). Furthermore, the innate ability to handle magic is a fundamental difference between wizards and Muggles in the Potterverse, and Mitchell argues that this is an analogy for genetic variation, and the qualities or abilities that are related to this variation are akin to those needed to make something work. He proposes that the limitations of magic and the rules created by Rowling to govern the magical world are another powerful similarity with our real world.

While sharing the view that there are more similarities between the Harry Potter brand of magic and the technology in our world than there are differences, this chapter takes a different focus from that of previous studies; it concentrates on mechanisms of interaction and adoption (i.e. the take-up of technological tools into everyday practices for specific means) and does so from a human-centred computing perspective. Therefore the "magical infrastructure" in the Potterverse shall be described and discussed as a socio-technical system where tools, resources and people are all part of a complex ecology of interaction.

Magic in the Harry Potter world has precise rules of operation and agency, in contrast with other literary representations where magic is conceptualized and depicted as a mysterious and rogue power. While establishing the boundaries and workings of magic in her world-building for the series, Rowling has also established a contrast between the complexity of mastering and channelling magical power and the technological development of the wizarding world: the refinement of an innate (genetic) ability has meant a somehow stunted technological development and limited technical ingenuity compared to the Muggle world. It has also meant a widespread

cultural attitude among wizards that sees the use (and even appreciation) of Muggle technological appliances as an admission of weak magical power or of a lack of wizarding pride (Rowling 2015a). One exception is the car, although not many wizards are in possession of one. Even the Ministry of Magic owns a fleet of cars and “[m]any wizards love cars with a child-like passion, and there have been cases of pure-bloods who claim never to touch a Muggle artefact, and yet are discovered to have a flying Rolls Royce in their garage” (2015a).

Extreme anti-Muggle views, naturally, also mean a disdain for Muggle technology that becomes part of the pureblood (or “wizards first”) political agenda. Sirius Black’s love of motorbikes is something that strongly signals his difference from the rest of the Black family and his desire to annoy them. He particularly flaunts his passion (for example, in decorating his bedroom) as part of his rebellion against the pureblood ideology of his parents and of most of his relatives. Similarly, Arthur Weasley’s enthusiasm for Muggles and their technology goes hand in hand with his lack of pureblood prejudices: while he does not use Muggle technology as it is intended, he is a collector and a tinkerer – a hacker of the magical world, according to Ratnabalasuriar (2012), adding magical properties to Muggle artefacts when he gets the opportunity, such as the old Ford Anglia and indeed Sirius’ motorbike. Even Molly, Arthur’s wife, who is similarly averse to pureblood ideology, finds his passion eccentric and hard to understand. While Muggle technology is something that only a few eccentric wizards would care for, magical power – the great defining ability that shapes wizarding lives and society – has led to a unique technological (and technical) infrastructure in the wizarding world, in the same way as human cognitive, social and physical abilities have led to Muggle infrastructure and technology (Mitchell 2007, 42–4).

Here, “infrastructure” is intended as it has been conceptualized and described in studies of technology design and adoption, and of socio-technical systems: a set of resources, artefacts and circumstances in the background that enables practices in the foreground. According to Susan Leigh Star, infrastructure is “a system of substrates – railroad lines, pipes and plumbing, electrical power plants, and wires. It is by definition invisible, part of the background for other kinds of work. It is ready-to-hand [...]. The image becomes more complicated when one begins to investigate large-scale technical systems in the making, or to examine the situations of those who are not served by a particular infrastructure. For a railroad engineer, the rails are not infrastructure but topic” (1991 377–80). Infrastructure is the enabler of practice, often invisible and taken for granted unless it fails us. People draw from it as it provides resources and sets constraints for their activities. Infrastructure is also relational (Star and Ruhleder 1996, 111): the relationships between the systems that constitute it are as crucial as those between foreground and background, for example when thinking of the challenges of tweaking the infrastructure to suit one’s particular needs. Star defines the properties of infrastructure as follows: embeddedness; transparency; reach or scope; learned as part of membership; links with conventions of practice; embodiment of standards; built on an installed base; becomes visible upon breakdown; is fixed in modular increments (Star 1991, 377).

When considering these properties with respect to the wizarding world, it can clearly be seen that Rowling’s creation accurately parallels reality in terms of the social, organizational and political implications of the infrastructuring process. It is indeed in

the limitations imposed by the author on magic and on its devices that the depth and complexity of such fictional infrastructure can be appreciated. For example, the circumstances under which spells or magical artefacts fail, either by poor skill or by constraints imposed on them by law, ethics or the inner workings of magic, direct our attention to the infrastructure's embeddedness in practices and its transparency to magical practices, as well as its political and social connotations. Harry's journey through Hogwarts and through the wizarding world can be thought of as a path to discovering such infrastructure and its levels of operation and conventions of practice. As we learn about this world with Harry, we learn how it works: this is, in the words of Star and Ruhleder, "learned as part of membership" (1996, 113).

How do interactions with devices and infrastructure occur in the wizarding world? If the infrastructure is the necessary background enabler of interaction, it is magical practices that are indeed in the foreground, including interactions with magical technology. While magic is an innate ability, degrees of magical power vary in different individuals. Furthermore, magic's correct and controlled execution is the result of long and complex training consisting of seven years at Hogwarts, and of further independent study, research or apprenticeship for exceptional wizards seeking to occupy positions of particular skill or responsibility. Effective magical practices also rely on the use of magical artefacts that are carefully designed or (as in the case of potions) composed. Wands are the most important of these artefacts as they are the channel of raw magical power as well as the executor of a wizard's intentions. Purposeful and effective wandless magic is almost impossible in the Potterverse. Wands are also notable among wizard-made artefacts in that they hold a degree of independent agency, particularly in deciding whether and how effectively they should do a witch or wizard's bidding. While interactions such as spellcasting appear to be simple and natural, in fact they require two important components: firstly, the ability and skill of the person, as spells are not only words to be recited but specific intellectual or cognitive efforts that are then channelled in words and wand movements; secondly, a powerful and well-built wand that has affinity with its owner. As Rowling reminds the reader throughout the series, "it's really the wand that chooses the wizard" (PS 1997, 63), and power and craftsmanship alone are no guarantee of successful interaction with a wand.

Spells and incantations are the established and well-tested "scripts" that wand and wizard execute together, and they are also created by particularly skilled individuals. Mitchell indeed suggests that incantations are akin to computer programmes or software (Mitchell 2007, 44). The books make it clear that inventing a new spell is not a straightforward activity, and that it can be risky and dangerous to use a spell that is not tried and tested. For example, Luna Lovegood's mother Pandora, who was deemed an extraordinary witch, was killed when one of her experimental spells went badly wrong. Furthermore, if a newly created spell is indeed viable, choosing the right (combination of) words to channel the magic is another difficult step that might require several iterations, as we see from the notes that the Half-Blood Prince made on his old potion book about spells of his own invention, such as *Muffliato*, *Sectumsepra* and *Levicorpus*. Spellcasting and spell creation are anything but natural or intuitive, and the Ministry of Magic maintains control over which spells are officially approved – something of which Hermione reminds Harry every time he sings the praises of the Half-Blood Prince's inventions.

The physical aspect of interacting with a wand is in most cases fairly simple (basic gripping and waving movements). However, the wand itself is a very complex technological artefact: the underlying complexity of physically interacting with it is almost invisible to the wizard and rests almost entirely upon the shoulders of the designer: i.e., the wandmaker. As we learn in *Deathly Hallows*, the ability to create a powerful wand is rare and shrouded in mystery for most of the wizarding community. Not even Voldemort, one of the most skilled wizards in magical history, has a full grasp of it. A successful wandmaker has extensive knowledge not only of the raw materials that can be assembled into a high-quality wand (appropriate wood, magical substance at the core, and length), but also of the deeper levels – the “source code” – of magic (Rowling 2015c). As mentioned earlier, wand-making brings forth man-made artefacts that have built into them a degree of sentient thought and agency which, albeit in particularly unusual circumstances, may develop in ways that are beyond the wandmaker’s or the owner’s control.

Many other magical artefacts populate the wizarding world: some are used for basic and fairly mundane interactions, while others enable more complex practices. A few require wand use in order to be fully operated – for example, the Pensieve and the Marauder’s Map – while others do not, at least at the moment of use. Examples of the latter include broomsticks, invisibility cloaks, Floo powder, sneakoscopes and remembralls. All these artefacts, both complex and simple, have been charmed and/or magically assembled by their makers (Rowling 2015a). They are the product of both conceptual and technical design. In many cases, the interaction with them is fairly passive: the artefact reacts to an event or situation or performs a small set of actions. They are, in other words, a basic interface.

Complex actions that are allowed in wizarding society – such as the full transfiguration of something or someone, or apparating – are achieved by explicit agency by a wizard or witch and their wand, rather than by using a device, or through an assemblage of magical components (such as in a potion) under the close supervision of a wizard or witch. An artefact that behaves in a complex manner without a wizard’s direct intervention and control is usually suspicious, and most often assumed to be the product of dark magic: “Do not trust anything that can think for itself but you don’t know where it keeps its brain” (CS 1998, 242). The prime examples of this, Horcruxes and the Resurrection Stone, are forbidden or illegal in the case of the former, and tamper dangerously with the deepest laws of magic in the case of the latter.

Sheltrown (2003) divides magical artefacts in the Potterverse into “magic-tech” – objects that exist in some form in the Muggle world and that are charmed to behave magically in the wizarding world, such as broomsticks or cars – and “tech-magic” – items that have no Muggle world counterpart, wands being the prime example. He also highlights how there is a strong link between magical technology and expression of identity, with specific magical devices – such as wands and the Mirror of Erised – enabling interactions that channel and bring to the fore the deepest personal qualities and identity of a witch or wizard (Sheltrown 2003, 47). This view suggests that interactivity and interaction in the wizarding world are therefore only superficially intuitive, and furthermore they involve the use of significant cognitive and intellectual efforts as well as of extremely complex technical and technological designs. Simple interactivity usually means simple effects or consequences, while complex effects are

the result of complex agency, often achievable only by a very small minority of wizards.

Interestingly, while both the magical and non-magical worlds are technologically complex and require skilled interactions, wizards have trouble adjusting their skills to Muggle devices and standards: from understanding Muggle money, to using a telephone, or affixing the right stamps to a letter. According to Ratnabalasuriar: “this contrast can help us understand the diminishing magical quality – the banality – of technology in our own social contexts” (2012, 28). However, in light of Star’s definition, this rather seems to highlight the difficulty of moving one’s interaction from within a well-appropriated (and usually invisible) infrastructure, to a different one mediating alternative standards of practice.

The evolution of interactivity is very slow in the wizarding world. In the seven years of the story arc covered in the books, nothing changes in the way magic and magical artefacts operate. The only technical innovation taking place in the course of the books is the release of new broomstick models. This is even more striking if compared with the pace of technological change and device obsolescence in the Muggle world. Similarly, major magical discoveries seem to be rare and far between. The few examples mentioned in the books include Albus Dumbledore’s discovery of the twelve uses of dragon blood (which could be in the fairly distant past given Dumbledore’s long life), the more recent invention by of the Wolfsbane potion by Marcus Belby’s uncle, Damocles , and the invention of minor spells. It is not possible to determine whether this slow pace of change is due to the risks associated with channelling raw magical power or simply to a closed and conservative society. The existence of the Department of Mysteries, where experimentation occur with the deepest and most dangerous powers of magical life, hints at both explanations.

It does emerge, however, that the infrastructure underpinning magical interaction and the execution of magical practices – while immensely powerful and well structured – has glitches: spells can go wrong, but also other practices can be dangerous, or difficult. Floo powder, for example, is an amazingly efficient means of magical transportation: however, it is uncomfortable, unpleasant and also easy to get wrong. It was invented in the thirteenth century (Rowling 2015b) and yet we know of no attempts at improving it. Indeed, its low price – unchanged for over a century – is an incentive to abandon attempts to create homemade (and dangerous) versions of Floo powder.

While these interaction mechanisms are cumbersome, difficult and sometimes dangerous, this seems to be accepted by everyone as a matter of fact. The “links with conventions of practices” listed by Star and Ruhleder as one of the defining features of infrastructure seems particularly strong in this example (1996, 113). This may link to the fact that the infrastructure is too complicated to change or revise, or maybe too dangerous to tamper with. Or rather this could be accepted on the grounds of magic itself being a power that can be as destructive as it can be useful. At the same time as the slow pace of evolution of magical technology, the degree of acceptance of Muggle inventions by the wizarding world is limited and almost unchanging. As Sheltrown notes:

Students at Hogwarts write with quills, parchment, and ink. Their photographs, though moving, are in black-and-white. They lack electricity, phones and other regular fixtures of the Muggle world. Of course, much of what they do with magic replaces the need for clever technologies; however, some of the difficulties Harry and his friends faced could have been more easily remedied with basic Muggle technologies. (Sheltrown 2003, 57)

Magical forms of interactions in the Potterverse have long fascinated and inspired the design of interactions with digital technology in the real world. Interaction Design is a relatively recent field of research and practice, originating within the discipline of Human-Computer Interaction (HCI): “the study of how people interact with computers. It focuses on design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (ACM SIGCHI 1992). HCI has its roots in both cognitive psychology and computer systems development: it emerged as an attempt to bridge knowledge of how humans perceive, process and react to information in the world and knowledge of how to implement usable and effective digital interactions on computing systems. Through the years, HCI has expanded in parallel to the evolution of digital technologies to include concerns for the social and organizational context of interaction, and for the aesthetic and affective qualities of digital technologies and interactive experiences. Interaction Design adopts a clear perspective on enabling interactions with digital technologies that not only are effective and efficient, but also pleasurable, engaging and immersive for end users (Preece, Rogers and Sharp 2002, 9–15).

With an increasing concern for these experiential aspects of interaction came a debate on “natural” or “intuitive” interaction and attempts to make the mechanisms of interaction with digital technologies understandable to a wide variety of users without specialized knowledge or the need for extensive training. Particularly relevant is the connection to work on tangible and embodied interaction (Hornecker and Buur 2006, 439), where physical movement, gestures or presence and the use of graspable and manipulable devices replace more traditional input devices such as keyboards.

In this context of rethinking digital interactions outside the framework of the desktop personal computer, unsurprisingly, the Harry Potter world has often been a source of inspiration or comparison for real-world technologies and devices that behave in ways akin to the magical interactions portrayed in the series. Examples are the various prototypes of Invisibility Cloaks created using either smart textiles or projections (Fischer et al. 2011); the Pensieve project looking at ways to support social online reminiscence (Peesapati et al. 2010); and the Whereabouts Clock – a device for supporting situated awareness among family members (Sellen et al. 2006), which displays a striking resemblance to the Weasley family’s clock. Magic has often been seen as the guiding metaphor for realizing novel and immersive interactions (Drozd et al. 2001; Ylipulli et al. 2017), and the word “magical” is also widely used by designers to communicate the novelty and positive user experience values of their products.

The magical artefacts featuring in the Potterverse have been seen by some as a paradigm of a “technological utopia” where interaction is natural, intuitive, fun and embedded in familiar and tangible objects (Eggen and Eggen 2013, 40) that often



appear less sophisticated or less futuristic than other devices such as computer screens and keyboards. Indeed, reducing the need for end users to be aware of both hardware and of the inner workings of software in favour of concentrating on the interaction and its effect has been a clear goal of much interaction design work. These apparently natural features of interaction are culturally widely shared as a hopeful view of technological progress, and an ultimate goal for user experience design, and they resonate with established agendas in the human–computer interaction and computing fields that have been inspired by scenarios such as computer scientist Mark Weiser’s “Ubiquitous Computing” (1991) and human–computer interaction designer Don Norman’s “The Invisible Computer” (1999); technology is seen as disappearing within spaces, objects and tools and its design is concerned with humans and their abilities, thus cognitively disappearing. In Weiser’s words:

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it [...] The arcane aura that surrounds personal computers is not just a “user interface” problem. [...] Such machines cannot truly make computing an integral, invisible part of the way people live their lives. Therefore, we are trying to conceive a new way of thinking about computers in the world, one that takes into account the natural human environment and allows the computers themselves to vanish into the background. (Weiser 1991, 94)

The original vision of Ubiquitous Computing and some of the ways in which it has been adopted as an agenda for technological development have been critiqued from various perspectives, and also in comparison with what digital technology has indeed become in the decades that followed Weiser’s seminal article (Dourish and Bell 2011). There has also been some criticism of the idea of natural interaction, arguing that interaction can never be completely natural and intuitive but that it is instead a cultural and social product and the result of both familiarization and appropriation. Contemporary digital technologies feature both widespread use of interaction mechanisms based on simple gestures – such as touch patterns and swiping on a smart phone’s screen, or the motion tracking that operates certain gaming consoles – and of embedded processing power in everyday objects, such as in the Internet of Things, where everyday objects represent independent units of interaction that are able to communicate among themselves as well as with end users. However, our practices with and around these tools and platforms have also evolved in a socially and culturally embedded way: “technology and social life are not easily separated – social life is already entwined with technologies and technological practices of all kinds, and technologies and their designs are embedded in social systems that they reflect, reproduce, and transform” (Dourish and Bell 2011, 59).

Reflecting on these issues at the time of writing, just over 20 years since the publication of *Harry Potter and the Philosopher’s Stone* and with many Muggle technological advancements having occurred during this period, this resonates even more strongly with the mechanisms of how magical interactions work in the wizarding world: something only superficially simple, and, in fact, deeply embedded in the social, cultural and technical complexities of the magical world. Our world has become more thoroughly pervaded with “magical” digital technologies since Rowling originally plotted her story, from instant wireless communication to tangible interactions and smart objects. This actually has possibly increased the longstanding

fascination with the Potterverse's brand of technology, as it is possible to think more readily of ways in which to replicate some of its mechanisms of interaction. However, it is also timely to reflect on the profound contradictions and complications underpinning technology in the magical world and questioning its widespread appeal and perception as a technological utopia. What about the "messiness" and boundaries in the (magical) infrastructure?

This chapter has thus far touched upon several issues linking ideas of interactivity from the Harry Potter world to real-world interaction design. Breakdowns and infrastructural constraints are particularly interesting in this respect, because they link to the political and cultural aspects of technological and technical development in the wizarding world. The British magical community portrayed in the Potter canon is small and close-knit; secrecy and safety are its main concerns, and it relies on abilities and resources that are powerful and therefore to be handled with great caution. In this society, the deepest and strongest forces of magic and their control are the domain of just a few wizards – there seems to be only one wandmaker in the whole the British Isles: Mr Ollivander – or of the government (the Department of Mysteries). Advanced technological knowledge resides with the designers, developers or managers rather than the end users. The magical infrastructure is also managed and controlled by a restricted few, and we don't often see a witch or wizard attempting to adapt it to their needs. Compliance probably comes from the need for protection and secrecy and it is not surprising that the story's greatest villain, Lord Voldemort, also fashions himself as a magical innovator.

Previous examples showed how breakdowns, errors and accidents are very common during interactions with wizarding technology, but there seems to be a very slow pace of innovation. The Muggle fascination with magic seen as a simplification of life and as a desirable view of how interactions with technology should occur is at odds with how magic in the Potterverse actually works: it poses difficulties, brings as many complications as it resolves, and operates through a high degree of skill and training and complex technological artefacts. In their discussion of the evolution of the Ubiquitous Computing vision, Dourish and Bell discuss technomyths and the divination exercise that envisioning and enacting an agenda for the future of technology – and predicting its consequences – can be. They also refer to the inescapable messiness that characterizes both infrastructure and technological practices: "When we talk of the mess, we want to suggest that the practice of any technology in the world is never quite as simple, straightforward, or idealized as it is imagined to be" (2011, 4). Just as it applies to our world, this brand of messiness also runs deep in the execution and infrastructure of magic, which is more imperfect – and more human – than it is often perceived or judged to be. During Harry's early introduction to the wizarding world, he is wide-eyed and amazed at the possibilities offered by magic and by wizarding ingenuity and so are we, the readers. Gradually, Harry learns about the complications, difficulties and risks that come with deploying magic as he delves deeper into the complexity and messiness of both magical power and magical technology (Mitchell 2007, 71). Magic has limits, some imposed by nature and some by humans for safety, control and peacekeeping. Boundaries are placed not only between wizard and Muggle technology, but also within the magical world. Boundaries exist at many levels within the magical infrastructure: in how devices work and in how they can or cannot be appropriated. Throughout the series, the reader learns what the devices that break certain deep boundaries – such as the

Deathly Hallows and Horcruxes – can do and what risks they pose (Sheltrown 2003, 60). There are also boundaries in terms of technological ingenuity within wizarding society. It is clear that designers and developers hold advanced magical knowledge but that such knowledge is not widespread. Furthermore, there is great variation in magical ability among individuals.

In light of this, the appearance of seamless interaction through magic is replaced with a fragmentation that is akin to that of Muggle dealings with technology and infrastructure. The initial impression of seamlessness in interaction gives way to seamfulness: concepts discussed in the interaction design debate around ubiquitous and disappearing technologies. Seamfulness emerges when the seams keeping together different parts of the infrastructure become visible at the juncture between device and device, or platform and platform (Chalmers 2003, 2). Seamfulness is not just another word to indicate errors or breakdowns, but rather refers to a more complex issue: the artful interweaving of heterogeneous artefacts and systems into a coherent “disappearing” whole and the lingering presence of limits and constraints that, in turn, give other opportunities for appropriation. When seams in how infrastructure and practice overlap occur or become visible, humans appropriate tools in such a way to work around the seams or take advantage of them: “A user’s activity is influenced by what they perceive and understand of the characteristics of sensors, transducers and other I/O devices, as well as the system’s internal models and infrastructure. When seams show through in interaction, what is ‘infrastructure’ to system designers may be ‘interface’ to users” (Chalmers 2003, 3).

To give an example, a constraint is established by the Headmaster so that it is not possible to apparate in and out of Hogwarts, nor to reach it without permission. However, by accident, a seam becomes visible in the infrastructure of transportation in and out of Hogwarts: the Vanishing Cabinet. This then becomes the key to letting the Death Eaters into the Castle in the *Half-Blood Prince*. Another seam in an otherwise solid part of the infrastructure is the difficulty that wands that are “siblings” (i.e. that share cores) have in working properly against each other. Voldemort becomes aware of this and devises a workaround by using another wizard’s wand to attack Harry.

Seams between magic and Muggle infrastructures also make appearances – points when the two touch but not seamlessly so. The Floo network is a prime example as it relies on a device that is also part of the Muggle world: the fireplace. Arthur Weasley, one of the foremost subversive tinkerers in the Potterverse, exploits this to disruptive yet comical effect when he tries to connect Number Four Privet Drive to the Floo network to take Harry safely away to the Burrow. Do such seams also show in the Muggle world beyond? It appears that most Muggles are unaware of them, preferring to give logical explanations for phenomena that might hint at any magic whatsoever. However, for those Muggles who are aware of the magical world (such as the Dursleys and the Muggle Prime Minister), such junctures between magical and non-magical infrastructure are uncomfortably evident.

In conclusion, this chapter discussed two main interlinked issues: firstly magic as a technological infrastructure, and secondly the cultural influence that the Potterverse’s representation of interaction has had on widely shared views of how “magic” could improve our own technology. The contrasts and similarities between these two

technological visions were discussed and so, more broadly, was the influence of Rowling's fictional universe on interaction design. In the more than 20 years since the publication of the first Harry Potter book, digital technology has evolved significantly, often leading to experimentations inspired by what appears to be natural and intuitive interaction in the magical world. As a matter of fact, however, previous examples showed how technology in the wizarding world is a messy – and very human – socio-technical assemblage relying on an infrastructure that both enables practices and constrains them.

While the magical world has often been perceived as a technological utopia where interactions are effortless, and magic provides a reliable and efficient source of agency, in fact it has more in common with the Muggle world than has often been assumed: cultural, social and personal boundaries and seams deeply characterize magical infrastructure, and these constraints provide the basis for important points in the Harry Potter narrative. The magical technology in the world created by Rowling might not offer an alternative technomyth for how we envision the future of interaction, but it nonetheless provides us with food for thought in considering the contradictions and complexities of our own relationship with infrastructure.

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