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Notes

1. I should note here that when I use the singular word ‘electrical’ to describe a medium, I am referring to those electrical mediums that do not offer the digital affordance of computability. That is, I am talking about electrical mediums that emerged and existed prior to digital technologies becoming widespread, such as analogue television. Similarly, when I discuss ‘machines’ as belonging to a particular foundation technology, I will be referring to machines that are not also electrical. The early mechanical printing press is an example of such. This is a categorization of mediums into groups that reflect their lowest level affordance. This in turn indicates the foundation technology that they belong to.

2. Sam Lehman-Wilzig and Nava Cohen-Avigdor (2004) suggest that existing mediums that are threatened by new technologies are subject to the re-negotiation of their social use, and undergo a dramatic stage of evolution. These are usually what they call ‘adapted’ or ‘converged’ mediums: being old mediums that are resisting dissolution from the threat of new, similar, mediums (2004: 720). In direct relation to this, a thorough explanation of how existing mediums transition through the introduction of new foundation technologies is, indeed, warranted. Unfortunately, this is outside the scope of this article – though I intend to detail such in a subsequent article as soon as possible.

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mediums, such as television and radio, can be considered machines, in that they use energy to perform an intended action. Further, contemporary digital computers and the Internet can be described as having electrical properties and offering the proto-affordance of instantaneity. Thus, mediums of the digital foundation technology are 'digital

electrical machines that separate our thoughts from our bodies' and possess the proto-affordances of at least four foundation technologies: computability, instantaneity, reproducibility and separability.

Conclusion

At the beginning of this article, I remarked that theorists already call online platforms 'mediums', and that perhaps they do so without much consideration. This is not actually surprising, in some senses – as their experiences with, and understandings of, digital communication technologies such as YouTube, SoundCloud and Twitter no doubt feel similar to their experiences with, and understandings of, previous analogue mediums. Not that the specificities of these old mediums are identical to that of new digital mediums, of course, but in the sense that all are socially constructed, shaped and shared, evolving processes of human communication.

The theory of foundation technologies and their respective proto-affordances provides theorists with a legitimate way of recognizing the above. It does this through identifying that key underlying technologies offering new unique affordances hold a pivotal place in the evolution of expressive and communicative technologies. From these foundation technologies, new categories of mediums emerge – with each newly developed medium remediating existing mediums of a similar mode.

The proto-affordance that comes with a foundation technology offers new expressive and communicative potential to these old mediums, and a period of social upheaval and disruption, or what can be called 'new media', ensues. Here, digital mediums are simply an extension of the present genealogy of mediums: a technological leap that is (as Kittler would say) more interesting than the spaces in between. With the introduction of the digital foundation technology and its proto-affordance of computability, new digital mediums have been developed, adopted and shaped by Western society. These new mediums are online platforms, such as YouTube, SoundCloud and Twitter, and their specific cultural practices and processes have been derived with respect to the higher level affordances offered by each one's unique combination of software and hardware. The Internet meta-medium, as a global network of digital computers, lies at the technological base of these existing mediums, while also supporting the creation of future digital electrical machines of expression and communication.

Permitting online platforms to be called 'mediums' aids in making sense of the evolutionary process of medium emergence and constitution. Mediums and society are in constant tension, and the study of the relation between old mediums and new digital mediums helps us understand and control our present, and even guide our potential future. Indeed, the theory of foundation technologies also points to the possibility that a new foundation technology with at least one unique proto-affordance will eventually be introduced. Recognizing this as early as possible, and making an effort to determine the novel proto-affordance that will be added to those already offered by current digital technologies, will better facilitate our move into this new social situation.

A new understanding of 'New Media':
Online platforms as digital mediums

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detail is what more distinctly identifies the medium's roots, its proto-affordance and its potential for sociocultural impact.

Note that my last statement regarding the identification of a medium's sociocultural impact does not refer to the level of such. To be clear, any new medium can stimulate change within a society, but none can predetermine the degree of that change. What the knowledge of a new medium's foundation technology can indicate, though, is the new action potential that a particular medium can offer a society. It is the foundation technology's proto-affordance that inspires social change, and so it is the knowledge of this proto-affordance that offers clues regarding the types and forms of social changes that may occur. For example, when the telegraph was introduced, it offered the affordance of communicating instantaneously over large distances through text. The social effect of this was that the dissemination of news became faster and more widespread than it was via the written word. At the time, this caused a weakening of the political control that the metropolitan press had over the regions through the post-office and the newspaper exchange (Innis, 1991 [1951]: 169).

The evolution of mediums In discussing the existence of past periods of new media, it is important to recognize that a prevailing foundation technology does not necessarily end with the introduction of a new one. Hence, as electrical mediums emerged, mechanical mediums did not cease to exist. As Bolter (1991: 36) states in the introduction to his book, *Turing's Man: Western Culture in the Computer Age*: 'In the past, even a major new technology of materials or power has seldom done away with its predecessor entirely. Instead one technology relegates another to subservience, to tasks at which the new technology is either inappropriate or uneconomical'. Thus, room is usually found for new and old mediums to coexist, despite the potential for mediums to become dissolved through lack of specificity – if they enter an unstable and intermedial position.

Indeed, mediums that emerged from old foundation technologies often continue with the advent of a new one, as more alternatives and advancements to the various methods of human communication are added. It could be said that this is (at least) partly because of the well-established social institutions of the existing mediums and also their potential for Bolter and Grusin's (2000: 105) concept of 'reciprocal remediation', where existing mediums remediate emerging mediums.² The digital manipulation of cinematic and televisual images are examples of the latter, and thus it is not surprising to see both classical cinema and traditional broadcast television evolve to exist in digital forms. After all, the introduction of television in the mid-20th century only saw the institutions of cinema transform the medium to persevere for economic reasons. In this, cinema resisted intermediality and dissolution by redefining its specificity to something that, at the time, television could not easily emulate. The widescreen format, surround sound and a high-resolution image all played a big part in this.

Foundation technologies can build on each other in an evolutionary way, much like mediums remediating each other. Manovich (2013: 233) suggests that we should thus expect an increase in diversity, and complexity, of mediums over time. Mediums emerging from new foundation technologies have the potential to adopt and build upon the proto-affordances of existing ones, and often do. To exemplify, machines can also be understood as artefactual; in that, they function to separate our thoughts from our bodies. Electrical

it has been less than 50 years since digital expression and communication began to permeate our society to the degree where it began to radically change the lives of the general public. In that time, we have seen the introduction of new digital mediums that remediate old mediums, such as YouTube (which remediates television), Spotify (which remediates radio) and Skype (which remediates the telephone). Fifty years is a short period of time if one compares it to the mechanical foundation technology – where the printing press was introduced in 1440, but it was nearly 450 years later that film and cinema were eventually developed. In this instance, the mechanization of moving images actually occurred after the introduction of the first electrical medium, the telegraph, in 1832.

To explain this phenomenon, when foundation technologies are introduced they offer a footing upon which to build new mediums that, due to their unique proto-affordance, remediate existing mediums. When developed and adopted by a society, these new mediums may offer such a great leap in our existing practices and processes of expression and communication that they can induce, what we now call, social disruption. The disruption occurs if these new mediums completely redefine aspects of our lives and culture, such as our financial models, the way we see our physical spaces, our relationships with each other and even the way we think. The term ‘new media’ can be employed to define, and even to some degree explain, this complete experience. Mediums of a foundation technology that emerge much later than the first new mediums of that foundation technology, however, such as cinema, also remediate existing mediums of the same mode (e.g. cinema remediates the magic lantern – both being moving-image mediums). Whether the new mediums can truly be designated as ‘new media’, however, is debatable due to the lateness of their appearance. This is similar to media theorists today questioning whether the term ‘new media’ still applies to the digital foundation technology – considering that we have been discussing new media for more than 20 years now.

My perspective is that the term ‘new media’ itself is perhaps not particularly useful in relation to a theory of foundation technologies. Most definitely, it can indicate the considerable change and tension we experience when new categories of expressive and communicative technologies impact on our lives. This is not as valuable, however, as realizing that these experiences are tied in with the advent of a specific foundation technology. It is also not as beneficial as being aware of what particular proto-affordance is at the root of a wave of emergent mediums. This is especially true when one considers that any medium can inspire change within a society following its invention and widespread acceptance. Indeed, Lisa Gitelman (2006) reminds us that, in this way, all media were indeed once ‘new’.

To continue my previous example, in the 15th century, the printing press heralded the new media of the mechanical foundation technology. Its unique action potential was in duplicating the written word much more rapidly and accurately than was possible with handwriting. The intended meaning within the text as content, thus, was easier to distribute widely, which in turn encouraged social change. Cinema was not invented during this early period of mechanical new media, though it was, at the time of its own invention, a ‘new’ medium. Whether cinema can be considered mechanical ‘new media’, or not, is not as important or useful as the fact that it is a mechanical medium that remediated the artefactual moving-image mediums of the time. This latter

cluding artefactual and mechanical ones) were remediated by the electrical foundation technology.

In fact, de Sola Pool (1983: 6) wrote:

The key technological change, at the root of the social changes, is that communication . . . is becoming overwhelmingly electronic. Not only is electronic communication growing faster than traditional media of publishing, but also the convergence of modes of delivery is bringing the press, journals, and books into the electronic world.

Building upon de Sola Pool's observation, I suggest that the convergence effected by electricity is analogous to that resulting from digitization.

True to this, John Pavlik and Shawn McIntosh (2011: 8) state that one understanding of 'technological convergence refers to specific types of media, such as print, audio, and video, all converging into digital media forms'. Following de Sola Pool, above, it can also be said that a similar process was associated with the introduction of electrical mediums. For example, the telegraph is the process of writing instantaneously over distance, and similarly the radio remediates the gramophone but compresses space. Television remediates cinema in the same way but for moving images, sound and text.

During the advent of electrical 'new media', separate mechanical mediums of text, sound and moving images all converged into electrical 'media forms' (to use Pavlik and McIntosh's (2011) phrase), and even often travelled the same electrical pathways as each other. Text and audio both travelled along telephone lines as the fax machine and the telephone (Rouse, 2006), and television and radio both travelled the airways via EMR, or what we commonly call radio waves (Kittler, 2002/2010: 45). Analogue cellular phones followed suit with audio and their version of text communication: SMS or Short Message Service (ACMA, 2013). Electrical mediums also evolved to persist in time by devising ways to store content to various devices, such as magnetic tape. From there it could be copied, manipulated and even physically distributed as medium objects; what Kittler (2002/2010: 47) would call an example of 'a very slow broadcast medium'.

Using the term 'new media' to describe the emergence of new artefactual, mechanical and electrical mediums is not the sense in which it is usually employed. That is, the current theoretical understanding of 'new media' is deeply rooted in the practices, ideas and social arrangements that stem from digitization. Manovich (2003) offers no less than eight propositions for distinguishing new media, most of which indicate a break from existing cultural objects and practices due to computerization and/or the introduction of software as the basis for cultural change. In essentially describing how digital computers function as media creation and distribution technologies, it can be said that these accounts of new media stem from the unique digital proto-affordance of computability. Yet the existence of previous foundation technologies also instigated the introduction of new mediums and corresponding cultural and technological upheaval. Thus, I take the term 'new media' to more generally refer to similar revolutionary changes in the forms of human expression and communication particular to each foundation technology.

Important to note is that our experience of the digital category of new media has been much more condensed than that of previous foundation technologies. This has caused us to experience the development and implementation of more digital mediums in our lifetime than people would have experienced after, say, the mechanical foundation technology was introduced. To clarify,

also be seen as a simplification, or automation, of repetitive work.

The proto-affordance of mechanical technologies is thus reproducibility. All artefactual mediums promote the separation of thoughts and ideas from the body, and thus the proto-affordance of the artefactual foundation technology is one of separability. In terms of digitization, its inherent dependence on numerical simulation means that every digital technology relies on computerization, as shown earlier. Hence, all things that are digitized are computable, and the proto-affordance of the digital foundation technology is one of computability.

The introduction of a foundation technology, offering its unique proto-affordance, spawns an abundance of new expressive and communicative mediums that only function because of that fundamental technology. From the telegraph, through the telephone, to radio, television and video – the new foundation technology of electricity remediated and multiplied the existing mediums with its unique proto-affordance of instantaneity. Likewise, as artefactual methods of expressing oneself and communicating, such as writing, painting and sculpture, were remediated by the replication processes of the machine – the printing press, the typewriter, photography, the phonograph, film and so on were introduced. This process seems a familiar model of ‘new media, remediating old media’ as distinctive new mediums emerge. That is, we observe a convergence of existing mediums into a new foundation technology, and then a divergence and proliferation of newly developed mediums following that foundation technology’s social integration.

As Henry Jenkins (2006: 14–15) suggests, instead of technological convergence causing all medium content to eventually flow through one black box, there will be many black boxes as ‘specialised media appliances’. I agree that with the digital we should expect this technological ‘divergence from convergence’ in what we define as a medium. That is, as the power of the distinguishing nature of digital technology fully materializes, we can expect new software-based mediums to emerge to mediate culture and facilitate the sharing of new conventions and languages to support communication – mediums whose foundation technology’s unique proto-affordance is computability.

The introduction of the digital meta-medium, then, being the global network of interconnected computers that is the Internet may indeed succeed in remediating all existing mediums. However, it does not, in my view, herald an end to the emergence of future mediums. Instead it supports the potential for a plethora of new digital mediums to be developed, adopted and shaped within a society. Manovich (2013: 233–236) agrees with this, in that instead of the networked digital computer meta-medium being a ‘monomedium’ into which all mediums converge, he suggests that mediums multiply in an evolutionary sense. In evidence of this, the introduction of the digital foundation technology and its proto-affordance of computability has inspired a range of digital mediums with new expressive and communicative potential – in online platforms such as You-Tube, SoundCloud and Twitter.

A more general understanding of ‘New Media’ Considering the above, I suggest a variation in perspective of new media analysis, in that our sense of new media can be seen as a reflection of the introduction of a unique foundation technology. The artefact, the machine and electricity, as foundation technologies, have all been past instigators of entirely new categories of mediums. To take electricity as an example, just as the networked computer remediates existing mediums – when electricity was introduced, existing mediums (in-

tality as a technology affords the creation and implementation of hardware and software that, in turn, supports expression and communication through computing.

As a global network of digital computers, the Internet introduces a wide range of communicative affordances to a society that engages with it. These reflect the interconnectedness of each and every person who has access to the Internet, in an 'integrated infrastructure for the distribution of one-to-one, one-to-many, as well as many-to-many communications' (Jensen and Helles, 2011: 518). The Internet also supports these practices in both asynchronous and synchronous modes – that is, both as storage and immediate transmission – and allows users to engage in text, audio and video, as easily as each other.

Klaus Jensen and Rasmus Helles (2011: 520) note that the Internet does not represent the first time that humans have had the opportunity for many-to-many communications, with community noticeboards and a sports stadium being offline examples, but it is true that 'such practices have had few institutional precedents'. It is also true that this is the first time that many-to-many communication is possible between people scattered throughout the entire globe, wherever there is Internet access and a computer. If anything, the way in which the Internet supports a wide variety of communication practices, particularly in the mode of many-to-many social engagement, offers a wealth of new affordances to those with access to it. In short, digitality affords the Internet, which in turn affords social video platforms such as YouTube, SoundCloud and Twitter. The accumulation of software and hardware as technological support of these new communication practices constitutes new digital mediums. The root of all these digital mediums is, what I call, the 'proto-affordance' of computability.

Proto-affordances

A foundation technology, then, is an original technological substrate from which new specific and singular mediums are developed. The appearance of a new foundation technology is a unique occurrence, and the underpinning action possibility offered by this underlying technology has never been present in the relationship between people and objects/environments in exactly the same way. Due to its power to introduce radical new possibilities for human expression and communication, I call this mode of affordance a 'proto-affordance'. In terms of expression and communication, it is also less a product of an individual's relationship with a singular object than it is a key technology's relationship with an entire culture. This is because a society that engages the unique intrinsic affordance of a new foundation technology has the potential to undergo major shifts in the way it creates and communicates messages; this, in turn, can fundamentally reshape the cultural and communicative practices of that society.

A proto-affordance is fundamental to the workings of the new foundation technology and is what makes it unique and powerful to a culture. For example, Ithiel de Sola Pool (1990: 8–9) would nominate communicative instantaneity as one of the electricity's key attractions for scientists during the late 18th century. This is because electricity is instantaneous by nature, and thus provides this as a proto-affordance for all inventors and users. Similarly, the primary human use of a machine is to transform energy into an intended, repeatable, action – in many ways this is what machines 'do'. A machine can

The affordance of instantaneous communication is present and operative in the aforementioned electrical mediums of radio and the telephone, as they transmit sound in a near-immediate way.

Also, moving images, sound and text are conveyed directly to viewers' homes by television, and the telegraph and fax machine are mediums that achieve the instantaneous electrical transmission of the word. The electrical foundation technology fostered a return in dominance of visual and aural communication, but this time it was over great distances, instead of face-to-face. The synchronous representation of interpersonal cues of communication, such as facial expressions, voicetone and gestures, across space is an affordance that is prominent with the electrical mediums of the telephone, radio and television.

The digital foundation technology

Digital technology is exceptional not only because the digital computer can add further values to existing mediums to create new ones but also that the digital state affords programming. Programming allows medium objects to be subject to algorithmic manipulation, and hence for completely new digital technologies to be created. Manovich (2013: 103) describes this specificity of digital computers as being 'meta-generative' in that 'a computer can be used to create new tools for working with the media types it already provides as well as to develop new not-yet-invented media'. There is thus much scope for the creation of new digital electrical machines with new computational processes.

Referring to the emergence of new digital mediums, Stephen Holtzman (1997: 15) states that, to him, 'what's most interesting is not how well a computer can emulate our familiar world, but rather the entirely new territory that computers open for human expression – worlds of expression inconceivable prior to the invention of the computer'. An example of this is Wikipedia, which is a platform that permits anyone with a computing device and Internet access to contribute at any time as a collaborative author. Its content also evolves much more rapidly than a traditional encyclopaedia, and at a greatly reduced cost. Wikipedia is an indication of one of the digital foundation technology's potential communicative practices, in that it affords a many-to-many asynchronous mode of human engagement through a network of digital computers: The Internet.

The Internet is much more than physical computer networks, though, and imperative to its functionality are protocols and packet switching technologies that are innately digital. Though Kay and Goldberg (1977) initially heralded the digital computer as a 'meta-medium', Kittler (1999: 2)

indicates that he sees the power of the digital computer in erasing the very concept of the medium as attributable to 'a total media link on a digital base'. The Internet is the global technological infrastructure that supports the digital connection of digital computers, and thus extends their expressive potential to incorporate a communicative function over distance. The Internet, thus, completes the meta-medium.

The term 'foundation technology' is not necessarily analogous with the term 'meta-medium', as foundation technologies in general do not exist with one remediating device as their underlying technological structure. Instead, the power of numerical simulation, where the networked digital computer can be all other mediums, only exists through being digital. In this case, digi-

ing, in that a mutually understood set of symbols allowed messages to be immediately transferred across two fixed positions in space. This provided the telegraph the affordance of one-to-one synchronous communication.

The telephone was also first developed as a fixed point-to-point technology but extended this by the implementation of manual (and later automatic) exchange systems. These allowed the caller to select which other telephone owner that they wished to be connected to. There were even special 'local loop circuits' setup (colloquially called 'party lines') that afforded more than two callers to engage in few-to-few audio communication. For most of its existence though, the traditional landline telephone system has relied on wired connections between two or more points to connect two people in conversation.

Converse to the above, electromagnetic radiation (EMR) is a technology that needs no physical connection between the sender and the receiver in order to transmit a communicative signal and is the phenomenon by which radio and television operate. Though the creation of EMR for communication transmission is dependent on electrical energy, the signal is actually a combination of both electrical and magnetic fields. In this it is a form of light, though not in the sense of visible light, as we usually understand the term. In some ways, this may signify EMR as distinct from the electrical foundation technology – or even a subset of such – though many media theorists classify communicative devices that employ EMR as 'electrical' or 'electronic' (Kittler, 1999; Marvin, 1988; McLuhan, 1964). In the same way, I will include radio and television under the electrical foundation technology rubric with wired devices such as the telegraph and the telephone.

The difference between the two is that wired technologies (such as the telegraph, the telephone and the fax machine) tend to offer one-to-one, two-way, communicative affordances, and those that use EMR to transmit (such as radio and television) largely furnish one-to-many, one-way communicative affordances.

Here, I should clarify why I prefer to use the term 'electrical' to broadly categorize these instantaneous technologies, while sometimes the term 'electronic' is also referenced. Firstly, though all devices that operate using electricity are 'electrical', the latter term, 'electronic', refers more specifically to a device 'having or operating with components such as microchips and transistors that control and direct electric currents' (Oxford Dictionary, 2017). Thus, though perhaps 'electronic' more precisely defines mediums such as television and radio, it does not define the medium of the telegraph. This is because the supporting technology of the telegraph has no direct need for mechanisms of current control, such as transistors or valves. The term 'electrical' then, with its more general meaning of being concerned with, or operating by, electricity, serves to encompass any medium that uses the instantaneous transmission of an electrical signal in any way to facilitate human communication.

Similarly, modern computers are electronic devices, in that they function through electronic circuits controlling the flow and application of binary information. Important to remember, however, is that digital computers can be non-electronic (e.g. Lehmer's sieve and Babbage's analytical engine) and analogue computers can be electronic. Computers can even be non-digital and non-electronic, such as the analogue computer, the Antikythera mechanism, used by the ancient Greeks. As such, the term 'electronic' loses relevance in defining foundation technologies, as it is not truly a technology that exists at the very foundation of a new wave of similar mediums.

Hence, I defer to naming this foundation technology, 'electrical', although the term 'electronic' will be maintained when quoting other theorists if it is specifically employed to describe what can also be considered an electrical medium.

epoch is what Benjamin (1969) speaks of in his article, 'The Work of Art in the Age of Mechanical Reproduction', in discussing the mass production of notable visual artistic pieces. The power of the machine is not in the replication of human techniques, as Kittler (2002/2010: 119) points out, in that 'machines are not just simple copies of human abilities'.

Instead, they should be seen as new scientific media technologies, which insist on the re-evaluation of the practices and values of expression and communication. It is this mechanical reproduction – of work and of the world itself in moving images and sounds – which is the unique affordance introduced by the mechanical foundation technology.

In the mid-15th century, the printing press allowed the mechanical mass replication of written words, but no technology was introduced at the time that could directly record and replicate what we hear or what we see. That is, sound and sight could not be mechanically transcribed and copied to support playback and mass distribution until many years after the uptake of the printing press (though hand-created images and graphics could be replicated with this device). The mechanical representation of sound was invented in the ninth century (Fowler, 1967: 45) but was only musical and mimetic in nature, and it wasn't until 1877 (with the invention of the phonograph – which is also often called 'the gramophone', though strictly speaking the latter does not support recording) that live human vocal sounds, such as singing or speech, could actually be recorded and then reproduced.

Around 50 years before this time, the invention of photography as a mechanical method for transcribing and copying sight was also in its infant stages. The result of these timings gave print more than 400 years to independently influence culture and ways of thinking. This fact is what inspired Innis (1950/2007) to rightfully nominate it as the dominant medium that greatly affected the civilizations of its time. Other new mediums that emerged from the mechanical epoch of foundation technologies are film and cinema (as what can be seen as, respectively, expressive and communicative mechanical mediums of the moving image) and the typewriter (which mechanically transcribes the word). This latter achievement was something which the printing press could not do as easily. This is because the printing press was slow to set up by its very design, and hence it was not used for transcribing ideas directly into text. It was more effective to write out the text to be printed by hand, before setting up the machine to rapidly make multiple copies.

During the 400-plus years of print domination, the efficient reproducibility of the word through mechanical printing enabled us to 'share the same knowledge across wide areas' (Meyrowitz, 1994: 57). This affordance of sharing accurate copies of printed knowledge promoted scientific advancement and discovery and was a catalyst for the Scientific Revolution that commenced in the mid-16th century. From this rapid influx of scientific knowledge, then, came great advances in the understanding of electricity (Kuhn, 1970: 21). Meyrowitz, following the lead from McLuhan, suggests that electrical mediums are 'like extensions of our sensory apparatus that reach around the planet. Electronic sensors return us to seemingly "direct" encounters, but on a global scale' (Meyrowitz 1994: 58). To rephrase this in the spirit of Gibson (1977): instantaneity of communication is one of the electricity's intrinsic affordances. The instantaneously transmitted action possibility of the electrical foundation technology belongs to all mediums that use electricity as a signal. This means that any respective communication can be conveyed synchronously across vast distances with only nominal time displacement.

The electrical foundation technology

Invented in the mid-1700s, but not made commercial until well into the 1800s, the electrical telegraph was arguably the first electrical medium. It functioned by two points of communication being connected by one or more wires. Electrical current was then instantaneously transmitted through the wire(s), and various methods were employed in signalling between these two points.

Essentially, the early telegraph was a point-to-point method of remote writ-

will examine and expand on the more relevant of these foundation technologies.

The artefactual foundation technology

The temporal period of civilizational impact that Innis labels specifically as the 'scribal epoch' can also be interpreted as referring to one significant type of medium that exists within a more general category. I call this the 'artefactual' foundation technology, because it afforded, for the first time, the temporal and spatial separation of a person from their thoughts in the creation of meaningful objects. This foundation technology supported the creation of medium content made by the human body and its engagement with early technologies. These were the first mediums, and from within this period of history began expressive and communicative technologies.

Mediums in this epoch include writing, painting and sculpture. The creation of artefacts when engaging with these mediums often involves the use of technologies as tools – such as pens, paintbrushes and chisels – but can also be created purely by physical means, as in the manual shaping of clay pots. The unique affordance of the artefactual foundation technology is one of 'separation', as the mediums that come under this rubric all allow the message to be detached from the body that created them.

The artefactual foundation technology also speaks of the distribution of its medium content by purely physical means; for example, walking. It is true that walking is not a technology, but it is the technology of the artefact, and perhaps the tool that was used in creating it, that allows it to be moved away from the message creator to another place or person. One can thus see that physically created and distributed artefacts, in many ways, respectively, reflect what I understand as expressive and communicative mediums. That is, a person can express themselves by drawing an image on a scroll of parchment and subsequently communicate with that hand-drawn content by having someone carry the scroll to another person, perhaps a considerable distance away. This is an indication of the communicative bias of compressing space. Conversely, the message creator could put it safely away for someone else to view at a much later date, which signifies the compression of time.

The mechanical foundation technology

The next disruptive leap in the evolution of expression and communication technologies occurred with the introduction of the machine. When discussing mechanical technologies, I am referring to devices for applying power or changing their direction for a specific purpose (Shigley and Uicker, 1981: 5). A mechanical technology can be a simple machine (such as a lever or a pulley) or a complex/compound machine (such as a car engine or a printing press), which is a collection and combination of smaller machines. Machines can be powered by the harnessing of natural forces such as the movement of water, the combustion of compressed air and fuel, an electrical charge or human effort, but ultimately they all automatically modify mechanical energy to meet some predetermined human need. Examples of early machines as mediums are the printing press, film and the phonograph.

The mechanical mediums mentioned above all convert an applied force to a repeatable mechanical motion that creates an intended action in order to support human communication. In this way, machines are distinct from the previous foundation technology, the artefactual, in that they can automate functions that were previously done manually. For example, photography is the automatic recording of a scene that might previously have been painted by hand. Further, the mediums belonging to the artefactual foundation technology (whose implements of communication can only be classified as tools) did not easily support automatic replication. Evidence of this is that manuscripts were required to be individually and laboriously copied by hand, which took much time and often incurred transcriptive errors.

The mechanical foundation technology is the category which first afforded mass replication and distribution, and hence sowed the seeds of broadcast culture. Indeed, the distinctive reproductive affordance of the mechanical

gies at the same time. His view was that the gradual, overlapping, technological evolution from mechanization to electrification created social disruption: Literacy remains even now the base and model of all programs of industrial mechanization; but, at the same time, it locks the minds and senses of its users in the mechanical and fragmentary matrix that is so necessary to the maintenance of mechanized society. That is why the transition from mechanical to electric technology is so very traumatic and severe for us all. The mechanical techniques, with their limited powers, we have long used as weapons. The electric techniques cannot be used aggressively except to end all life at once, like turning off a light. To live with both of these technologies at the same time is the peculiar drama of the twentieth century. (McLuhan 1964: 342)

Here, McLuhan is outlining the social tension between old (mechanical) and new (electrical) technologies, which resonates with the ‘peculiar drama’ that we now experience between these previous foundation technologies and emergent digital technologies.¹ Crucial here is that I use the term ‘foundation’ to indicate that these technologies are the root of higher level technologies. As an example, electricity is the root of television, and though television usually offers a different expressive and communicative affordance than radio (i.e. one can communicate using moving images), they both share the instantaneous affordance of electricity.

Harold Innis also identified historical social disruptions due to the introduction of radical new mediums. In *The Bias of Communication* (Innis, 1991 [1951]), he explores the prevailing mediums that existed throughout history and comes to conclude that one could categorize them into several ‘epochs’ or temporal periods of civilizational impact: oral, scribal, print and electronic. This list reflects the ‘dominant forms of media that absorb, record, and transform information into systems of knowledge consonant with the institutional power structure of the society in question’ (1991 [1951]: xvi), and it has been generally accepted, and is widely used, among media and communications scholars (Meyrowitz, 1985).

In discussing his understanding of Innis’s medium epochs, Joshua Meyrowitz (1997: 61) argues that ‘all electronic media, for example, share some characteristics that make them different from all print media’ – which is itself an indicator that he recognizes that mediums can be grouped in relation to their underlying affordances. That is, Innis’s list aims to categorize media within an overarching technological support (as in, what I call ‘electrical mediums’), presumably from which similar affordances are offered. This also reflects Bolter and Grusin’s (2000) position that digital media share characteristics that make them different from all previously existing mediums. Innis’s term ‘print media’, however, indicates not an entirely general type of medium, as ‘electronic media’ does, but a specific typographic category of medium, which includes books, newspapers, magazines and so on.

Of course, the above does not imply that Innis is wrong in his assessment, but merely that his aim was to identify historical epochs of dominant mediums that significantly affected Western civilization. Though this categorization of mediums by Innis reflects a leaning towards clusters of analogous expressive and communicative affordances through technological support, the purpose of my analysis is different to his. I seek to show the historical existence of foundation technologies that supported the emergence of new categories of mediums – each through the offering of a new underlying affordance. In this light, the current period of digital mediums is thus an addition to the foundation technology lineage. This variation on Innis’s existing epochal theory allows me to suggest that the term ‘medium’ remains valid in the digital environment, and that online platforms, such as YouTube, can be called such. Because of this, it makes more sense for me to recognize Innis’s historically dominant medium of printing as an indicator of the overarching ‘mechanical’ foundation technology, as print media rely implicitly on machinery to enable their revolutionary practice of easily, rapidly and accurately replicating text. It can be said, then, that Innis’s theory of dominant mediums demonstrates the historical introduction of new eras of overarching technologies and the respective unique underlying affordances that each offers. In what follows, I

‘mass media’. The label is taken for granted – as researchers are focussed on other areas of the platform’s cultural impact.

Jean Burgess and Joshua Green (2009: 52, 36), however, as creative industries and media studies theorists, are aware of the significance of the ‘medium’ label and refer to YouTube as an ‘emerging medium’ while questioning ‘just what kind of medium is it?’. Communication theorist, Jin Kim (2012: 53), takes it one step further and refers to it as ‘a convergence medium between the Internet and TV’. Marie-Laure Ryan (2004) also treats the medium in the digital age as such, suggesting that employing different digital authoring software results in medium-specific forms and modes of narrative.

One significant idea challenges the continuing validity of the term ‘medium’ in reference to online technologies of expression or communication. This is the notion that the digital computer is a single technology that can simulate all existing mediums through digitization, and thus is the medium to end all future mediums. The progenitors of laptop computing, Alan Kay and Adele Goldberg (1977: 31), were perhaps the first to identify this, and subsequently called the computer the first ‘metamedium’.

Wolfgang Coy (1995) takes this one step further and suggests that ‘all written, optical, and electric media with the use of microelectronics and computer techniques finally will merge into one universal medium’. Friedrich Kittler (1999: 1–2) makes a bolder claim still and predicts the death of the medium: ‘The general digitisation of channels and information erases the differences among individual media . . . a total media link on a digital base will erase the very concept of medium’.

More recently, Stefan Heidenreich (2011: 16) confirms that we are in a ‘post media situation . . . as media have ceased to exist, at least in their plurality. There are not many media left, but only one medium, as different media have converged and fallen prey to a single network of computers’. For these theorists, it seems that the term ‘medium’ is all but redundant in future theoretical discourse, as it is suggested that all existing mediums will eventually converge into one – the networked digital computer. This indicates that within current Western media theory it is, indeed, not relevant to call online platforms, ‘mediums’.

There is much tension between these two positions. In the first position, the authors feel that YouTube exhibits a mediating cultural function, and that it is the technological basis for a contemporary social and cultural process of communication. The second position does not necessarily deny the validity of these observations but stipulates that the framework of media theory within which researchers operate does not support the ‘medium’ nomenclature being used to describe specific software-based online platforms. The difficulty is that the latter position implies that YouTube cannot then be directly compared to traditional moving-image mediums, such as cinema and television. Thus, researchers are unable to legitimately apply the sociocultural lessons learned from these earlier analogue mediums to YouTube. This position restricts our ability to discuss the future shaping of YouTube as an extension of the evolution of moving-image mediums.

I developed the theory of ‘foundation technologies’ and their associated ‘proto-affordances’ to address this issue. It is a framework for understanding the evolution of expressive and communicative technologies that allows new digital mediums to exist. This theory places digitality as one more major leap in a line of other key technologies, including electricity, machinery and the artefact. These previous foundation technologies, when introduced, all inspired the emergence of a swarm of new mediums. These caused varying degrees of social disruption through the introduction of at least one shared underlying affordance to Western society. In retrospect, the appearance of these categories of similar mediums can be likened to the period of ‘new media’ we currently experience with the digital.

Foundation technologies

Marshall McLuhan indicated the existence of distinct underpinning technologies when he noted that we live with both mechanical and electrical technolo-

A new understanding of 'New Media': Online platforms as digital mediums

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abstract

For the last few decades, media theorists have been faced with the understanding that the networked digital computer is the meta-medium to end all mediums. This places researchers in the curious position where online platforms, such as YouTube, cannot legitimately and directly be contrasted with traditional analogue mediums, such as cinema and television. To address this inconsistency, I developed the theory of foundation technologies and their respective proto-affordances, which demonstrates the existence of past periods of 'new media'. These were brought about by the introduction of key technologies that each offered, at the time, a new and unique underlying affordance to a society. Each new 'proto-affordance' inspired social disruption, as new specific mediums were spawned – each remediating existing mediums of similar mode. This framework shows digitality as another evolutionary step in a line of foundation technologies, which includes the artefact, the machine and electricity.

The theory of foundation technologies permits software-based online platforms, such as YouTube, SoundCloud and Twitter, to be called digital mediums, and thus aids in understanding their technological substrate and unique affordances. Justifying this relation between old-mediums and new, digital, ones equips us to more effectively comprehend and analyse these platforms as to their social adoption and uses, cultural practices, implications and effects. This allows us to better understand and control our present, and even guide our potential future.

Keywords

Affordance, digital medium, foundation technology, medium, meta-medium, new media, online platform, YouTube

Introduction

The authors of many contemporary articles refer to online platforms as 'mediums'. Take YouTube, for example, where such articles focus on disparate fields of knowledge such as sport (Stauff, 2009), dentistry (Knosel et al., 2011), cancer research (Chou et al., 2011) and relate to diverse topics such as juvenile fire-setting (Thoman et al., 2012), US presidential elections (Savoie, 2009) and tobacco control (Freeman and Chapman, 2007). It is likely in these circumstances that the use of the term 'medium' when referring to YouTube is carried over from the authors' understanding of television and other

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