Sustainability and Digital Art: Democratization, Globalization, and Interdisciplinarity

From online information searches and e-commerce transactions to mobile phone messaging and flash drives, we are immersed in the digital realm on an everyday basis. Information about the world, encoded in the form of digital data, expands exponentially. Consider a yottabyte (YB). It is equivalent to all the books ever written in every language, sixty-two billion iPhones or one septillion bytes. The American states of Delaware and Rhode Island, divided into city block-sized data warehouses, would currently be what is needed to store a single yottabyte using the average capacity of PC hard drives today. Yet, in the not-so-distant future, a yottabyte could be contained in a miniscule area not larger than a pinhead. Technologies and data rapidly evolve and spread out. Through this kind of futuristic perspective, it could be argued that everything in the natural, material world will soon have a digital, virtual counterpart, of one form or another, or even be replaced by it. These counterparts—as digital data—offer not only unprecedented possibilities for science and technology, but also for cultural identity, creative practice and interdisciplinary thinking.

The proliferation of technologies has greatly impacted the arts, leading to what artists and critics now call 'the digital arts'. Artists love to experiment with new technologies, and they have done so throughout history. In Chapter 1, we explore existing theoretical perspectives on the digital arts and discuss the spectrum of artistic approaches that have appeared as digital technology and data continue to progress.The explosion of new media has revolutionized the production of art—redefining the nature of arts criticism, creating more complex markets for art and enhancing public access to the arts. We suggest that an essential first step towards understanding the digital arts is distinguishing the term from discrete but related artforms, including new media, electronic, computer, internet,

behaviourist, telematic, virtual and unstable media art. The principal perspectives and contexts explored throughout the volume are democratization, globalization and interdisciplinarity. Towards the end of thischapter, we introduce subsequent chapters in the book and explain key student-focused components, including case studies, reflections, questions and group exercises. Central to this introductory chapter and others is the idea of digital art as part of the ongoing continuum of technology that artists have been fascinated with throughout history—a theme further developed in Chapter 2. But first, we will talk about how to define digitality—the technological foundation of digital art.

What is Digitality?

The term 'digital' is a ubiquitous part of our vernacular in today's ever more globalized world. The digital revolution of the 1990s introduced computer power to the public at an unparalleled rate (Lovejoy et al. 2011: 2). This period entailed a significant transfer in the production, storage and distribution of data to digital technologies. Multimedia or hypertext documents combining text, images, sound and video have become standard. Living in the 'digital age' now, we frequently come across 'digital technology', 'digital information' and of course, 'digital art', but what does it mean for something—including creative work—to be digital? Indeed, to understand digital art as a movement, we need to start from the ground floor and examine briefly the mechanics of digitality. Typically, the digital is defined as new technology in contrast to older, pre-digital or analogue forms. In digital media, input data—as light (images), sound (audio) or spatial configurations (text, graphs, diagrams)—is converted to numerical patterns, which are then processed and manipulated in various ways by a computer's hardware and software (Lister et al. 2003: 14). Through digital processing, the physical properties of phenomena become numbers or abstract symbols.

In this sense, 'digital' simply means the 'assignation of numerical values to phenomena' (Lister et al. 2003: 15-16). Hence, 'digital' is a mathematical format and process for storing, transferring and modifying information. Algorithms in computer software subject the data to numerical processing. For example, digital image files consist of discrete modular components; assembling these modules into an image requires a series of mathematical executions (see Chapter 3). The numerical system behind digitality is binary, employing variations of 0s and 1s to produce alternating states that underlie how devices function: for example, off or on, current or no current. The conversion of data to a binary schema enables the transfer and storage of information to memory technology (hard drives), digital disks (CDs or DVDs) or online repositories (file hosting and storage services). The modern mathematical processes behind digital technology were founded in the work of German mathematician Gottfried Wilhelm Leibniz (1646–1716), English inventor Charles Babbage (1791–1871) and in the 1930s, English mathematician Alan Turing (1912–1954) (see Chapters 2 and 6).

When traditional media (e.g. newspapers, video, records) are digitized, they become dematerialized at the same time. The process of digitization involves the shift from the physical domain described by physics, chemistry, biology and engineering to the symbolic domain explored by computer science (Lister et al. 2003: 16). In other words, the materiality of the original (i.e. paper, magnetic tape, vinyl) is superseded by an immaterial binary pattern and, therefore, the original medium becomes largely redundant. Requiring specialized technology, such as specific software, digital data,(released from their physical media) can be compressed, accessed at high speeds and readily manipulated (Lister et al. 2003: 16).

Whereas digital media exist in a state of flux, analogue media are comparatively fixed. Analogue media, including newspapers, photographs, tapes and films, tend to be associated with technologies of mass production. Yet analogue processes transfer data to another physical object (an 'analogue'), such as light, sound or handwriting, where it is encoded and stored to a physical medium (i.e. grooves on a vinyl record, magnetic particles on a tape or ink on a sheet of paper). An *analogous* relationship is thus forged between the original data and the tangible medium. For instance, the analogue reproduction of a book employs movable type and ink to produce a physical imprint of the original on paper (Lister et al. 2003: 15). In contrast, a book written on a computer undergoes a different process; every letter of the manuscript generates a binary value in response to the touching of the author's fingers to the keyboard. The resulting digital document can be exported in various ways (e.g. as an email attachment, PDF or ZIP file) and eventually published as an e-book without ever being printed to the traditional, material medium. Electronic broadcasting media were also historically analogue. For example, the physical properties of images and sounds were converted to wave forms of differing lengths and intensities, corresponding to the voltage of transmission signals.

What is Digital Art?

'Digital art' is a name that shifts in the sands of digitality, culture, history, science and art. Impossible to define as a single phenomenon, it represents instead a fluid set of artistic techniques, technologies and concepts—often associated with the history of the computer. There are a great many names for digital art, some of which are more current or useful than others. An important first push for students is to become familiar with the terms in circulation and how they overlap and differ. Indeed, it is difficult to find an academic

commentator who will commit to a straight-forward definition, but Beryl Graham has come the closest. She defines digital art simply as 'art made with, and for, digital media including the internet, digital imaging, or computer-controlled installations' (Graham 2007: 93). However, what we now think of as 'digital art' has undergone a multitude of name changes, from 'computer art' in the 1970s to 'multimedia art' in the early 1990s to 'new media art' more recently. In many ways, 'digital art' is outdated language, subsumed within the category of new media art by the end of the 1990s.

Nevertheless, the variety of related words in currency demonstrates that digital art and its naming are 'characteristically in a state of flux' (Graham 2007: 106)—reflecting, in part, the mutability and constant evolution of the technologies used by artists. The bevy of names (often erroneously used as synonyms for digital art) includes—in addition to new media, multimedia and computer art—software art, hypermedia art, emergent media art, unstable media art, electronic art, internet art, net art, browser art, behaviourist art, cybernetic art, telepresence art, virtual art, interactive art and participatory art, amongst others. The meaning of each term should be considered variable and highly contingent on the historical timeframe, the commentator's background (e.g. artist, programmer, curator, archivist or critic) and the technology explored as a medium by the artist. Furthermore, certain terms are subsets of the broader practice of digital art; for example, internet art is based on the internet, browser art makes use of internet browsers and software art involves computer software in some manner. Other terms, such as behaviourist, interactive and sound art are more inclusive than 'digital art' and encompass a continuum of analogue and digital art practices, from site-based installation works to internet-based telerobotics projects. Still, others are period-specific and seem like anachronisms to us now; for

example, ‘net art’ designates the internet art of practitioners working in the 1990s(see Chapter 6).

Despite the name-game, the tendency to hybridize across media boundaries is characteristic of digital art, as we will see in Chapter 2. Thus, by shifting between media and employing a range of techniques, digital artworks eschew categorization according to their genre or form. Installation, film, video, animation, photography, internet art, software art, virtual reality projects and musical compositions can fall under its umbrella (Paul 2003: 70). Rather than venturing definitions, critics tend to foreground the attributes of digital artworks. For example, Bruce Wands points to the new forms that emerge out of digital art practices: ‘intricate images that could not be created by hand; sculptures formed in three-dimensional databases rather than in stone or metal; interactive installations that involve internet participation from around the globe; and virtual worlds within which artificial life forms live and die’ (Wands 2006: 8). As Christiane Paul (2003: 7) argues, digital art comprises a broad array of practices but lacks a single, unifying aesthetic approach. She makes the critical distinction between digital technologies as tools and technologies as media (see Chapter 2). In this book, we use ‘digital art’ to refer to the artistic movement encompassing a variety of digital practices. In many instances, we also use the pluralized term ‘the digital arts’ to stress the diversity of artforms and media (e.g.internet art, software art, telematic art, etc.) included within the singular term. As we see in the next section, an introduction to digital art is very much an exploration of terminology in relation to the history of art and technology.

Digital Art and Its Relatives: Understanding the Typologies

New Media Art

Although ‘new media art’ is often used synonymously with ‘digital art’, ‘computer art’, ‘multimedia art’ and ‘interactive art’, there are some key differences between these terms to consider. Understanding what constitutes digital art entails understanding the way everyday language changes in the context of technology. For instance, the terms ‘digital media’ and ‘digital new media’ have been used to refer to ‘new media’ (Lister et al. 2003: 14). In the early 1990s, with the release of the first commercial internet browser and the beginning of the digital revolution, the term ‘new media art’ began to be used by artists, critics and curators working with emerging technologies (Tribe and Jana 2006: ‘Defining New Media Art’). Indeed, the appearance of new media art paralleled the proliferation of information technologies. Early new media artworks included interactive installations exploiting a variety of media, virtual reality experiments, telerobotics pieces and web browser-based projects, all using the latest digital technologies of the time. Mark Tribe and Reena Janadefine new media art as ‘projects that make use of emerging media technologies and are concerned with the cultural, political, and aesthetic possibilities of these tools’ (2006: ‘Defining New Media Art’).

In situating new media art as a distinct movement, Tribe and Jana (2006) distinguish between the categories ‘art and technology’ (in reference to the collective Experiments in Art and Technology founded in 1967) and ‘media art’. On the one hand, ‘art and technology’ encompasses computer, electronic, robotic, genomic and biological art involving up-and-coming technologies, but not intrinsically media-related. On the other, ‘media art’ includes television, video and satellite art, as well as experimental film and other forms of art that make use of media technologies that were no longer considered new or emerging by the 1990s. For Tribe and Jana, new media art represents the intersection of both movements, but with an emphasis on ‘new’ media technologies: the internet, social media, video and

computer gaming, surveillance systems, mobile telephony, wearable technology and GPS (Global Positioning Systems) devices. New media artists critically or experimentally engage with new technologies. However, there are many art-historical precedents that have shaped new media art, including other art movements that questioned the relationships between art, culture and technology. In particular, Dadaism (see Chapter 6), pop art, conceptualism (Chapter 2) and the video art of the late 1960s, exemplified by the work of Nam June Paik (Case Study 2.3), have influenced the trajectory of new media art since its inception. Common themes in new media works include collaboration, participation, appropriation, hacktivism, telepresence and surveillance (Tribe and Jana 2006: 'Themes/Tendencies') Art')(see Chapter 2).

Electronic Art

The typology 'electronic art' is perhaps the most inclusive for our discussion, aside from the broad category of 'art' itself. It is also the term that has evolved the most since its initial historical emergence. Often interactive and participatory, electronic art incorporates electronic components in the production or display of a work. The range of electronic technologies is vast, and comprises the internet, computing, robotics, mobile devices and virtual reality platforms, as well as the 'old' media of radio, teleconferencing, radio, video, television and film. Moreover, dance, music, performance, writing and installation pieces can be classified as electronic art if they incorporate electronic dimensions. Encompassing both old and new media, electronic art should not, by default, be classified as digital art. However, the adjective 'electronic' is often invoked interchangeably by critics in referring to digital, computer, internet or information-based art. We suggest that it is most instructive to think of the term 'electronic art' as denoting a particular period in the history of Western art, culture and technology. Indeed, the origins of electronic art can be traced back to the

early to mid-twentieth century when innovators, notably Marcel Duchamp and later, Ben Laposky, began to encounter and incorporate technologies in their works (Lovejoy 2004: 1). Electronic media, such as tape, projections and the computer, allowed artists to devise new modes of aesthetic representation and creative possibility. Within electronic art, video art is a central subgenre, especially as the medium melded over time with television, film and music (Rogers 2013; Rush 2003). Beginning in 1965 with the release of the Sony Portapak, video art demonstrates how progress in electronic and later in the twentieth century, digital art has paralleled developments in technology and science (see Chapter 2 for art-historical precedents). The practices included within electronic and video art have developed rapidly since one of the first video artists, Nam June Paik, placed a magnet on top of a television set to distort the imagery discussed in detail in Chapter 2. Named after the analogue video tape, contemporary video art uses the digital media of CD-ROMs, DVDs and real-time streaming.

Computer Art

'Computer art' is another wide-ranging classification with shifting boundaries. It encompasses most forms of software, database, internet, browser and game art, as well as computer music. Broadly defined, computer art takes advantage of computing technology to create or display an artwork. As a subset of computer art, computer music refers to compositions that involve computer technologies at any point in their life cycles, although other definitions are more restrictive (Collins 2009: 1-2) (also, see Chapter 5). According to Dominic Lopes, the two defining characteristics of computer art—interactivity and computing—distinguish it from other interactive performances and some forms of digital art (Lopes 2010: 52). As Lopes (2010: 52) further argues, 'the realms of computer art and digital art overlap. Not all digital art is computer art—most of it's not interactive—but typical

computer art is either made digitally or made for digital display'. For other critics, interactivity is not a necessary component of computer art. Within the umbrella term is included a range of subgenres, such as software, database and game art, that evolved when artists began to involve computers in their practices in the mid-twentieth century (Wands 2006: 164).

Briefly, software art can be defined as 'creative work that finds its origins in programmes written by the artist' (Wands 2006: 164). For some critics, implicit within this definition is the notion of authorship; the artist-programmer tends to write the software code, although this is not always the case, as Chapter 3 explains. In slight contrast, database art often 'relies on pre-existing, created or real-time collections of information' while game art uses 'commercial gaming software or incorporates elements of play and role-playing' (Wands 2006: 164). Rather than creating code as part of an artwork, database art tends to re-interpret data collections or engage participants or viewers in the creation of datasets. Hybridity between aesthetics and technology is characteristic of most computer artworks. In particular, computer artists are competent with the use and development of software, including gaming platforms, database programs and computer languages such as C++, Java and Visual Basic. A prominent example of a computer artwork is Lynn Hershman Leeson's *Synthia*(2000-2002), a sculpture using 3D animation to represent streaming stock market data. The character Synthia responds according to market trends, for example, dancing when the stocks are up or chain smoking when they drop (Wands 2006: 167).

Internet Art

As the typologies (i.e. new media, computer, behaviourist, cybernetic, telematic, virtual, unstable media) explored in this section reveal, there are different ways to classify and

analyze digital artworks. Inevitably, the categories overlap and—as individual terms—are incomplete descriptions in themselves. A single work (such as the work *Dialogue with the Knowbotic South* explored under the heading virtual art later in this section) may exhibit aspects of all categories, depending on which of its components is emphasized. Like 'computer art', 'internet art' is another example of an umbrella term for various interrelated digital arts practices. Within internet art falls a variety of practices (Lovejoy et al. 2011: 7). For example, some software art is coded by artist-programmers and made publicly available over networks. Internet browser-based artworks use software such as Netscape Navigator. Telerobotics works connect remote places and participants via webcams. Participatory performance works are created by online visitors. 'Hypertext' poetry projects experiment with new forms of digital storytelling. 'Netactivism' initiatives exploit the capabilities of digital networks to question commercial interests in the digital era. Social media artworks make use of Twitter or Facebook (see Chapter 9). A telling example is Mark Napier's *net.flag* (2002–present), which cuts across several of these categories. The classification of the work depends on who is interested: artist, audience, technician, conservator or critic. It is an interactive, browser-based, performance work with overtones of netactivism. As with most browser-based digital artworks, *net.flag* entailed the development of software to accommodate the specific needs of the project and its long-term conservation (see Chapter 8 for more detail on the project). Finally, *net.flag* is an unstable media work necessitating an individualized conservation plan.

Post-Media Aesthetics

Rather than adopting the typologies of new, old or multi- media art, theorist Lev Manovich proposes a 'post-media aesthetics' (Manovich 2001b). The 1960s and subsequent decades were marked by the rapid development of novel artforms—for example, happenings,

installations, public works, performances and conceptual art—all of which called into question the predominance of the traditional medium-based 'spatial' arts of painting, illustration, sculpture and architecture as well as the 'temporal arts' of music and dance. The emerging artforms of this period either combined a range of media (e.g. installation works using painting, sculpture, video and audience participation) or 'dematerialized' artworks altogether through a focus on the primacy of concepts (see the discussion of conceptual art in Chapter 2). Post-media artforms interrogated the practices of mass culture and mass distribution, normally associated with old media. Manovich asserts that, with post-media art, the criteria for discerning between media depends not on the materiality of the work but rather the manner in which an audience is involved and the space (i.e. public or private) in which the interaction takes place. Post-media artworks rupture the conventional linkages between an artwork's identity and its medium (e.g. a sculpture in stone, a painting on canvas or a novel on paper). Since the digital revolution, new art genres—such as net art or computer art—arose from this long-standing tendency to define an artwork through its medium (Manovich 2001b: 5). For Manovich, this correlation is a mistake that limits a broader comprehension of art in the digital era. A post-media aesthetics points to the need for new typologies to characterize how artworks organize information and human experience of that information. An aesthetics concerned with user behaviour and data organization over materiality is not limited through exclusive focus on an artwork's medium.

Behaviourist Art

An example of Manovich's notion of post-media aesthetics is the category of 'behaviourist art' or 'cybernetic art'. Proposed in 1966 by artist and theorist Roy Ascott, these interrelated categories of art draw 'the spectator into active participation in the act of creation' and in

which ‘the evolution of the artwork/experience is governed by the intimate involvement of the spectator’ (Ascott 2001: 97-98). For Ascott, who is discussed again in Chapter 9, mid-twentieth-century art is characterized by open-endedness, uncertainty, flux, transition and dialogue with the spectator, user or participant—irrespective of the particular medium employed by the artist. Behaviourist art involves the spectator in unprecedented ways, producing artworks that can be said to exhibit some form of behaviour. Ascott points to a ‘fundamental behavioural quality’ that distinguishes art of this period from its predecessors (Ascott 2001: 102). He further argues that ‘the vision of art has shifted from the field of objects to the field of behaviour and its function has become less descriptive and more purposive’ (Ascott 2001: 97). To be sure, such artworks trigger in spectators new ways of being and interacting with art and, reciprocally, the spectators instigate unpredictable behaviours in the artwork. Rather than a fixed object emanating preconceived ideas, attitudes and values, the work became a ‘matrix’ and ‘catalyst’ for creative experiences and spontaneous modes of participation.

The mechanism of ‘feedback’ between all constituents of the artwork is essential to making the ‘artist/artwork/observer’ triad ‘an integral whole’ (Ascott 2001: 98). Within the dynamic feedback loop of behaviourist works, the experiences of artists and viewers are no longer clearly demarcated. Ascott’s vision of behaviourist art was influenced ostensibly by the science of cybernetics, founded in the 1940s by American mathematician Norbert Wiener (Shanken 2002) (also see Chapter 2). Wiener defined cybernetics as a method of regulating the behaviour of communication systems through the control of information feedback or interactivity. Early cybernetic principles identified commonalities between the ways machines and the human brain process information. In 1956, French-Hungarian artist Nicolas Schöffer created the ‘cybernetic sculptures’ *CYSP 0* and *CYSP 1* in collaboration with

engineers from the Philips company. The titles combined the first two letters of the words 'cybernetic' and 'spatio-dynamique' (Shanken 2009: 62). Regarded as the first cybernetic sculpture, *CYSP 1*comprised a microphone, photoelectric cells, a base mounted on four rollers and sixteen motor-controlled polychrome plates. The kinetic sculpture had an electronic brain connected to sensors, allowing the work to change its overall form in response to variations in light, sound, colour and audience movement (Shanken 2009: 62). This early interactive robotic sculpture is an example of Ascott's notion of behaviourist art and is an excellent example of the use of feedback loops by artists.

Telematic Art

An extension of behaviourist and cybernetic art, telematic art is regarded as an evolution of Ascott's experiments in science, technology, art and consciousness from the 1960s onward. Telematics is defined as is the science integrating telecommunications and computer technologies, resulting in familiar and commonplace modern technologies, such as email and ATMs (automatic teller machines) (Shanken 2003: 1).Much digital art since the 1990s exhibits features of telematic art, especially the interdisciplinary synthesis of science, technology and art. Moreover, telematic artworks frequently take the form of interactive, non-linear, online projects exploring the fundamental nature of communication through networks (see Chapter 2). French economists Simon Nora and Alain Minc coined the word 'telematics'(or *telematique*in French) in their book *The Computerization of Society*, initially published in 1978 as a policy document presented to the French president at the time. They maintained that the increasing interconnections between computers and telecommunications would transform data processing, information science and human experience more generally (Nora and Minc 1981).

In 1978, around the time of Nora and Minc's report, Ascott first used the term 'telematic art' as part of *Terminal Art* (1980), a computer conferencing project connecting eight artists physically based in the United States and United Kingdom, including Ascott (Shanken 2003: 62). The teleconferencing project used the Infomedia Notepad System to allow participants to download and upload information to a central computer through portable terminals. Although emerging fully under the banner of telematic art in the early 1980s, the use of communications technologies by artists can be traced back to Hungarian artist László Moholy-Nagy (1895–1946) and his work*Telephone Pictures* (1922) (see Chapter 6). Like behaviourist art, telematic art calls into question the conventional relationship between a human viewer and an artistic object by creating 'interactive, behavioural contexts for remote aesthetic encounters' (Shanken 2003: 1). As the *Terminal Art*project demonstrates, telematic artworks often occur within a global space where participants in dispersed locations collaborate via electronic networks. Another example of telematic art is Ascott's *Ten Wings* (1982). The project used ARTBOX computer conferencing to organize the first global throwing of the *I Ching* or *The Book of Changes*, the ancient Chinese divination system dating from sixth century B.C.E. Ascott conducted *Ten Wings*as part of artist Robert Adrian's *The World in 24 Hours* (1982), a telecommunications project connecting artists across the globe. Ten different participants contributed to a 'master hexagram', demonstrating the linkages between networked communication systems and esoteric divination, in Ascott's view (Ascott 2003: 184-185).

Virtual Art

Art historian Oliver Grau (2003: 3) contends that digital art 'exists in a state of limbo'. Grau navigates his way through the limbo by investing in the category 'virtual art' as a way of speaking broadly about media art (video, animation and computer graphics), new media art

(internet, virtual reality), interactive art, telepresence art and genetic art (a form of bioart; see Chapter 4). The hallmarks of virtual art are interface, interaction, immersion and image evolution (Grau 2003: 10). Immersion involves the sensation of being inside a constructed image or reality which appears to surround and engulf the viewer. In some technological environments, human subjects lose the sense of separation between themselves and the simulation (Lister et al. 2003: 387). Like telematic art, virtual art also integrates art and technology through the use of virtual reality (VR), augmented reality (AR) or mixed reality (MR) environments. Grigore Burdea and Philippe Coiffet (2003: 3) define virtual reality as 'a high-end user-computer interface that involves real-time simulation and interactions through multiple sensorial channels'. VR environments have no real counterparts and are distinguished by human immersion, interaction and imagination (Burdea and Coiffet 2003: 3). Augmented reality, also known as enhanced reality (ER) or mediated reality (MeR), incorporates elements that exist in the material world, thus hybridizing the real and the virtual. Related to augmented reality is mixed reality (MR), in which digital and physical objects intermingle in real-time and within a shared space. For Grau, the computer has created the foundation for the emergence of virtual reality as the chief creative medium of our societies. Computer technologies produce the impression of 'immersing oneself in the image space, moving and interacting there in 'real time,' and intervening creatively' (Grau 2003: 3). An example of a virtual artwork is the installation *Dialogue with the Knowbotic South* (*DWTKS*) (1994–1997) by the Knowbotic Research group, consisting of Yvonne Wilhelm, Christian Hübler and Alexander Tuchacek. The work entailed the visualization of scientific data uploaded every three hours from field research stations in Antarctica to create an abstract, interactive representation of the icy continent. Visitors could manipulate the data fields by using hand-held electronic wands in the installation space. An immersive

mixed reality environment included air cooled to the Antarctic readings and pumped into the installation. *DWTKS*necessitated computer programming in C++ and Java languages, showing the synthesis of art and technology that is at the core of Grau's concept of virtual art. In particular, the work pointed to questions about representation, simulation and scientific knowledge.

Unstable Media Art

The multi-disciplinary V2 Institute for Unstable Media in the Netherlands was established in 1981 to stimulate research into experimental technology-driven arts practices. Capturing Unstable Media (2003) was a project spearheaded by V2 on archiving and preserving unstable media (Fauconnier and Frommé 2004). Mostly used by V2 and other digital arts conservation organizations, the term 'unstable media art' reflects, in particular, the perspectives of conservators and curators. This category (although straying from Manovich's notion of post-media aesthetics) underscores the ephemeral and fragile nature of media art and the unique strategies, such as scoring and notation, that must be implemented to ensure the future survival of digital artworks (see Chapter 8). V2 uses the metaphor of the electron to convey the instability of these works. However, the electron metaphor also expresses the transformative power of digital art to cross categories and to catalyze change within the arts and society more generally. According to V2, unstable media artworks consist of:

> electron streams and frequencies, such as motors, light, sound, video, computers and so forth. The word unstable is, according to us, more adequate than electronic, because it refers to one of the most important properties of these media, to wit, the

> rendering unstable of all things social, political and cultural within our society—the unstable electron as a basic concept for our society. (cited in S. Wilson 2002: 862)

The emphasis on instability in this category further underscores the difference between digital works and traditional objects of art (e.g. paintings, illustrations, sculptures), which are relatively unchanging over time. Exposed to harsh light, high temperatures or rough handling, a painting will unquestionably deteriorate; but with proper conservation its form can remain comparatively intact and identifiable through the ages. In contrast, unstable media works—often based on audience participation, one-off events and critical concepts—are in states of perpetual flux and hence, resist the notion that all artworks are unchanging objects. The ever-changing nature of some digital artworks poses challenges to conservators who, instead of conceptualizing works as objects, must think in terms of processes, happenings and the pervasive importance of novelty.

Perspectives on Technology, Culture and the Digital Arts

Digital art includes the principle of change as an artistic idea. However, in addition to the analysis of the nature of artworks, we can also examine the broader contexts in which art evolve and in which artists work. In this section, we explore three themes—democratization, globalization and interdisciplinarity—that can help us situate digital artworks in a variety of cultural, social, political and intellectual areas.

Democratization

One of the conceptual strands we explore throughout *Digital Arts* is the perspective that digital technologies can democratize the arts. The ethos of democratization includes the belief that every person has the right to engage in the arts. A democratic view of the arts argues that all individuals should be able to explore their creativity and appreciate the

artistic works of others. Thus, the democratization of art increases public access and involvement in artworks through a form of 'regime change' (e.g. the development of new platforms for interactive art outside of 'sanctioned' gallery or museum spaces). There are, however, a number of interpretations of what democratization means for the arts and a variety of factors that influence the process. Art historians and sociologists of art measure democratization in terms of access, participation, interactivity, reciprocity and decentralization. For example, Paul DiMaggio and Michael Useem point to the 'increasing representation of nonelites among visitors to museums and performing arts events' as an indication of a growing democratic environment (DiMaggio and Useem 1989: 166). Improved participation in the arts counterbalances the historical trend in which involvement in the arts was primarily the domain of the middle and upper classes. Hence, democratization is a political and social process that aims to remove barriers to access amongst rural communities, the working classes, the disadvantaged and those without university educations, fostering an 'elite experience for everyone' (Zolberg 2003). Enhanced access to an artistic resource (e.g. a gallery, museum, exhibition, installation, object of art, creative process, medium or material), along with the right to experiment and create, are the essential ideals of democratization. One's involvement in an arts community (online or virtual, either as an artist or spectator), thus, becomes more central than one's social, political or economic status.

The democratization of the arts through technology relates to the development of critical theory to interrogate the social value of old and new media. In the late 1960s and early 1970s, a call for public participation in democratic processes was based on the belief that social progress could be fostered through lateral, non-hierarchical and two-way forms of communication. A radical critique of mainstream media channels (e.g. television, radio

and newspapers) entailed growing support for a new, democratic media that would involve a broader social and community base. The critique of mass media was by no means unique to the revolutionary atmosphere of the 1960s.The Frankfurt School in the 1920s criticized mass media and wanted social and political communications to operate in a more transparent and accessible manner (Lister et al. 2003: 43-44). The Frankfurt School was a group of scholars and critics based in Germany, including seminal philosophers and critics Theodor Adorno, Herbert Marcuse, Max Horkheimer, Walter Benjamin and Jürgen Habermas. In particular, we will explore the ideas of Adorno and Benjamin in subsequent chapters. In the context of World War II and the social upheaval triggered by Fascism, the Frankfurt School developed 'critical theory' through Marxist principles that advocated fundamental change of the world (activism), as well as critical analysis (scholarship). Frankfurt scholars argued that the 'culture industry' produced passive consumers rather than engaged, participating and independent citizens (Lister et al. 2003: 386-387). With this basis in critical theory, throughout the twentieth century, the call to democratize the media consisted of three aims: (a) the revival of community structures and the creation of a free public sphere of debate; (b) the liberation of communication from authoritarian control and threats of censorship; and (c) the experimentation with new forms of virtual community and the construction of identity as an active and ongoing process involving the input of the public (Lister et al. 2003: 70).

The democratization of the arts through digital technologies can occur on multiple levels. Increased public attendance at physical gallery and museum spaces is but one dimension of a larger and more complex process. The advent of online platforms, especially evident in browser-based projects such as Olia Lialina's *Anna Karenina Goes to Paradise* (1994–1996) (see Chapter 7), means that art can be available to anyone with an internet

connection anywhere in the world and at any time, twenty-four-hours-a-day. Here, democratization takes shape through the interpretation of the internet as an artistic medium; artists exploit the inherent possibilities of new media for increased public involvement. However, new media has made it possible to transform viewership and spectatorship into engagement and participation, thereby taking the process of democratization one step further. The public can play an active and central part in generating form and content. For example, the installation piece *Fractal Flesh* (1995) by performance artist Stelarc empowered the audience to affect the artist's muscle movements remotely through electrodes connected to the internet (see Chapters 2 and 4). Audience presence in the artwork becomes integral and indispensable rather than optional or intermittent; the work *is* the dynamic interaction between artist, audience, technology and concept. Other digital artworks necessitate ongoing user input over many years, thus posingcertain challenges for the conservation of digital art (see Chapter 8). Furthermore, the digital revolution has granted users, who would not necessarily consider themselves artists, the tools to explore creativity on an everyday basis through new technologies. In the world of photography, for example, the democratization of art takes place with every digital camera click, followed by the use of photo touch-up software to fine-tune the composition before the posting of images to social media websites such as Facebook and Flickr.

Globalization

In addition to democratization as a perspective on technology, culture and the arts in the digital era, we also refer to globalization as a context in which many arts practices have evolved in relation to their relevant media (e.g. the internet, teleconferencing, mobile telephony, social media). Moreover, polycentrism and decentralization present countervailing perspectives to that of globalization. Both of these concepts contribute to the

dispersion of power and the creation of new forms of community. In his essay 'Globalization and (Contemporary) Art', art historian T.J. Demos poses a pertinent question for our introduction to the digital arts: 'How does artistic practice…define, negotiate, and challenge the cultural, economic and political forms of globalisation?' (Demos 2010: 211). If digital art is 'made with, and for, digital media including the internet, digital imaging, or computer-controlled installations' (Graham 2007: 93), then what is the relationship between art and the processes of globalization to which such media are inextricably connected? Classically a contentious theme within political science, economics and communications theory, globalization can be defined as 'a dissolving of national states and boundaries in terms of trade, corporate organization, customs and cultures, identities and beliefs' (Lister et al. 2003: 10). One outcome of globalization is an international economy produced by the activities of multi-national businesses, the emergence of global financial markets and the increasing homogeneity of goods and services around the world (Lister et al. 2003: 194). Moreover, the emergence of 'global culture' is attributed to globalization and specifically, the world-wide influence of the American mass media (e.g. reality television shows, conservative online news programs and Hollywood cinema motifs).

New media has contributed to the processes of globalization by facilitating instantaneous digital communication that transcends regional or national boundaries. To conceptualize globalization as the product of digital media, however, invites the idea of 'technological determinism' into the debate (Lister et al. 2003: 201). This position takes a variety of forms and strengths all of which broadly maintain that technology underpins the shape of human culture, society, values and practices. The issue of determinism points to the dynamics between humans and the devices we produce through our innovation and scientific experimentation. Most of us would agree that technological conditions affect

everyday life and the construction of culture, to some extent (Lovejoy 2004: 311). On the one hand, 'weak technological determinism' concedes that we ultimately control technology, even though technology always shapes our culture (Feist et al. 2010: 5). On the other, a stronger version of determinism—or what is called 'autonomous technological determinism'—asserts that there is the potential for humans to lose our grip on technology, that is, for our digital devices to take on an almost Frankensteinian form of liberation from us and to impact the world in unprecedented and possibly, harmful ways (Feist et al. 2010: 5). Therefore, one of the organizing themes for students to consider throughout this book is the relationship between new media, globalization and the digital arts. We encourage students to think about the following questions and others that come to mind: How do digital artists negotiate 'global culture' as a progressively more powerful and homogenizing phenomenon? How are new media tools utilized by artists in ways that call attention to and invite critiques of globalization? To what extent are the shapes of digital artefacts (e.g. browser-based artworks or photographic images) determined by technology? Do the artist and audience ultimately decide the nature of a digital artwork, despite the important and inescapable influences of technology? And finally, do artists and their artworks reflect affirmative, neutral or negative attitudes towards new media?

Globalization brings to the fore the issue of cultural production in the context of mass culture and mass media. Just as digital artists probe the intrinsic democratic possibilities of new media, so too do they engage with the global interactive potential of internet technologies. An alternative way to think about globalization and its homogenizing effects is through the concepts of polycentrism and decentralization. Polycentrism argues that the dynamics between the global and the local, the centre and the periphery, the north and the south, are as vital to consider as the broad-scale impacts of globalization and the traditional

geographical centres of economic and cultural power (Western Europe, the United States and more recently, parts of Asia). The concept foregrounds the dynamics between multiple, interrelated 'sites', including physical locations, cultural positions, philosophical orientations or aesthetic ideas (Scholte 2005). Ella Shohat and Robert Stam (1994) propose a 'polycentric aesthetic' to encompass a diversity of 'sites' and to call attention to artists and artworks existing at the thresholds between concepts, discourses and identities (Jones 2011: 169). A polycentric perspective of a digital artwork examines the multiple positions that constitute a work—from the physical locations where collaborators are located to the theoretical, ethical and aesthetic values and modes of the participants. The 'local' dimensions of the work (i.e. the contribution of each geographical site to the artwork as a whole or the technological innovations forwarded by artist-engineer collectives with specific affiliations) figure into a polycentric interpretation of a digital artwork. Decentralization involves the decentring of established regimes (e.g. political, economic and, we argue, aesthetic) and the weakening of the control mechanisms of authority hubs. The networks spawned by new media have facilitated the process of decentring by democratizing access to information (Lister et al. 2003: 10). In terms of digital art, decentralization provides an illuminating perspective for analyzing works. How does an artwork distribute authorship and creative authority across a widely-based network of anonymous participants? How does virtual or internet art decentralize the activities of artists, contributors and institutions in a myriad of ways?

Interdisciplinarity

The third context of the digital arts that we explore, along with democratization and globalization, is interdisciplinarity. Is a digital practitioner an artist, poet, scientist, engineer, conservator or all of the above? This question points to the hybrid identities of artists and

artworks in terms of interdisciplinarity. A term coined by social scientists in the mid-1920s, 'interdisciplinarity' is the convergence of knowledge disciplines. The perspective reflects a broader momentum during the twentieth century to resolve the 'two cultures' (i.e. art vs. science) dilemma in which the disciplines (e.g. the arts, humanities, biological sciences, engineering, etc.) were thought to limit the possibility of knowledge integration. Addressingconcerns over specialization, interdisciplinarity entails the use of more than one discipline in an artistic practice. Its premise is that the disciplines collectively form the foundations of creativity and that, while individual disciplines maintain discrete identities within theory and practice, there is a degree of interplay that is important to foster. We distinguish between 'interdisciplinarity', in which disciplines collaborate to produce knowledge forms, and 'transdisciplinarity', in which there is a deeper degree of integration and greater loss of disciplinary identity. Transdisciplinary artistic practice requires the methods and theories established in disciplines, and conversely, disciplines need thought that is transdisciplinary in nature to go beyond the inherent limits of the discipline. Many of the artists and artworks featured in *Digital Arts* are interdisciplinary or transdisciplinary in character insofar as they cross between art, science, engineering and specific sub-disciplines (e.g. studio practice, biology, robotics, optics, etc.).

Interdisciplinarity is defined according to the degree of intermeshing between disciplines. Joe Moran (2010: 14)defines interdisciplinarity as 'any form of dialogue or interaction between two or more disciplines'. What is most essential to interdisciplinarity, according to Julie Klein (1990: 13), is a 'dispersion of discourse 'characterized by the placing of creative activities within a broader (i.e. not discipline-specific) framework. Allen Repko (2008: 6)describes the space between disciplines as 'contested terrain'.Other scholars stress the reality of engaged formal and informal interactions between disciplines (Soulé and Press

1998: 399). These theorists point to the fact that interdisciplinary artists should understand the languages of other disciplines before, during and after cooperative projects.

Roland Barthes (1977)asserts that interdisciplinarity is more than disciplinary knowledge streams converging to produce new epistemological forms. It is rather the dissolving of disciplinary strictures altogether:

> It is indeed as though the *interdisciplinarity* which is today held up as a prime value in research cannot be accomplished by the simple confrontation of specialist branches of knowledge. Interdisciplinarity is not the calm of an easy security; it begins *effectively* (as opposed to the mere expression of a pious wish) when the solidarity of the old disciplines breaks down [italics in original]. (155)

Expanding interdisciplinarity beyond its disciplinary allegiances, the neologism 'transdisciplinarity' appeared in the 1970s in the works of psychologist Jean Piaget, sociologist Edgar Morin and astrophysicist Erich Jantsch to indicate the transcendence of knowledge boundaries (Nicolescu 2002). In the nineteenth century, English polymath William Whewell's concept of consilience signified the interpenetration of knowledge 'where disciplines are not juxtaposed additively but integrated into a new synthesis' (Walls 1995: 11). Borrowing from Whewell's work, *Consilience: The Unity of Knowledge* by biologist Edward O. Wilson (1998) offers a contemporary interpretation of theinterplay between the sciences, arts and humanities. Wilson (1998: 8) defines consilience as 'literally a 'jumping together' of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation'. As we will see in subsequent chapters,

transdisciplinarity is applicable to a wide spectrum of research areas andcreative practices in the digital era.