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DEUS PER MACHINAM?

Sociotechnical Imaginaries of Human Enhancement
Technologies in *Deus Ex: Human Revolution*

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1. Introduction

There exist endless variations of fictional stories in which human beings are endowed with superhuman powers through the advancements of science and technology. In the movie *Iron Man* (2008) the character Tony Stark is empowered by a highly advanced robotic exoskeleton which not only grants him increased strength but also near invincible resilience; in the 1970s TV series *The Six Million Dollar Man* Steve Austin boasts abilities such as running at tremendous speeds granted by his bionic body parts; and in the recent video game *Deus Ex: Human Revolution* (2011)¹ Adam Jensen is bestowed with capabilities beyond human limitations through mechanical augmentation technologies. Due to their enhancements, these characters are able to successfully fight against evil with the help of incredible powers which have left audiences wondering whether science is able to create such enhancing technologies. For in contrast to the famous *Superman* – whose abilities are literally not of this planet – the characters mentioned above are normal able-bodied citizens until they are enhanced with technology.

We are entering times in which such imaginations of the future increasingly are becoming reality and in which a growing range of prosthetic devices can be taken as the foundation of human enhancement technologies: cochlear implants restore the loss of hearing; with bionic eyes blind patients are able to partially gain sight (“Monash Vision: Direct to brain bionic eye,” 2013); and robotic prosthetics replace amputees’ lost limbs. The Biomechantronics department at the MIT Media Lab led by Dr. Hugh Herr is responsible for the development of the BiOM (“BiOM: Personal Bionics,” 2013) an advanced computerized, robotic ankle that is capable of reproducing the natural walking gait of biological legs. In a TEDMed talk in 2010 (“Hugh Herr at TEDMED 2010,” 2010) Professor Herr, a user of his own technology, ushers his audience into the advent of the bionic age and states that

Through fundamental advances in fields such as genetics, regenerative medicine, bionics we will rid the world of disability and we will set the technological foundation where the only limits that we will see or experience are the limits of physical law – the laws of nature – and the boundaries of our collective imagination. The extent to which we can change human function and expression will be deeply profound. (“Hugh Herr at TEDMED 2010,” 2010)

As the title of this thesis – ‘*deus per machinam?*’ which loosely translates into ‘becoming a God through technology?’ – suggests, at the core lies the implicit question how such human-

¹ re-released in October 2013 in a revised Director’s Cut version

machine reconfigurations as Hugh Herr is alluding to might alter society, the meaning of normalcy and what it means to be human. However, it is difficult and close to impossible to examine phenomena that have not taken place yet, but are an anticipation of the future. Nevertheless, the imaginations and the cultural products that sprout from them such as novels, movies or games can be taken as research objects. Hence, this thesis undertakes an analysis of the video game *Deus Ex: Human Revolution* (DXHR) – a game that enables the player to use advanced augmentation technologies and explore the possibilities and risks of human enhancement in the near future of 2027 – and ventures to answer the research question “How are human enhancement technologies and augmented human bodies performed in *Deus Ex: Human Revolution*?”. The word ‘performed’ is hereby chosen to denote that the enhancement technologies are more than just visual representation, but are constructed through the input of a player. The analysis requires the combination of science & technology studies (STS) as well as game studies approaches in order to investigate the underlying sociotechnical imaginary (Jasanoff & Kim, 2009) of human enhancement technologies in *DXHR*. Moreover, I hold the assumption that there is ample reason for STS to take up digital games as empirical data (cf. O’Donnel, 2007), because games are more than mere entertainment. Video games and cultural products in general influence audience perception of emerging developments in science and technology and I tacitly argue in this thesis that video games can be viewed as sites where society critically reflects upon scientific innovation and technological advancement.

Before moving to the analysis of *DXHR*, important preliminaries have to be covered beforehand. Chapter 2 contains a definition of human enhancement technologies and moreover includes a short historical peek into the attempts of overcoming biological limitation. Furthermore, psychological and philosophical reasons for the human being’s affinity for technological extension shall be briefly explored. The subsequent chapter 3 forms the theoretical backbone of the analysis and comprises, among others, the concept of the imaginary. The research questions as well as the methodology are delineated in chapter 4 followed directly by the analysis of *DXHR* which moves from covering the game in its entirety (chapter 5) to the examination of selected enhancement technologies (chapter 6). Lastly, chapter 7 and the conclusion, then, return to the research questions and aim to provide clear and lucid answers.

2. Background and Contextual Information

This section shall give a preliminary overview of the human being's efforts to extend his abilities beyond biological limitations and, in addition, seek the reasons for the human doing so. In relation to the scope and focus of this thesis, this section is not to be regarded as exhaustive or comprehensive, but rather it is a first attempt to gather historical accounts and theories that engage with the topic of human augmentation. However, as will be clear in the following sections, not every achievement detailed here was originally intended to break the limitations of the human biology, but were in some cases a need to overcome a lack such as a prosthetic that aims to restore the functionality after the loss of a limb.

2.1. What are human enhancement technologies?

In order to investigate the sociotechnical imaginary underlying *Deus Ex: Human Revolution* (DXHR), it has to be clarified what human enhancement is, what kind of technologies are associated with it and what broader ideas are connected with them. Human enhancement takes on many names and forms, and evokes certain cultural images. According to the definition provided by the *Science and Technology Options Assessment* (STOA) – a study done on human enhancement by the department of economic and scientific policy of the European Parliament - “human enhancement” comprises any modification that is “aimed at improving individual human performance and [that is] brought about by science-based or technology-based interventions in the human body. This definition includes “strong”, second-stage forms of human enhancement with long-term effective or permanent results as well as “temporary” enhancements” (European Parliament, 2009, p. 17). This definition includes various possible forms of enhancement available through science and technology, which can be internal or external by nature. Internal options of enhancement include the use of implantable devices, drug intake or genetic modifications, whereas external options require the wearing of technological devices outside of the body such as prosthetic devices or exoskeletons and typically can be removed easily in contrast to internal enhancements (Roco & Bainbridge, 2003). However, it has to be distinguished between enhancements that are directed towards the “restoration of a previous condition after a disease or after an injury (*restitutio ad integrum*)” (European Parliament, 2009, p. 17) and “interventions designed to improve human form or functioning beyond what is necessary to sustain or restore good health” (Juengst, 1998 quoted in: European Parliament, 2009, p. 17).

The image of the “cyborg” is a common association that emerges in discussions surrounding human enhancement technologies. While many people will refer to instantiations of the cyborg in products of popular culture particularly movies and television series such as *The Six Million Dollar Man*, *Star Wars* or *RoboCop*, the term has gained conceptual relevance in the field of science and technology studies in the early nineties through Donna Haraway. In *A Cyborg Manifesto* Haraway has described that a “cyborg is a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction” (Haraway, 1991, p. 149). She employed the notion of this artificial entity transgressing the Nature/Culture boundary to dissolve conventional views of essentialism and feminism: “The cyborg does not dream of community on the model of the organic family, this time without the oedipal project. The cyborg would not recognize the Garden of Eden; it is not made of mud and cannot dream of returning to dust” (Haraway, 1991).

The compound term ‘cyborg’ is, however, not a word coined by Haraway but goes back to early American space travel of the 1960s. The ‘cyborg technique’ was the first mentioning of the term and was used as a proposal of how to make astronauts fit for the hostile environment of space. Rather than encapsulating astronauts in an enclosure that simulates earth-like conditions, the scientists Manfred Clynes and Nathan S. Kline suggested artificially altering the human body. Instead of adjusting the environment to the human body, the body was to be adjusted to survive in the foreign, atmosphere-less environment.

Clynes and Kline proposed that humans could endure the rigors of long space flights, to Mars for example, by becoming cybernetically extended organisms. [...] humans would be unconsciously injected with drugs to control their physiological functions – a form of artificial homeostasis – so they could explore the vastness of space without cumbersome space suits and other life-support equipment. Artificial organs would further reduce their physiological needs. (Kline, 2009, p. 339f.)

Cybernetics - “the science of communication and control theory that is concerned especially with the comparative study of automatic control systems (as the nervous system and brain and mechanical-electrical communication systems)” (Merriam Webster, 2012) - was very prominent in the second half of the 20th century and maintained its influence until today. The founding father and one of the most distinguished cyberneticians was Norbert Wiener, who had an interest in prosthetics, a field where he could combine “humans and machines into integrated information systems” (Kline, 2009, p. 336). Ronald Kline details in his article *Where are the Cyborgs in Cybernetics?* a prosthetic device – the hearing glove - which Wiener developed in collaboration with the MIT. This technological apparatus was designed to be sensitive to sounds which it translated into electrical signals which in turn activate specific sensors residing in the fingertips of the glove. In effect, this should enable hearing-impaired or even deaf people to hear via feeling sounds (Kline, 2009, p. 339). “The hearing

glove is a good example of what Hayles calls technical cyborgs, although she does not mention the device. Information is extracted from sound waves in a disembodied form so it can travel across the boundary between the machine (the electrical filters) and the organism (the human hand)” (Kline, 2009, p. 338).

Katherine Hayles has made a distinction between ‘technical’ and ‘metaphorical’ cyborgs. Analogous to the juxtaposition of ‘internal’ and ‘external’ enhancements, a technical cyborg is according to Hayles a human with some form of technology built into the body such as a pacemaker, whereas a metaphorical cyborg is defined by the interaction and engagement with technology outside of the body like “a human playing video games” (Kline, 2009, p. 334), for example. By this definition, it is true to ascertain that “we are all cyborgs now” (Case, 2010) because technological devices have been integrated into everyday life and have become extensions of the self. In 1995, Hayles has already pointed out that “about 10% of the current U.S. population are estimated to be cyborgs in the technical sense, including people with electronic pacemakers, artificial joints, drug implant systems, implanted corneal lenses, and artificial skin” (Hayles, 1995, p. 322). Based on these facts she argues “that the age of the human has given way to the posthuman” (Hayles, 1995, p. 321) whereby the cyborg forms the next step on the evolutionary ladder of humanity in which biological limitations can be overcome through science and technology.

[C]ybernetics can be used not only to correct dysfunctions but also to improve normal functioning. As a result, the cyborg signifies something more than a retrofitted human. It points toward an improved hybrid species that has the capacity to be humanity’s evolutionary successor. (Kline, 2009, p. 334)

The ‘posthuman’ is one of the two central terms that are often used erroneously as synonyms. ‘Transhumanism’ and ‘posthumanism’ are both traditions that refer to a state of being ‘human’ which deviates from current standards. Hereby ‘transhumanism’ refers to a particular thinking that sees the human being in its current form as incomplete in its development. Biology is just one way of developing the human being, but to transhumanism it does not represent the end of the process. Rather the current form of the human being can be augmented by applying scientific knowledge and, thus, transhumanism sees human enhancement as “[t]he intellectual and cultural movement that affirms the possibility and desirability of fundamentally improving the human condition through applied reason, especially by developing and making widely available technologies to eliminate aging and to greatly enhance human intellectual, physical, and psychological capacities” (Chrislenko et al., 2001). While ‘transhumanism’ heavily focuses on the alterations to the specific human nature and hence is closely tied to the age of enlightenment (K. Scott, 2011),

‘posthumanism’ is more heterogeneous in the way that the prefix ‘post-’ can imply a plethora of things. Basically denoting a state that is *beyond human*, it can mean that we have entered an age after humanism, that one definition of ‘human’ is displaced by another, or more disturbingly that it “envision[s] humans displaced as the dominant form of life on the planet by intelligent machines” (Hayles, 1999, p. 283). Although in literature, above all the genre of science fiction, a pessimistic even apocalyptic view of the posthuman is presented, it does not need to entail such a scenario as Hayles argues: “[...] we can craft [other versions] that will be conducive to the long-range survival of humans and of the other life-forms biological and artificial, with whom we share the planet and ourselves” (Hayles, 1999, p. 291).

In this section a definition of human enhancement technologies has been presented along with the broader imaginaries that exist in association with human enhancement including the picture of the cyborg and the ideas of transhumanism and posthumanism. These clarifications are necessary to not only be able to focus on the particular facet of human enhancement present in *Deus Ex: Human Revolution* (namely mechanical augmentations and implants) and in consequence to be able to answer how these enhancing technologies are imagined in the game, but also to situate this thesis in relevant epistemic discourses surrounding human enhancement.

2.2. Historical overview and further examples

Human enhancement is not something relegated to the premises of literary and cinematic science fiction, but on the contrary a contemporary phenomenon. This section will delineate some real-world examples and, thus, will demonstrate to the reader the relevance and topicality of the engagement with human enhancement technologies

In the history of mankind there are many traces to be found that can be linked to endeavors of extending, enhancing or supplementing a perceived lack of the human body. Of course, an enumeration of such efforts (or a history of human enhancement) depends heavily on how human enhancement is defined. An ‘inclusive’ definition might incorporate any tool that the human has ever developed. This section, however, shall restrict itself to the presentation of some of the most interesting examples.

In terms of prosthetic technology, many people still have a prototypical image of a crude replacement limb in mind that merely is a remedy aesthetically rather than functionally. Slowly, this picture is changing nowadays with more and more reports appearing about

bionic limbs that are able to restore some of its user's lost abilities.² Despite this recent phenomenon, older reports and evidence exist that prove that not everyone in the past settled for a functionless aesthetic device as limb surrogate.

Götz von Berlichingen is a dramatic play that was written by Goethe in the 18th century. The play is based on the actual life of the German imperial knight Gottfried "Götz" von Berlichingen who lived at the beginning of the 16th century and has left an autobiography behind. This knight was known for two things. On the one hand, he is notorious for a vulgar expression that was made popular through Goethe's play, and on the other hand, he was famous for his iron hand. At the age 24, the young mercenary lost his right arm due to a cannon ball.



Figure 1: Götz von Berlichingen & his Iron Hand (Forbes, 2008)

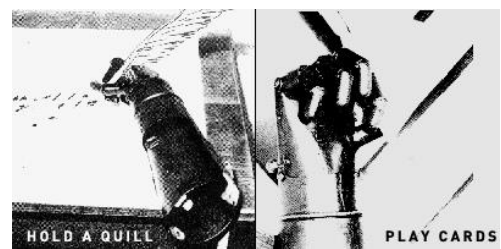


Figure 2: The Iron hand (Forbes, 2008)

Instead of retiring from his profession, an iron prosthetic was made for von Berlichingen, which was a remarkable mechanical piece of engineering well ahead of its time and is on display in the Jagsthausen museum in Germany. "Complete with articulated fingers, spring action and an array of levers and buttons, the hand allowed a degree of control that's stunning even today" (Forbes, 2008). Definitely a forerunner of modern prostheses, the iron hand was passively able to do a variety of tasks such as holding a sword or lance, directing a horse, playing cards or even holding a quill (see figure 2).

A different approach to human enhancement was undertaken, for example, in the second half of the 1960s by United States military. Funded by General Electric, *Hardiman* was a joint Army-Navy project that ran from 1965 to 1971 and was thus one of the earliest attempts to create a man-augmentation in the form of an exoskeleton. Rather than replacing lost functionality, like a prosthesis does, this project was aimed at amplifying human strength with the help of technology. The manual from 1970s explains what this powered exoskeleton could do:

Worn as an outer mechanical garment, the exoskeletal structure will be powered to dramatically amplify the wearer's strength and endurance by a factor of

² An example stems from the Austrian general hospital in Vienna. In 2011 two young men, Patrick and Milorad, have voluntarily had their functionless hands amputated to have them replaced with bionic prosthetics that restore some of the lost functionality such as gripping and pinching. (Angerer & Dietl, 2011)

approximately 25 to one, i. e., when the exoskeleton wearer lifts 25 pounds, he will 'feel' as if he is lifting only one pound. [...] The exoskeleton, called 'Hardiman', mimics the movements of its wearer, presenting a literal union of man and machine. thus, the human's flexibility, intellect, and versatility are combined with the machine's strength (Makinson, 1971)



Figure 3: Project Hardiman (GE, 2010)

Essentially *Hardiman* was able to lift 1500 lbs (680 kg), however, the exoskeleton weighed nearly as much. In connection with the size, lack of stability and the power-supply issues, *Hardiman* failed to make it beyond the stage of the prototype, but succeeded to prove that man-augmentation system was theoretically possible.

A recent example of a man-amplifying exoskeleton is the *XOS-2* by Raytheon/Sarcos which is funded by the US military's Defense Advanced Research Projects Agency (DARPA) (Roco & Bainbridge, 2003, p. 338). This lightweight exoskeleton was reported in the news on CNN in conjunction with the release of the blockbuster movie *Iron Man 2*. The *XOS-2* is able to augment the wearer's strength by a factor of 17 and is flexible and responsive enough to follow the movement of the wearer without obstructing. Moreover, it allows the wearer to walk or run without tiring even while transporting heavy luggage. The only hindrance at the moment is the lack of a small, strong, portable power source, which is why the *XOS-2* has to be tethered to a power source during operation (Marrapodi & Lawrence, 2010).

A final example stems from the MIT Media Lab in Cambridge, Massachusetts. Dr. Hugh Herr is the head of the Biomechatronics Group and responsible for the development of a bionic ankle called "BiOM". This prosthetic device belongs to one of the first of its kind that rely upon robotics to help mimic the natural gait of human beings. Herr is wearing two of these prosthetic devices himself. After a tragic incident in the mountains when he was 17, Herr was amputated on both legs below his knee due to severe frostbite and he was ever since hooked on to developing innovative prostheses. However, Dr. Herr does not only want to restore functionality to its natural state, but uses the opportunity improve upon the biological design and effectively supersede nature. Herr has designed "[...] a robotic lower-leg device that uses a complex onboard system of microprocessors, environmental sensors, control loops, springs, struts and muscle- and tendon-like motors to emulate natural locomotion. The BiOMs bend like joints, flex like muscles. Automatically, reflexively, they adjust mid-stride to different speeds, slopes and terrains, and recycle energy, as if they're flesh and bone" (Rago, 2012). Herr argues that through science and technology, a human state of disability can be eradicated in the coming decades: "Humans aren't broken. They're never broken. The technology we provide for rehabilitation is broken" (Rago, 2012).

As can be seen from this chapter, there exist both present and past attempts to augment the human body through various technological means. There exist many more contemporary examples of research projects aiming at the improvement of human performance which, alas, do not have any space in this short section. However, the few examples demonstrate that the technology is on its way and will pervade various areas of human life. “The age of bionics [...] is just beginning” (Rago, 2012) as Dr. Hugh Herr points out, but how it will exactly look like and what technology will be able to do cannot be reliably predicted. Nevertheless, there are (media) spaces where speculations about a possible future are made. One of those spaces is the videogame, which, as I will argue below, is not only a site of speculation, but also site that has the potential to disseminate a sociotechnical imaginary of human enhancement and influence our expectations of this kind of technology.

2.3. The Need to Overcome Biology

Before moving on to the theoretical framework, I want to briefly discuss why people are interested in pushing their abilities beyond biological limitations. Why is it that people, especially transhumanists, search for remedies to ostensible deficiencies of the human body?

Several scholars have directly engaged with the reasons of human enhancement or touched upon the subject in some form. Among the most notable is the Austrian psychologist Sigmund Freud who elaborated on the topic in his work *Das Unbehagen in der Kultur* (1930).

It sounds like a fairy-tale, but not only that; this story of what man by his science and practical inventions has achieved on this earth, [...] is a direct fulfillment of all, or of most, of the dearest wishes in his fairy-tales. [...] Long ago he formed an ideal conception of omnipotence and omniscience which he embodied in his gods. Whatever seemed unattainable to his desires - or forbidden to him - he attributed to these gods. One may say, therefore, that these gods were the ideals of his culture. Now he has himself approached very near to realizing this ideal, he has nearly become a god himself. But only, it is true, in the way that ideals are usually realized in the general experience of humanity. Not completely; in some respects not at all, in others only by halves. Man has become a god by means of artificial limbs, so to speak, quite magnificent when equipped with all his accessory organs; but they do not grow on him and they still give him trouble at times. However, he is entitled to console himself with the thought that this evolution will not come to an end in A. D. 1930. Future ages will produce further great advances in this realm of culture, probably inconceivable now. and will increase man's likeness to a god still more. But with the aim of our study in mind, we will not forget, all the same, that the human being of today is not happy with all his likeness to a god.³ (Freud, 1929, p. 15)

³ Es klingt nicht nur wie ein Märchen, es ist direkt die Erfüllung aller – nein, der meisten – Märchenwünsche, was der Mensch durch seine Wissenschaft und Technik auf dieser Erde hergestellt hat [...] Er hatte sich seit langen Zeiten eine Idealvorstellung von Allmacht und Allwissenheit gebildet, die er in seinen Göttern verkörperte. Ihnen

Freud states that the reasons for extending and supplementing the human's capabilities – and thereby, incidentally, creating 'culture' – lies in the distinction to animals and nature, in general. Animals are innately better equipped to survive in nature than humans are. The human needed to find ways to overcome his natural shortcomings. According to Freud, before man had found ways to remedy his deficiencies, humans endowed the Gods with those abilities man himself was not able to possess. In Freud's interpretation, then, the Gods became a standard by which man measured himself. With growing technological proficiency, man "has nearly become a God himself" (Freud, 1929, p. 15). In consequence, Freud lists various achievements of the human being, which can all be related to some form of bodily activity that needed augmentation.

By means of all his tools, man makes his own organs more perfect - both the motor and the sensory - or else removes the obstacles in the way of their activity. Machinery places gigantic power at his disposal which, like his muscles, he can employ in any direction; ships and aircraft have the effect that neither air nor water can prevent his traversing them. With spectacles he corrects the defects of the lens in his own eyes; with telescopes he looks at far distances; with the microscope he overcomes the limitations in visibility due to the structure of his retina. [...].⁴ (Freud, 1929, p. 15)

Similar observations have been made by other philosophers such as Johann Gottfried Herder who pointed out that "viewed as a naked, instinct-less animal, the human being is the most miserable of all creatures"⁵. This idea has been taken up as an incentive by Arnold Gehlen who described the human being in comparison to animals as a "Mängelwesen" – a deficient creature. Despite the negativity of this descriptor, Gehlen attributed a positive quality to the inchoate state of the human being as one of its defining characteristics. The human in contrast to other creatures does not only act externally but also has the ability to act internally, directed towards him- or herself and adapt at will. While most superior

schrieb er alle zu, was seinen Wünschen unerreichbar schien – oder ihm verboten war. Man darf also sagen, diese Götter waren Kulturideale. Nun hat er sich der Erreichung dieses Ideals sehr angegnähert, ist beinahe selbst ein Gott geworden. Freilich nur so, wie man nach allgemein menschlichem Urteil Ideale zu erreichen pflegt. Nicht vollkommen, in einigen Stücken gar nicht, in anderen nur so halbwegs. Der Mensch ist sozusagen eine Art Prothesengott geworden, recht großartig, wenn er alle seine Hilfsorgane anlegt, aber sie sind nicht mit ihm verwachsen und machen ihm gelegentlich noch viel zu schaffen. Er hat übrigens ein Recht, sich damit zu trösten, daß diese Entwicklung nicht gerade mit dem Jahr 1930 A.D. abgeschlossen sein wird. Ferne Zeiten werden neue, wahrscheinlich unvorstellbar große Fortschritte auf diesem Gebiete der Kultur mit sich bringen, die Gottähnlichkeit noch weiter steigern. Im Interesse unserer Untersuchung wollen wir aber auch nicht daran vergessen, daß der heutige Mensch sich in seiner Gottähnlichkeit nicht glücklich fühlt. (Freud, 2001, pp. 57–58)

⁴ Mit all seinen Werkzeugen vervollkommenet der Mensch seine Organe – motorischen wie die sensorischen – oder räumt die Schranken für ihre Leistung weg. Die Motoren stellen ihm riesige Kräfte zur Verfügung, die er wie seine Muskeln in beliebige Richtungen schicken kann, das Schiff und Flugzeug machen, daß weder Wasser noch Luft seine Fortbewegung hindern können. Mit der Brille korrigiert er die Mängel der Linse in seine Auge, mit dem Fernrohr schaut er in entfernte Weiten, mit dem Mikroskop überwindet er die Grenzen der Sichtbarkeit, die durch den Bau seiner Netzhaut abgesteckt werden. [...] (Freud, 2001, pp. 56–57)

⁵ „[a]ls nacktes, instinktloses Tier betrachtet, ist der Mensch das elendeste aller Wesen" (Herder, 1770)

creatures exhibit specialized features, such as sharp claws for hunting, they are inextricably bound to the specific environment they are specialized for. The human, on the other side, lacks this feature, but is in his inferiority open to all of the world's environments. In conjunction with the human's ability to predict, s/he can even act upon events in the future and adapt to situations not yet present (Menne, Trutwin, & Türk, 1986, pp. 61–64). In this way, Gehlen's descriptions overlap with the views of Freud insofar that technology is part of the human's culture and that technology becomes a means to replace, substitute, relieve or outdo by nature missing organs. "The stone in the hand relieves and outdoes the success of the hitting fist; the vehicle [...] relieves us of the walking motion and outdoes its ability. [...] The plane, moreover, replaces the wings that have not grown and outdoes all organic flying performance." (Menne et al., 1986, p. 104)⁶

Interestingly, Gehlen also addresses the fear that accompanies technological development, which he refers to as the "Dämonie der Technik" ("demonic possession of technology") (Menne et al., 1986, p. 106). It is the fear of a major worldwide transformation of culture, the displacement of the customary and the known. This can be illustrated by humanity's transition from a nomadic hunting culture to the sedentary *modus vivendi* and the modern engineered industrialism. "Even then the transformation was immeasurably profound and [...] must have lasted many centuries ... " (Menne et al., 1986, p. 106)⁷

Psychology and philosophy teach us that technological creativity and development lies at the core of human nature and constitute a grand part of human culture. This brief chapter illustrates that overcoming biological limitation through technological enhancement has ostensibly been at the center of humanity's survival on this planet and is in principle not a new psychological development. This insight can help us dissect and comprehend the formation of modern imaginaries of augmentation. As will become apparent in the analytical chapters, the sociotechnical imaginary of DXHR draws upon the notion of the human being as not only a deficient creature (*Mängelwesen*) but on the other side also on Freud's conception of a god of prosthesis.

⁶ „Der Schlagstein in der Hand entlastet und überbietet zugleich im Erfolg die schlagende Faust; der Wagen, das Reittier entlasten uns von der Gehbewegung und überbieten weit deren Fähigkeit. [...] Das Flugzeug wieder ersetzt uns die nicht gewachsenen Flügel und überbietet weit alle organischen Flugleistungen.

⁷ „Auch damals war die Transformation unabsehbar tiefgreifend und ging durch die Menschen quer hindurch, sie muß viele Jahrhunderte gedauert haben...“

3. Theoretical Framework

3.1. The Imaginary

In order to answer the questions what kind of sociotechnical imaginaries are present in DXHR and how human enhancement technologies and augmented human bodies are depicted in this game, the theoretical concept of the 'imaginary' needs to be clarified.

The 'imaginary' is a fairly young concept that is most closely related to the fields of sociology, cultural studies and anthropology where the term is being used in the place of 'culture' or 'cultural beliefs'. Claudia Strauss states that the term 'imaginary' has become so commonplace that some authors do not even cite sources for the term anymore. This section is dedicated to clarify the meaning and partially the history of the key term 'imaginary' in order to arrive at the concept of 'sociotechnical imaginary' (Jasanoff & Kim, 2009).

3.1.1. The Symbolic, the Real, the Imaginary (Lacan)

The 'imaginary' is a concept that goes back to 1970s and has its roots in the psychoanalytic tradition of Jacques Lacan. Since then it has found its way into a multitude of other academic areas such as psychology, anthropology, cultural studies, political sciences and social sciences, where definitions and applications of the term differ. The French psychiatrist Jacques Lacan is believed to be the first to have coined the term 'imaginary' in his discussions of subject formation and general constitutive forces of human existence. He proposed a triad of forces consisting of the symbolic, the real and the imaginary. Leaning on theories of Freud, Lacan "[...] saw personalities as constructed in social and cultural relations, as fundamentally intersubjective" (Strauss, 2006, p. 327). The self can only be constructed through the comparison and contrast to the other, to that, which lies outside of the body. The famous example that Lacan provides to exemplify this is an infant's first perception of its own image in a mirror. In addition, Lacan was also heavily influenced by linguistic and structuralist ideas. The imaginary in the Lacanian sense is thus "the space in which the relation 'between the ego and its images' (Miller, 280) is developed" (Loos, 2002). Lacan's imaginary

[...] explicitly theorizes the relation between psyche and society: individuals take their self image from social symbols and images, and the inadequacy of an identity constructed in this way its failure to recognize real lacks, is source of anxiety. Second, for Lacan, the imaginary is the fantasy of a specific person. Unsurprisingly given that he was a practicing psychoanalyst, Lacan based his

theories on careful study of individual personalities. While he stressed the cultural construction of the unconscious, he also noted that individuals' subjectivities were not completely expressed by shared discourses and have to be understood in their particularity [...]. Illusions are those of specific persons, not of an abstract cultural subject. (Strauss, 2006, p. 328)

Lacan's view of the imaginary is focused upon the individual and the construal of the self-image. While this early conception of 'imaginary' has influenced subsequent scholars, the understanding of 'imaginary' has shifted considerably towards the collective rather than the individual.

3.1.2. The Social Imaginary (Castoriadis)

Cornelius Castoriadis's definition of the 'imaginary' stands quite apart from Lacan's insofar that it is not person- but group-centered and is thus closer to what is understood by 'culture'. On the one side, the imaginary, as is inherent in the term, refers to the human's ability to imagine, "the capacity to see in a thing what it is not, to see it other than it is" (Castoriadis, 1987, In: Strauss, 2006, p. 324). On the other side, it refers to a social imaginary. Castoriadis demarcated the mere capacity to imagine or the imagination from what he referred to as 'the imaginary'. "More specifically, the 'radical imaginary' is this capacity and the 'actual imaginary' is its result in what has been imagined (1987: 388 n. 25). The 'social imaginary' is the actual imaginary of a society (e.g. 1987: 143). In other words, it is a society's imaginings, rather than ideas about society (although it might include that)" (Strauss, 2006, p. 324).

The concept of the 'social imaginary' can be viewed as a form of critique from Castoriadis against traditional thought which often conflated and equated ideology and imaginary. "Traditional thought thus misses the essential feature of the social-historical world, namely that this world is not articulated once and for all but is in each case the creation of the society concerned" (Thompson, 1982, p. 663). The social imaginary is the space in which a certain form of society emerges and, more elementary, "[...] the imaginary is what renders possible any relation of object and image; it is the creation *ex nihilo* of figures and forms, without which there could be no reflection of anything" (Thompson, 1982, p. 664). In addition, Castoriadis has pointed out that the imaginary "[...] is expressed primarily through the medium of symbolism and signification" (Thompson, 1982, p. 665) specifically through language. Moreover, the imaginary in contrast to ideology is unbounded and not limited to a specific system, but rather there are indefinite possibilities. In his discussion of Castoriadis Thompson writes that "[s]ocial imaginary significations necessarily escape from the confines

of a self-enclosed system, comprising a *magma* of meanings that cannot be organized into a logically structured whole” (Thompson, 1982, p. 665).

Despite the innate notion of infinity inherent in musings about the imaginary, Castoriadis did, as mentioned above, speak also of *the* social imaginary, referring to a single imagining of a given society. The social imaginary one is living in or by is difficult to perceive as it fills the mind and initially obstructs the view to something else possible. Castoriadis provides the following example to clarify the notion of social imaginary:

No technical fact has an assignable meaning if it is isolated from the society in which it is produced and none imposes a univocal and ineluctable sense to the human activities that it underlies . . . At a distance of only a few kilometers, in the same jungle, with the same weapons and instruments, two primitive tribes develop social structures and cultures as dissimilar as possible. (Castoriadis, 1987, In: Strauss, 2006, p. 324)

Strauss elaborates that Castoriadis did not limit his conception of the imaginary to the macro-level of society. On the contrary, as a practicing psychoanalyst he acknowledged the existence of individual imaginaries, which, nevertheless, must differ from each other. A social imaginary is shared by many people and therefore has so-to-speak physical and non-physical implementations in the social system: “it is a machine gun, a call to arms, a pay check and high-priced essential goods, a court decision and a prison. [...]’ (1987: 109). This implies that social imaginaries have a concrete location in material objects, institutions, and practices” (Strauss, 2006, p. 325).

3.1.3. Imagined Community (Anderson)

One of the most famous applications of the imaginary stems from the political scientist Benedict Anderson, who adapted it to the theory of the emergence and creation of nations and states. Anderson, who was dissatisfied with existing definitions, defined a nation as “[...] an imagined political community - [...] imagined as both inherently limited and sovereign” (Anderson, 2006 [1983], p. 6). In other words, a nation does not exist due to any pre-given natural constraints, but because the people of a nation imagine the nation, its boundaries, values, rules and members. Anderson states that the nation needs to be imagined “[...] because the members of even the smallest nation will never know most of their fellow-members, meet them, or even hear of them, yet in the minds of each lives the image of their communion” (Anderson, 2006 [1983], p. 6).

3.1.4. Modern Social Imaginaries (Taylor)

The philosopher Charles Taylor has built upon the ideas of earlier thinkers and writers in particular Anderson's *Imagined Communities*. Taylor distinguishes the term 'social imaginary' from 'social theory' as he argues that these two are fundamentally different concepts: "I speak of *imaginary* because I'm talking about the way ordinary people "imagine" their social surroundings, and this is often not expressed in theoretical terms: it is carried in images, stories, and legends" (Taylor, 2002, p. 106). The social imaginary holds and subsumes the values, norms, rules, the possible relations and interactions of a society. Taylor goes on to explain that, despite the fact that social theory and social imaginary stand apart from each other, they are nevertheless related to each in the way that a theory is normally held by a minority of people or even only an individual and that an imaginary is "shared by large groups of people, if not the whole society" (Taylor, 2002, p. 106). Taylor exemplifies his concept with the help of Western modernity and the advent of its associated moral order of society. The moral order prevalent in most of Western society was once merely a vision and a theory, which Taylor traces to Hugo Grotius and John Locke. In the 17th century, Grotius imagined human beings as "[...] rational, sociable agents who are meant to collaborate in peace to their mutual benefit" (Taylor, 2002, p. 92). This, as Taylor explains, is the typical moral order believed to be true by most of modern society. It is a form of social imaginary that includes not only moral codes such as natural rights – nowadays referred to as human rights –, but also prescribes a certain way of living with each other. However, before and during Grotius's era, other versions of moral order prevailed over the imaginaries of society. One was based on "the idea of the *law* of a people a law that has existed "time out of mind"; and which in a sense defines a group as a people" (Taylor, 2002, p. 94). The second version is "organized around a notion of a hierarchy in society that expresses and corresponds to a hierarchy in the cosmos" (Taylor, 2002, p. 94). People believed that there was pre-given, natural structure to which society and nature had to adhere in order to maintain harmony. People believed that "[...] disorders in the human realm will resonate in nature, because the very order of things is threatened. (Taylor, 2002, p. 94). Such a hierarchy of society was, for example, sustained in the Medieval in which society was divided into three tiers: "*oratores, bellatores, and laboratores* – those who pray, those who fight, and those who work" (Taylor, 2002, p. 95). However, the old moral orders were slowly surpassed by new ideas and "what start off as theories held by a few people [...] came] to infiltrate the social imaginary, first that of elites, perhaps, and then of society as a whole. This is what happened, *grosso modo*, to the theories of Grotius and Locke, although the transformations have been many along the way, and the ultimate forms are rather varied" (Taylor, 2002, p. 104).

The social imaginary for Taylor is a broad understanding of the social world we live in and how it is structured. It is

[...] the ways in which people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations. [...] Our social imaginary at any given time is complex. It incorporates a sense of the normal expectations that we have of one another, the kind of common understanding which enables us to carry out the collective practices that make up our social life. This incorporates some sense of how we all fit together in carrying out the common practice. This understanding is both factual and “normative”; that is, we have a sense of how things usually go, but this is interwoven with an idea of how they ought to go, of what missteps would invalidate the practice (Taylor, 2002, p. 106)

In contrast to Castoriadis understanding, Taylor’s conception of social imaginaries corresponds already closely to the conception of ‘imaginaries’ in this thesis as it incorporates the dimension of mutual social existence in a community based on moral order and modern human rights. It is this dimension that will become important in the analysis of the imaginaries in DXHR, but needs to first be extended by a technological dimension by which normative values are also manifested.

3.1.5. Technoscientific Imaginaries (Marcus)

“Technoscientific Imaginaries” is the title used for the second installment of a book series edited by George E. Marcus. This edition is a collection of essays dedicated to the analysis of changing ways in science, especially technoscience. In the introduction Marcus states why the term ‘imaginary’ has been employed for this edition: “I think this might have been because of immediate associations of scientific practice with the “visual,” or “imaging,” on one hand, and with visionary, innovative, imagination, on the other – an orientation to imagining futures and the fantastic” (Marcus, 1995, p. 3). In the process of change, visualization technologies play a major role as more and more scientific fields particularly in the Western world rely on such technologies. Nevertheless, technologies per se are not exclusively the reason for shifting patterns of scientific practices. Other stimulators might be political change such as the end of the cold war, or new market- or economy-driven perspectives of science. However, as fitting as the term ‘imaginary’ might be, the Lacanian sense of the imaginary is not directly referred to. What interested Marcus and the contributors to the volume more was how scientists more or less actively construct their field in the face of new challenges. “[Scientists] are constantly trying to understand the present by borrowing from a cautiously imagined emergent future, filled with volatility, and uncertainty,

but in which faith in practices of technoscience become even more complexly and interestingly constructed in new locations of doing science” (Marcus, 1995, p. 4).

An example for the application of the concept ‘technoscientific imaginary’ can be found in the article by Kim and Mike Fortun, who have conducted a study on U.S. Toxicology to analyze the notion of ‘civic science’ which they understand as a “product of an “imaginary”” (Fortun & Fortun, 2005, p. 44). The concept of ‘civic science’ denotes those practices of (toxicological) scientists that are geared towards the service of the public good, rather than the progress and advancement of science in general. The latter is not necessarily excluded by the former and it does not exigently entail a fundamentally different way of doing science, but “civic science” “[...] is something that scientists think about and pursue through practical projects” (Fortun & Fortun, 2005, p. 44). Fortun and Fortun utilize the imaginary, leaning particularly on the concept of technoscientific imaginaries used by Marcus to better grasp the process of subject formation in the sciences and that “civic science” is but one of a multitude of conceivable possibilities that may structure the practices of scientists.

The study of imaginaries has allowed us to examine how large-scale change happens and is understood at the local level. Focusing on imaginaries is a way to study the forces constitutive of subjectivity and how subjects negotiate those forces. And it is also a way to study how people shape and are shaped by complex technical, social, and political-economic systems (Fortun & Fortun, 2005, p. 44)

3.1.6. Sociotechnical Imaginaries (Jasanoff)

One of the most recent re-workings of the concept of the imaginary stems from the STS scholar Sheila Jasanoff and Sang-Hyun Kim. In the 2009 article *Containing the Atom*, Jasanoff and Kim have proposed the study of *sociotechnical imaginaries* to account for undertheorized aspects of technological research and society, specifically in relation to nation-building. They provide a concise definition of sociotechnical imaginaries, which are “collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects” (Jasanoff & Kim, 2009, p. 120). They argue that sociotechnical imaginaries fill the space between national policy agendas and master narratives and that “imaginaries operate [...] in the understudied regions between imagination and action, between discourse and decision, and between inchoate public opinion and instrumental state policy” (Jasanoff & Kim, 2009, p. 123).

They ground their concept in the works spanning Castoriadis, Anderson and Taylor, but also acknowledge that more and more scholars recognize the centrality of imagination in the constitution of social and political life.

The image, the imagined, the imaginary – these are all terms that direct us to something critical and new in global cultural processes: *the imagination as a social practice*. No longer mere fantasy (opium for the masses whose real work is elsewhere), no longer simple escape (from a world defined principally by more concrete purposes and structures), no longer elite pastime (thus not relevant to the lives of ordinary people), and no longer mere contemplation (irrelevant for new forms of desire and subjectivity), the imagination has become an organized field of social practices, a form of work (in the sense of both labor and culturally organized practice), and a form of negotiation between sites of agency (individuals) and globally defined fields of possibility. This unleashing of the imagination links the play of pastiche (in some settings) to the terror and coercion of states and their competitors. The imagination is now central to all forms of agency, is itself a social fact, and is the key component of the new global order. (Appadurai, 1996, p. 31)

Similar to Appadurai, Jasanoff and Kim argue that imagination is a key component in the creation and maintenance of a social order. However, at this point they extend their understanding of imaginaries by adding technology to the equation. Imaginaries not only hold collective imaginings of social life, but also include “promises, visions and practices of future possibilities [...] embedded in the social organization and practices of science and technology” (Jasanoff & Kim, 2009, p. 122). It is a practice particularly obvious in emerging fields of science and technology such as robotics, genetics or artificial intelligence, in which scientists “are literally producing the future” (Fujimura, 2003, p. 176). However, as Jasanoff and Kim state, the future projections of science and technology are not created solely by scientists isolated from the rest of society, but rather specific social understandings are innate to such technoscientific imaginaries as was visible in the discussion of Fortun and Fortun’s article about U.S. Toxicology and civic science (Fortun & Fortun, 2005).

[Imaginaries] are almost always imbued with implicit understandings of what is good or desirable in the social world writ large [...] In that sense, technoscientific imaginaries are simultaneously also “social imaginaries,” encoding collective visions of the good society. [...] they articulate feasible futures. Conversely, imaginaries also warn against risks or hazards that might accompany innovation if it is pushed too hard or too fast (Jasanoff & Kim, 2009, pp. 122–123).

In *Containing the Atom*, Jasanoff and Kim comparatively study the research & development agenda of nuclear power of South Korea and the USA to filter and display the implicit sociotechnical imaginaries of these nations. They have shown that since the detonation of the first atomic bomb at the end of the Second World War, the two nations have distinctly framed this technology towards the benefit of the public good in different ways. This has culminated in the USA to an imaginary that Jasanoff et al. subsume under the header “atoms for peace” and in the South Korea “atoms for national development”. Jasanoff and Kim’s

concept allows for understanding anticipated technoscientific progress and for this reason it is used as the central theoretical concept. Analogous to the approach taken by Jasanoff and Kim by analyzing policy documents, DXHR is seen as the text which contains the sociotechnical imaginaries. In consequence, the analysis of the game does not merely seek to identify the sociotechnical imaginaries in place, but moreover aims to uncover by which strategic techniques the developers have constructed and contained the imaginaries in DXHR.

3.2. Building Blocks of a Sociotechnical Imaginary

An imaginary is something implicit to a text and unleashes its full potential by working in the background. Other phenomena / concepts are situated more at the visible surface and can be more easily identified. Such concepts work towards the formation and undergirding of the sociotechnical imaginary and some of these concepts will be discussed in the following sections for clarification and, furthermore, will also be an object of inquiry in the analytical section.

For the purpose of analyzing the sociotechnical imaginary underlying the digital game under consideration, I have divided these concepts into three tiers that, in conjunction, help build and form a convincing sociotechnical imaginary. The first tier of the sociotechnical imaginary of human enhancement technologies is *narrative*, the second *diegetic prototypes* and the third *scientificity*.

3.2.1. A Convincing Narrative

A well-constructed narrative is a vital component of a persuasive sociotechnical imaginary and, thus, an investigation of the narrative of DXHR is indispensable in order to answer how human enhancement technologies and augmented bodies are depicted in this game. For this reason, a brief look at the nature of 'narrative' is necessary.

'Narrative' is not necessarily something that is restricted to writing alone. In fact, scholars, such as the narratologist Monika Fludernik, have ascertained that 'narrative' is a crucial cognitive aid that not only supports the process of memorizing and recalling events, but also provides for order through causality in the face of an eternal stream of complexities. For this reason, Fludernik refers to 'narrative' as "a fundamental epistemological structure" (Fludernik, 2009, p. 2). However, despite the apparent all-pervasiveness, the term 'narrative' has experienced a significant extension regarding its usage.

One says 'narrative' instead of 'explanation' or 'argumentation' (because it is more tentative); one prefers 'narrative' to 'theory,' 'hypothesis,' or 'evidence' (because it is less scientific); one speaks of a 'narrative' rather than 'ideology' (because it is less judgmental); one substitutes 'narrative' for 'message' (because it is more indeterminate) (Ryan, 2007, p. 22).

In a traditional narratological sense, a narrative is one of the four elementary types of text – argumentation, description, exposition, narrative – whose distinct features are its causality, its “chrono-logic” (Chatman, 1990, p. 9), and the presence of a narrator figure (Fludernik, 2009). However, the last distinguishing criterion precludes many forms of media from being defined as 'narrative'. To put it in a nutshell, merely prose writing, especially the form of the novel, fits such a restrictive definition of narrative, which is the reason why scholars such as Marie-Laure Ryan have sought a more inclusive definition for narrative and extend its realm of application. Ryan has proposed the instantiation of a 'transmedial narratology' that goes beyond the conventional “language-based, or rather, speech-act approach to narrative” (Ryan, 2005, p. 2). She points to the fact that the traditional formula of story-plus-narrator excludes media without an overt narrator and that the figure of the narrator is inherently biased towards retrospectivity, i.e. re-telling past stories. This effectively expels, for example, drama from being classified as narrative due to the fact that events happen in the present. In her article, Ryan suggests the following broader definition of narrative:

1. Narrative involves the construction of the mental image of a world populated with individuated agents (characters) and objects (spatial dimension).
2. This world must undergo not fully predictable changes of state that are caused by non-habitual physical events: either accidents (happenings) or deliberate actions by intelligent agents (temporal dimension).
3. In addition to being linked to physical states by causal relations, the physical events must be associated with mental states and events (goals, plans, emotions). This network of connections gives events coherence, motivation, closure, and intelligibility and turns them into a plot (logical, mental and formal dimension). (Ryan, 2005, p. 4)

By means of such a definition, the inclusion of videogames into the realm of the narrative becomes possible. Videogames as interactive media are an interesting object of study from a narratological perspective as they include features that no other medium exhibits – in particular 'interactivity' and 'immersion'.

Ryan differentiates between two main forms of this medium namely the *narrative game* and the *playable story*. In the former one, “narrative meaning is subordinated to the player's actions” (Ryan, 2009, p. 45); in the latter “the play's actions are subordinated to narrative meaning. Or, to put it differently, in a narrative game, story is meant to enhance gameplay, while in a playable story, gameplay is meant to produce a story” (Ryan, 2009, p. 45). In the context of this thesis the notion of *playable story* is not relevant as this refers to a form of

play that is marked by creativity and spontaneity, such as is apparent in a game like *The Sims* in which “the purpose of the player is not to beat the game, but to observe the evolution of the storyworld” (Ryan, 2009, p. 46).

Narrative games maintain their focus on physical action as a means to engage with the virtual environment, but are augmented by narrative which refers to “semiotic transactions”. It is “the interpersonal, language-based kind [of action that] is the glue that ties together the physical actions” (Ryan, 2009, p. 47). Unfortunately, direct linguistic interaction as in real-life is not yet possible in videogames which would require a sophisticated, Turing-approved artificial intelligence, but “[m]any computer games [...] allow the player to dialogue with the characters by selecting an item from a list of canned utterances” (Ryan, 2009, p. 49). With DXHR we find ourselves situated in the realm of a narrative game. The gameplay is infused in a predefined story which must be fulfilled no matter which path is taken by the player. Although the game offers the player a certain freedom, the choices that can be taken are clearly limited and railed towards a common end.

What some videogames such as DXHR allow players to do is to reflect or even make direct choices on ethical issues embedded in the game. Rowan Tulloch has discussed the centrality of ethics in games such as *Bioshock* (2K Games, 2007) and claims that “many video games take on a pedagogic relationship to the player” (Tulloch, 2009) in respect to implicit and explicit ethical issues. He situates *Bioshock* in the literary tradition of dystopian, postmodern fiction. “Dystopias have long been read as embodying the cultural anxieties and fears of the time period of their writing/making” (Tulloch, 2009) and famous literary examples include *Nineteen-Eighty-Four* by George Orwell, *Brave New World* by Aldous Huxley, and *Fahrenheit 451* by Ray Bradbury. A plethora of videogames fit this category as well noticeably the *Bioshock* series (2007-2013) and the *Deus Ex* trilogy (2000-2011). However, in contrast to “[...] traditional dystopia, there is an additional facet [...] that must be acknowledged in any exploration: its ludic (i.e. play) dimension” (Tulloch, 2009). However, as Karen Schrier explains a “few frameworks have indicated the potential of an intersection of games and ethics [...], yet only a few studies have empirically investigated ethical thinking in games” (Schrier, 2012, p. 375) and more work must be done on this subject.

3.2.2. Making Prototypes Tangible

In relation to the research questions and the research object of this thesis, another concept becomes important and forms the second tier of the tripartite construction suggested here. Videogames in general and *Deus Ex: Human Revolution* in particular are not in any way ‘pure’ and clean descriptions of science and technology, but very often are renditions of

extrapolations of ideas, fear or anxieties of science and technology. The human enhancement technologies in *DXHR* do not adhere to any real-world model, because they do not exist in this specific form yet. In other words, the computer generated models of human enhancement technologies such as the *Cybernetic Arm Prosthesis* can be viewed as being prototypes.

In the audiovisual realm of the cinema, David Kirby calls such fictional depictions of technologies 'diegetic prototypes'. Kirby provides the example of an artificial heart which appeared in the movie *Threshold* from the year 1981. Nowadays, transplantations of artificial organs are relatively common; however, at the time of the movie the notion of a technological device being implanted into the human body was controversial. The movie, however, allowed for the portrayal and framing of an artificial heart as the only viable solution to a health problem. No controversy was voiced and furthermore, the technological device was depicted as fully functional and safe in the fictional world.

According to Kirby's definition diegetic prototypes are "cinematic depictions of future technologies [...] that demonstrate to large public audiences a technology's need, benevolence and viability." (Kirby, 2010, p. 43) and are founded upon the effect of 'virtual witnessing' (Shapin & Schaffer, 1985). Kirby argues that technologies such as artificial hearts and pacemakers produced a lot of commotion prior to their introduction and were by far not welcomed with open arms by the wider public. For that reason scientists deliberately took a step towards the film industry. In the case of the artificial heart, it was the inventor, Robert Jarvik, who helped the filmmakers to create a suitable narrative for the specific purpose of 'popularizing this technology. Kirby explains: "In order to overcome public anxiety about the implantation of a permanent artificial heart in humans, scientists had to establish: (1) the *necessity* of this technology; (2) the *normalcy* of a person who receives an artificial heart and (3) the heart's *viability*." (Kirby, 2010, p. 42). By doing so, filmmakers and science consultants instantiated a 'diegetic prototype' and thus are "contextualizing technologies within the social sphere" (Kirby, 2010, p. 43). Kirby's hypothesis is that through diegetic prototypes, i.e. the cinematic portrayal of emerging technologies, not only a possible technology or an idea of a technology is presented to a large audience, but also societal impediment can be reduced and perhaps even subverted and reversed.

[t]he presentation of science within the cinematic framework can convince audiences of the validity of ideas and create public excitement about nascent technologies. Fiction's lack of constraints and film-makers' creative assistance provides an open, 'free' space to put forward speculative conceptualizations; it also embeds these speculations within a narrative that treats these ideas as already actualized within a social context. (Kirby, 2010, p. 66)

Potentially, as has been mentioned above, the audience of such scientific and technological representations includes scientists. Kirby highlights that “[...] it should be evident that fictional media can have an impact on science, given that previous studies of scientific activity reveal the powerful role images and representation have played in scientific practice” (Kirby, 2003, p. 232). Representations, thus, play a fundamental role in the formation of scientific facts.

3.2.3. Forming Scientificity

Creating a narrative and diegetic prototypes is one part of making sociotechnical imaginaries substantial. In order to make sociotechnical imaginaries relevant and believable, an audience needs to be convinced of their adherence to scientific principles and method. This can be well exemplified on the case of the famous 17th century scientist Robert Boyle and his invention, the air-pump. In their seminal work *Leviathan and the Air-Pump*, Steven Shapin and Simon Schaffer describe in what ways Boyle has disseminated his findings about the air-pump in order to acquire support from a wider community and gather more allies for his research. Shapin and Schaffer have identified three methods that Boyle has employed to distribute and show his experiments which included live performances at the Royal Society of London as well as distant replication of experiments through others by means of detailed instructions. The third way, as Shapin and Schaffer describe, was by ‘virtual witnessing’

The technology of virtual witnessing involves the production in a *reader's* mind of such an image of an experimental scene as obviates the necessity for either direct witness or replication. Through virtual witnessing the multiplication of witnesses could be, in principle, unlimited (Shapin & Schaffer, 1985, p. 60).

To achieve the effect of virtual witnessing, Boyle had to rethink not only the standards of experimental essays and scientific texts, but to some extent also of visual engravings. What makes Boyle’s experimental delineations particular is their exuberant length, for which Boyle even included apologies. Nevertheless, he deemed the prolixity of his texts as inevitable due to the amount of circumstantial detail that he included. “The provision of circumstantial details was a way of assuring readers that real experiments had yielded the findings stipulated” (Shapin & Schaffer, 1985, p. 64). Moreover, besides this diegetic device of creating an image in the reader’s mind, Boyle also employed mimetic devices to supplement the experimental essay. He dedicated effort to the creation of expensive visual depictions, which were not “schematized line drawing[s] but an attempt at detailed naturalistic representation[s] complete with the conventions of shadowing and cut-away sections of the

parts” (Shapin & Schaffer, 1985, p. 61). All of these efforts that Boyle had undertaken were directed at demonstrating to the reader of the truth content of the experiments done as delineated and, furthermore, “they allayed distrust and facilitated virtual witnessing” (Shapin & Schaffer, 1985, p. 62). Interestingly, although Boyle was of course not able to include all circumstantial details that emerged during the experiments because this would go beyond the scope of his texts, he did consider it necessary to “offer readers circumstantial accounts of *failed* experiments” (Shapin & Schaffer, 1985, p. 64) and also of negative contingencies such as “the fact that air-pumps sometimes did not work properly or that they often leaked” (Shapin & Schaffer, 1985, p. 64).

This performed two functions: first, it allayed anxieties in those neophyte experimentalists whose expectations of success were not immediately fulfilled; second, it assured the reader that the relator was not willfully suppressing inconvenient evidence, that he was in fact being faithful to reality. Complex and circumstantial accounts were to be taken as undistorted mirrors of complex experimental outcomes. (Shapin & Schaffer, 1985, p. 64)

Although Boyle’s prolix experimental essays fall in the category of ‘scientificity’, they are a special case in which a scientist was able to enhance the scientific verisimilitude of the scientific description of his experiments by thorough narration and accurate mimetic representations. The prototypical examples of ‘scientificity’ would rather include non-scientific fields which can draw a benefit by increasing the scientific validity of their output. One such field is cinema.

In *Lab Coats in Hollywood*, David Kirby has written extensively about the presence and usage of science consultants in major Blockbuster movies. Since “the rise of the blockbuster “spectacle” film in the 1980s and 1990s [that] resulted in a renewed emphasis on film realism” (Kirby, 2011, p. 28), it has been a burgeoning phenomenon that filmmakers reel in the help of scientists. There is a cross-benefit to be found for both parties involved. For scientists, cinema is “an ideal technology for transforming phenomena that were invisible to the naked eye into spectacular visions” (Kirby, 2011, p. 26) and thus cinema became a virtual witnessing technology par excellence. It could demonstrate scientific findings to an audience of a size that was unprecedented. For filmmakers augmenting their fictional products with scientificity allowed them to claim legitimacy and “enhanced their ability to draw in audiences” (Kirby, 2011, p. 27).

As Kirby states employing science consultants does not necessarily entail discarding all degrees of artistic freedom on the side of the filmmakers. At the end of the day it is the filmmakers who decide over what is shown on screen and what not. And so it has come to scientific inaccuracies in movies such as *Jurassic Park* (1993). “Based on what we know from the fossil record the representation of *Dilophosaurus* in *Jurassic Park* was completely

inaccurate. It was too small, had a neck frill, and there is no evidence that the species could spit venom” (Kirby, 2011, p. 230). However, this does not impart the reality effect it has on the lay audience which has led to advantageous side-effects in the past. In his work, Kirby has shown that scientists have used the possibility to consult on a film to educate the public about science, what is possible and what not. Moreover, fictional films can popularize and encourage the work of scientists in a field: raising awareness about a certain line of work (e.g. the menace of asteroid collisions), promotional activity such as raising funds, or even the recruiting of young scientists can be possible benefits. Besides communicating scientific knowledge to lay-audiences, fictional movies can also function as an alternative communication route between specialists. In this way there is “the possibility that such films can shape scientific knowledge itself” (Kirby, 2003, p. 246). This effect is achieved in particular through the visualization of scientific concepts in the films. It is known that visualization eases the communication of ideas and concepts in inter-specialist communication as for example “[...] computer-generated animation models have long been routine equipment in seismology, molecular biology, and astronomy” (Kirby, 2003, p. 249). The visualization capacity of science fiction films, as one consultant for the movie *2001: A Space Odyssey* describes, makes it easier to clarify implications of scientific work as for example the risks and possibilities of artificial intelligence (see Kirby, 2003, p. 249). Lastly, fictional films can function as speculative spaces: fictive ideas shown in a film can be inspiring to real scientific practice. So, for example, “many of the scientific ideas used in the film [*Woman in the Moon* from 1929] have come to pass” (Kirby, 2003, p. 251).

As mentioned above, the science shown in fictional products does not need to be rigidly accurate, neither for the filmmakers nor for the audience. The scholars Michal Shapiro and Makan Chock have shown that audiences do not judge a fictional film by its ‘absolute perceptual reality’ but rather by its ‘relative perceptual reality’ which “involves judgments about how realistic images and situations are if those sorts of images were to actually exist or those situations were to actually occur” (Kirby, 2011, p. 33). Similar observations have been made by Martin Barker and Kate Brook’s work on audience reception of the science fiction film *Judge Dredd*. “They interviewed filmgoers about their perceptions of the future world depicted in the film and found that audiences make judgments about what is plausible within the film’s world, not about what seems “real” when compared to our own world” (Kirby, 2011, p. 33).

Nevertheless, cinema’s potential to blur the boundaries between the real and the fictional should not be underestimated. “Popular cinema is particularly effective as a virtual witnessing technology because the intent of its construction is to blur the distinction between virtual witnessing and direct witnessing” (Kirby, 2011, p. 26). This cinematic intention to mimic reality as close as possible may lead to a discrepancy between reality and fiction.

Nowadays “[...] film images have become so perceptually realistic that audiences are unable to determine whether filmic images are ‘effects’ or ‘reality’” (Kirby, 2003, p. 239).

Lastly, a film is a restricted medium in the sense that there is only limited screen time available to show certain events and facts. In this way, Kirby explains, the scientific facts shown in movies are usually one-sided and may even be contested views for which no consensus has been formed yet in the scientific community.

Film, in fact, can have a very powerful epistemological impact because of its virtual witnessing capacity. Film has the ability to create an image of the natural world on the screen and, thus, in the audience’s mind; such images include ‘here is what a comet looks like’, ‘here is how dinosaurs communicate’, ‘here is an effective cloning protocol’, etc. When scientists design representations for films it is their conceptions of comets, dinosaurs, cloning protocols, etc., that make it onto the screen. The film, of course, does not imply uncertainty about any of these topics or suggest alternatives. (Kirby, 2003, p. 258)

The same can be safely inferred for videogames. With new innovations in computer-generated imagery (CGI) that allow the creation of realistic, almost natural faces as a recent video done by the Imperial College of London and the gaming developer Activision shows (cf. Heaven, 2013), videogames are increasingly able to blur the lines between the fictional and the real.

From the discussion of the role of science in movies it can be deduced amongst other things that the impact of representations, be they verbal or visual, can be augmented by increasing their *scientificity* or in other words by locating them closer to audiences’ expectation of scientific validity. Thus, in this thesis the term ‘scientificity’ will be used to denote a quality of description and/or depiction of an object or event that adheres to the principles of science and is thorough enough for an audience to be convinced of its verisimilitude and feasibility. This notion is not to be equated with virtual witnessing, but both ‘scientificity’ and ‘virtual witnessing’ benefit from each other.

3.3. Game Studies and the problematic of analyzing games

The following section constitutes the first steps towards the methodology of the analysis of DXHR and should be understood as a pathway from the theoretical framework to the subsequent chapter on methods. Due to the centrality of the field of Game Studies in this thesis, it is essential to cover some of the concepts of the field that are imperative to the analysis of the game under consideration. Inevitably, methodological issues arise in the discussion. Hence, this section is also closely related to the methodology of this thesis.

According to Frans Mäyrä there are two types of analysis to the so-called analytical play. This is on the one side the *structural gameplay analysis* and on the other the *thematic analysis*. “While the first is derived from analytical play by paying special attention to how game rules and interactions with game objects and other players are structured, [... the] thematic analysis highlights the experience of players sensitive to the symbols and messages conveyed by game’s operation as a cultural medium” (Mäyrä, 2008, pp. 165–166). One also speaks of the dialectic of the *core* and the *shell* of a game and ideally both layers of analysis should be attended as the meaning of a game arises from the combination of the two layers. “While the core, or the gameplay layer concerns everything a player can do while playing the game, and also game rules that govern these action, the shell [or representational layer] includes all the semiotic richness modifying, containing and adding significance to that basic interaction” (Mäyrä, 2008, p. 17). Thus, many variables which range from the specificities of the programming code over the quality and texture of the hardware to the attitudes of the player alter the perception and even the realization of a video game.

However, as mentioned above there exists no approved method to analytically playing a video game that can be applied. The researcher has to develop his own appropriate method for analysis driven and inspired by the specific research intention of the project. Nevertheless, various scholars such as Aarseth, Juul or Kücklich have sought to unify approaches to studying video games and have tried to disclose the core essentials of such a study:

The primary objective/meaning of most games, how to play well and win, demands an analytical approach. In order to progress through the learning stages of a game, the player must explore various strategies and experiment with different techniques. [...] While the interpretation of a literary or filmatic work will require certain analytical skills, the game requires analysis practices as performance, with direct feedback from the system. This is a dynamic, real-time hermeneutics that lacks a corresponding structure in film or literature. (Aarseth, 2003, p. 5)

Nonetheless, the literature review has shown that there is a lack of systematic approaches to analyzing video games through analytical play. There are many studies that address the problem of systematic access of the text inherent in a game, but seldom go farther than describing that the “object of analysis [...] is dependent upon the activity of an actual player in order to be accessible for scrutiny” (Iversen, 2012). In other words, many studies simply do not include extensive methodological considerations and, instead, it appears as if games are handled in a similar fashion to literary texts which leads to the assumption that some studies do not investigate some of the crucial layers that constitute the idiosyncratic nature

of games in contrast to literary products. Many studies investigate the representational aspects of a game – the shell – but are short in terms of a consideration of the core, i.e. those elements that structure the play of a specific game. Moreover, methodological reflection on part of the player's contribution is an essential part of analyzing games. While it may be said that a "reader shapes the [literary] text through his/her interpretational work" (Juul, 1999), it is all the more true for games, especially in times where games are becoming more and more complex in terms of player choice and determination of the final outcome.

Even though that the reader's interpretational and the player's contributinal aspects sound alike, there is an inherent difference. Unlike a traditional literary text, the game requires active input from the side of the player and, furthermore, it challenges the player in various ways, thus necessitating him/her to become better at the game (Juul, 1999). In other words, "[s]tudying games, according to Juul, implies interacting with the game rules and exploring the possibilities created by these rules, in addition to studying the graphical codes or the narration that unfolds" (Malliet, 2007). This means that for the analysis of a game, the researcher needs to consider the player as being a major influencing variable which cannot (or should not) be excluded in the investigation. "[P]laying a game implies making active choices another player or researcher would not necessarily make" (Malliet, 2007), which has lead scholars to propose the existence of an 'ideal player'. Attempts are being made to suggest the implementation of a ludological version of the concept of the implied reader. In narratology the notion of the 'implied reader' "designates the image of the recipient that the author had while writing or, more accurately, the author's image of the recipient that is fixed and objectified in the text by specific indexical signs" (Schmid, n.d.). The notion of the 'implied player' as a ludological strategy to fill the methodological gap created by not considering an actual player's influence on the game, is only a partial solution as transduction of the elements of the implied reader into the new medium does not work on every level. While it is true to say that producers have a certain kind of ideal player in terms of sex, age and level of proficiency with game mechanics in mind during the development of a game, it is problematic to ascertain, for example, what kind of indexical signs are fixed and objectified and clearly portend an image of an ideal player envisioned by the producers. "Kücklich claims that there exists no such thing as an ideal player, because it is an essential part of games that players are allowed (and required) to be creative within the framework provided by the game rules" (Malliet, 2007)

Instead of analyzing a game with the help of an implied player, Aarseth has proposed a different approach which involves reflection on part of the researcher. The researcher needs to question him- or herself what type of player s/he is, which will determine the result of the analytical play. Aarseth points to four basic types of player styles proffered by Richard Bartle in 1996:

The four types are *socializers* (the players who play to enjoy the company of other players), *killers* (players who enjoy preying on and harassing other players), *achievers* (players who like to win and triumph) and *explorers* (players who enjoy discovering the game's secrets and hidden mechanics including discovering and exploiting programming errors) (Aarseth, 2003).

While this typology is already quite dated and appears rather too general, Aarseth argues that it may be viewed as a “general model of human behaviour in virtual environments, and one which certainly could be used to classify game scholars as well” (Aarseth, 2003). It is unlikely that one player will fall into only one of the four categories, but rather the idiosyncratic playing style will be a result of a combination of the four. Nevertheless, Aarseth suggests that extensive analysis of a game should be achieved by the researcher through multiple completions of a game whereby the researcher should try to incorporate another one of the four playing styles each time. Nevertheless, the disadvantage of such an approach is that the analysis of even one game may become tedious and time-consuming especially for complex role-playing games that have manifold sub-plot lines and offer the player choices that will trigger different final outcomes.

In the case of *Deus Ex Human Revolution*, for instance, the time needed to complete the game significantly varies according to the particular style that the player chooses. Exploring every corner of the virtual world to collect every possible achievement will take up significantly more time than to merely follow the main plotline without completing any optional side-quests. Furthermore, the gaming experience of *Deus Ex* is structured according to what the developers refer to as the ‘four pillars of gameplay’, which are *Stealth*, *Combat*, *Hacking* and *Social* (Comic-Con, 2011). This basically means that the producers have tried to provide the player with four degrees of freedom to come up with solutions for a problem in the game. So, for example, if the player is required to retrieve a classified object from a police station, one can either choose to enter the building through sneaking in through the air duct on the roof; hacking the security system and enter the station through the sewer entrance; cunningly persuade the officer at the front desk to grant you access; or by using fire power to fight your way through the main entrance and the rest of the building. In essence, this means that in average the playing time of *Deus Ex* lies between 20 to 43 hours, but may be as long as 77 hours in individual cases according to *howlongtobeat.com* (HowLongToBeat.com, 2013).

3.4. Conclusion of Theory Chapter

Before moving on to the methodological section of this thesis, a short, recapitulative conclusion of the theoretical framework shall be offered to the reader. A range of theories have been covered. Their comprehension is critical for the analysis of the sociotechnical imaginary of human enhancement technologies in DXHR. To be exact, the object of analysis is the “collectively imagined [form] of social life and social order reflected in the design and fulfillment [...]” (Jasanoff & Kim, 2009, p. 120) of human enhancement technologies in the fictional world of DXHR. In order to analyze the sociotechnical imaginaries, the individual components need to be detected and investigated. I have suggested that effectiveness of the sociotechnical imaginaries of the digital game under consideration is basically achieved on three tiers, which are the provision of a *convincing narrative*, the construction of *diegetic prototypes*, and the formation of *scientificity*. It has been defined what a narrative is according to traditional narratology and how scholars, such as Ryan, attempt to re-define narrative to accommodate new forms of mediation. Furthermore, the concept of diegetic prototypes which are “cinematic depictions of future technologies [...] that demonstrate to large public audiences a technology’s need, benevolence and viability” (Kirby, 2010, p. 43) has been discussed. Lastly, I have explained what is meant by ‘scientificity’. Basically scientificity denotes that an object – be it a specific technology or a complete digital game - is presented in such a way as to persuade recipients of its adherence to common known scientific principles. The design should exclude obvious logical gaps and shortcomings that might suggest to recipients that this is a work of fiction. It should follow the premises of ‘virtual witnessing’ (Shapin & Schaffer, 1985) and hence include thorough details and perhaps even include faults in order to allay distrust of critics. My theoretical perspectives on the object analysis require a tailored methodological toolset which will be discussed in the following chapter.

4. Methodology

4.1. Research Questions

At the heart of this case study is the investigation of sociotechnical imaginaries underlying one particular game. Moreover, it is the aim to uncover what strategic elements the producers of the game have employed to create the sociotechnical imaginaries. Following the model of Jasanoff & Kim who analyzed nuclear power in the context of two nations, I have focused on one strand of technology namely mechanical human enhancement through prosthetics and implants in the context of a videogame. The question that has led this research is the following:

How are human enhancement technologies and augmented human bodies performed in Deus Ex: Human Revolution (DXHR)?

While it is true that there are specific design goals chosen by the developers to represent the technologies under consideration, the meaning is more than the aesthetic element alone but is “fought for by the author, the text, and the reader” (Harvey, 2009, p. 3). The verb ‘perform’ was chosen to account for the productive interaction between the text and the player and underlines the fact that the game by itself does not reveal the whole picture without the input on the side of the player.

In this way the semantic performance of DXHR compliments the concept of the sociotechnical imaginary: the mutuality of the production of meaning, the cooperative imaginative effort between the game and the player can be described as a constituent in the production of a sociotechnical imaginary.

In order to answer the main research question a number of subquestions are posed and operationalized that help uncover the ‘performance’ of human enhancement technologies.

1. *How are the (1) need, (2) benevolence and (3) viability of the human enhancement technologies as diegetic prototypes demonstrated to the player?*

This question is derived from the second tier of the constitution of sociotechnical imaginaries, namely ‘making prototypes tangible’. I aim to inquire to what extent the human enhancement technologies in DXHR can be referred to as “diegetic prototypes” according to the definition of Kirby (2010).

- *Is the technology presented as a solution to a problem?*
- *Is the technology presented as safe to use?*

- *Can it be abused by “bad guys”?*
- *Is the technology presented as doing good to humans?*
- *Is the technology depicted as fully-functional?*
- *Is the usage of the technology available and possible for everyone?*
- *Are specific forms of social life shown in relation to human enhancement technologies?*

2. *How does the narrative of DXHR influence the depiction and perception of human enhancement technologies?*

This question is related to the first tier of the theory chapter ‘convincing narrative’ and the goal is to investigate the centrality of enhancement technologies in the narrative.

- *Does the narrative hinge on human enhancement technologies?*
- *Is there a distinct opposition shown between non-augmented and augmented human bodies?*

3. *How does the medium – the videogame – influence the perception of the sociotechnical imaginaries of human enhancement technologies?*

This question is derived from the theoretical section on ‘forming scientificity’ and particularly originates from Shapin and Schaffer’s notion of ‘virtual witnessing’.

- *Is interaction between the player and the technologies encouraged?*
- *Can the player modify a given body according to his or her imagination and will?*

4. *How have the producers created an impression of ‘scientificity’ in the game?*

This question is aimed at investigating the extent of scientific validity and is related to the theory in the chapter on ‘forming scientificity’.

- *Have the producers included extensive information about the function and properties of the technologies?*
- *Have the producers used a scientific style for the information, such as referencing and a formal jargon?*

5. *In how far is the player challenged to cognitively engage with the imagined technologies?*

- *Is there a need for the player to actively think about the morality of human enhancement?*
- *Does the player receive any benefits for using or not using enhancement technologies?*

4.2. Research Field

In order to answer the research questions, the research field needs to be staked out prior to analysis. As Jasanoff & Kim (2009) have defined and have shown in their analysis, a sociotechnical imaginary is collectively imagined. In DXHR a variety of agents take part in the instantiation of the imaginary of human enhancement technologies, which I have summarized with the help of an ordered situational map (Clarke, 2003). According to Adele Clarke a “situational map should include all analytically pertinent human and nonhuman, material and symbolic/discursive elements of a particular situation as framed by those in it *and by the analyst*” (Clarke, 2003, p. 561) What will follow below is a list of individual actors, collective actors, gathered data, themes and topics and other elements that have informed the research,. The material necessary for and relating to the analysis has proven itself to be difficult and confusing to handle, chiefly due to the circumstance that the real, the fictional and the virtual are tightly entangled in the case of human enhancement technologies in DXHR. For this reason I have employed Clarke’s situational analysis, an approach to “opening up’ the data” and overcoming or avoid “analytical paralysis” (Clarke, 2003, p. 560), in order to dis-entangle the confusion and bring order to chaos.

Stakeholders (real)

1. **The player**, which in this case is the researcher and author of this thesis, is central to the meaning of the game. Hayles has termed the player a “metaphorical cyborg” (Hayles, 1995) and in his classification of videogames as cybertext (Harvey, 2009, p. 3), Aarseth defined that the meaning of the cybertext is a mutual result between the text and the player. The player steps into a cybernetic feedback loop with the videogame and thus the relationship is reciprocal.
2. **Will Rosellini**: He was involved in the production of DXHR as a scientific advisor. He is a neuroscientist and entrepreneur who co-founded the companies MicroTransponder Inc. and Rosellini Scientific. I found out about him and his role in DXHR through Internet research during the fourth quarter of 2012. He is mentioned in several online magazine articles. Data used in relation to Rosellini is the e-mail interview I have had with him in May 2013 and the entry on the scientific reality of the “Infolink”⁸ which he has published on his personal blog in February 2013. In addition, interview excerpts from the interview panel in San Diego (Comic-Con, 2011) and the DXHR Making of documentary (Eidos Montreal, 2011a) have been used. Rosellini’s ontological status has been open to debate after my presentation of my thesis

⁸ The Infolink is an enhancement technology in DXHR which consists of implants in the cranium and enables wireless verbal communication similar to a cellphone.

topic at the STS department at the University of Vienna. His line of work at the forefront of implantable medical technologies, his responses in my and other interviews, his blog entry and further findings made in DXHR have led to doubts about his reality. This science consultant appeared too good to be true, but no evidence could be found suggesting that Rosellini might be an actor hired by EIDOS to impersonate a neuroscientist to raise the sales figures (for example).

3. **Jonathan Jacques-Belletête:** He is the Art Director of DXHR and mentioned as one of the first in the ending credits of DXHR. I have found out about him at the end of February after completing a playthrough of DXHR. I conducted an E-mail interview with him on the 3rd of July 2013. Furthermore, interview excerpts from the DXHR Making of video have been used as well as two separate interviews that have appeared in the online magazine *Gamasutra* (Nutt, 2011; Remo, 2010)
4. **Mary DeMarle:** She is listed as the Narrative Designer & Lead Writer of DXHR in the ending credits (Eidos Montreal, 2011b). I have attempted to conduct an interview with her, but unfortunately no correspondence could be established. Nevertheless, interview excerpts from the San Diego Comic Con (Comic-Con, 2011) and the DXHR Making of video (Eidos Montreal, 2011a) have been used.

5. **EIDOS Montreal:** The company responsible for development of the game. The company was founded in 2007 and was briefed with the development of a new Deus Ex title (Nutt, 2012). DXHR was a huge success and has sold over 2 million copies after the first six months of its release (Goulter, 2012). A further indication for the success can be found in reviews published by renowned gaming magazines and other evaluative platforms such as *Metacritic*. The online platform *Metacritic* has become quite important concerning scoring of various types of media including videogames (“Metacritic,” n.d.). *Metacritic* calculates a weighted average rating from multiple reviews and publishes the resulting simplified rating as *Metascore* (Metacritic, 2013a), which is nowadays used widely to judge games. Some distribution platforms such as *Steam*, on which DXHR can be bought, include only the *Metascore*. “Metascores range from 0-100, with higher scores indicating better overall reviews” (<http://www.metacritic.com/about-metascores>). It must be pointed out for clarification that Metascores are only based on professional critics reviews. Metacritic offers a separate option for users to rate a product on a scale from 0-10. *Deus Ex: Human Revolution* has achieved a Metascore of 90 based on the reviews of 52 critics, which earns this game ‘universal acclaim’. In addition, 2191 users have rated DXHR

General Meaning of Score	Movies, TV & Music	Games
Universal Acclaim	81 - 100	90 - 100
Generally Favorable Reviews	61 - 80	75 - 89
Mixed or Average Reviews	40 - 60	50 - 74
Generally Unfavorable Reviews	20 - 39	20 - 49
Overwhelming Dislike	0 - 19	0 - 19

Figure 4: Metacritic's metascore scale

which has resulted in a user score of 8.4. An overwhelming majority (1930 users) has reviewed the game positively while only 137 users have rated it negatively (Metacritic, 2013b). Although the scores generally refer to the game as a whole package and not just the narrative, it does give a good indication that the story of DXHR is considered convincing. Another indication is that the game was a huge success for EIDOS Montreal, which has released *The Missing Link* - an optional downloadable mission expansion - and *Deus Ex: The Fall* - a standalone iOS game for the iPhone and iPad. Later in 2013, EIDOS Montreal will release a *Director's Cut* of DXHR which is a remastered version of the game specifically suited for the Nintendo Wii U console (Reiner, 2013). Lastly in 2012 the production

company CBS has announced to produce a movie based upon DXHR with Scott Derrickson as director of the project (Tilly, 2012).

6. **Microtransponder Inc.:** One of the companies founded by Will Rosellini and which develops implants to interface with the human nervous system in order to remedy diseases such as tinnitus or after effects of a stroke seizure. On his blog and at the Comic Con conference, Rosellini has drawn a connection between some of the enhancement technologies in DXHR and the work that is done at MicroTransponder.
7. **Rosellini Scientific:** The second company in which Will Rosellini is involved and which funds research on healthcare technologies to “support patients by preventing diseases, restoring functions and enhancing the quality of life” (Rosellini Scientific, 2013) What raised my interest in this company is the fact that the logo of Rosellini Scientific has a remarkable resemblance to the logo of Sarif Industries.



Stakeholders (fictional)

9. **Adam Jensen:** He is the main protagonist of DXHR and the only playable character of the game. He is the player's test subject for human enhancement technologies and functions as the player's virtual, surrogate body. In DXHR he is the only person whose body does not reject augmentations due to a favorable genetic disposition. Unknowingly, he holds the genetic key to unlocking augmentations for every human being on the planet which is also the reason why David Sarif has employed him in the first place.
10. **David Sarif:** Head and founding father of 'Sarif Industries'. He is the employer of Adam Jensen and is responsible for Jensen's augmentations after he was mortally wounded. Sarif serves as the representative for the proponents of human enhancement.
11. **Hugh Darrow:** The 'father' of human enhancement in the world of DXHR. Although he has more or less single-handedly invented every augmentation, he belongs to a small percentage of people in the world who absolutely cannot receive enhancement surgery. This fact in connection with the belief that his inventions do no good to humanity has made him an opponent of the technology.
12. **William Taggart:** He is the lead figure of the pro-human political group *Humanity Front* which fights for legal regulations and strict limitations of human enhancement technologies.
13. **Augmentations – Human Enhancement Technologies:** An actor in the narrative of the game.

14. **Prosthetics:** The most visible form of human enhancement. Particularly notable are the various cybernetic arm prostheses. Primarily, prosthetics alter the human physique and physical capabilities.
15. **Implants:** The second branch of augmentations, which can take up various forms. These can be chips in the brain to make the mind and reactions quicker or also skin implantations which harden the skin for example.
16. **Black Ops Mercenaries:** These are the three main antagonists in the game consisting of Jaron Namir, Yelena Fedorova and Lawrence Barrett. All three of them exhibit a high amount of enhancement. They are responsible for the attack on Sarif Industries in the beginning of the game whereby Namir fatally wounds Jensen by throwing him through a glass wall and shooting him in the head with a handgun. Jaron Namir is the head of the black ops mercenary trio. Next to Adam Jensen, the mercenaries are the most heavily augmented humans in DXHR.
17. **Sarif Industries:** In DXHR, Sarif Industries is one of the market leading biotechnology firms that researches and produces human enhancement technologies. It plays a major part in the narrative of DXHR and also in the promotional strategy of the game. One of the trailers for DXHR is a testimonial-style advertisement by Sarif Industries.
18. **L.I.M.B. clinic:** Liberty in Mind and Body (LIMB) is the sole, legal retailer of human augmentations in DXHR. The LIMB clinics which exist in every city of the game sell and implant augmentations as well as accessories (such as Praxis Kits, energy bars and ammunition for certain augmentations) to the people.



Figure 5: The augmented body of Namir

Themes

19. **Transhumansim:** This is the underlying moral topic of the game and ideology that denotes the belief in the naturalness of advancing the human being and his abilities beyond biology with the help of technology.
20. **Posthumanism:** this term is often falsely used as a synonym to transhumanism. Actually, it denotes a state of thinking that supersedes the ideas of humanism, which have made humanity the center of biology.
21. **Renaissance:** This period is alluded to at various points. The renaissance forms a comparative back bone to the fictional future setting and the transhuman ideas of the game. It is particularly apparent in the E3 2010 trailer (Square Visual Works, 2010) and the art director explains the choice in various interviews.

22. **Near-future setting:** The game is set in the future, the year 2027 for several reasons. First of all, being a prequel to the original Deus Ex (2000) DXHR had to be set into a time that precedes the year 2052. Second, the genre (Cyberpunk) is marked by a near-future setting. Third, due to the human enhancement technologies a time span had to be chosen that on the one side is distanced enough from the present (i.e. 2011) to make the development of the technologies feasible and on the other side near enough for audiences to still be able to relate to the time and feel intrigued.
23. **Dystopia:** A literary sub-genre the game belongs to. Dystopias such as DXHR often “present bleak accounts of dangerous worlds of corporate domination, technological disaster and totalitarian control” (Tulloch, 2009).
24. **Timeline of possible technological development:** One of the strategies that the developers have employed in order to make the development of the human enhancement technologies comprehensible and credible.
25. **Corporate Control:** One of the main themes of DXHR. Enhancement technology is not only a way to improve human life, but also provides the corporations that manufacture the technology the opportunity to control augmented persons. The game envisions for instance a hidden killswitch that allows for remotely disabling implanted augmentations. Another form of corporate control is presented through the fictional news agency Picus and its news anchor Eliza Cassan. Picus is the leading news agency in DXHR, but is led by the Illuminati. Manipulation of the news and the deception of the public are a consequence of this influence.
26. **Property rights of body:** A minor theme in the game. Chiefly only alluded to at the beginning of the game. During the surgical scene, the Sarif logo appears inside of Jensen’s body which infers that part of his control over his own body is lost during the augmentation process. Also Michael Zelazny (side quest) alludes to this topic by explaining that the private military security group, Belltower, for whom he worked formerly, had unknowingly fitted their augmented soldiers with cerebral implants which allowed Belltower to control the memories of the soldiers.
27. **Tampering with human biology:** The radical group *Purity First* believes that human enhancement through technology is against biology and against the natural order of things.
28. **Self-controlled human evolution:** The human enhancement technologies are effective strategies for mankind to willingly control for the first time the further evolution of the human body and mind without having to wait for the natural progression.
29. **Social divide between Augs and Non-Augs:** One of the main conflicts in the game. Those who are augmented and have become transhuman cyborgs stand in opposition to those people who believe that augmentation is unnatural and unfair. Not everybody has to wish to

augment or the financial resources to become augmented and pay for the life-long dependency on the drug Neuropozyne.

- 30. **What does it mean to be human?:** A topic and underlying question of DXHR, which is especially highlighted during the various ending scenes.
- 31. **Dangerous Knowledge:** not every knowledge should also be discovered or even used. In the novel *Frankenstein* (Shelley, 2006) it was the scientific discovery of giving life to lifeless bodies, for example. In DXHR it is the knowledge to make humans physically and cognitively more powerful through technology.

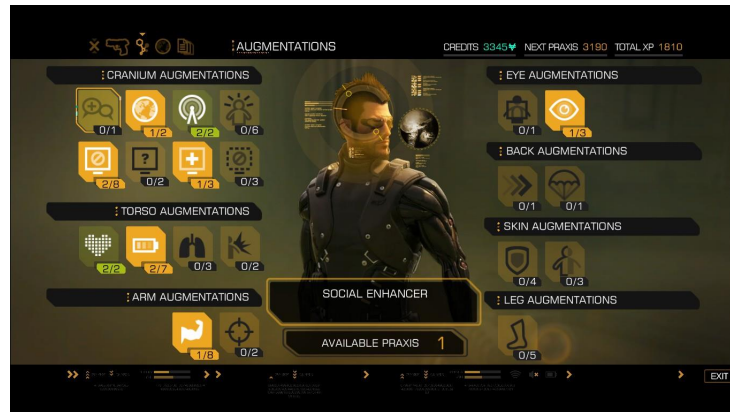
(Cultural) References

- 32. **Greek mythology:** The myth of Daedalus and Icarus plays an important role in the E3 2010 trailer (Square Visual Works, 2010), is mentioned in the game in the form of the repeating appearance of the painting “The Fall of Icarus” (Rubens, 1636) and is referred to in the final conversation with Hugh Darrow who sees himself as Daedalus with his offspring (the human enhancement technologies) spiraling out of control. Furthermore, this Greek myth also links DXHR with the original *Deus Ex* (Ion Storm, 2000), in which two AIs named Daedalus and Icarus played a significant role. Moreover, the final stage of the game is set on a fictional structure built entirely by augmented people named ‘Panchaea’. In Greek mythology *Panchaea* is an island where an utopian society lives (“Panchaea,” n.d.)
- 33. **Similarity of Sarif and Rosellini logo:** Most likely this is an homage to the influence of Will Rosellini in the development of the game. Rosellini was present during the pre-release conference in San Diego but was on the other side not mentioned as scientific advisor in the Credits of the game. (just mentioned under “Special Thanks”)
- 34. **Cyber-Renaissance:** The new genre that was incepted by Jonathan Jacques-Belletête efforts. It is a compound noun created from the terms “cyberpunk” and “renaissance”. It grew out of the effort to instill new life into the dated genre cyberpunk and also implies the comparative link between the ideologies of the age of enlightenment and transhumanism.
- 35. **Use of Colors:** DXHR is distinctively recognizable by the unique color palette that has been used. The two colors dominating the visual impression are black and gold.

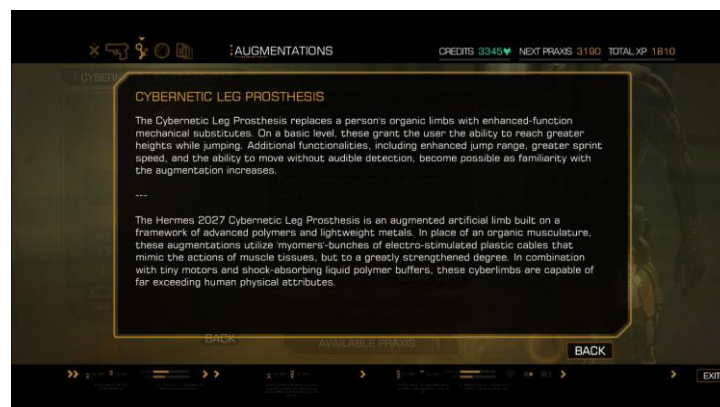
Research material

- 36. **Screenshots:** Source of data that stems from own playthrough in February 2013.
- 37. **Narrative:** An important source of data. The narrative still is somewhat in opposition to the medium videogame.

38. **Augmentation Screen:** A source of data discovered during the playthrough of the game in February 2013. Provides an overview of all the augmentations in Jensen's body and contains the relevant information for the player to make choices about activation and upgrade of augmentations.



39. **More Info section:** A source of data discovered during the playthrough of the game in February 2013. In contrast to the augmentation screen, the more info section contains optional information which is not relevant for gameplay. It provides descriptions and explanations for the augmentations.



40. **eBooks:** A source of data discovered during the playthrough of the game in February 2013. The eBooks are optional elements in the game and there exist four categories: (1) books that contain optional story elements; (2) books that contain passcodes for loot or doors; (3) the Hugh-Darrow-books which contain historical background information on human enhancement technologies; (4) leisure books (such as fiction writing). Only the discovery of the Hugh Darrow books (3) bring a direct gratification for the player in the form of xp points. Books containing passcodes offer indirect reward, but require the finding of the corresponding lock.

41. **Trailer: Sarif Infomercial:** The Sarif trailer is a live-action trailer meaning that real-life actors have been used to produce this short movie. It is an advertisement for the human

enhancement products of Sarif Industries and features three separate testimonials of satisfied customers whose life has been improved through human enhancement. At the end of the video is a reference to the company's website www.sarifindustries.com. (Eidos Montreal, 2011c)

42. **Trailer: Purity First:** The second live-action trailer is a propaganda style video of the anti-augmentation group *Purity First* and explains to the audience that human enhancement corrupts humanity. It too employs real (not CGI) actors who exhibit disturbing side-effects of augmentation. (Eidos Montreal, 2011d)
43. **Trailer: E3 2010 CGI:** The third trailer that is used as data is a 3 minute computer generated imagery (CGI) movie that introduces the audience to the world of DXHR and its main themes. (Square Visual Works, 2010)
44. **Website: sarifindustries.com:** The website is part of the promotional activity of DXHR and works in conjunction with the two live-action trailers. The viewers can explore the technologies marketed by Sarif Industries and also discover links to real life science: present and past developments of human enhancement. (Eidos Montreal, 2011e)
45. **Interview panel Comic-Con 2011 San Diego, CA:** The pre-release conference is a public interview session with Mary DeMarle and Will Rosellini. This interview panel is highly interesting for this thesis because the central topic is the human enhancement technologies in the game. (Comic-Con, 2011)
46. **Interviews: Making Of video:** This video is a conglomeration of interviews conducted with various members of the development team of DXHR. Particularly the excerpts involving Jacques-Belletête, DeMarle and Rosellini are highly relevant for this case study. (Eidos Montreal, 2011a)
47. **Expert interview: Rosellini:** On May 16, 2013 I have contacted Rosellini through the social media service *LinkedIn* and requested an interview. An interview was granted on the following day, however, not via Skype but through e-mail. A questionnaire consisting of 10 semi-open questions has been sent on May 18. Rosellini has returned the filled out questionnaire on May 21. Furthermore, Rosellini was willing to help establish contact with Mary DeMarle, but the attempt, alas, was in vain.
48. **Expert Interview: Jacques-Belletête:** On July 3 I have contacted the marketing department of EIDOS Montreal requesting an interview with Mary DeMarle and Jonathan Jacques-Belletête. The request for an interview via phone or Skype was rejected due to time constraints on the side of EIDOS. Similar to the Rosellini interview, I sent a questionnaire consisting of 12 semi-open questions on May 22, 2013. The filled out questionnaire was returned on July 15.

49. **Interview: Gamasutra Jacques-Belletête 1:** The first *Gamasutra* interview was done by Chris Remo in 2010 and is entitled “Past and Future Tension: The Visual Design of *Deus Ex: Human Revolution*”. It was recovered on April 23, 2013. (Remo, 2010)
50. **Interview: Gamasutra Jacques-Belletête 2:** The second interview is entitled “A Cyber-Renaissance in Art Direction” and was conducted by Christian Nutt in 2011. It was recovered on April 23, 2013. (Nutt, 2011)
51. **Policy Doc: NBIC report:** The National Science Fund report on “Converging Technologies for Improving Human Performance. Nanotechnology, Biotechnology, Information Technology and Cognitive Science” was done in 2003. The extensive document delineates on nearly 500 pages various suggestions and attempts of ameliorating the human being's physical and cognitive abilities through science and technology. I have added this document to my library in September 2012 when I was doing literature research on an earlier version of this thesis. (Roco & Bainbridge, 2003)
52. **Policy Doc: Converging Technologies European Commission:** Related to the NBIC report by the American science fund, the European Commission debriefed a high level expert group to foresight the implementation of converging technologies in an European Knowledge society. Added to research data in May 2013. (European Parliament, 2009)

The above list is quite extensive, but its' production aided me in the process of identifying important elements of this thesis and determining the eventual research design of the analysis. Furthermore, instead of a conventional glossary I found it valuable to add this list here for the reader to facilitate comprehension of some elements and give an overview over other data that was not considered as deeply as desired due to the tight scope and formal limits of the thesis.

4.3. Data Collection

A toolbox of methods is used to analyze the research questions as stated above. For that purpose not only STS-related methods are employed, but also methods akin to game studies. However, the literature search of game studies methods has shown that “there is no single methodology organizing work done within game studies; rather, every researcher needs to construct their own toolbox of methods to suit their particular approach” (Mäyrä, 2008, p. 156). This is due to game studies being an interdisciplinary field which includes both “distinctly humanities and social sciences-related approaches” (Mäyrä, 2008, p. 156). Nevertheless, according to Espen Aarseth there are three different ways to study a video game:

Firstly, we can study the design, rules and mechanics of the game, insofar as these are available to us, e.g. by talking to the developers of the game. Secondly, we can observe others play, or read their reports and reviews, and hope that their knowledge is representative and their play competent. Thirdly, we can play the game ourselves (Aarseth, 2003, p. 3)

Aarseth argues that a serious analytic appreciation of the video game, i.e. the object of inquiry, can only be attained through analytical play. The researcher has to play the games himself in order to understand the game. This implies that the third way to analyze games is the most important and cannot be substituted through analysis of merely external resources such as interviews with the developers or reading reviews by other players. To a certain extent, this thesis entails a combination of all three ways to analyze the game whereby the game under consideration is played in an explorative fashion as will be detailed in the upcoming section.

The STS-related methods that are employed encompass situational analysis (Clarke, 2003), auto-ethnography (Ellis, Adams, & Bochner, 2010), online asynchronous interviews (Bampton & Cowton, 2002; Meho, 2006) and discourse analysis (Ruiz, 2009).

4.3.1. Data-Gathering by Playing the Game

DXHR is an action role-playing game that allows the player certain freedom in terms of personal playing style. In contrast to the recommendation of Aarseth (Aarseth, 2003), no multiple playthroughs of *DXHR* were conducted. This means that not all possible outcomes could be achieved. Nevertheless, the game is designed in such a way as to allow for a relative adaptive playing style in relation to the four pillars of gameplay. Together with the option of game saves it was possible to test a variety of 'solutions' for problems and thus experience all modes of gameplay – stealth, assault, social, and hacking - so-to-speak. Scenarios were reloaded to experience the various options available in 'choice conversations'. Screenshots were taken of these conversations in which the player has the option to choose a response and determine the moral slant of Adam Jensen. Through this approach, it is possible to hear the different responses, but ultimately one response is required to be chosen to progress in the game. In addition, an explorative style of play (Aarseth, 2003) has been used which entails the completion of all optional side-quests and the extensive exploration of the virtual environments to uncover the details that the designers of *Deus Ex: Human Revolution* have included about human enhancement. This completionist approach to gameplay was time intensive and took about 45 hours to complete the game.

Prior to playing the game, an approach similar to Adele Clarke's 'situational maps' (Clarke, 2003) has been done. I have identified and collected questions that I have deemed important at that point of time and level of knowledge about the game. In the next step, I have divided and allocated this messy accumulation of questions into three major categories which overlap and intersect necessarily: questions pertaining to the 'narrative'; to the 'technology'; and to the 'player'. Thus, I was able to identify the most important questions

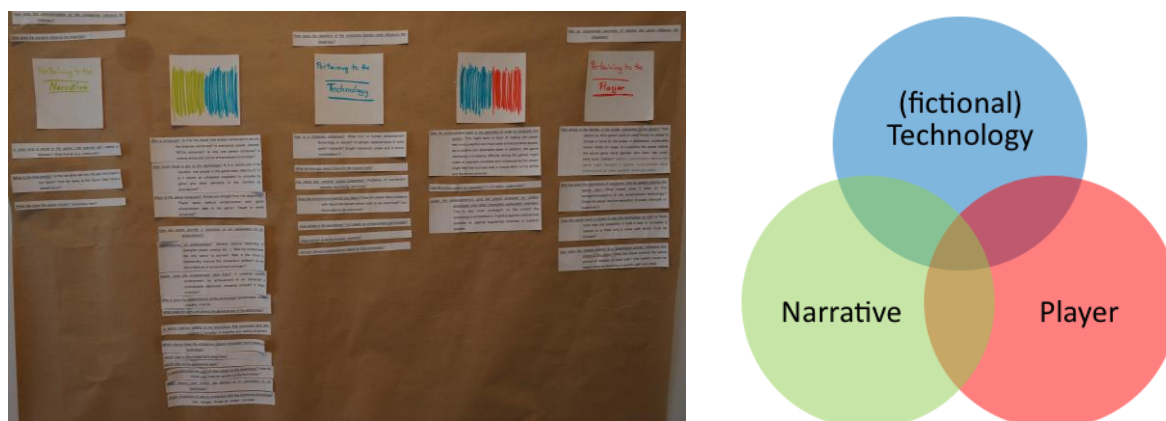


Figure 6: Ordered map of questions & the three major overlapping categories of observation criteria

and created observation criteria that should help me search for the relevant elements in the game. Particularly important is the category 'fictional technology', which includes general questions such as 'what technology is visible?', but also 'are there any medical issues presented?' and 'do the enhancements exhibit any flaws?'. The other categories and intersecting sections are, of course, important as well and should support an exhaustive gathering of data. The goal is to arrive at an analysis of the human enhancement technologies in the game with respect to both the shell and the core of the game, as both spheres shape the perception of the technologies on the player. The shell includes the design issues, visual appearance and any cultural references that are utilized to shape the game and the fictional technologies depicted in it. The core is insofar relevant in this analysis, because the player needs to shape the character's augmentations in the course of the game, and vice versa the augmentations shape the way that the player is able to play the game.

4.3.2. Interviews

Besides employing analytic play to acquire data useful for investigating the research questions, interviews with experts have been conducted. With the help of the credits of the game and articles from the internet, I was able to determine who the relevant actors are in

connection to the research interest. In the case of *DXHR*, the most relevant persons are Will Rosellini, a neuroscientist who acted as scientific advisor to the science and technology incorporated and represented in the game, Jonathan Jacques-Belletête, the art director and Mary DeMarle, the lead narrative author. The relevant persons for my investigation are, unfortunately, too remotely located on the North American continent to conduct an interview in person, but an interview with the help of the software *Skype* was sought. I have contacted the production company of *DXHR*, EIDOS Montreal, via e-mail and, in addition, Will Rosellini through the social media platform 'LinkedIn' and have been able to establish contact with Rosellini and Jacques-Belletête. Despite Rosellini helping me to establish contact, unfortunately DeMarle has not responded to my inquiries and no interview was conducted with her.

Apart from the data gathered from the interviews that I have conducted, there are numerous other sources that I draw upon for the thesis. Due to the success of *DXHR*, there exist interviews which were done for various online magazines such as *Gamasutra* (Nutt, 2011; Remo, 2010) for which the art director Jacques-Belletête has been questioned to the visual appearance and other related design questions of the game. Also, there is the official *Making Of* documentary (Eidos Montreal, 2011a), that was distributed with an 'Augmented Edition', i.e. a limited edition of the game and which includes interviews with DeMarle, Rosellini and Jacques-Belletête. Lastly, there exists a video recording of a pre-release interview panel held at the San Diego Comic-Con in 2011 (Comic-Con, 2011), where DeMarle and Rosellini responded to questions about their involvement in the production of the game.

For my interviews, Will Rosellini and Jonathan Jacques-Belletête have both consented to responding to questions via email rather than *Skype* or telephone, which means that I have conducted two online asynchronous interviews or 'e-interviews' as Roberta Bampton and Christopher Cowton call it (Bampton & Cowton, 2002; Meho, 2006). This form of interview is marked by a temporal distance between the interview partners meaning that "in an e-interview the delay in interaction between researcher and subject can range from seconds (virtually real time) to hours or days" (Bampton & Cowton, 2002). This asynchronicity holds advantages for the interview partners namely that geographically remote situated interviewees can be easily reached (Meho, 2006, p. 1285) and that "busy subjects [...] do not have to identify a mutually convenient time to talk to each other" (Bampton & Cowton, 2002) which was the case for both of my interview partners. In addition, "asynchronicity also enables interviewees to reflect and then supply a considered reply" (Bampton & Cowton, 2002) and could yield interesting results that may not sprout from the spontaneity of face-to-face interviews. All in all I have sent ten questions to Will Rosellini, who responded swiftly.

The correspondence with Rosellini was concluded in the course of four days between the 16th and 20th of May 2013. The correspondence with Jonathan Jacques-Belletête, on the other side, whom I have sent overall 12 questions to answer, evolved over the course of 60 days starting on May, 16th and ending on July, 15th 2013. The reason for this longer period was that Jacques-Belletête was busy during that time, which delayed the interview process. The questions that I have developed for my interview partners have been informed by the interview material that was already available on the internet and I have sought to pose questions which I was not able to answer with the help of the data I already had collected.

4.3.3. Further Discourse Exploration

Finally, to further investigate the sociotechnical imaginary underlying the game, the audio-visual material produced for public presentation is a fruitful source of data as the promotional material presents many main ideas of the game in a condensed, nearly distilled form, and foregrounds other elements implicit in the game and makes them more explicit, such as the connection between the transhumanist future of 2027 and the 16th century Renaissance period. In this regard, three trailers are of particular importance. The first is a trailer presented at the E3 gaming convention in 2010 (Square Visual Works, 2010) (commonly referred to as E3 2010 trailer) which is an elaborate teaser trailer that has been created using computer-generated imagery (CGI). The other two trailers can be termed ‘live-action’ trailers as they rely on actors and are similar to conventional cinematic trailers. These last two, which I will refer to as the ‘Sarif’ (Eidos Montreal, 2011c) and the ‘Purity First’ (Eidos Montreal, 2011d) trailer, have been released in conjunction with a website (Eidos Montreal, 2011e) which is supposed to underscore the ‘make-believe’ reality of the live-action trailers. The trailers are analyzed with the help of discourse analysis. “From a sociological standpoint, *discourse* is defined as any practice by which individuals imbue reality with meaning” (Ruiz, 2009, para. 3) which traditionally comes in the form of verbally produced output, although visual material is certainly also permeated by discourse. The consideration of trailers in a discourse analytical fashion requires the cycling of three steps: *textual analysis*, which involves description of “non-verbal discourse” and transcription of spoken discourse (Ruiz, 2009, para. 14). This is followed by a *contextual analysis* which centers on “the space in which the discourse has emerged and in which it acquires meaning” (Ruiz, 2009, para. 27). Lastly follows *interpretation* of the discourse which “involves making connections between the discourses analyzed and the social space in which they have emerged” (Ruiz, 2009, para. 38).

Finally, I want to note that I have read postings in various online forums relating to the game and also have read and viewed contributions, articles and videos concerning advancements

in the improvement of human performance with the help of science and technology. This material was not included and does not make up direct data, but it has informed me as a researcher, which is why it should be pointed out.

4.4. Data Analysis

The outcome of the data collection is a large compilation of various materials that require varying kinds of analytical approaches. As delineated in the last section, the materials can be broadly divided into three groups. The first group comprises the findings of the game itself, whereby the ‘text’ of the game will be treated as, what Espen Aarseth terms, “cybertext” which is “the site of cyborg aesthetics, wherein control of meaning is fought for by the author, the text, and the reader” (Harvey, 2009, p. 2). This definition of videogame as ‘cybertext’ coincides well with Hayles’ definition of the player of a videogame as a ‘metaphorical cyborg’. The player, the metaphorical cyborg who is “the user of the cybertext differs from the reader of a traditional text because her performance is extranoematic, which means that it is outside the boundaries of human thought [... and implies] that the cybertext user is more than a spectator; she is a participant who must take risks, get lost, explore, and discover” (Harvey, 2009, p. 2). The findings found in the cybertext will be analyzed with the help of ‘close-reading’.

A close reading is a detailed examination, deconstruction, and analysis of a media text. It is the quintessential humanist methodology, born in the study of literature, and adapted to other media forms such as cinema studies (Jim Bizzocchi & Tanenbaum, 2011).

[It is] the detailed observation of a work, based on immersion into the piece sustained over repeated viewing, supplemented by the systematic notation of relevant details, leading to an explication and higher order analysis of the work (J. Bizzocchi & Tanenbaum, 2012, p. 395)

Jim Bizzocchi and Joshua Tanenbaum (2012) have taken this approach to analyze the game *Mass Effect 2* which will be used as a role model. They have employed the humanities-driven method of ‘close-reading’ to investigate five distinct design parameters – narrative arc, storyworld, character, emotion, narrativized interface - that they argue undergird the narrativity of a digital game. Bizzocchi & Tanenbaum’s approach reflects many aspects of game analysis discussed in the section above and for that reasons appears the most fitting and suitable for this analysis. However, the approach is not adopted as it is, but has been adapted to suit the needs of this project. I have supplanted repeated playthroughs with the use of save files and have reloaded scenes, events and especially conversations to try out various solutions.

The second group of data consist of the e-mail responses by Rosellini and Jacques-Belletête, the two *Gamasutra* interviews with Jacques-Belletête (Nutt, 2011; Remo, 2010), and the two transcripts of the *Making-Of* video (Eidos Montreal, 2011a) and the Comic-Con panel (Comic-Con, 2011). The third and final group is constituted by the promotional material that has been published prior to the release of *DXHR* which spans the Sarif Industries website (Eidos Montreal, 2011e) and particularly the trailers (Eidos Montreal, 2011c, 2011d) and are analyzed and interpreted with the help of discourse analysis (Ruiz, 2009).

The focus of each of the analyses is the depiction of human enhancement technologies and how specific elements work towards the formation of a sociotechnical imaginary. In respect to the central focus of this thesis, it needs to be pointed out that no holistic analysis of human enhancement technologies in *DXHR* can be made due to the fact that this would go beyond the scope of this thesis. The sheer amount of different augmentations available in *DXHR* necessitates the selection of a few of the most important and most interesting technologies and describe and analyze those selected in greater detail. Those technologies that will be analyzed in more detail in chapter 6 are the 'Infolink Telecommunications Package' and the 'Cybernetic Arm Prosthesis'. These two augmentations provide a representative cross section of the entirety of augmentations as they stand in a juxtapositional relation to each other: implant vs. prosthesis; invisible vs. visible; upgradeable vs. non-upgradeable; social vs. personal technology.

5. Analysis of Deus Ex: Human Revolution

The structure of the empirical part of this thesis will move through the three tiers that I have suggested help constitute a sociotechnical imaginary: A convincing narrative, diegetic prototypes, and scientificity. With the help of the data I will attempt to isolate each of the three tiers of the sociotechnical imaginary of DXHR. Complete and clean dissection of each of the tiers will, however, be not entirely possible as the elements are to a certain extent closely enmeshed with each other. Subsequent to this, I will move to the detailed analysis of the two selected augmentations, the *Infolink Package* and the *Cybernetic Arm Prosthesis*, respectively.

5.1. Tier 1: A Convincing Narrative

Writing a convincing and, above all, an enticing narrative is the first stepping stone on the path to constructing a sociotechnical imaginary and forms the basis on which the imaginary is performed in this game. This tier does not only involve the narrative or the main story, but also the imagined world in which it is situated as well as the characters. These elements will be discussed in the following sections one after the other.

5.1.1. The Context & the Main Story

Deus Ex: Human Revolution (DXHR) is set in a near future in the year 2027 in which human enhancement technology is the custom. Several biotechnology companies exist in this fictional world whereby two have a central role in the plot: Sarif Industries in Detroit and Tai Yong Medical in the fictional Chinese city, Hengsha. Through the availability of the technology, society has been split into two fractions that either embraces or rejects human enhancement. The crucial conspiratorial problem of the game is that Sarif Industries has found a way – a gene – that eliminates the problem of tissue rejection of implanted technology and makes the technology available and usable for everybody. However, a secret group – the Illuminati – prevents this from happening by sending heavily augmented elite mercenaries to abduct the crucial scientists of Sarif Industries. The head of security, Adam Jensen, is fatally wounded and nearly killed in the assault on the Sarif laboratories and is saved by his employer through life-saving operations that entail augmentation of Jensen's body through Sarif Industries' most advanced military technology. However, as can be learned in the course of the game through an email found at the Detroit LIMB clinic, Jensen has been augmented beyond any life-saving necessity:

One previous operation, 6 months ago, life-critical, requiring full replacement of chest cavity and left arm; right arm and legs replaced at behest of employer, authority granted under terms of employment contract (Email Notes: AJ09-0921, Detroit LIMB clinic) (Eidos Montreal, 2011b)

It becomes clear that Jensen has been enhanced against his will with all of the most advanced augmentation technologies that Sarif Industries has to offer.

Six months after Jensen's surgery, a Sarif manufacturing plant has been sieged and taken by radical *Purity First* activists who are probably after Sarif's top-secret Typhoon Explosive augmentation. Jensen is able to confirm the suspicion when he finds an augmented hacker of *Purity First* trying to steal the augmentation. Before Jensen can question the man, the hacker shoots himself in the head while simultaneously pleading for help as if he were doing it against his will. Jensen confronts the *Purity First* leader Zeke Sanders in the facility, who denies having a hacker on the team with augmentations as that would be against *Purity First's* pro-human-anti-augmentation ideology. When the augmented hacker also fails to show up in the police report, Sarif sends Jensen to investigate a possible cover-up. Jensen breaks into the police headquarters where he finds the body of the hacker and is able to steal the augmentation. An analysis by Frank Pritchard, Sarif's technical expert, yields the result that the augmentation allowed somebody else to take control of the hacker whose signal stems from a nearby old factory complex. Jensen discovers a secret military facility in the lower levels of the factory and finds Lawrence Barrett, one of the three mercenaries, who were responsible for the attack on Sarif headquarters six months earlier. Before dying, Barrett gives Jensen an address in Hengsha.

The address leads to an apartment complex in Hengsha that is under lock-down by the private military company *Belltower*. Inside Jensen finds the hacker who was controlling the *Purity First* terrorist, who discloses that he was hired by Zhao Yun Ru, the president of the Chinese biotechnology company *Tai Yong Medical*. Jensen infiltrates *Tai Yong Medical* and finds Zhao Yun Ru, who reveals that Sarif's scientists were not killed in the attack but abducted before she flees and leaves Jensen to fight her security guards. Furthermore, Yun Ru mentioned that Eliza Cassan, the popular news anchor of *Picus TV*, was also involved in the kidnapping of the scientists. So Jensen flies to Montreal to the Picus headquarters to find Cassan.

However, it turns out that Eliza Cassan is actually a sophisticated artificial intelligence "designed to manipulate public's perception through the media but has also gained some degree of self-awareness" ("Synopsis of Deus Ex: Human Revolution," 2013). After defeating the Yelena Fedorova, the second mercenary, Cassan tells that the abducted scientists cannot be found because their implants by which they can be located have been removed by Doctor Isaias Sandoval, the right hand of William Taggart, the leading figure of *Humanity*

Front – a peaceful pro-human organization that is fighting for stricter regulation of science on human enhancement.

Jensen travels back to Detroit where *Humanity Front* is holding a conference at the convention center. Taggart claims to have been unaware of Sandoval's actions and discloses that Isaias Sandoval is the brother of Zeke Sanders, the *Purity First* leader. He directs Jensen to Sandoval's apartment where Jensen finds a secret hideout of *Purity First*. Sandoval himself tells Jensen that he was not able to remove the scientists' implants and instead changed the frequency, which then enables Frank Pritchard to trace one of the scientists to Hengsha. Upon returning to Hengsha, Jensen and every other augmented person experience a massive, painful glitch which is caused by a defective biochip according to the official news broadcast. Augmented people are advised to have the defective biochips replaced for a new one at a local LIMB clinic.

Jensen finds out that the scientist is unfortunately already dead and that the body has been sold and harvested for the valuable high-end augmentations. The association who sold the scientist's body was the private military company *Belltower*, which causes Jensen to investigate this new lead. Jensen enters one of *Belltower's* cargo ships and hides away in a hibernation pod to find out where it is going. A few days later, Jensen awakes at the Omega Ranch, a high profile research facility for biotechnology in Singapore. He finds the remaining four scientists at the facility and encounters Zhao Yun Ru again. Meanwhile, Jensen has collected enough knowledge to know that Yun Ru is cooperating with the Illuminati, who are creating a killswitch for augmented people. Zhao Yun Ru then activates the killswitch on Jensen. Depending on whether Jensen has had his biochip replaced, the killswitch will either have no effect or cause a severe malfunction of all his augmentations while he has to fight against Jaron Namir, the last augmented mercenary. After Jensen has successfully defeated Namir, he finds Megan Reed who explains that Hugh Darrow, the 'father of human enhancement', owns the facility and is currently assembling a world conference at Panchaea where all the leaders including Taggart and Sarif will be gathered. While Jensen is on the way to Panchaea, which is situated in the Arctic Ocean, Darrow activates the killswitch which causes every augmented person with a modified biochip to suffer from uncontrollable hallucinations and go mad. "Darrow explains that he invented the technology to help the less fortunate but it has since become just another means for the powerful to control said less fortunate [...] as well as potentially causing humanity to lose its moral center. Darrow used the insanity inducing signal as an attempt to get the technology permanently banned." ("Synopsis of Deus Ex: Human Revolution," 2013) Jensen confronts Darrow, but no matter whether Jensen is able to convince Darrow that the killswitch was a mistake and that the Illuminati have abused him, Jensen will head to the core of Panchaea to attempt to stop the signal from being broadcasted worldwide. At the core, Jensen meets Zhao Yun Ru again

who tries to merge with the Hyron Project, “a huge bioelectronic quantum supercomputer” (“Synopsis of Deus Ex: Human Revolution,” 2013), in order to gain control over it making her the most powerful person in the world. After defeating the Hyron project and Zhao, Jensen reaches the broadcast center where he is greeted by Eliza Cassan who informs him about the four possible options open to him. Either Cassan will broadcast the message as intended by Darrow, which will effect a permanent ban of all human enhancement technologies; or she can edit the message according to Taggart’s suggestion, which would effect heavy regulations on research on human augmentation; or edit the message to Sarif’s suggestion, which would grant biotechnologies freedom to develop human enhancement technologies without regulations; or, lastly, to disengage Panachaea’s pressure regulation which would cause the facility to collapse under the weight of the ocean and bury everyone – Jensen, Sarif, Taggart, Darrow – along with it. No one would be left to spin the story. Humanity would never know what happened and would instead decide on its own (without Jensen deciding upon its fate) how to handle human augmentation. (Eidos Montreal, 2011b)

5.1.2. A narratively convincing story?

How does the narrative described above work towards the formation of a sociotechnical imaginary of human enhancement technologies? Whether the narrative of DXHR is convincing or not, ultimately is a concern that each player will decide for his or her own. Nevertheless, the definition of a narrative by Ryan (2005, p. 4), which was described in section 3.2.1., can be used to test the narrative.

The spatial dimension is given at the very beginning of the narrative before the attack on Sarif HQ takes place. Many of the characters of the story are introduced including David Sarif, Megan Reed and Adam Jensen. Moreover, the player learns that the story takes place in America and, hence, it is easily relatable for the player. In addition the player learns that this is a world in which people enhance themselves with the help of augmentation technology. The temporal dimension of Ryan’s definition is fulfilled in the moment the attack happens on Sarif Industries which sets the fictional world in turbulence through unforeseen events. The player can deduce by the information given at the beginning that the attack must stand in relation to Megan Reed’s research, which lends the narrative its logical dimension. Important in this respect are also the three trailers.

The CGI trailer released for the E3 conference in 2010 (Square Visual Works, 2010) is a condensed introduction to the story of DXHR as it features the keywords of the narrative diegetically (i.e. through telling) but above all mimetically (i.e. through showing). Mimetically the trailer establishes a connection between the Renaissance and a transhuman epoch; it establishes a connection between the 16th century past and the imaginable future in 2027; a

connection that runs straight through our time. The trailer explicitly points out that a major conflict is the science of human enhancement. It mentions the year the story is set in as well as that “it is a time of great innovation and technological advancement” (Square Visual Works, 2010). The trailer prepares potential players for their encounter with the story, the world and the themes of DXHR.

As mentioned, the developers of DXHR seek to make the player reflect about the morality of transhumanism, i.e. the enhancement of physical and cognitive human capabilities with the help of technology. Hence, ‘transhumanism’ is the most prevalent theme, but others are shown as well such as ‘tampering with human biology’ or the question of corporate control through technology.

The E3 trailer elucidates the transhumanist theme by showing the beginning (knowledge acquisition of human anatomy in the Renaissance) and the end of the process (the falling Icarus). The Icarus myth serves as a well-known example for the symbolization of taking ideas too far: knowledge about the human anatomy can make humans ascend higher spheres and go beyond their biological limitations, but caution should be heeded as the wings of Icarus easily burn. The fall of Icarus is immediately replaced by the augmented Adam Jensen who wondrously observes his prosthetic arms. Jensen’s prostheses are the 21st century result of the ambitions of the Renaissance scientists. Implicitly, he is directly compared to Icarus, but with the difference that Jensen has not yet flown too close to the sun with his new wings.

In the following minutes of the trailer the centrality of human enhancement technology in the game is further reinforced along with its controversy. Rioters protest in the streets against human augmentation which become involved in a violent fight with police forces in the second half of the trailer. Such scenes make it clear that DXHR is about a dystopian vision of the future of human enhancement and also a dystopian vision of society in which “corporations have more power than the government” (Square Visual Works, 2010)

5.1.3. Ethical decision-making

Ethical thinking – the ability to assess, interpret, and reflect on our decisions, empathize with others, and comprehend the complexities of ethical questions – is essential for citizenship (Schrier, 2012, p. 375)

The story of *DXHR* fundamentally hinges upon the ethical dilemmas surrounding human enhancement technologies. This is well exemplified by the Sarif and the Purity First trailers (Eidos Montreal, 2011c, 2011d) which show the two opposing views on human enhancement, respectively. The Sarif Industries live-action trailer paints a positive picture; a bright future enabled by enhancement technologies. The trailer is composed of the

testimonials of three people, two men and one woman, who share their experiences with Sarif augmentations with the audience and explain that the augmentations have improved their life. The calm sounds of the piano playing in the background coupled with the clean and bright overall look of this quasi-commercial of Sarif Industries suggest to the audience that human enhancement technologies are something necessary, beneficial and viable. Furthermore, the technologies are presented as a solution to a problem. The father who explains that he had an accident is only able to play football with his son - the two things that he loves - because of his Cybernetic Arm Prosthesis. However, the other two people do not identify a problem like a disability after an accident. The woman only says that it has enabled her to play the piano better, easier and she is enjoying it more. In addition, she points out that people now know her this way because of her augmentations. The other man argues that without the augmentations he would not be able to be “the best of the best” and “part of the elite” and that receiving augmentations is what he has got to do if he wants to be the best (Eidos Montreal, 2011c). .

The Purity First trailer (Eidos Montreal, 2011d) is the opposite and destabilizes the promises made in the Sarif trailer. The music is tense; the atmosphere dark and brooding. It is explained to the audience by anonymous speakers but also by a scientist and a doctor that the big biotechnology corporations like Sarif Industries are encouraging unnecessary surgical alterations to the human body only to make millions of dollars. Moreover, the enhancement technologies threaten to eradicate humanity and give the corporations control over the body of augmented people. Furthermore, it is explained that the technology is not safe, that the human body rejects the augmentations unless suppressed by the intake of the costly and highly addictive drug ‘Neuropozyne’. The verbal messages are accompanied by disturbing visual material of augmented people who are suffering because of their augmentations. Enhancement technologies have not improved their lives but destroyed it and turned them into drug-addicts and beggars. The female doctor points out in the trailer that

At no point have they [the corporations] thought about the consequences of their actions. They actively encourage you to exchange your perfectly functional body parts for upgraded augmentations. What they are doing is ethically and morally wrong and they should be brought to justice (Eidos Montreal, 2011d)

The two trailers summarize the different views that are presented to the player in the game. On the one side, the extreme techno-optimistic, transhumanist ideal represented in the Sarif trailer and, on the other, the consideration of ethics, morality and the assessment of the impact of such technology on humanity. It is crucial in respect to the sociotechnical imaginary to analyze and account for the ethical and moral dimensions built into *DXHR*. In

the course of playing the game the player is confronted with and forced to choose his or her moral standpoint towards human enhancement through conversations with non-playable characters (NPCs) and through the actions taken, i.e. whether the player chooses to use a lethal or non-lethal path of gameplay.

It is put into the hands of the player to decide whether human enhancement technologies have saved Adam Jensen or whether they have exterminated his humanity and turned him into a cold machine. The player may choose to play the game in whatever fashion s/he pleases be it as a deadly posthuman supersoldier or a pacifist hacker who will not use the augmentations to hurt others. The choices made are however not binding. At either point in the game the player may choose to change the playing style. Ultimately, the final narration at the very end of the game will reveal the moral outcome of the player's actions and choices. Depending on the predominant moral slant (i.e. good, bad or neutral) the final narration will be slightly different. Here are comparative excerpts from the Sarif ending when playing morally good and bad:

These past few months I was challenged many times, but more often than not didn't I try to keep morality in mind, knowing that my actions didn't have to harm others? Time and time again, didn't I resist the urge to abuse power and resources simply to achieve my goals more swiftly? (Pulse Gaming, 2011a)

These past few months I was tested many times, and too often I chose to inflict suffering when challenged even though I had alternatives. I reacted selfishly, abusing power and resources to accomplish my goals and I lost my humanity along the way. (Pulse Gaming, 2011b)

What stands out in this form of moral feedback on the player is that it is neither thorough nor powerful. In direct comparison the moral nuances surface, but during playing the game the morality does not have a high impact on the player. On the one side, this feature is good because it does not try to force a prefabricated sense of morality on the player and leaves the themes upon for individual interpretation. On the other side, there is the risk that the morality of the themes might pass unnoticed as there are rarely any sanctions which might bring the themes to the player's attention.

5.1.4. Shaping Adam Jensen

With Adam Jensen, the player is provided a character that is more or less fully augmented from the start of the game. There is a short phase at the beginning of the game in which the player controls a non-augmented Jensen and encounters a few enemies while investigating the attack on Sarif Industries. As already mentioned, Jensen is fatally wounded and then

saved through augmentation surgery. The player has no influence over the augmentation process but may determine the moment of activation provided the player has accumulated sufficient praxis points. There is only one instance in the game that allows the player to make a decision on actually augmenting Jensen. A few times Jensen will suffer from a short visual and physical malfunction of his augmentations. The news will call out that there is a problem with a biochip and that all augmented persons are advised to exchange the ostensible faulty chip for free at a LIMB clinic. The player may either choose to implant the new biochip and seemingly improve Jensen further, or ignore the call for replacement.

Adam Jensen is not an “empty vessel” but has a full-fledged identity which is distinct from the player’s identity (J. Bizzocchi & Tanenbaum, 2012, p. 397) which is similar to Bizzocchi & Tanenbaum’s observation of Commander Shepard, the main protagonist in *Mass Effect 2*. Jensen’s identity is fixed in certain ways but open to change and interpretation through the player in other. First of all, Jensen possesses a history, a past back-story that surfaces along the course of the game which explains in part who Adam Jensen is and how he became who he is now. Jensen is an ex-SWAT officer, who was resigned from his job due to a refusal to obey orders that involved killing an augmented boy. The backstory explains why Jensen is proficient at wielding weapons, for example. Other features of Jensen’s identity are that he always operates alone on his missions and that he has distinct stances towards certain people. While in general Jensen appears to be coldly distanced to most people, he displays aversion towards the technician Frank Pritchard, affection for his former girlfriend Megan Reed and respect and dutiful loyalty for his boss David Sarif. Jensen is portrayed as a reserved man with a sense of morality when it comes to preserving life. Notable are his utterances at the beginning of the game, where he points out that Sarif Industries is financed by contracts of the military and the Department of Defense. Here he shows concrete aversion towards enhancement technology pointing out that it does only good for the military.



Figure 7: Attitude selections in conversations and social battles

The influence the player has over Jensen's personality is limited to "attitudinal vectors" (J. Bizzocchi & Tanenbaum, 2012, p. 397) which affect the moral stance of Jensen's attitude towards augmentation and violence. However, the design of the gameplay does not force the player to comply with one particular moral route, but gives players the option to be inconsistent with their choices. The most conspicuous examples are what I call 'social battles' - conversations where the player is always presented with three response options and which often directly have something to do with augmentations. In one of the first of those conversations in the game, Cassandra Reed, the mother of Megan, remarks that she "can't get over just how much they've changed you". She highlights the profound alterations that have been done to Jensen after the attack and inquires how he handles those changes. The player can choose to reply either 'resentful', 'detached' or 'optimistic' (figure 7). In order to ease the choice and help the player guess what Jensen will exactly reply, a shortened version of each of the three replies is shown. A similar conversation must be held with the helicopter pilot Faridah Malik, Jensen's chauffeur, who points out that "the new look suits you" and asks how being augmented feels, because, after all, Jensen never asked to be augmented.

Other possibilities to influence Jensen's personality are via the actions taken. Saving all of the hostages during the first mission will result in one of the hostages offering to help Jensen with supplies; sparing the life of the *Purity First* leader Zeke Sanders will result in Sanders providing Jensen with information later on; or even disregarding Sarif's note for urgency before the first mission will result in the hostages already being dead when Jensen arrives at the scene.

5.1.5. Conclusion Tier 1

The sociotechnical imaginary is tightly entangled with the main narrative of the story. The narrative does not only hinge on enhancement technology, as an enabling device for gameplay, but moreover revolves around this technology. Nearly everything that the player can do or experience in the game is in one way or another connected with augmentation technology, ranging from structural components such as the Panacea facility or the LIMB clinics over to optional sidequests and down to random NPC encounters in the streets and edifices of the cities. The largest part of missions, verbal encounters and discoveries the player can make are concerted to lead the player into deeper waters over the controversy of human enhancement. The centering on the technology and the wealth of information and options to engage with the topic constitutes major parts of the sociotechnical imaginaries

In this chapter the narrative of DXHR and its intricate, symbiotic relation to the sociotechnical imaginaries of human enhancement has been uncovered and detailed. Already it has become clear that the enhancement technologies are not exclusively depicted positively or negatively in DXHR. In the following chapters the lens will be narrowed to analytically focus on the specific augmentations in the game, how they are presented and how they are performed through the player. The game heavily relies on the player's engagement and usage of diegetic prototypes as will be detailed below.

5.2. Tier 2: Diegetic Prototypes

5.2.1. The Presentation of Technology in DXHR

In the world of *Deus Ex: Human Revolution* there exist many different technologies that are used to enhance the human body, some of which are more visible than others. While there are many opportunities in the fictional world to see other augmented people, the one place (or non-place) where the player is confronted the most with the technologies is the augmentations screen in the player menu. The primary function of this screen is to give the player an organized view of the augmentations and their momentary state in order to

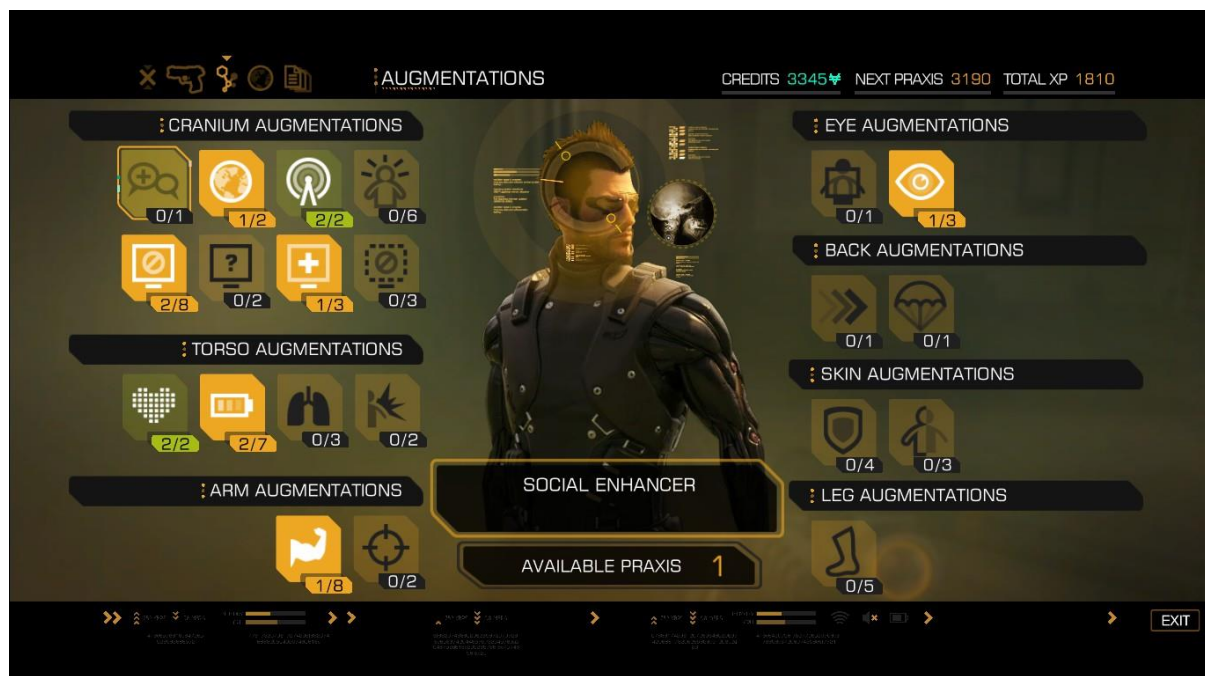


Figure 8: Augmentation Screen as it appears in *Deus Ex: Human Revolution*

efficiently manage the player's abilities. The first level, which can be seen on the above figure, gives an overview of every augmentation that is implemented in Jensen's body

whereby the second level or sub-level reveals the abilities of each augmentation. The first level includes the basic information about the augmentations and their abilities which the player needs to know to make decisions which of the augmentations s/he wants to upgrade. However, the game includes another level of information about each augmentation that can be accessed through a 'More Info' button. For the interested gamer, this reveals two things: one the one side, a detailed, well-formulated description of the functions of the implant and, on the other, a seeming scientific description of the highlighted augmentation. To make the two stages of information clearer to the reader, the Social Enhancer augmentation is excerpted here as an example:

First level of information:

Use: Analyze people and persuade them into following certain courses of action.
Directions: See the More Info section.
Activation: Contextual.
Energy Consumption: None.

Second level of information / the More Info section:

The C.A.S.I.E. implant provides its user with a direct monitor of behavior patterns and likely responses from conversational subjects. In real terms, this means the user can gain an insight into which conversational methods to employ in any given situation, discover subtle clues and intentions, and view a virtual 'persuasion' gauge for their target.

The Computer-Assisted Social Interaction Enhancer is a cranial implant that ties directly in to the user's exiting Eye-Know Retinal Prosthesis to relay environmental and personal data about targeted individuals, in order to assist social interaction. The C.A.S.I.E. implant uses an Optical Psychophysiological responses Analyzer (aka 'Optical Polygraph') to gauge a rudimentary psychological profile based on facial expression, body language, and environmental cues. Combined with the advanced Emotional Intelligence Enhancer software engine, the system can deliver real-time predictive data directly to the user, enabling them to correctly interpret responses and draw the desired result from face-to-face conversations. (Social Enhancer More Info Augmentation Screen DXHR)

As can be seen from this example, the first part of the *More Info* section is a detailed elaboration of the first level of information. However, the second part of the *More Info* section goes beyond any gaming relevant information and is actually an optional level of information. Strictly speaking, the player does not need this sort of information to successfully play and complete the game. All that a player needs to know about the augmentations is already included on the overview screen and the first level of information. The *More Info* section, however, provokes the impression that the developers have not just randomly placed abilities into the game without thought, but that the augmentations and their respective abilities are grounded in reasonable logic. This impression is enhanced by the use of

elevated jargon such as the terms ‘cranial’ or ‘psychophysiological’ that can be classified as ‘scientific’. It contains a brief, yet to some extent scientific description of how the technology is imagined to function within the boundaries of the fictional world. The level of detail is not exhaustive, yet holistically comprehensive enough to convince a lay audience of its validity.

What is important to mention about the augmentation system in DXHR is that the player actually has no choice over which augmentations should be fitted into Adam Jensen’s body. Instead, the player is provided with a character that is already fully equipped with every augmentation Sarif Industries has to offer. In other words, technically the player cannot augment the character anymore, but s/he can, on the one side, choose which of the inactive augmentations should be activated at a player’s elected time and, on the other, which activated augmentation should be upgraded if available. (see also section 5.1.5.)

5.2.2. Prostheses and Implants

DXHR features many different fictional technologies which can be subsumed under the banner of human enhancement technologies. Primarily the augmentations in DXHR can be categorized into two basic elements namely implants, which are innately invisible to the observer, and prostheses, which typically replace a certain part of the human body. According to the augmentation screen, the protagonist is fitted with three types of prosthetics which cover his arms, his legs and his eyes, and eighteen different implants. Nine implants reside in the cranium, six in the torso, two in the skin and one in the eye and the arms, respectively. Some of the implants, according to their descriptions in the *More Info* section, are decentralized systems and may consist of several parts located in various locations of the body. For instance, even though the *Aim Stabilizer* augmentation is found under the header of ‘arm augmentations’ it consists of “elements embedded in the user’s nerve-brain connections, inner ear structure, and optic nerves” (Aim Stabilizer, More Info, DXHR). This augmentation is implicitly described as a cybernetic feedback loop in which the system processes information from certain inputs of the body (e.g. vision and balance) and returns them modified in order to attain an improved level of aiming stability while wielding weapons. Most of the augmentations can be upgraded with the help of praxis points on the augmentation screen. The upgrading is depicted as a growing proficiency with the augmentations over time, i.e. gaining experience with the technological devices opens up more skills. For the player upgrading means either unlocking a new ability, such as “Move/Throw Heavy Objects” under the Cybernetic Arm Prosthesis, or improving an ability, such as “Capture 2” under the Hacking: Capture implant which allows to also be able to hack terminals with a security level of 2. Despite the fact that the body of the protagonist is

already modified with every possible augmentation; the majority of the augmentations are inactive at first. There is a small amount of augmentations that are pre-activated from the start⁹ and, thus, structure the basic, unalterable playing experience of DXHR, in other words, they are part of this game's 'gameplay'. "Gameplay is what doesn't change when you change the surface: the rules" (Mäyrä, 2008, p. 16). Nevertheless, the gameplay is in relation to digital games, according to Mäyrä, not easy to capture in a definition as there is a plethora of elements, parts and units that constitute gameplay in digital games:

In board games this is clear: the sundry local editions of Monopoly all have identical gameplay despite the different names of the streets. In videogames this is rather more delicate, as virtually everything is gameplay, and a slight change of a single parameter (say, speeding up a character, or making a weapon stronger) may radically change the effective strategies that emerge from the game. (Mäyrä, 2008, p. 16)

In general, the augmentations are the fundamental gameplay mechanic that distinguishes DXHR from other games and the use of augmentations can make certain tasks significantly easier. Activating the 'Social Enhancer' augmentation will for instance facilitate persuasion of people in social battles. Additional digital overlays will appear during a conversation on the HUD (heads up display) provided through the retinal prosthesis and give the player insights into the conversation partner such as personality traits and a suggested response strategy. Despite a small amount of augmentations that are pre-activated from the start mentioned above, there does not exist a pre-structured pattern that the player has to follow for augmentations. It is completely up to the player which augmentations s/he uses in which combination. During the interview session at the Comic-Con (2011) DeMarle explained that the augmentations allow playing the game according to any one of the four pillars of gameplay – *Stealth*, *Hacking*, *Social* and *Combat*. DXHR is designed in such a way that the player will never find himself stuck in a situation due to an inactive augmentation, but there will always be multiple solutions to a problem. For example: Jensen needs to find out the whereabouts of Isaias Sandoval, the right hand of *Humanity Front* leader William Taggart. The player may either choose to openly confront Taggart during his speech at a *Humanity Front* conference and use the Social Enhancer to elicit information; or s/he may choose to hack his computer in the backstage changing room which can be reached either by sneaking

⁹ These pre-activated augmentations are the following: Radar System (Radar 1), Hacking Capture (Capture 1 + Camera Domination), Hacking Fortify (Fortify 1), Sentinel RX Health System (Cardioverter Defibrillator + Angiogenesis Protein Therapy), Sarif Energy Converter (Base Energy Level, Base Recharge Rate), Cybernetic Arm Prosthesis (Instant Take-Down), Retinal Prosthesis (Retinal HUD)

past the guards through the ventilation system (requires jump enhancement of the Cybernetic Leg Prosthesis) or defeating the guards.

5.2.3. Prototypes in the Imaginary

In connection to the sociotechnical imaginary the freedom over augmentation that is given to the player plays a fundamental role. The player will necessarily spend a lot of time reflecting about his or her preferred playing style and hence ponder long about which augmentations s/he wants to use. This requires the player to economize praxis points throughout the game in order to activate all the desired augmentations. Particularly during the first few hours of the game I have found myself collecting and stockpiling praxis points because I was not sure into which augmentations I should invest my hard earned points. Although it is possible to undo spent praxis points by reloading an earlier save game, replaying already passed sections of the game can be quite tedious and time consuming. Nevertheless, the player is forced to spend a significant amount of time thinking about the augmentations, imagining and anticipating their usage in the boundaries of the game world, which can lead to an increase in personal value of augmentations for the player. It must be pointed out that the augmentations are – despite their role as a gameplay mechanic – optional in use and players have proved that a complete playthrough without activating any augmentations is possible (jacobalbano, 2012). In other words, the constant engagement with the augmentations can make them indispensable and valuable assets for the player. This has consequences for the sociotechnical imaginary as the augmentations become diegetic prototypes (Kirby, 2010).

The fact that an established neuroscientist - Will Rosellini (see section 5.3.5.) - has helped with the creation of the augmentations by putting the fictional technologies in direct relation with real-world scientific advancements undergirds my argument that the augmentations of DXHR can be described as valid diegetic prototypes. The prototypes are embedded in a specific framework, a fictional social context in which they exist as matter-of-fact. In the words of Kirby the augmentations in DXHR

[...] are at once both completely artificial – all aspects of their depiction are controlled – and normalized as practical objects. Characters treat these technologies as a “natural” part of their landscape and interact with these prototypes as if they are everyday parts of their world. [...] fictional characters are “socializing” technological artifacts by creating meanings for the audience, “which is tantamount to making the artifacts socially relevant”. (Kirby, 2011, p. 196)

As diegetic prototypes the augmentations prove their necessity, benevolence and viability. In DXHR the augmentations are necessary to keep the protagonist Adam Jensen alive after the assailant inflicted near-lethal injuries on him. Simultaneously, however, this incident marks also the disqualification of the 'benevolence' criteria as the assailant is a user of highly-advanced blackmarket augmentations. In addition to the fact that villains have access to the enhancement technologies, the safe use of the augmentations is portrayed as highly ambivalent in the game. The enhancement technologies require the regular, life-long intake of the costly drug 'Neuropozyne' in order to avoid rejection effects through the immune system which can have painful, if not even lethal effects (Comic-Con, 2011; Eidos Montreal, 2011d) Furthermore, evil corporations secretly initiate the distribution of a modified biochip in the story which, when implanted, allows for limited control over augmented people. This is of course a major safety concern and a crucial disadvantage of enhancement technologies.

Failures

The viability of the augmentations, on the other side, is provided because the enhancement technologies function reliably and practically do not fail the user as long as no external disturbing signal occurs. There are only two sources of negative influence featured in DXHR which are able to make augmentations temporarily fail. These are the electro-magnetic pulse (EMP) grenade and the above mentioned abuse through a modified biochip. Two times in the game Jensen and hence the player will experience a random glitch that affects primarily the visual augmentations (see Figure below). Furthermore, if the player chooses to replace

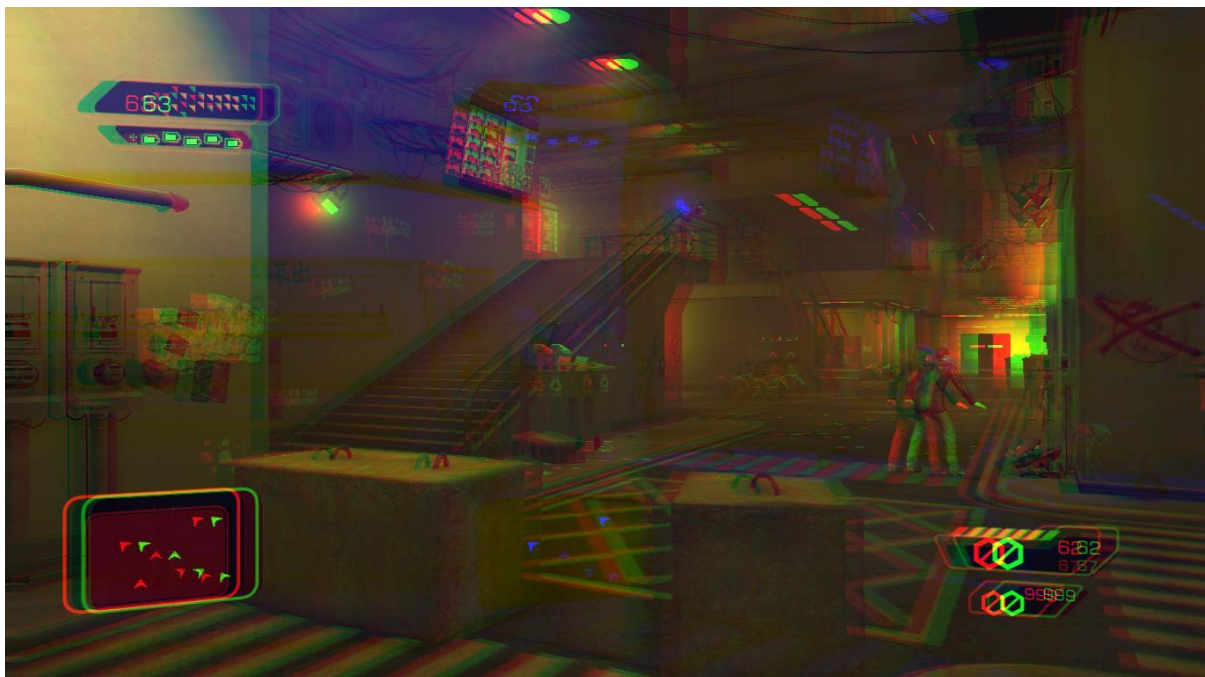


Figure 9: Visual glitch - temporal failure of augmentations

the ostensible faulty biochip in a LIMB clinic – as it is narratively explained in the game – the new modified biochip will cause all of Jensen’s augmentations to malfunction or be disabled during the final boss fight and make this battle extraordinarily difficult to win due to the fact that none of the augmentations will work and vision will be significantly impaired similarly to figure.

Even though the enhancement technologies of DXHR do not conform to the ‘benevolence’ criteria of diegetic prototypes (Kirby, 2010) they nonetheless are depicted as realistic, imaginable prototypes due to the effect of ‘virtual witnessing’ (see section 3.2.3).

Virtual Witnessing

As an audio-visual medium the video game exhibits many similarities to cinema and in this sense many of the observations and conclusions made by David Kirby are directly applicable to the digital game. Most importantly, the player, the recipient of the digitally rendered content of DXHR, is able to virtually witness scientific and technological advancements by seeing and reading about these. DXHR contains a lot of information conveying a sense of scientific authenticity to the player, but this will be discussed in more detail in section 5.3. At this moment I want to point out that the videogame transgresses the efficiency of a cinematic product as a virtual witnessing technology because the player does not only perceive diegetic prototypes through auditory and visual channels but there is an additional interactive, tactile layer. In DXHR the player is able to virtually test-drive said diegetic prototypes and try out human enhancement technologies in context without leaving his or her room (or even undergo surgery).

5.2.4. Aesthetics

In the preceding chapters the focus was on the options of interaction with the enhancement technologies that a player has in DXHR, but how the game and the augmentations visually appear has a significant influence on perception and experience, too. The overarching theme of the *Deus Ex* universe is Cyberpunk and which is commonly known in public through various science-fiction novels and movies such as *Blade Runner* (R. Scott, 1982) or *The Matrix* (Wachowski & Wachowski, 1999), which people remember in connection with this genre. Generally speaking, Cyberpunk is marked by a dark oppressing ambience with a bluish tint which gives this genre its futuristic feel. In the *Making Of* video (Eidos Montreal, 2011a), the art director of DXHR, Jonathan Jacques-Belletête explained that the development team intentionally distanced themselves from directly recreating imaginations that already exist. For this reason DXHR is not a typical Cyberpunk game, but exhibits some of its elements. It retains for example the dark, oppressing ambience associated with the

genre, yet features a distinct gold tint, which makes the whole game appear warmer. “[T]he fact that it is warmer brings it closer again to this whole kind of Renaissance, kind of humanity feeling type of thing” (Eidos Montreal, 2011a). Although DXHR can be clearly categorized in the Cyberpunk genre, the developers did not want to directly invoke this genre, because they felt that it was too futuristic and too remote for the audience to identify with and too remote for the underlying transhumanist theme of the game. Instead, the development team not only wanted DXHR to have its “own flavor” and its “own voice” (Jacques-Belletête, Making Of), but it was also supposed to be closer to the present while preserving Cyberpunk elements and features of the original *Deus Ex* game from 2000. In terms of art design, the team achieved to create something truly new for which the term “Cyber-Renaissance” was coined. In an interview with the online magazine *Gamasutra* the art director Jonathan Jacques-Belletête explained how he and the team arrived at the combination of the Renaissance period with the Cyberpunk genre:

Jacques-Belletête: [...] I started doing all this research on transhumanism and posthumanism, which is one of the main themes of the game. I started looking around and buying books and reading and doing research in Google, and I searched for terms like "anatomy," "cybernetics," "biology," and "genetics." Doing all this research, I started seeing images of Leonardo da Vinci's anatomical studies and dissections and everything, and saw a very strong correlation with cybernetics and everything else.

Chris Remo: That was the era when anatomy was first started to being understood. It was very rare to be able to dissect a human and understand, so when they did, major progress was made.

Jacques-Belletête: Exactly. It's exactly like that. It's like that's when they started to understand the machine -- the human machine -- and how it works. Cyberpunk or transhumanism is where we upgrade that system, so in order to upgrade that system, first you need to understand how it works. So, it's almost as if the Renaissance was like the first stepping stone towards, you know, a cyberpunk or transhumanist era. (Remo, 2010)

In addition, much of the game is heavily laden with references to Greek myths and paintings from the Renaissance period. Particularly prominent in this respect are *The Anatomy Lesson of Dr. Nicolaes Tulp* by Rembrandt (1632) and the myth of Icarus.



Figure 10: The Anatomy Lesson of Dr. Nicolaes Tulp (1632)

These play a major role in the E3 2010 trailer (Square Visual Works, 2010) in which they are part of Jensen's dream. Both the Icarus myth as well as *The Anatomy Lesson* visualize in the trailer the augmentation of the arms and invoke the theme of 'dangerous knowledge'. The mentioned trailer begins with an animation of the Rembrandt painting which shows 17th century scientists standing around the corpse of Adam Jensen, ostensibly discussing anatomical features of Jensen's exposed arms. The skin of the arms has been removed to lay bare the structure of the upper limbs and the camera moves over the arms to show the viewer a close-up of the muscles, the tendons and the bones of the arms. Then slowly rising from the corpse, the spirit of Jensen manifests itself and Jensen grows wings and soars upwards towards the sky breaking through the dome of the building without effort. Rising ever higher and approaching the sun, the wings start to come apart and are eventually lost. Rapidly falling into nothingness, the winged Jensen becomes the augmented Jensen of 2027, who awakes in his apartment and scrutinizingly observes his mechanical arms.

Jacques-Belletête: You reread it [the myth of Icarus], and it's like the perfect metaphor for augmentations for Transhumanism because, basically, his father, Daedalus, augments him with wings. He starts flying, and he's having so much fun he's overexaggerating -- Transhumanism won -- and he gets too close to the sun. He dies; there's a really good message there. (Nutt, 2011)

The environment in which Jensen awakes is subtly streaked with visual cues that evoke the impression that Jensen is situated in a world that is connected to the 17th century operating



Figure 11: Various arm prostheses. White prosthesis taken from Sarif trailer

table. The golden hue, the curvy stylistics of the wallpaper and the sofa, and the antique drawing in the book lying open on the table in front of him, all implicitly transport the idea that there is a link between his new bionic arms and the age of enlightenment. “Show, don’t tell” (Nutt, 2011) is what the art director calls this and this motif is continued throughout the actual game.

Another instance of this motif can be seen in the black and gold visual style that is utilized through the most part of the game, which stems from the mélange of Cyberpunk and the Renaissance according to Jacques-Belletête. He explains that “[...] the Renaissance was the golden era. It was an age of discovery and an age of enlightenment” (Remo, 2010) and this idea is invoked through the use of the color gold. Concerning the color palette, Mary DeMarle stated at the Comic-Con Panel that

the gold represents for us the great – it is also a tie-in to the Icarus myth and the sun – and the gold represents the future that mankind is striving for; in that sense the bright future. We’re striving for the gold. But the black represents all of those conspiracy elements, all of those shadows that are trying to come in and encroach it (Comic-Con, 2011)

The appearance of human enhancement technologies in the game is limited as the majority of augmentations are implants and thus invisible to the eye. There is a range of arm and leg prosthetics which chiefly appear in a black or dark metal look, although other color variations exist too such as flesh, white or the color of muscles (see figure 11). The prosthetics that

major characters wear in the game are typically rather human-like featuring smooth shapes and contours and reminisce biological tissue. The prosthetics worn by random NPCs that roam the streets of Detroit and Hengsha, for example, seem to be older generations of prosthetics (cf. upper right picture figure 11) and appear more industrial and robot-like.

The appearance of prosthetics will be more thoroughly discussed in section 6.2. Concerning the implants, only a few things can be said about their look as they cannot be observed, but merely their effects can be seen such as the production of additional output on the HUD. I have found one envisioning of an implant as a commercial product and one non-commercial version. The former is located on the promotional website www.sarifindustries.com and the latter in-game at the end of the first mission (the manufacturing plant). The first image on the left (figure 12) is an imagination of the Computer-Assisted Social Interaction Enhancer (C.A.S.I.E.) implant which is part of the Social Enhancer augmentation. The small inset next to the brain shows the front view of the implant and discloses that the implant is a filigree network of components and wires that are distributed across the brain's surface. Furthermore, the larger, black parts of the implant appear to be very thin and are either flexible or fixed and molded to fit the brain's curvature. In contrast, the non-commercial implant on the right side of figure 12 is a single rectangular unit that appears to be inflexible and rigid given the fact that Jensen can easily grasp it between his fingers without bending it. Two I/O jacks are visible on the implant as well as a label on the bottom that might be a serial number and a neutral description in the middle that reads 'neuro implant'. I describe this implant 'non-commercial' because it was used in the game to remote control another person against his will. This action required cables plugged into the side of the head of the person being remote controlled, which adds to the obtrusive impression of this implant. The commercial implant, however, suggests the opposite. It is intrusive and not obtrusive. The implant, and hence the augmentation will not be seen externally and the person receiving this enhancement will continue to appear as usual.

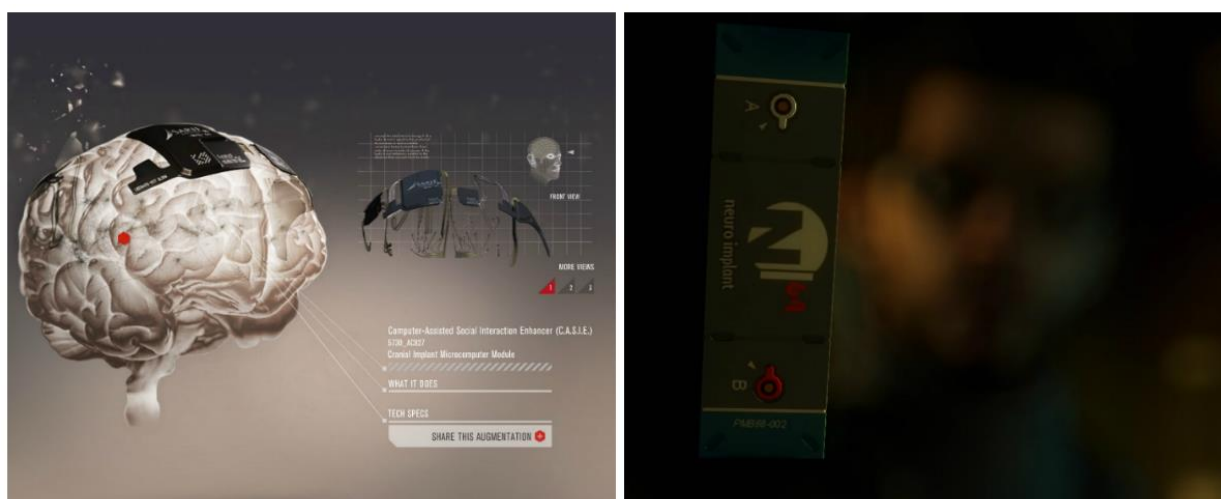


Figure 12: Two cranial implants

5.2.5. Wrap-up of Section

How does the appearance of the game and the human enhancement technologies affect the sociotechnical imaginary? The visual style stems from a pure “video game decision” as Jacques-Belletête explained in an interview with me. Particularly the arm prostheses of Adam Jensen were styled in such a way as to appear appealing to the (male) player:

we ended up opting for a purely "video game" decision as in we wanted to make sure the player would feel and see the "power" and "coolness" of his arms at all time. Basically, not to "conceal" their wow factor. Also, because we wanted them to be visible at all time when Adam was not wearing his trenchcoat, the tests we did with the vest and the flesh colored arms made him look too much like a biker or a douche, which of course was not at all the feeling we were aiming for.
(Interview Jacques-Belletête)

In the context of the sociotechnical imaginary conveyed through this visual style this suggests that people wearing enhancement technologies, specifically prosthetics, will want to highlight their otherness and not necessarily try to make the prosthetics look like normal biological arms or legs. The augmentations and the resulting increased abilities should be visible and not concealed. Nevertheless, although the appearance is trimmed to look appealing, other people in the game will still critically comment on it. For example, in the Detroit city area people in the back alleys will call Jensen a ‘robot-boy’ and in the Upper Structure of the Tai Yong Medical building in Hengsha employees can give Jensen the following response: “You must be one of the new promotions. ‘Physically’ augmented workers like you are usually found in the Cryo-storage pool.... In the LOWER building” (Eidos Montreal, 2011b). While attractiveness, ‘coolness’ and allure were the overweighing aims for the appearance of augmentations, opposing opinions are included as well, although these are mostly only accessible if the player searches for them.

5.3. Tier 3: Scientificity

The final tier to be discussed in relation to the sociotechnical imaginary is scientificity and this section will consequently be focused on the breadth and depth of information present in DXHR in relation to enhancement technologies. In section 5.2.1. I have pointed out that the *More Info* sections provide extra, but optional information on the augmentations and that this suggests that the producers of DXHR have tried to increase the credibility and plausibility of the augmentations and concurrently the imaginaries through scientific explanations of the functionalities of an enhancement by detailing the technicalities of the technology. Through such rational explanations, the producers are able to improve the realism of the technology

and its functions. The *More Info* sections of the individual augmentations already raise the level of scientificity, but this is only part of the steps taken by the developers.

5.3.1. Timeline of Augmentations

To arrive at realistic and credible augmentations the producers have included a backstory for human enhancement technology, which Mary DeMarle and Will Rosellini have called timeline of augmentations. It was an active goal during the creation of the game to achieve a high degree of credibility with the depicted technologies as DeMarle explained at the Comic-Con 2011 and Jacques-Belletête disclosed in my interview with him

Jacques-Belletête: This was something we had all agreed straight from the minute we chose transhumanism as the central focus of the game, that credibility and plausibility were essential and necessary. We truly wanted to make a work of fiction that had real contemporary motifs and messages. DXHR is much more a work of anticipation than pure sci-fi, and in order to achieve a proper anticipation, credibility and plausibility is of the utmost importance. Without them, your anticipation falls flat. All in all, we wanted people to think and reflect on what all this stuff meant for humanity, and mostly, for their own lives.

The development team created a temporal trajectory of the possible evolution of certain human enhancement and prosthetic technologies beginning in the year of the game's development. These predictions not only included technological innovation, but also the societal stimuli that are potentially able to undergird and concurrently undermine scientific and technological advancement. DeMarle mentioned the South African double-amputee running athlete Oscar Pistorius, who had won quite a few races on his Cheetah-Flex prostheses at the time of development:

DeMarle: we kind of were looking at him and when we started we said, OK in our timeline, in the history of our timeline there is going to be a problem with the Olympics because the Olympics are gonna – there's going to be a runner like Oscar Pistorius who is going to say 'I want to run in the normal Olympics. I don't want to run in the Paralympics' and he would petition the Olympic committee and he would say let me in. And we predicted that the Olympic committee would say 'no' because you have an advantage and then we built from there and we said, well that would be this big upshot and then about six or seven months after we said this, that's exactly what happened. (Comic-Con, 2011)

On the basis of this method, the team set out to create a list of augmentations that were essential to the world of *Deus Ex* and to the gameplay of this specific game, which in essence meant that also improbable technologies were required. A few augmentations remained in the game despite their fictitious realization in real-life such as invisibility. “[W]e got to keep certain things that were in *Deus Ex* like Cloaking” (Comic-Con, 2011).

In the course of 2008, Will Rosellini, neuroscientist and then-CEO of MicroTransponder Inc., reportedly approached the team seeking to help make the technologies more plausible. Rosellini directed the team to rethink the design and implementation of the imagined technologies to make them appear more credible and connected them to actual research projects such as a governmental program that seeks to improve prosthetics and the integration with these devices through direct connection to the human's nervous system. "It is called the 'Revolutionizing Prosthetics Program' and we should have an FDA approved device where you can have an amputation replaced and have active implantable utilization by about 2014. So there is a lot of stuff that is in development that they built on in the game, which I think makes it a lot cooler" (Comic-Con, 2011). According to Rosellini

[...] they [the development team] took extreme care to make sure that the game ... that the details were brought out, because for me that was important and makes it more real. So what Mary is describing we had a way for almost everything to say 'this is feasible in the next ten years and more likely than not in the next twenty years' (Comic-Con, 2011)

At the end of the process the team had created a timeline of augmentation via extrapolating the present state of science and technology approximately twenty years into the future. A technological trajectory has been created and this has been incorporated into the game explicitly and implicitly. The timeline is apparent implicitly by the existence of different versions of prosthetics for example which has been mentioned above in section 5.2.4. during the discussion of figure 11. Some arm prostheses like that of Jensen are ostensibly more advanced while others worn by minor NPCs appear to be precursory models. Explicitly the timeline is observable at two sites. On the one side the promotional website (Eidos Montreal, 2011e) features an explorable timeline and offers the audience links to follow to videos, articles and abstracts about real and fictional advancements relating to science and technology of human enhancement. On the other side there are the special collectable eBooks to be found in the game, which will be discussed in the next section.

5.3.2. The Darrow eBooks

Built into DXHR are 29 collectable eBooks concerning the fictional scientist Hugh Darrow – the 'father of human enhancement' in the context of the game. These eBooks have each been equipped with a year that falls into the range of 2001 to 2022. Hence, a comprehensible trajectory is created that provides the audience with a reasonable and logical path to cognitively replicate the technological development underlying the fictional world. In addition, the player is motivated to find these eBooks, because they award the player 200 extra experience points.

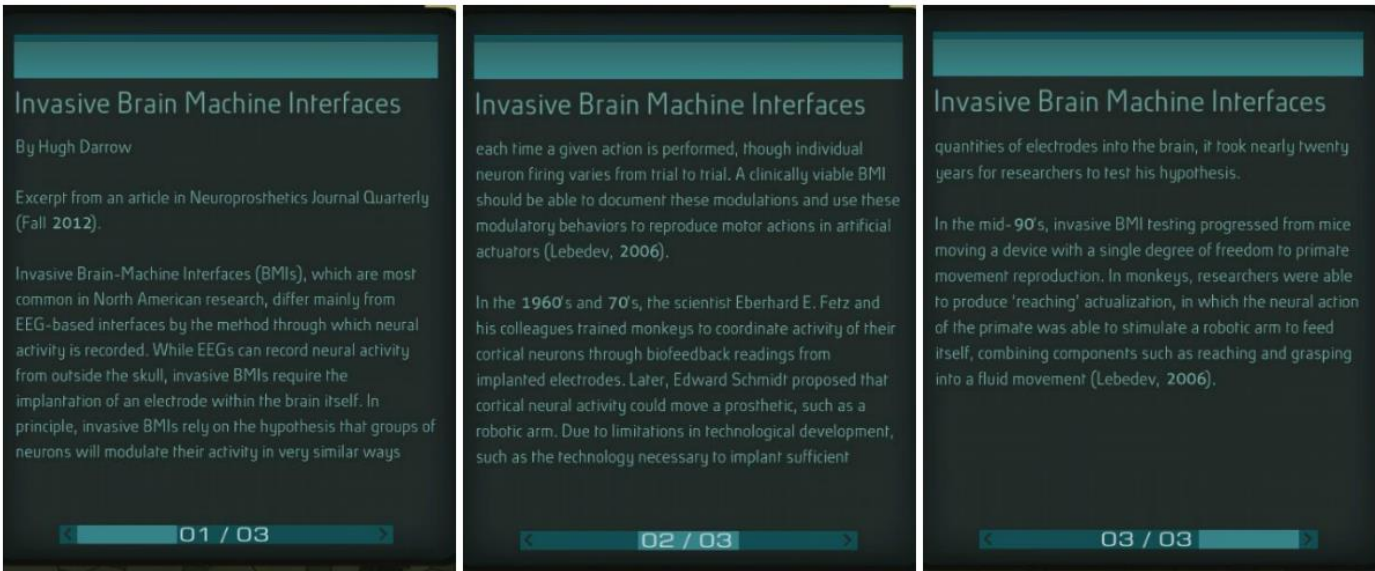


Figure 13: A Hugh Darrow eBook

The eBooks increase the scientificity of the game not only by providing even more information about related scientific advancements, but further through the fact that they come in the form of scientific journal articles, excerpts of papers, or conference proceedings, which grants the information a scholarly impression. Furthermore, in some cases, as in the example above (Figure 13), there even is a proper in-text citation indicating from whom the knowledge stems from. In the case of the example above it might be an article entitled *Brain-machine interfaces: past, present and future* (Lebedev & Nicolelis, 2006). Other eBooks again may lack citations but are instead very closely based on their sources as in the case of the eBook on artificial muscles:

Darrow eBook ,Artificial Muscles‘	Likely source
From a seminar by Hugh Darrow in Spring 2009	Fukushima, T., Asaka, K., Kosaka, A. and Aida, T. (2005), Fully Plastic Actuator through Layer-by-Layer Casting with Ionic-Liquid-Based Bucky Gel. <i>Angew. Chem. Int. Ed.</i> , 44: 2410–2413.
[...] ‘fully plastic actuator’ mechanism. In basic terms, we have a three-part structure - a sandwich of gel layers made up of a matrix of dispersed single-walled carbon nanotubes, situated on either side of an ionic fluid pyroelectrolyte core. Known as a ‘bucky gel’ structure, in references to the carbon Fullerene nanotubes, the design’s similar arrangement of soft electrodes and electrolyte layers is capable of operating at very low voltages.	Ionic liquids containing dispersed single-walled carbon nanotubes (bucky gels), allow the first layer-by-layer casting fabrication of a fully plastic actuator. This actuator adopts a simple three-layered configuration of soft electrodes and electrolyte layers [...] and can operate in air at low voltages. (Fukushima, Asaka, Kosaka, & Aida, 2005)

5.3.3. Medical issues of the augmentations

Apart from technical facts, cogitations about medical and psychological effects caused by technological enhancement are also reflected in the game. The sociotechnical imaginary of augmentation in DXHR is not one that involves the technology as the ultimate solution that has only positive effects. Rather the impression is conveyed that the augmentations are a major encroachment on the human body and that the bodily modifications require follow-up medical attendance after the surgery. Prominently, there is the surgery scene at the beginning of the game that depicts the augmentation process not only as a considerable manipulation of the appearance of the human body, but above all as a painful and bloody medical procedure. The surgery scene contains interesting visual clues hinting at the implicit, underlying imaginary of human enhancement of the game under consideration. This becomes particularly clear for the scenes showing Jensen's heart. The beating heart is shown two times – once before and once after the enhancement process is executed – and this enables and to a certain extent invites the viewer to compare the two frames. Before the

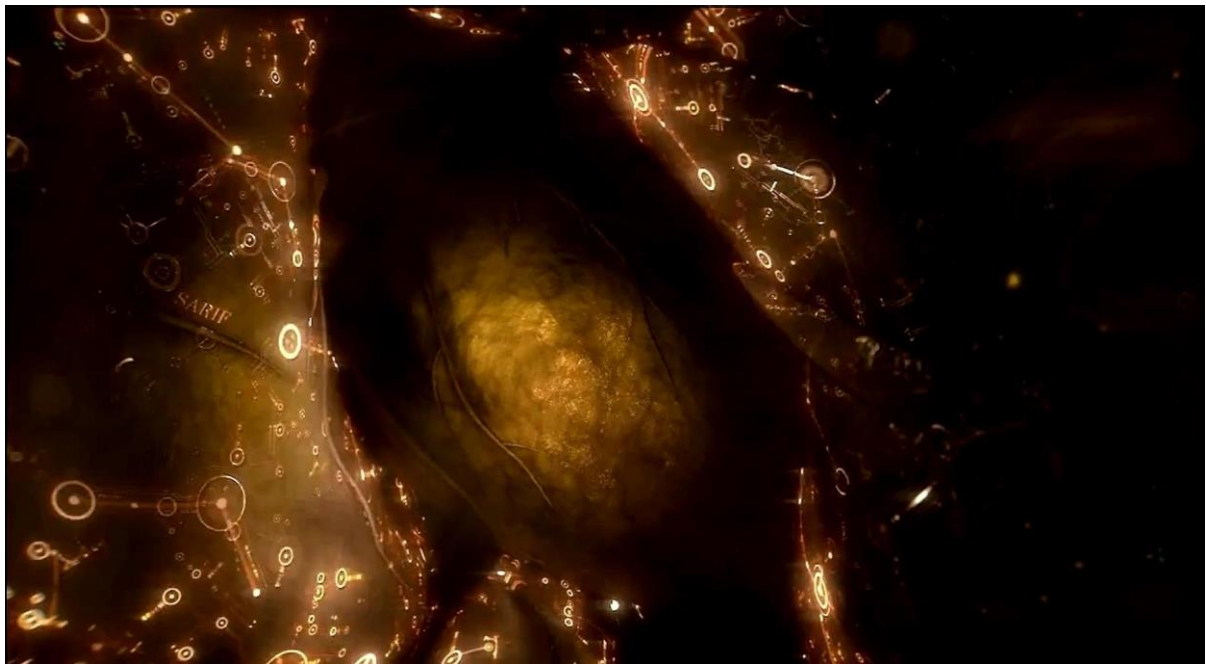


Figure 14: Opening credits: Adam Jensen's heart

surgery is done, Jensen's heart and the tissue enclosing the cavity is untouched; organic by nature. However, after the enhancement, the organic tissue surrounding the heart is interlaced by lines, dots and circles which flash once in synchronization with the beating of the heart invoking the impression of a printed circuit board and electrical circuitries. This clearly raises questions in how far Adam Jensen has been augmented and modified and to what proportions his body has been replaced and supplemented by mechanical and electronic devices. These inquiries inevitably lead to the doubt of Jensen's ontological status. Is he still human?

Moreover, the scene comprises another detail, which is also included on the X-ray scans seen during the opening credits. In the middle of the left side of figure 12, the name 'Sarif' is clearly distinguishable and marks the implanted technology as the property of Sarif Industries. This minor inclusion jeopardizes natural, untouchable rights of property. Who owns Adam Jensen's body after augmentation? The issue is ambivalent and reminiscent of similar debates, especially eligibility of patenting of specific human genes on part of companies on grounds of discovery such as the legal case of *Association of Molecular Pathology vs. Myriad Genetics* (Fisher, 2013).

Other parts of the game are not short of medical information on human enhancement technologies. The narrative of the game states specifically during the first visit to a LIMB ('Liberty In Mind And Body') clinic why not all augmentations are available from the beginning even though they are already implanted in the body and theoretically available: "The damage caused by the hematoma had to be taken into account. Your brain needed time to recover. To get used to the mechanical neuroprocessors and turn them on naturally, over time." (Eidos Montreal, 2011b). Activation of the 'sleeping' augmentations is possible either naturally over time, which denotes the bodies healing process after the surgery as well as the growing experience with the augmentations, which is directly represented in the game through the receipt of experience points; or through the consumption of a so-called praxis kit, which can be either found or bought.

Further medical information on the technologies, such as imagined location of implantation, is provided on the augmentation screen which shows in which part of the body which augmentation resides and in the *More Info* sections. In addition, the aforementioned eBooks sometimes offer basic biological background knowledge on the functionality of such things as the visual cortex or the human hearing apparatus.

Active engagement with scientific rationale

Most of the medical and psychological information on human enhancement, however, is not handed to the player on the silver platter. Rather, the player needs to actively observe and perceive the environment and be sensitive to cues that hint towards certain issues. A good example is the missing six months' time frame between Jensen's augmentation surgery and his return to duty. This is a crucial period as it involves the highly interesting phase of recovery that Jensen had to overcome after the attack on Sarif Industries and his surgical procedure. None of this is explicitly voiced in the game, but there are subtle clues which signify psychological ruptures, perhaps even an identity crisis, that Jensen has undergone after augmentation and alteration of his body. This can be discovered at the protagonist's apartment in future Detroit where much of his background story is ingrained. There the player can find a broken mirror in the bathroom. The fractures of the mirror commence

clearly from the center and extend from there. A small Post-It note can be found attached to the bottom right corner of the mirror saying “Call Landlord. Replacement mirror AGAIN” (Eidos Montreal, 2011b)



Figure 15: A broken mirror and self-help book

Furthermore, a look into Jensen’s computer reveals a distinctly annoyed email from the landlord about the mirror, stating that no degree of “pestering” will accelerate the repairs due to delivery problems with the distributor and that the landlord is “still unclear as to how precisely this mirror came to be damaged” (Eidos Montreal, 2011b) because Jensen has not commented on this fact. The minor sub-story about the broken mirror implies a broken self-conception after augmentation, which ostensibly led Jensen to an irate outburst. In addition, there are alcoholic beverages and cigarettes strewn across the apartment, a self-help book on “Living with your new cybernetic prosthesis” (Figure 15) along with painkillers in the bathroom which indicate that Jensen apparently suffered from post-surgical pain or even trauma which he tried to remedy through drugs and alcohol. In other words, the imaginary of the game clearly involves difficulties with the implantation of mechanical parts into the human organism, for which Jensen sought effective coping strategies. Some of the recovery process is also chronicled verbally as for instance in the ominous ‘Patient X’ file that lies in Megan Reed’s office or the ‘AJ09’ email at the first LIMB clinic.

Except for Jensen, who plays a special role in the narrative due to his genomic predisposition, all other augmented people suffer from acute tissue rejection – a severe after-effect of technological augmentation which forces people to a life-long dependency on the fictional drug ‘Neuropozyne’. It is imagined in the game that the human body rejects any foreign parts, which requires augmented people to take an anti-rejection drug to hinder the

body's immune system from battling inorganic parts. According to Will Rosellini, this fact is also based in real-life, which he explained in response to a question at the Comic-Con panel in 2011. He equated the human body's reaction to implants with the reaction to a splinter, meaning generally that the body will attack any foreign object in the body, which will cause an inflammation at the affected region and, in the case of a splinter, will eventually force it out through the epidermis. (Comic Con, 2011)

5.3.4. Social Implications of Augmentation

Similar to medical and psychological issues, impacts on society are also reflected in DXHR. These actually make up a part of the narrative and form the major conflict of the game. Human enhancement technologies are envisioned to cause social turmoil because not everybody will be able to afford augmentations and not everybody will want to technologically alter their body. This results in unfair advantages for the wealthy augmented people and effectively renders the non-augmented person a second class citizen. This is well exemplified in the *Purity First* trailer, but other or similar social implications are explored in the world of the game. So for example, the developers have provided that virtually every NPC can be addressed and will in most cases reply with a statement concerning human augmentation. In the Detroit level for instance a lot of the homeless people in the alleys utter statements like "I ain't no guinea pig. Ain't no way I was getting aug-ed just to keep my job" (Eidos Montreal, 2011b). There are also opinions on the other end of the extreme. People who oppose the anti-augmentation thinking of William Taggart and his *Humanity Front* may say the following: "I just can't subscribe to Taggart's Neanderthal opinions. It's like he thinks human development is a sin. I can't believe there are still people out there with such backward mentalities" (Eidos Montreal, 2011b)

Moreover, there are several optional sidequests that a player may complete, which explore a social dimension of augmentation. The sidequest 'Rotten Business' involves Jensen helping a prostitute who has been abducted by her own employer and forced to undergo prosthetic augmentation surgery in order to attract more customers who demand augmented prostitutes. In another quest entitled 'Bar Tab' the player will meet a business woman, a broker who explains that most brokers stem from rich families and have a significant advantage in the market due to their augmentations. After her long and expensive studies she was not able to compete in the market and so she had to turn to the illegal black market to buy an affordable augmentation. Now she is blackmailed by those people and has to turn in monthly payments, even though the augmentation has been long paid off.

Apart from the sidequests, which many players will try to complete, there are also minor details included in the game which can easily be overlooked or passed by. One of these minor details can be experienced during the first visit to Jensen's apartment. The player can

walk down the corridor of the apartment building and stand close to the last locked apartment door. There Jensen will be able to eavesdrop on an enhanced couple having an argument concerning their understanding of ‘normalcy’:

Woman: It was a spur of the moment! It didn’t mean anything!

Man: Yeah, I’m sure it was. I knew you and that natch [colloquial expression for a person without augmentations] were close but I didn’t realize you were that close!

Woman: I’m sorry! I don’t know I guess I wanted to be reminded of what it was to be with someone ... normal.

Man: You were the one who wanted us to get enhanced! Now you’re saying we’re not normal anymore? Well I’ll try not to touch you too often with my cold, dead, metal hand, okay! (Eidos Montreal, 2011b)

Another intriguing element of social impact through the technology is the formation of criminal groups called ‘the Harvesters’, who are eponymously specialized on harvesting marketable enhancement technologies from victims. A main mission will require Jensen to infiltrate the Harvesters’ hideout in order to track down one of the abducted scientists. Jensen finds out that the Harvesters have received the corpse of the missing scientists and that the head of the group has exchanged his old mechanical arm with the far more advanced one that the Sarif scientist was wearing. Nevertheless, there is room in the hideout (Figure 16) that represents the criminal work of the Harvesters in a visceral visual style – the darkest imaginations of how enhancement technologies might affect society.



Figure 16: Harvesting room

5.3.5. Translational Science Consultant

The major strategy to improve the scientificity of the sociotechnical imaginary of enhancement technologies in *DXHR* was the inclusion of a science consultant in the development process. Will Rosellini, a neuroscientist and entrepreneur, was responsible for many descriptions of the enhancement technologies in *DXHR* as he explains in various interviews. He is the co-founder and director of the company MicroTransponder Inc. which is “a medical device company developing wireless devices to interface with the nervous

system” (Eidos Montreal, 2011a) and also the executive chairman of the board of Rosellini Scientific, a company whose ethos is to “empower freedom from disease by developing intelligent medical rehabilitation devices to support patients post-procedure. [...] Where no therapy currently exists, we are actively developing solutions utilizing the interconnection of software, hardware, and biomedical implants” (Rosellini Scientific, 2013).

Rosellini joined the development team of *DXHR* on his own parts, meaning that he approached the producers and offered to help in the development. At the Comic-Con panel and in my interview Rosellini mentioned that he was a big fan of the *Deus Ex* series and that he was disappointed in the second installment *Invisible War* (2003) and its treatment of nanotechnology-based human enhancements. Out of this motivation, Rosellini wanted to improve the credibility of the technologies, which are an inherent part of the genre of the game series. Concerning the question where the initial idea came from to help and work on this specific videogame and videogames in general, Rosellini replied:

Hard to say, I decided that my job as a researcher/translational scientist was to predict the future and then set out creating incremental experiments to make these products come true. I was a big fan of Deus Ex, so I called up the CEO and told him I was ready to help. He thought I was just another crazy fan until he read my resume (Interview Rosellini)

The response is very interesting in the sense that Rosellini first makes a statement about his occupation before referring to his fandom of the first *Deus Ex* (2000). Judging solely from the response, there is a logical connection that Rosellini draws between his tasks (‘predicting the future’ & ‘creating incremental experiments to make these products come true’) and the video game *Deus Ex*. There is an implicit suggestion or assumption that this sort of game offers another perspective, angle or way to approach or fulfill the mentioned tasks. This reading is in accord with other responses that Rosellini provided. To the question whether video games can function as serious presentation displays of prototypes of future technologies Rosellini stated that

Science Fiction is an excellent place to explore the what-if...it would be hard to say that innovation has a process that works...we know that corporations have tried to make innovation standardized with process oriented procedures...however, this hasn't yielded more returns on their innovation dollars. Being creative is hard to pin down... (Interview Rosellini)

This is of course not a direct answer to the question, but nevertheless reveals that he sees his involvement in the production of *DXHR* entangled with innovation and the need to be creative in his field of operation. Furthermore, he stated that he is not worried about a possible deterioration of his professional reputation due to his involvement in *DXHR* but he is

“hoping to ride the wave of innovation towards break-through technologies” (Interview Rosellini).

Finally, it would have been interesting to find out whether Rosellini’s involvement in DXHR has had some positive promotional effects for his companies. He replied that he could notice no remarkable increase of professional interest in his companies due to DXHR. And furthermore I was not able to ascertain any details about the similarities of the logos of Rosellini Scientific and Sarif Industries, which means that no valid inferences can be made whether EIDOS has chosen to use Rosellini Scientific’s winged logo or vice versa. Despite this semantic lacuna, what remains is that the logos construct a bridge between the fictional and the real biotechnology company.



Figure 17: Rosellini Scientific vs. Sarif Industries logo

5.3.6. The Sociotechnical Imaginary

A broad analysis of *DXHR* has been undertaken in chapter 5 centering on the entirety of the game instead of only a few augmentations. In this concluding section the construction of sociotechnical imaginaries shall be summarized. There exist multiple imaginaries on human enhancement in *DXHR*. The two key imaginaries are on the one side, the transhumanist imaginary which proclaims that guiding human evolution with the help of technology is proper and lies in the nature of the human being. On the other side, there is an opposing, purist imaginary which holds human enhancement technology as a means to tamper with human biology in unjustified ways. What connects these two contrary key imaginaries - and may be taken as the foundation of an overarching sociotechnical imaginary - is that human enhancement technologies are promethean and controversial. They are neither a guiding light into a brighter future, nor an annihilating force that threatens human nature. The game promises to put the player on the line between deciding whether the science of human enhancement is trying to play god or whether it enables us “to become the gods we’ve always been striving to be” (Jensen, Sarif ending, *DXHR*) (Eidos Montreal, 2011b). In this way the promise is fulfilled by providing arguments for both oppositions.

The second common element among the imaginaries is the depiction of mechanical human enhancement technologies as an axiomatic hard fact of the near future. Particularly the ending of the game, which boldly places the player in a locked room with a choice of one of four buttons, challenges the player to think about the further future of human enhancement after the events of *DXHR*. However, it remains that the root – and thus the overarching sociotechnical imaginary – is the fact that prosthetic and implantable technologies to improve human performance will exist in that form and that it will challenge humanity. To a certain extent, this implicit assertion of *DXHR* is a self-fulfilling prophecy as the game problematizes the science of human enhancement in the present which it proclaims only will be a topic confronting humanity in the future.

In the last chapter I have disclosed on three tiers that the developers have created a game that features a high engagement with an imagined future of human enhancement technologies. The sociotechnical imaginaries are fixated with the help of narrative elements which include the centrality of human enhancement in the main story line and the optional side quests, and the dialogues with and utterances of NPCs. Furthermore, the developers employed a high degree of diegetic prototyping which involves the depiction and the aesthetics of augmentations, particularly of the prosthetics, and the player interaction with the augmentations in the form of an essential gameplay mechanic. The third tier that construes the sociotechnical imaginaries in *DXHR* is the formation of scientificity with the help of a science consultant and extensive background knowledge that refers to actual research and is presented in a form associated with the procedures of science (e.g. use of scientific jargon and presentation of knowledge in articles).

While all of the imaginaries can be discerned, the gameplay of *DXHR* allows for the decision for one sociotechnical imaginary on the side of the player. The replies in social battles, the choices made in side quests, the actions taken throughout the game (such as a lethal or non-lethal approach) and overall the playing style of the player (e.g. stealth, combat, etc.) manifests to a certain degree the player's personalized imaginary of human enhancement. The playing style encompasses the use of specific augmentations, which means that the player will embrace some augmentations and reject others. During my analytical play I have chosen to play in an explorative way and favored a lethal combat approach. Getting rid of all enemies in my way gave me the opportunity to investigate the environment for details on human enhancement without the danger of being disturbed through an attack. For this reason I primarily invested my praxis points in the combat friendly augmentations such as the *Reflex Booster* (taking down two enemies with a single melee attack), the *Dermal Armor* (Jensen withstands more damage) and the *Cybernetic Arm Prosthesis* (full carrying capacity to store more ammunition in inventory). Secondly, I invested the praxis points in what I felt were exploration friendly augmentations such as the various *Hacking* implants which grant

me access to locked areas or augmentations such as the *Implanted Rebreather* or the *Cybernetic Leg Prosthesis* that allow Jensen to sprint for a longer time which is handy to get around the large city hub areas. These are some of the augmentations that I valued in the course of the game, others, however, I rejected as they seemed useless for my case, such as the *Stealth Enhancer*.

Playing DXHR is a learning process to find a set of augmentations that works for a personal playing style. It involves constant reflections, decisions and choices of which augmentations to activate and upgrade as the augmentations determine the playing style to some extent. The end of the game is a final attempt on the side of the developers to make the player reflect upon the morality of human enhancement, but it presupposes a will on the side of the player to engage in this reflection. The events in the game, the social battles, and other sources of information have educated the player on the sociotechnical imaginaries of human enhancement and the last choice in the game invites to reflect upon the choices taken in the many hours of playtime that came before. I as the participating player entered the final reflection and introspectively asked: Now that I beat the game, were the augmentations really useful? How did I like handling the augmentations? Did I treat the people I met throughout the story morally right? I did not consider my choices as enclosed within the world DXHR, but made analogies between the fictional and the real world. For instance, I found it extremely difficult to act bad towards other characters as I felt that the choice would affect who I am to some extent. This impression does not apply for enemies, however. I was not fully aware that killing enemy soldiers in the game is in any way morally bad. Only until a few hours into the game did I realize that I was able to gain a 'pacifist achievement award' for not killing any enemies and that this might also impact the moral slant of Jensen. Nevertheless, it took quite some time to decide on one of the four possible endings of the game and I considered my choice well, particularly referring back to social battles and other choice conversations as these lingered the most in my mind. It would be interesting, however, to conduct interviews with other players of DXHR and investigate how they decided which of the endings to select and which cognitive strategies they took.

6. Two Augmentations In-Depth

In the previous chapter, the general aspects and form of the sociotechnical imaginaries of human enhancement technologies present in *DXHR* have been discussed. This has required the examination of the narrative, the scientificity of the game as well as the investigation of all of the augmentations. In order to make the sociotechnical imaginaries of human enhancement technologies and its performance in the game more explicit, the following section will focus on two example augmentations and their fulfillment of the criteria of diegetic prototypes. These two technologies are able to respectively stand for the realistic augmentations of the game. The first augmentations – the Infolink Package – has been chosen on the one side because it is part of the unalterable gameplay experience of *DXHR*, which means that every player will be confronted with it, and on the other because Will Rosellini has made apparent on his personal blog (Rosellini, 2013) that it has a firm foundation in contemporary scientific work. The second augmentation – the Cybernetic Arm Prosthesis – has been selected because it is the trademark augmentation of *DXHR*. The quadruple amputee Adam Jensen is best known for and identified by his arm prostheses that along with his sunglasses grant him his signature appearance.

6.1. The Infolink Package

6.1.1. The Technology

6.1.1.1. Description

The Infolink Package or simply ‘Infolink’ is a transmission package that allows the user to wirelessly communicate with others. It is a composition of a cochlear and a uvocal communications implant that reside in the cranium and that are also connected to function with a retinal prosthesis. The Infolink belongs to those few augmentations that are activated from the start of the game. Furthermore, like the Sentinel RX Health System, the Infolink is fully activated by default and is non-upgradeable. Thus, together with the other default activated augmentations, the Infolink forms the basis of the player experience of the game.

6.1.1.2. (Verbal) Appearance

In the game itself, the Infolink cannot be seen as it resides inside the skull. Nevertheless, a verbal description is provided. on the Augmentations Screen by entering the *More Info* Section of the enhancement:

Essentially a microelectronic membrane processor implanted at the rear of the skull, just behind the ear, the Infolink Telecommunications Package is a short-range audiovisual transceiver for digital video, audio, and data signals. A vibrational pickup mounted in the mastoid bone allows users to transmit subvocalized verbal communications, while a cochlear implant relays audio information directly into the ear. (Eidos Montreal, 2011b)

This information is neither essential, nor necessary for gameplay, however it increases realism and authenticity of the game by explaining the technology, its location in the body as well as its operating principle. This makes the technology reasonable and open to scrutiny. Nonetheless, this is not the only source of information provided for this technology. Players are able to find an eBook entitled *The Science and Theory behind Cochlear Implants* which includes biological background information on the process of hearing.

6.1.2. The Player

6.1.2.1. Introducing the Infolink and the HUD

After the initial credits which cover the enhancement surgery of Jensen, the player takes control of the augmented Jensen. The cutscene shows the interior of Sarif Industries and zooms in to view Jensen entering the building through the main entrance. The camera grants the player a full view of the protagonist, who seems to not have changed much after the surgery. He is wearing a similar black coat as in the first minutes of the game and the only real visible alteration seem to be two V-shaped black parts mounted to his temples and a hexagonal indentation on his forehead. Before the player can get a good view of Jensen's eyes, sunglasses extend from these black parts and the camera moves to Jensen's back where it seems to enter and give the player control of Jensen.

Apart from the retractable sunglasses, the Infolink and the heads-up-display (HUD) of the Retinal Prosthesis are the first augmentations the player is introduced to. As soon as the player takes control, Jensen receives a call from his boss David Sarif who informs him about a hostage situation at one of the laboratories of Sarif Industries. Jensen replies that he first needs to see a technician because his retinal enhancement is malfunctioning. Indeed, in the first few minutes in which the player is able to play an enhanced Jensen, the individual items displayed on the HUD produced by the retinal enhancement are flickering and not

functioning properly. The first objective is then to visit the technician in his tech-lab to repair the flickering HUD, which he can easily do by using a special, not further-defined tool. The technician positions the tool on the right side of Jensen's head and then the player can perceive a sound similar to that of an electric screwdriver. In the next moment, while the technician is in the process of warning Jensen that the procedure might hurt, the sound of the technician's voice suddenly dampens; Jensen crinkles and emits a short cry of pain. Then, the items on the HUD are replaced by multiple instances of the word 'Rebooting' and a high-pitched tone can be heard. During the reboot of the retinal enhancement, the technician Pritchard explains that it

looks like your left and right imaging processors weren't completely in sync, but don't worry – your Sentinel Health implant will kick in soon repairing any damage that might have caused. Your retinal display should be fine now. Its recognition software won't be picking up hostiles yet, but you should be seeing radar and targeting reticules. (DXHR, Frank Pritchard, Tech Lab, Sarif Industries)



Figure 18: Technician repairing issues with Retinal Prosthesis

This short speech simultaneously functions as a quick introduction of the HUD as the individual overlays re-appear according to the content of this speech: the health information delivered by the Sentinel RX Health System appears in the upper left corner of the screen along with the charge level of energy provided by the Sarif Energy Converter. After that, the small radar screen at the bottom left corner of the screen reboots and shows the player's position as a yellow arrow. Further elements of the player HUD are a pop-up box, which appears and informs the player of various updates such as new objectives and acquired items (left edge of screen); the momentary weapon equipped along with details about the

weapon's ammunition status (lower right corner); and the Infolink overlay which only appears in the case of a call (upper right corner). Furthermore, the HUD also includes a waypoint in the form of an X and a distance marker, which points to the location of the next objective that the player needs to attend.

6.1.2.2. Engagement and Interaction with the Infolink

The Infolink can be described as an omnipresent augmentation on which the player has no decisive influence. There is no option of choosing to reject an incoming signal in *DXHR* and the player is forced to take every call scripted in the game's narrative. It is possible that this 'powerless' situation should in part reflect the military nature of the augmentations and the primary purpose of Adam Jensen's enhancements. As one of the first major enemies points out, Adam Jensen is to a certain extent David Sarif's "watchdog" (Eidos Montreal, 2011b) and, thus, it makes sense that Jensen is subjugated to his employer and sponsor, and that Sarif is able to directly and instantly communicate with his major investment.



Figure 19: Receiving a call via the Infolink

6.1.2.3. Making the Player Aware

In connection to the Infolink and above all the HUD – the augmented reality overlay produced by the Retinal Prosthesis - the producers of *DXHR* needed to overcome an obstacle. In gaming terms the HUD is not an enhancement technology, but a wide-spread gameplay mechanic. In racing games the car's dashboard is virtually rendered showing the

player the momentary speed, gear and position in the race; in action games like First-Person Shooters the HUD typically displays the health and ammunition status and often also a radar map - see figure 14 for a comparison of DXHR's HUD with the 13 year old classic game *Metal Gear Solid*, which basically features the same HUD items. To put it in a nutshell, players are accustomed to the presence of a HUD and it must be presumed by the developers of *DXHR* that the average player will be familiar with the HUD and, thus, not register the HUD and the overlays of the Infolink as an augmentation, but as a usual gameplay mechanic.



Figure 20: HUD in *Metal Gear Solid* (1998) and *DXHR* (2011)

For this reason, I argue, the developers have implemented the malfunction of the HUD that the player encounters when first taking control of the augmented Jensen (see 6.1.2.1 above) in order to draw attention to the fact that the HUD is the product of an augmentation. The flickering digital overlays, the need to visit a technician and the brief rebooting sequence of the HUD after the repair (see figure 18) all are elements that help make the player aware that the HUD and the Infolink are advanced human enhancement technologies and not (just) gameplay items. In addition, there are also the few minutes of play time at the beginning of the game with a non-augmented Adam Jensen where no digital overlays are present that serve as a foil to the augmented field-of-vision in the rest of the game.

6.1.3. The Narrative

By definition, the Infolink can be ascribed to the category of invisible technologies as it is mostly absent from the user's awareness. As mentioned the Infolink is out of the player's range of manipulation due to narrative reasons. Despite the openness of the world in *DX* and the many freedoms that the player has in exploration of this world, the problem-solving options (i.e. style of gameplay: stealth, combat, social, hacking) and choice of utterances in conversation, certain parts of the game are fixed and unalterable in the light of the main storyline. The tension that arises between player-controlled and scripted events have been respectively termed the "framed narrative" and the "ludonarrative, which is unscripted and

gamer-determined” (Bissell, 2011, p. 37). Tom Bissell has exemplified this terminology with the help of the first-person shooter *Call of Duty 4* in which a scene requires the player and a computer-controlled partner to fight their way from one point to another. The framed narrative of the game requires the two soldiers to arrive at the destination together and this fact cannot be altered no matter what the player does on the way to the destination. Even if the player kills his partner, the next cutscene will show the two characters arriving at the destination together.

DXHR belongs to those games that seek to overcome this dichotomy through “allowing decisions made during the ludonarrative to alter the framed narrative” (Bissell, 2011, p. 38). This fact is reflected in the several instances in the game that ask for the player’s stance of morality and ultimately leads to the realization of one of twelve different endings. Nevertheless, there is a main storyline that the player needs to experience, which is communicated through cinematic cutscenes that take away the agency from the player, and through transmissions via the Infolink. This renders the Infolink in the context of *DXHR* a ‘narrative’ technology, which advances the main storyline without disrupting the “illusion of agency” (Bissell, 2011, p. 37) that is provided by the ludonarrative.

Furthermore, it replaces the need to physically meet up with certain people in the course of the game. Although the player still has to physically visit people at some times, often objective updates are received via the Infolink. Hence, the technology is potentially able to isolate the character from the world by eradicating the need to meet people. Simultaneously, however, the character is never alone, because of the technology. Characters can communicate with Jensen seemingly at will and also a few times in the game unknown characters hack into Jensen’s frequency and, thus, force him to communicate. In addition, sometimes characters eavesdrop on Jensen’s conversations without him noticing. In other words, the Infolink augmentation is a technology that may lead to social isolation while concurrently making the user always-available. In connection with the Infolink serving the “framed narrative”, the ‘important’ conversations – those that the player can and must influence, and in which s/he can determine Jensen’s morality – are held in person. Perhaps these instances can be described as another method to overcome the problem of “framed narrative” by granting the player a limited set of pre-defined choices to choose from. On the ludonarrative-framed-narrative spectrum, the choice conversations can be defined as a hybrid between the two extremes.

6.1.4. Conclusion Infolink

In terms of the sociotechnical imaginary the Infolink presents itself as a chiefly enabling technology which provides the protagonist Adam Jensen an intuitive and always-ready

means of communication. However, it also raises implicit concerns about security and privacy due to its seat in the human skull and its resulting inability to remove the technology when unneeded. The Infolink as Jensen's main and only communication device allows others to breach his communication pathway and force him to communicate. The player, on the other hand, through his or her position outside of the game experiences the uncontrollability of this enhancement technology even more thoroughly. As mentioned, The Infolink is non-upgradeable and cannot be deactivated. Furthermore, no calls can be placed or rejected at the player's will.

Through the analytical lens of Kirby's 'diegetic prototypes', the Infolink maintains its necessity on the level of narrative. It does not fulfill the criterion of benevolence as other characters can seemingly easily tune into the Infolink's frequency. Lastly, the viability is provided due to the fact that the technology functions flawlessly throughout the game. Even though not all of the criteria of a 'diegetic prototype' (Kirby, 2010) are given, the Infolink is depicted in a realistic and credible way and its anchorage in actual real world science has been clarified by Will Rosellini (Rosellini, 2013; see also 5.3.5.) . The effect of virtual witnessing (Shapin & Schaffer, 1985) requires the production of a comprehensive, exhaustive picture of a technology in order to make it appear believable to an audience. The fact that the Infolink is performed in *DXHR* as an enhancement technology that is not entirely safe to use because it raises issues of personal privacy and because the user loses control over the technology as it is implanted and irremovable.

6.2. The Cybernetic Arm Prosthesis

6.2.1. The Technology

6.2.1.1. Description

The Cybernetic Arm Prosthesis is the hallmark augmentation of *DXHR*. It is the most striking and visually conspicuous augmentation in the game and the two upper limb prostheses allow the protagonist, when fully upgraded, to take down a single enemy lethally or non-lethally, punch through a wall, fully compensate weapon recoil, move and throw heavy objects, and carry more items.

Developed by Sarif Industries, the Cybernetic Arm Prosthesis is a military grade arm augmentation built on a framework of advanced polymers and lightweight metals. It features a 50cm nano-ceramic blade, housed in a retractable plate that allows it to extend both forward and inverted. The arm is equipped with a

proprietary typhoon claymore system that releases a matrix of explosive 10mm stainless steel ball bearings in an optimal radius around the user (SA Studios Global, 2011)

Being mechanical, the arm prostheses are able to transform according to the situation. Most of the time, the player does not see Jensen's prostheses transform except during the take-down moves and some parts of the E3 2010 trailer. Transformations of Jensen's arm prostheses include, above all, a retractable blade that is hidden inside the forearms of his robotic limbs and is able to extend both forwards above the wrist and backwards near the elbow. In addition, Jensen is able to open his artificial hands inhumanely wide, which he uses for one of his take-down moves for which he splays out the fingers in an impossible fashion in order to efficiently grasp the head of an opponent.

6.2.1.2. General Appearance

The Cybernetic Arm Prostheses of Jensen are colored in shiny black, whereby parts of the prosthesis, particularly the shoulder and biceps region, appear to have a form of surface texture that is reminiscent of carbon. The surface of the forearm, on the other side, appears smoother in comparison. There are five red, circular indentations on each prosthesis located at the wrist, the inside of the forearm, the side of the elbow joint, the back of the elbow and the outer side of the biceps, which are part of the Typhoon Explosive augmentation. The prostheses are designed to emulate the appearance of well-toned arms which show patterns of strengthened muscles on the forearms and large biceps. However, at times the shoulder seems disproportionately large in relation to the rest of the arms. Nevertheless, this is not overly surprising as the art director Jonathan Jacques-Belletête explains in the *Making Of* documentary that the development team was not aiming for photorealistic representations of the human body.

The artificial arms can often be seen throughout the game and it is clear from the game alone that the entire arms including the shoulders are prostheses. However, where the artificial exactly meets the biological can only be seen during the opening credits, which is simultaneously the scene in which Jensen undergoes enhancement surgery; in a drawn picture (cf. figure 21), which one regularly encounters while reading reviews of the game and can also be seen in the E3 2010 trailer (Square Visual Works, 2010); and in the stand-alone expansion entitled *Deus Ex: Human Revolution – The Missing Link* (Eidos Montreal, 2011f) which fills a time gap of three days in the original game. In *The Missing Link*, Jensen is captured and stripped of his equipment and, thus, can be played with a bare torso for a brief period of time, granting the player a sight of how the game developers have imagined the artificial arms to be fastened to the human body. From these images it can be deduced that

the prosthetic arms are ostensibly fastened through the whole chest, instead of merely the shoulders. The opening credits reveal that there is another artificial part that replaces the original shoulder socket and functions as the analogue in which the cybernetic arm prosthesis can be plugged into. The drawn image and *The Missing Link* reveal that there seems to be more implanted into Jensen's shoulder region that holds the arm prostheses in place. In figure 19 shows that there are nine bolts or sockets in his chest, whereby the three lowest seem to be interconnected through a subdermal cable or wire. A short sequence during the opening credits undergird the assumption that these nine bolts are indeed sockets as cables are plugged into Jensen's chest. Furthermore, there is, what seems to be, an artificial tendon on either side of the neck of the character which points towards a bolt or socket nested on the clavicle. Nevertheless, it has to be pointed out that the game provides no further information on such anatomical or surgical aspects of this technology and the purpose of the nine sockets in the chest can merely be surmised from the visual material. In my interview with him, Jacques-Belletête explained why certain elements were put in place on the arms and the chest how the arms were envisioned to be attached to the body:

Most of the parts and functions on them were designed to support the various ideas we had for the offensive and defensive augmentations such as the blades and the claymore bombs. The sockets on his chest were added by one of our illustrators when he created the famous image of Adam Jensen sitting on his couch bare chested [figure 21]. They are the external bits of all the substantial internal changes that were made to Adam to support the arms prosthesis and their added strength. We always figured that the entire rib cage, chest cavity and compounded chest muscles (and even some organs) as well as the spinal cord had to be cybernetically replaced in order to supplement and allow the superhuman power provided by the arms. Just having metal cranes grafted to the shoulders would not make any sense. Lifting a heavy object would just rip the arms off or cause trunk, back, and leg injuries. (Interview Jacques-Belletête)



Figure 21: Concept Art of Adam Jensen

The concept art and conjunctively the response by the art director make it clear that thorough thought processes and reflections about the prosthetic's realism were made and have informed the design. Jacques-Belletête implies in response that the prosthetic arms should adhere to physical laws of nature, for example. The concept art of Jensen reveals much more, however, and refers to medical and psychological issues that have been broached in section 5.3.3. This image of Jensen does not reflect the empowerment of his enhancements in any way, but quite contrary portrays him as a vulnerable and fragile human being. Bandages are still covering wounds from the surgery and the attack and he appears depressed and tired, possibly dampening his feelings and post-surgical pains with alcohol and nicotine. This image shows a side of Adam Jensen that does not appear in the game itself. Chronologically it must be situated somewhere between the surgery and the return to duty at Sarif Industries – the six months' time period missing in the game. This portrayal of Jensen as a weak and vulnerable subject in this concept art helps to allay doubts about his humanity as not only the many mechanical parts in his body, but also his cold and distanced manner of speaking in the game often make him appear more machine than man.

6.2.1.3. Aesthetics of the Prosthesis

The process of developing a suitable model of the Cybernetic Arm Prosthesis rendered a multitude of different kinds of models. Jensen's sleek, black prostheses are just one of many imaginations how an advanced mechanical prosthesis might look like in the year 2027 and it is only one of many variations that have actually been implemented in the game. To begin with, in the temporal frame of DXHR there are prosthetics that look modern and appear to be the state-of-the-art, and there are prosthetics that appear more crude as if they are preceding versions of the more modern models. However, the variations do have a common thread in their design as Jacques-Belletête explains in the *Making Of* documentary:

One of the early things that we said is that we do not want to go the kind of old-school way of drawing cybernetics and stuff like that – the kind of like the chrome metallic arms with like wires coming out of chest plugging into the head – it makes no sense at all. So I really did not want to go for that. I wanted to go for something a little more subtle. The main thing was to actually generate a *planned uncanniness* almost like a prosthetic. You know when you look at a prosthetic, it does not look natural but yet its skin color and that kind of stuff it kind of looks weird (Eidos Montreal, 2011a)

His description coincides with the concept of the uncanny – in German 'das Unheimliche' - which has been explored by the psychoanalyst Sigmund Freud in 1919. Something that is *unheimlich* denotes the opposite of something that is *heimlich*, meaning that is familiar. This, according to Freud, would imply that everything foreign and new would appear uncanny which is not necessarily true for everything unknown and unfamiliar. It takes certain dispositions in part of the perceiving subject, which can be either strongly sensitive or insensitive to such qualities of feeling, or the object to be perceived that renders something as being *unheimlich*. As examples of what can induce the feeling of uncanniness, Freud mentions "wax-work figures, artificial dolls and automatons" (Freud, 2003) in other words objects which by its appearance are able to deceive the perceiver's vision into questioning the nature of the perceived. This raises "doubts whether an apparently animate being is really alive; or conversely, whether a lifeless object might not be in fact animate" (Freud, 2003).

As mentioned in section 5.2.4., the choice of colors for the arm prostheses has an impact on the perception of the technology and there exist various color variations in and around the game. While the majority of the prostheses are kept in dark, metal-related colors such as black, carbon, dark grey and so on, there are also yellow-colored versions which signify a gang affiliation. However, interestingly the prosthetics that Sarif Industries and Tai Yong Medical offer on the market are promoted in the color of white. This can be seen in the Sarif Industries main building lobby where there are large displays showing the arm and eye

prostheses, and it can be seen in the Sarif Industries promotional faux real trailer (figure 9). It may be assumed that the color of white serves a specific purpose especially if viewed in contrast to the prostheses on the street. The white suggests 'innocence', 'cleanliness', 'neutrality' and 'goodness' whereas black is typically associated with the antonyms of these words. The white suggests that something better can be obtained, and it summarizes David Sarif's vision of a better future and a better mankind through technology. Furthermore, the white not only creates a visual link between the arm prosthesis by Sarif Industries and the wings of Icarus seen in the E3 2010 trailer (Square Visual Works, 2010), but also 'White' evokes associations to 'Light', which is typically employed in literary works to symbolize scientific progress, specifically knowledge and enlightenment. So for instance, when Victor Frankenstein suddenly discovers the secret to create life from inanimate matter after spending innumerable nightly hours studying the decaying remains of bodies retrieved from cemeteries, he declares that "[...] from the midst of this darkness a sudden light broke in upon me – a light so brilliant and wondrous [...]" (Shelley, 2006 [1818], p. 44). The associations mentioned above are, nevertheless, not the only possible reasons why the color white was chosen for promotional displays:

As far as the color white for the Sarif Industries "ads", it was chosen to give them more mass appeal. We felt that a commercial product would have to be more elegant and somewhat toned down to appeal to regular people. We also wanted to give them a slight "Apple product" aesthetic, which was a big thing at the time of the game's design (Interview Jacques-Belletête)

In other words the design of the commercial product was adapted to contemporary design trends on the technology market in order to attract more attention for the fictional prosthetics.

6.2.2. The Player

In this section, I will delineate in what ways the player is able to engage with the Cybernetic Arm Prosthesis. The level of engagement is wider than with the Infolink but still rather limited concerning particular activities. There are some active actions that the player may perform, such as choosing an upgrade, but the main form of interaction with this augmentation is strictly visual.

The game is played primarily in first-person-mode which means that the player's point of view is internally focalized (Genette, 1980). The player experiences the story and the world through the eyes of Adam Jensen and can only see Jensen's hands and the weapon he is holding. However, during specific actions such as the hand-to-hand combat take-downs and whenever Jensen takes cover at a wall or behind a suitable object, the perspective changes

to third-person-mode and Jensen can be observed during these actions. This regularly allows the player to see and consider the arm prostheses. Furthermore, apart from Jensen's prostheses, there are many other characters that can be sighted in *DXHR*. However, except for wearing arm prostheses minor NPCs do not act upon their augmentations, i.e. they cannot be seen utilizing their improved abilities. The only other character next to Jensen who actively uses the prostheses is the enemy Lawrence Barrett who transforms his left arm into an automatic machine gun.

The major part of interaction with the Cybernetic Arm Prosthesis is passive in nature. Of the eight abilities that the augmentation offers only two are truly active in the sense that the player has the ability to trigger the effect at will. The other available upgrades – 'recoil compensation', 'carrying capacity' and 'move/throw heavy objects' – do not allow for specific actions. These upgrades are helpful, but the improvement or enhancing effect that they offer the player will be easily forgotten during gameplay. The ability to lift heavy objects for instance is unspectacular. The perspective remains in first-person-mode and there is no feedback that Jensen is actually lifting heavy objects. This might sound absurd given the fact that one of the main functions of the arm prosthesis is to grant the user superhuman strength and hence Jensen should be able to lift heavy objects without much effort. However, this lack of effort is what makes this ability appear indistinctive. In the game, when picking up an object, the object simply pops up semi-transparent in the field of view and falls down when dropped. While this ensures a very smooth, fast and convenient handling of lifting objects in the gameplay, it does not reflect the power and strength granted through the prosthesis. If, on the other hand, the perspective would yet again change to third-person-mode and show how Jensen stoops in front of the object, places his hands at suitable lifting spots, grunts as he overcomes the initial inertia caused by the relentless pull of gravity and then heaves the object with a sure upward movement until he stands upright again, the enhancement would appear more impressive and it would be easier for the player to comprehend this strength.

The 'punch-through-wall' ability of this augmentation exemplifies my argument. This upgrade to the prosthesis is one of the two activities that the player is able to launch at a weak wall structure. The perspective changes to third-person-mode and the player sees and hears how Jensen punches through a concrete wall. This, of course, visually very appealing and underlines the encouragement towards visual interaction with this augmentation, which has been designed in such a way, as Jonathan Jacques-Belletête explained in my interview, "to make sure the player would feel and see the "power" and "coolness" of his arms at all times [...] not to "conceal" their wow factor" (Interview Jacques-Belletête).

6.2.3. The Narrative

Lastly it shall be discussed in how far the Cybernetic Arm Prosthesis impacts the narrative of the game. It has been shown above that the Infolink augmentation fulfills specific functions for the narrative, but what is the case with the prosthesis?

Narratively, the arm prosthesis does not propel the storyline forward as the Infolink does, but for the individual narrative path that a player takes in the game the prosthesis makes a difference. Most responsible for a change in the path are the two upgrades 'punch-through-wall' and 'move/throw heavy objects'. Both upgrades of the arm prosthesis will open up alternative routes through levels. A ventilation shaft which Jensen can crawl through might be hidden behind a heavy object; a large heavy soda machine could be moved to reach a high ledge or part of a ladder; or a breakable wall on the backside of a building might offer a new way to sneak into an area. In a similar vein, the other upgrades such as increased 'carrying capacity' might be viewed. By choosing not to spend praxis points on enlarging the inventory space a player might restrict him- or herself which gear should be carried along. Heavy weaponry such as the rocket launcher, which are very useful for defeating large security bots that take a lot of damage, take up a lot of inventory space. So, the player might be forced to reconsider tactics and search for an alternative route – one that does not cross the line of fire of security bots.

6.2.4. Conclusion Cybernetic Arm Prosthesis

The analysis of the Cybernetic Arm Prosthesis will be concluded with a return to a discussion about the sociotechnical imaginary of human enhancement technologies in *DXHR*. It can be argued that the arm prosthesis is a diegetic prototype that is not embedded into an entirely supportive social environment. As mentioned in section 5.2.3. prototypes are marked by their embeddedness in a functional social framework in which actors engage with the prototypes as if they were established viable technologies and part of everyday practices (Kirby, 2011; Suchman, Trigg, & Blomberg, 2002). However, the Cybernetic Arm Prosthesis as the single most conspicuous augmentation is at the center of social controversy around human enhancement technologies in *DXHR*. While it is true that the prosthesis as a prototype is handled as an established everyday artifact by the people in *DXHR*, the social context in which it is placed is not only well disposed towards the technology. This augmentation is actually a culmination of the controversy and with every argument on one side an opposing view is provided in the game as well:

	Transhumanists	Humanists
<i>Necessity</i>	empowerment, rehabilitation, eradication of disability	disempowerment of able-bodied people
<i>Benevolence</i>	create equality among people	only rich people have access
<i>Viability</i>	uninterrupted, reliable functioning	only functional when combined with drug dependency
<i>Normalcy (of the user)</i>	producing & using technology is human	fundamentally changes human nature

However, it can be said that the Cybernetic Arm Prosthesis is a diegetic prototype as the multiplicity of opinions and views on the technology merely increases the effect of virtual witnessing and makes the depiction even more realistic. Already the 17th century scientist has found it indispensable to “offer readers circumstantial accounts of failed experiments” (Shapin & Schaffer, 1985, p. 64) and other circumstantial data with the hindsight to dismantle people of their doubts about the authenticity of his described experiments. Nothing less happens in the case of the Cybernetic Arm Prosthesis namely that the varied views eases and expedites virtual witnessing.

7. Enhancement technologies as sociotechnical imaginaries

Before coming to the final conclusion, this last section will directly take up the research questions defined in chapter 4 and align them with the results from the analytical sections of this thesis. This shall help streamlining the results from the analysis and make the outcome for readers more accessible and clear.

7.1. How are the (1) need, (2) benevolence and (3) viability of the human enhancement technologies as diegetic prototypes demonstrated to the player?

Is the technology presented as a solution to a problem?

The enhancement technologies are tightly enmeshed with the main narrative of the game which is again tightly entangled with the main protagonist Adam Jensen. For Jensen the technologies are concretely shown as a solution to a problem namely to save his life after a fatal attack on his person. Furthermore, it is likely that the enhancement technologies have spared Jensen a life marked by disability, although it is not exactly clear which parts of his body have been to what degree damaged during the attack. Nevertheless, the new

mechanical body parts allow Jensen to become more capable than before which allows him to take up the task of finding and rescuing the abducted scientists and defeating the augmented mercenaries responsible for the attack on Sarif Industries.

Jensen is the more or less the lens through which the player experiences the augmentations in *DXHR*. His is an idiosyncratic problem; yet, there is also a larger social scale by which the necessity of enhancement technologies can be measured in the game, but it is divided into two key opposing camps. The pro-augmentation group represented by David Sarif, who believes that enhancement technologies can eradicate disability, make humans equal to each other and lead us into a brighter future in which we can concentrate on the important values of humanity due to the excision of medical problems, for example. Certainly the technologies are also a commercial product and biotechnology companies make a profit from the manufacture and sale, however, at the forefront is the transhumanist sociotechnical imaginary of enhancement technology. On the other side, the radical anti-augmentation group represented by Hugh Darrow and Purity First who believe that self-guided human evolution with the help of technology is unnatural and dangerous. They believe that scientists are tampering with fundamental human biology and jeopardize what it means to be human by merging man and machine. Lastly there is the diplomatic anti-augmentation group represented by William Taggart and the Humanity Front organization who advocate the implementation of a rigid legal framework to significantly limit the access to human enhancement technologies.

The presentation of human enhancement technologies in *DXHR* is ambiguous and complex, which does not directly work in favor of the demonstration of the technology's need or benevolence, but is advantageous in relation to virtual witnessing. Analogous to what Shapin & Schaffer have written on Boyle's experimental descriptions, the developers assure the player that they were "not willfully suppressing inconvenient evidence" and that they were "in fact being faithful to reality" (Shapin & Schaffer, 1985, p. 64) by showing and telling the player not only the advantages but also the disadvantages of enhancement technologies.

Is the technology presented as safe to use?

The safety of the technology is chiefly depicted as negative although the matter is again ambiguous. For the most part it is made clear in the game and two of the three trailers that altering the human body with augmentations will lead to a severe side effect. The immune system of the human body will fight off the technology, whether it is an implant or prosthesis, and thus will force the augmented user into a lifelong dependency on the drug 'Neuropozyne'. Without this drug, the body will reject the augmentations and the person will be in acute danger of dying.

However, the game and the Sarif Industries advertisement trailer implicitly pose the questions: What if there would be no tissue rejection? What if the technology would be safe to use for everybody? In the world of DXHR, the player is in the privileged position of controlling the only person in the world who does not suffer from side effects and does not require the intake of

Neuropozyne. With Jensen, the player does not feel any restriction of which

augmentations can be activated and used, except for the order in which the individual abilities of an augmentation have to be activated. This order sometimes restricts the player in his or her choice as for instance in the *Implanted Rebreather* augmentation. Before the player can activate the ability to sprint for a longer time (i.e. the Hyper-Oxygenation upgrade), the resistance to chemical substances has to be unlocked first even if one does not want this ability.

Furthermore, the narrative of the game includes the twist that Sarif Industries wanted to reveal to the public that a way has been found for everybody to safely use augmentations. The head scientist Megan Reed has found a gene mutation that will help to eradicate tissue rejection due to augmentation and in consequence eliminate the need for Neuropozyne. In other words, before the attack happened Sarif Industries was about to reveal to the world that human enhancement technologies will be absolutely safe to use for everybody. This information is revealed throughout the game but can also be found in compact form in the newspaper at the very beginning of the game.



Figure 22: Implanted Rebreather

Washington braces for historic augmentation hearings

Police are bracing for massive demonstrations tomorrow on the National Mall. Protesters, led by the Humanity Front movement, have been arriving by the busload to make their voices heard.

At issue are claims of a major breakthrough in human augmentation research. The discovery, made by Dr. Megan Reed and her team of researchers at Sarif Industries, suggests that the bond between human tissue and mechanical electrodes can be strengthened through adaptive DNA fusing. This development could eliminate the need for Neuropozyne – a highly-expensive drug manufactured under an exclusive patent by the Versalife company.

If these findings are confirmed, the discovery will greatly democratize mechanical augmentations by making them safer and far less costly. Pro-human advocates want to ban the technology on moral and ethical grounds. (Newspaper Megan Reed's office, DXHR) (Eidos Montreal, 2011b)

Can it be abused by “bad guys”?

There exist no particular restrictions in the world of DXHR on who is able to become augmented. The official route to augmentation, the L.I.M.B. clinic, is open for everyone provided the client has sufficient financial means. Moreover, there are obviously other, illegal means by which to acquire augmentations which has been made apparent by optional sidequests and the presence of criminal groups such as the Harvesters (see section 5.3.4.). Also the major antagonists, the black ops mercenaries are equipped with leading-edge military augmentations not available through the conventional market.

Is the technology presented as doing good to humans?

There are passages in the material at hand that infer that human enhancement research is doing good to humans. Particularly the Sarif Industries trailer (Eidos Montreal, 2011c) stands out, which has been discussed above (section 5.1.3.). Moreover, the conversation with the scientist Megan Reed at the beginning of the game demonstrates to the viewer how augmentations can help humans. Reed argues that the research on improving human performance is doing good by “helping people overcome their physical limitations” (Megan Reed first conversation). Particularly “[n]eural augmentations that make you think faster, react quicker” can improve life.

Predominantly the technology is portrayed as doing damage to humanity: Society is split into two fractions, violent riots emerge, augmented people have to become drug addicts in order to fight tissue rejection, corporations can exert a certain level of control over augmented people. Furthermore, enhancement technologies raise ethical, medical and psychological issues particularly about the ontological status of augmentees, but also able-bodied humans. Are augmented people still human or are they machine? If augmented people are transhumans – improved human beings – are then able-bodied people disabled because of a lack of augmentations?

Is the technology depicted as fully-functional?

Overall the technology is portrayed as fully-functional which operates reliably and without hindrance in all situations. The only small exception is the retinal prosthesis that malfunctions slightly the first time Jensen enters the Sarif Industries building augmented. This is the only instance in which the technology itself is malfunctioning, but repair of this problem is a matter of seconds with the help of a technician and the right tools.

Although there are a few more visual glitches that appear in the game, these are not a problem that stems from the technology but from a modified component which is controlled by human agents. This issue is made completely clear by the time Jensen confronts the

heavily augmented opponent Jaron Namir. The difficulty of this fight is determined by the choice the player has made earlier in the game –if the player has opted to exchange the biochip will result in Jensen’s augmentations being deactivated for the fight and thus not functioning (see section 5.2.3.).

Is the usage of the technology available and possible for everyone?

Theoretically everybody in the world of DXHR can become augmented at a LIMB clinic provided the surgery, the augmentation and the Neuropozyne can be financed. This is implicitly clear in all of the materials analyzed.

However, it has to be pointed out that there exists a very small percentage of people such as Hugh Darrow who are unable to receive mechanical augmentations due to a rare genetic incompatibility.

Are specific forms of social life shown in relation to human enhancement technologies?

One specific form of social life is shown primarily. It is marked by conflict and instability due to the existence of human enhancement technologies. The E3 2010 trailer, the Purity First trailer and the game itself show that there is a high amount of social tension in the world of DXHR. In addition, the developers have included a lot of minor details in DXHR which enrich the game and invigorate the social atmosphere such as for example that people who cannot afford augmentations or Neuropozyne are homeless and roam the back alleys of Detroit or the conversation of an enhanced couple who struggles over the definition of ‘normalcy’ (see section 5.3.4). There are many optional opinions that a player can listen to throughout the game. However, the biggest, overarching idea concerning social life with human enhancement technologies is that there is a disrupted equilibrium in the working life of people. In order to remain in their job, many people are forced to augment themselves even if they do not want to. (section 5.3.4.)

Answer to 7.1.

The need, benevolence and viability of the entire enhancement technologies in DXHR as diegetic prototypes are only partly fulfilled. The analysis has shown that merely the viability of the diegetic prototypes is a comparatively uncontested matter in the game provided that the human body does not reject the augmentations. The necessity is demonstrated as ambivalent, while the benevolence of enhancement technologies is chiefly presented as not given. In terms of ‘diegetic prototypes’ the technologies fail Kirby’s definition as the technologies are prevailing depicted as unsafe and controversial.

7.2. How does the narrative of DXHR influence the depiction and perception of human enhancement technologies?

Does the narrative hinge on human enhancement technologies?

The story of DXHR revolves around human enhancement technologies. The science of human augmentation is the central point of conflict that the main actors of the game are fighting about. Furthermore, the developers have seen to the fact that virtually everything the player can experience in the game is in some way entangled with the topic of human enhancement: optional sidequests often deal with people whose lives are negatively affected by augmentation; locations in the game are the result of

the technologies (two biotechnology companies, the Panchaea facility was built by augmented workers, an anti-augmentation conference); readable eBooks and newspapers feature articles that are related to enhancement, and other minor details in the game such as self-help books (Figure 15), a magazine for augmented people, or even a box of 'Augmentchoo' cereal.

Moreover, the ending of the narrative is specifically designed to force the player to make a choice about the fictional future of human enhancement technologies. At the end of the game the player is confronted with the choice of four possible endings, which must be selected by pressing one of four buttons.



Figure 23: Augmentchoo cereal

Is there a distinct opposition shown between non-augmented and augmented human bodies?

The narrative requires the player to take control of a non-augmented Adam Jensen in the first few minutes of the game. This is distinctly felt through the lack of the eye prosthesis that provides the HUD and the augmented reality vision, which highlights interactable objects with a yellow border. Moreover, the change from non-augmented to augmented Jensen is further pointed out through the malfunctioning HUD that has been discussed elsewhere. Due to the malfunction it can be argued that the player is made aware of the HUD and the augmentation in general (see section 6.1.2.3)

In addition, some NPCs react to Jensen's augmented appearance by mentioning it in conversation which might cause the player to compare his or her notion of a normal human body with that of an augmented. This happens for example in conversations with Cassandra

Reed and Faridah Malik, who both directly inquire how Jensen feels about being augmented and thus require the player to make a choice (section 5.1.5)

Answer to 7.2.

The topic of human enhancement is tightly interwoven with the fabric of the narrative of DXHR. As mentioned above, nearly every object, event or location is connected with the topic and reminds the player that this fictional future world is heavily impacted by the advancements of the science and technology of human enhancement. The narrative relies on – and hence depicts – the negative aspects of this sort of technology, but also voices opposing opinions and even brighter outlooks for the future. Furthermore, the narrative is tailored in such a way as to necessitate the player to think about and make choices for or against the technologies.

7.3. How does the medium – the videogame – influence the perception of the sociotechnical imaginaries of human enhancement technologies?

Is interaction between the player and the technologies encouraged?

As detailed in section 6.2.2, interaction is encouraged but it is often relegated to visual perception. Particularly noticeable is the switch of perspective from first-person to third-person mode which occurs when Jensen uses specific augmentations or takes cover behind walls. This enables the player to observe and consider for example the arm prostheses. Furthermore, many augmentations have passive effects, which means that once activated they have a permanent enhancing effect on the character, but for that reason the player may lose sight of the enhancement. In the case of active effects, i.e. those augmentations that offer the player an action to be performed such as break through a wall will have a more ostentatious effect on the player.

Can the player modify a given body according to his or her imagination and will?

Depending on the standpoint of argumentation the answer to this question can be both yes and no. The player takes control of Jensen and influences his attitude, but the player does not have full control over Jensen's body. What the player can determine is which augmentations are activated at which point of time, but the player cannot decide which augmentations he should receive in the first place. The narrative is designed in such a way that requires Jensen to receive every possible enhancement that Sarif Industries offers. However, it is still possible for the player to decide whether s/he wants to make use of an augmentation or not. The game and the gameplay are structured to allow the player a high amount of freedom concerning the activation of the augmentations' abilities. There are some

pre-determined abilities that are activated from the start and cannot be changed, such as the regenerating health augmentation and the Infolink package, but other than that the player can ‘construct’ his or her own Adam Jensen corresponding to one’s preferred playing style.

Answer to 7.3.

By offering the player visual material, actions to be performed with the help of enhancement technologies, and choices to be made about attitudes and which augmentations to activate the medium affects the topic of human enhancement in an interactive manner.

7.4. How have the producers created an impression of ‘scientificity’ in the game?

Have the producers included extensive information about the function and properties of the technologies?

The *More Info* section included on the augmentation screen and the 29 collectable Hugh Darrow eBooks provide extra information on the human enhancement technologies in the game. The *More Info* section of each of the augmentations consists of details about the components and the functionalities of the technology, while the eBooks may contain background knowledge. Furthermore, the eBooks are based upon actual, real science and the original papers can often be easily found in the Internet. Often these eBooks contain ideas that exist outside of DXHR in the real world.

Another source of information about enhancement technologies is the Sarif Industries website, which includes the timeline of augmentation that the developers have created during the production phase of the game. On the website the timeline which can be found under the heading “The Road to Here” (Eidos Montreal, 2011e) roughly traces human enhancement technologies from the 1960s to the 2020s. What is remarkable is the entanglement of fictional and non-fictional facts about human enhancement, which make the augmentations seen in DXHR all the more intriguing. Some dates on the timeline are purely fictional and relate to the world of DXHR such as 1973 “Hugh Darrow is born”. Other dates such as the year 2000 ‘Light on the Eye’ refer to actual research results similar to the in-game eBooks.

Furthermore, the website and timeline includes many mentions of the well-known double amputee athlete Oscar Pistorius, such as his 100m world record run in 2007 or his involvement in the ban of prosthetic devices in able-bodied competitions by the International Associations of Athletics Federations in 2008. This circumstance along with the provision of direct links to articles and various *YouTube* videos about human enhancement facilitates audience engagement and relation with the topic.

Have the producers used a scientific style for the information, such as referencing and a formal jargon?

To a certain extent yes. The eBooks are presented as excerpts of scientific articles, papers and conference proceedings and use scientific jargon which is also present in the descriptions found in the *More Info* sections (sections 5.2.1 and 5.2.2). Moreover, some of the eBooks include in-line citations (see section 5.3.2.), but no full bibliographic entry.

Answer to 7.4.

By creating a timeline that anticipates the future trajectory of development of enhancement technologies, by receiving support from an established neuroscientist working in the biotechnology field, by including background information on each of the 21 augmentations, by incorporating possible social, medical and psychological contingencies the developers have achieved and produced a game with an distinct impression of scientificity.

7.5. In how far is the player challenged to cognitively engage with the imagined technologies?

Is there a need for the player to actively think about the morality of human enhancement?

Yes, the player is encouraged to think about the morality of human enhancement. This is done mainly through choice-conversations and social battles, as well as via the ending which forces the player to choose one of four possible outcomes. However, it is also done through the provision of optional side quests which often have something to do with the morality of human enhancement.

Does the player receive any benefits for using or not using enhancement technologies?

Experience points are awarded in both cases when it comes to combat. As an example, the player receives experience points for lethal as well as non-lethal eliminations of enemies. However, there are only a few augmentations that are directly rewarded with experience points including the hacking implant and take-down abilities provided by the Cybernetic Arm Prosthesis and the Quicksilver Reflex Booster. Successfully hacking a device will reward the player with a certain amount of experience points that will be higher if the terminal has a higher difficulty level. A take-down of a single enemy will reward the player with 20 experience points while a double takedown will earn the player 45 points.

Answer to 7.5.

The promise to make players reflect about human enhancement technologies is a unique selling point of the game. Depending on the interest of the particular player, the game offers ample material and moments to critically engage with the topic. Nevertheless, even players who just want to immerse themselves into the gameplay without exploring the optional material will be required to make attitudinal and moral choices in conversations and during the ending in order to successfully complete the game.

8. Conclusion

The imagination and depiction of technologies that greatly enhance human capabilities is not new, however, the analysis has shown that the videogame DXHR certainly is an exceptional example in the case. How are human enhancement technologies and augmented human bodies performed in DXHR? The performance of human enhancement technologies and augmented bodies is a tight interplay between the narrative and the input of the player. The deep enmeshment of the controversy of human enhancement in the narrative supports player engagement with the topic. The gameplay requires the player to navigate through the fictional near-future world and forces to utilize the augmentations at his/her disposal and make moral choices along the way, particularly at the end. Augmented bodies are both depicted blatantly as crude grafts of mechanical, robotic parts in the human body, and invisibly as the indiscernible blend between technology and the human, when it comes to implants.

The representation of human enhancement technologies is highly polarized throughout the game as well as in the promotional material, but the developers have sought to create an open, unsettled debate materialized in the form of diegetic protoyping (Kirby, 2010) of enhancement technologies and the conceit of a divided future society. The player's role lies in the metaphoric, temporary closure of this debate, who is encouraged to investigate the sociotechnical imaginaries of human enhancement. For that purpose, the developers have included a high amount of information on human enhancement and the various imaginaries to support the player in his/her decision making. Furthermore, they have employed a variety of strategies to make the information appear scientific. It can be estimated that the science consultant, Will Rosellini, has shaped the material in profound ways in terms of scientificity. Comprehensibility and relevance of human enhancement for the player's own reality has been maximized through the creation and implementation of a timeline of augmentation – an extrapolation of human enhancement technologies of the year 2027 from the present state of science and technology (Comic-Con, 2011). The timeline is not immediately visible in the game, but implicit and explicit clues hint at its underlying existence.

As the Art Director Jonathan Jacques-Belletête explained in an e-mail interview, it was a production goal to create a game that incepts reflection about nascent enhancement technologies and their meaning for humanity and everyday individual life. As such DXHR situates players in a setting where they have to make decisions about the ethics and morality of technology driven self-controlled human evolution. However, the moral reflection on human enhancement on the side of the player is entirely based upon gratuitousness and for

this reason the choice of moral alignment feels free and unbounded. Nevertheless, this fact also suggests that players might ignore the engagement with the topic due to the lack of immediate perceivable consequences.

If there is engagement with the central topic, as was in this analysis, the game can be described as a building set for a personalized sociotechnical imaginary of augmentation technology. In the realm of the clearly defined boundaries of the medium 'videogame' the protagonist Adam Jensen becomes the player's vessel to discover and construct one's own imaginary of human enhancement technologies. As mentioned the developers have intended to bestow DXHR with a balanced view on the topic of human enhancement and not to present a suggestive perspective. Still, the overarching sociotechnical imaginary in DXHR rather accentuates the negative than the positive aspects of enhancement technologies. It involves the depiction of human enhancement technologies as unambiguously controversial which sparks the fragmentation of society. Cutscenes, several newspapers and the E3 and Purity First trailers (Eidos Montreal, 2011d; Square Visual Works, 2010) show that the social disunification culminates in the course of the main narrative in the eruption of violent riots. Moreover, villains and criminals have access to the technologies as well as lawful citizens and it even sprouts new forms of organized crime symbolized by the Harvesters (section 5.3.4). A further negative aspect emphasized is the lack of safety of the technologies that requires the intake of a highly addictive and costly drug 'Neuropozyne' in order to avoid harmful rejection effects through the human immune system. Additionally DXHR displays the need to undergo painful surgery and long rehabilitation time after enhancement with the threat of suffering from psychological side effects such as identity crisis.

The positive aspects of enhancement technologies that are voiced in DXHR are primarily restricted to the attainment of superhuman abilities. Interestingly other possible positive aspects are chiefly presented in the form of what-if scenarios inside of the what-if scenario called 'DXHR'. The main proponent of enhancement technologies, David Sarif, alludes to the scenario in which using enhancement technologies becomes safe and accessible to use for everybody without Neuropozyne, and that this circumstance would allow mankind to enter a better future. The allusion is best summarized in the corresponding ending of the game:

Sarif was right about one thing it's in our nature to want to rise above our limits. Think about it. We were cold so we harnessed fire we were weak so we invented tools. Every time we met an obstacle we used creativity and ingenuity to overcome it. The cycle is inevitable, but will the outcome always be good? I guess that will depend on how we approach it. [...] In the past we've had to compensate for weaknesses, finding quick solutions that only benefit a few. But what if we never need to feel weak or morally conflicted again? What if the path Sarif wants us to take enables us to hold on to higher values with more stability?

One thing is obvious for the first time in history we have a chance to steal fire from the gods. To turn away from it now - to stop pursuing a future in which technology and biology combine leading to the promise of a singularity - would mean to deny the very essence of who we are. No doubt the road to get there will be bumpy, hurting some people along the way. But won't achieving the dream be worth it? We can become the gods we've always been striving to be. We might as well get good at it. (Eidos Montreal, 2011, Sarif ending)

This scenario is unknowingly trialed by the player throughout the game. Adam Jensen is the only person in the world of DXHR whose body naturally bonds with mechanical augmentations and who is independent of Neuropozyne. His genetic disposition allows him to become more than human but whether this applies only to his technological body parts or whether it denotes his higher sense of morality lies in the decisions, choices and playing style of the player. No matter which sociotechnical imaginary the player invigorates after playing the game, all imaginaries are pervasive and well supported because of the core integration and inextricable bonding with the narrative and gameplay.

The depiction of the enhancement technologies as diegetic prototypes (Kirby, 2010) also supports the sociotechnical imaginaries even though the analysis has disclosed that the criteria defined by Kirby cannot be clearly affirmed neither when applied to the analysis of the augmentations in their entirety (section 5) nor in the case of individual enhancements (section 6). Particularly *benevolence* fails to be proven due to the facts that the augmentations trigger a plethora of negative social, medical and psychological effects. The *necessity* of the technologies is ambivalent and a matter of perspective. It was argued, for instance, that the Infolink, the implanted communications device, does not hold any necessity despite its propelling function for the game's narrative. The Cybernetic Arm Prosthesis on the other hand spares Jensen a life marked by disability and even empowers him. While seen from Jensen's perspective the augmentations are necessary because he would have died without them and not be able to find the perpetrators, taking up a global view it can be argued that the augmentations are unnecessary because they disempower and dis-able able-bodied people, who cannot afford or do not want to enhance themselves. The *viability* is the only criterion of diegetic prototypes that can be asserted. Apart from the fact that augmentation requires Neuropozyne, the functionality of all the enhancement technologies is nearly flawless. Then again, the augmentations do not maintain the integrity of a person. On the contrary, the *normalcy* of an augmented person is not guaranteed and perhaps not even desired as the Sarif commercial trailer demonstrates.

What can be upheld in DXHR's framework is that these diegetic prototypes are embedded in a social environment in which actors naturally interact and engage with the not-existent forms of technology as established, normal objects of everyday life. This socializes the

augmentations for the player (Kirby, 2011). The normalization of the augmentations paired with their appealing visual, aesthetic style (see sections 5.2.4. & 6.2.1.) holds the potential to make the players of DXHR excited about nascent enhancement technologies. The diegetic prototypes are able to “stimulate a desire in audiences to see [the] potential technologies become realities” (Kirby, 2010, p. 41). The diegetic prototypes benefit from the effect of virtual witnessing (Shapin & Schaffer, 1985). Not only is virtual witnessing (see section 3.2.3) maintained by the fact that the video game is an audio-visual medium, but also by the fact that the developers have achieved a high degree of scientificity in DXHR by the incorporation of a lot of optional information that interested players can find when playing in an explorative style. Particularly striking are the *More Info* sections of the individual augmentations that provide extensive jargon-based descriptions beyond gameplay necessity, and the 29 collectable Darrow eBooks that present actual real scientific knowledge about human enhancement presented in a scientific format that partly even includes academic citations.

The thesis has shown that videogames can be used as empirical material to examine sociotechnical imaginaries of scientific and technological advancements, but the conduct of an autoethnography has proven to have its limitations. Further exploration into this topic is possible and the application of different methodological approaches would yield interesting results. Conducting interviews with other players or perhaps even utilizing focus groups to investigate not only how players go about the decision making process at the end of the game concerning the selection of sociotechnical imaginary, but further how players perceive the topic of human enhancement and what value they accrue to it. The outcome of such a study might not only be interesting to game developers (e.g. how to maximize impact of a topic in a game), but also to STS and science communications scholars. Moreover, it would be highly interesting as an STS researcher to conduct an ethnographic study of a development team of such a game¹⁰ in-the-making to further expand upon the idea of videogames as a site of societal criticism of science & technology. Such an ethnographic study could shed light on epistemological issues such as which kind of knowledge becomes inscribed into the game by whom and how is it selected?

As a final conclusion, DXHR exhibits features that indicate that the development team has acquired a high interactional expertise (Collins & Evans, 2007) in the science and technology of human enhancement. The credible presentation and the sociotechnical imaginaries of the

¹⁰ The development of two role-playing games has been announced which would allow for a follow-up study of where this thesis left off. On the one hand, the game *Cyberpunk 2077* by CD Projekt Red (Crecente, 2013) and, on the other, *Deus Ex: Universe* by Eidos Montreal (Whitehead, 2013)

future of human enhancement technologies concurrently induce desire for and fear of this branch of emerging technologies. Moreover, DXHR has a probable bi-directionality: as an audio-visual product it not only influences the perception of a certain audience, which is potentially made up of lay persons as well as scientists working and researching in the biotechnology sector; but it also is influenced by science, particularly the one scientist who functioned as the consultant for the game. It can be furthermore argued that because of the thorough and deep level of engagement with the topic, this video game can be seen as a site of societal criticism and important critical reflection of the science of human enhancement technologies. Human enhancement technologies are being researched as the existence of extensive policy documents demonstrate. The 482 page National Science Foundation report *Converging Technologies for Improving Human Performance* (Roco & Bainbridge, 2003), which includes various means of human enhancement akin to those depicted in DXHR, is already ten years old at the time of the writing of this thesis. Even though not actualized yet as displayed in DXHR, the risks and ethics of such scientific advancements should be put up to societal debate. To put the matter in the words uttered by the character William Taggart in a conversation with Jensen:

[We need to make an agreement about] the future, Mr. Jensen. This 'enhancement' technology threatens to change the course of human evolution – to redefine what it even means to be human. [...] we [can't] afford to sit by and watch it happen on its own. Not when we have the ability, the collective will and foresight to influence it (Eidos Montreal, 2011b)

9. Bibliography

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9.1. Figure Credits

Figure 1 and 2: Retrieved May 03, 2013, from <http://coilhouse.net/2008/03/the-iron-hand-of-gotz-von-berlichingen/>

Figure 3: Retrieved January 23, 2013, from <http://www.gereports.com/the-story-behind-the-real-iron-man-suit/>

Figure 4: Retrieved September 12, 2013, from <http://www.metacritic.com/about-metacritic>

Figure 5: Retrieved July 12, 2013, from <http://deusex.es/wp-content/uploads/2012/12/Namir-bossfight-standing.jpg>

Figure 6: photo and figure created by author

Figure 7: Screenshots from DXHR created February 17, 2013

Figure 8: Screenshot from DXHR created February 16, 2013

Figure 9: Screenshot from DXHR created February 23, 2013

Figure 10: Rembrandt. (1632). The Anatomy Lesson of Dr. Nicolaes Tulp. Retrieved November 23, 2013, from <http://www.wikipaintings.org/en/rembrandt/the-anatomy-lesson-of-dr-nicolaes-tulp-1632>

Figure 11: upper left screenshot from DXHR created February 15, 2013

upper right screenshot created February 19, 2013

lower left screenshot created February 25, 2013

lower right screenshot from Sarif Industries Trailer (Eidos Montreal, 2011c)

created September 26, 2013

Figure 12: left screenshot from Sarif Industries website (Eidos Montreal, 2011e) created April 27, 2013

right screenshot from DXHR created September 12, 2013

Figure 13: Screenshots from DXHR created February 21, 2013

Figure 14: Screenshot from DXHR created May 25, 2013

Figure 15: left screenshot from DXHR created February 17, 2013

right screenshot created September 12, 2013

Figure 16: Screenshots from DXHR created February 24, 2013

Figure 17: left screenshot taken from <http://www.roselliniscientific.com/>. Retrieved April 14, 2013

right screenshot taken from Sarif Industries website (Eidos Montreal, 2011e)

created April 14, 2013

Figure 18: Screenshot from DXHR created April 10, 2013

Figure 19: Screenshot from DXHR created April 10, 2013

Figure 20: left screenshot from Metal Gear Solid. Retrieved October 25, 2013, from
http://image.gamespotcdn.com/gamespot/images/screenshots/9/197909/mgs_screenshot019.jpg

Figure 21: Retrieved May 04, 2013, from
http://www.deusex.com/data/extensions_data/square_images/a/5/7/7/1/38//medium_image.jpg

Figure 22: Screenshot from DXHR created February 16, 2013

Figure 23: Screenshot from DXHR created September 12, 2013

10. Appendix

10.1. Interview Will Rosellini (Science Consultant)

First of all, I want to thank you for giving me the chance to ask you a few questions about your involvement in the production of Deus Ex. During my research, I have already been able to gather information that speaks to my topic. In particular, I am referring to your appearances in the official 'Making Of Deus Ex' video, as well as the interview panel that was held at the Comic-Con in 2011 in San Diego. These videos gave me a good overview of why and how the augmentation technologies were envisioned in the game. However, there are questions that I was not able to answer with the help of the material from the videos.

Before moving on to the questions, I want to say that it would be great if you would be able to answer as many questions as you can, but if you feel that there is a question that you do not want to comment on, you are of course free to do so!

1. During the Comic-Con session you said that the reason you became involved was because you were irritated with the black-boxing of technology in 'Deus Ex 2: Invisible War', but how did you actually get involved in the production of 'Human Revolution'? Where did the initial idea come from to act as a consultant to a video game or was there perhaps even an official job announcement for the position of scientific advisor?

Hard to say, I decided that my job as a researcher/translational scientist was to predict the future and then set out creating incremental experiments to make these products come true. I was big fan of Deus Ex, so I called up the CEO and told him I was ready to help. He thought I was just another crazy fan until he read my resume

2. Could you describe your scope of duties while consulting on Deus Ex? Were you only responsible for writing the scientific descriptions of the augmentations or did your tasks perhaps also extend to the realm of the narrative of the game; the visual design of the technologies (such as the Cybernetic Arm Prosthesis); the trailers; or the Sarif Industries website?

I was in charge of developing the augmentation timeline...so this meant I was supposed to help decide what would be possible in 2027...this was back in 2008. Eventually I helped

shaped the story/plot (ie remote monitoring kill switch, Neuropozyne etc...) to cater to what was feasible from a technology development standpoint. I worked for about 3 years on it.

3. Are you often contacted concerning your position as science advisor during the production of 'Human Revolution'? If so, by whom and for what reasons?

Yes, I'm contacted quite a bit by TV/movie producers that are looking to pitch projects, get advice...I usually help out for free, it is a good exercise to think about what might be possible in 20 years.

4. I see certain parallels in your consultation for Deus Ex to the work of other science advisors in the film industry. Especially John Underkoffler from Oblong Industries comes to mind who has created a pre-product placement – or “diegetic prototype” as the scholar David Kirby termed it - of his company's spatial operating environment 'G-Speak' in the 2001 movie 'Minority Report'. Would you say that video games can function as serious presentation displays of prototypes of future technologies? *Science Fiction is an excellent place to explore the what-if...it would be hard to say that innovation has a process that works...we know that corporations have tried to make innovation standardized with process oriented procedures...however, this hasn't yielded more returns on their innovation dollars. Being creative is hard to pin down...*

5. In February, you have published a post on your blog entitled “The Evolution of Medical Technology” which directly links the fictional technology in Deus Ex to real-world technologies and actual future possibilities. Do you see scientific potential or any advantages or disadvantages for representing scientific work in video games (perhaps utilizing the visualizations of technologies in video games as a means of enhancing public and scientific communication about one's own work)?

Yes, one of my companies Microtransponder is using video games and neurostimulation of the vagus nerve to rapidly reorganized the cortex and enhance learning and memory.

6. Despite your own expertise in neuroscience, were any other scientists asked for advice concerning the improvement of the depiction of the technologies in the game?

Yes

7. As a scientist, do you think that working on a science-fiction game – a product closely associated with entertainment – might diminish your professional image in the scientific community?

Yes, it has, but I'm not quite as concerned with scientific reputation as most traditional scientists. I'm hoping to ride the wave of innovation towards break-through technologies...this innovation happens at the edge of disciplines (hence all of my degrees). I care about getting patients better treatments, so while my reputation could look amateurish because I work on video games, my total work product overcomes this issue.

8. In the course of playing the game myself, I have noticed, for instance, that you had so-to-say a cameo appearance in the game (office number 27 in the Sarif Industries building). But what intrigues me the most is that the Sarif Industries logo boasts a remarkable similarity to the logo of Rosellini Scientific. What is the story behind this?

;)

9. It has been two years since the release of 'Human Revolution' and it has been a big success since. In this time, have you benefitted from your involvement in the production of Deus Ex? Has there been an increase of professional interest in your work at MicroTransponder and Rosellini Scientific, for instance?

Not really, people think it is cool, but no direct overlap

10. The More Info section of the Infolink includes the following sentence: "With experience, users can obtain mastery over wideband transmissions as well, enabling them to interface with line-of-sight computer terminals or similar devices". However, as far as I can tell, this ability does not exist in Deus Ex. Was this feature planned, but discarded and this sentence is sort of a residue?

It is an implicit ability in the hacking function

10.2. Interview Jonathan Jacques-Belletête (Art Director)

First of all, I want to thank you once again for giving me the opportunity to ask you some questions about Deus Ex: Human Revolution. In the course of my research I have already found useful materials that I am able to use for my thesis. In particular, the Making Of video of Deus Ex has shown to be a valuable source of information; however, there are still some questions that I was not able to answer.

Before moving on to the questions, I want to say that it would be great if you would be able to answer as many questions as you can and as detailed as possible (if your time allows for that), but if you feel that there are any questions that you do not want to comment on, you

are of course free to do so! If you have any questions concerning my questions, please do not hesitate to contact me through mfoith@gmail.com

1. Could you briefly elaborate on what your tasks were in the production of 'Human Revolution'? Were you only responsible for the artwork or were you perhaps also to some extent involved in forming the storyline; deciding over augmentations; creating the documentary-style trailers (Sarif Industries & Purity First), etc.?

As the art director I was responsible for the look and visual style of the game. This includes everything from the renaissance vs transhumanism analogy and the icarus myth metaphor, all the way to the color palettes and character designs, environment designs, weapon designs, props design, lighting... and visual marketing assets. I did play an important role in the game design and story design to the degree where we (the core creative team) designed the game together as a team. And yes I did have a visual and content directional role in all the trailers that were created for DXHR, just like the other directors had as well (game director, story director, animation director).

2. The Cybernetic Arm Prosthesis of Jensen is somewhat the trademark augmentation of Human Revolution. Were there bionic limbs that served as a role-model for the design?

We didn't use any one specific real life prosthetics as a reference for Adam's arms. We used ideas and concepts from a bunch of current and future techs, but not one in particular. We wanted the arms to feel slick and slightly uncanny at the same time.

3. Could you explain the appearance of the Arm Prosthesis, why certain elements are in place such as the sockets on Jensen's chest and generally, how the arms are envisioned to be attached to the body?

The arms are supposed to be some really advanced "black" tech sponsored by Sarif Industries, which is why we made them look black and slick. Most of the parts and functions on them were designed to support the various ideas we had for the offensive and defensive augmentations such as the blades and the claymore bombs. The sockets on his chest were added by one of our illustrators when he created the famous image of Adam Jensen sitting on his couch bare chested. They are the external bits of all the substantial internal changes that were made to Adam to support the arms prosthesis and their added strenght. We always figured that the entire rib cage, chest cavity and compounded chest muscles (and even some organs) as well as the spinal cord had to be cybernetically replaced in order to supplement and allow the superhuman power provided by the arms. Just having metal cranes grafted to the shoulders would not make any sense. Lifting a heavy object would just rip the off or cause trunk, back, and leg injuries

4. Last questions concerning the Arm Prosthesis: Why was Jensen's prostheses chosen to be black rather than flesh-colored? Would that not have increased the feeling of 'planned uncanniness' as you have stated in the Making Of video? Similarly, why was the color white chosen for Sarif Industries prosthetics, which only appear on 'promotional' media (e.g. the Sarif Industry trailer & website, and various posters and placards in the game)?

Very good question. The flesh colored augmented arms are exactly what we wanted at the beginning, and we went through many iterations of this specific direction. And yes, you are absolutely right about this making them feel more uncanny. However, we ended up opting for a purely "video game" decision as in we wanted to make sure the player would feel and see the "power" and "coolness" of his arms at all time. Basically, not to "conceal" their wow factor. Also, because we wanted them to be visible at all time when Adam was not wearing his trenchcoat, the tests we did with the vest and the flesh colored arms made him look too much like a biker or a douche, which of course was not at all the feeling we were aiming for. As far as the color white for the SI "ads", it was chosen to give them more mass appeal. We felt that a commercial product would have to be more elegant and somewhat toned down to appeal to regular people. We also wanted to give them a slight "Apple product" aesthetic, which was a big thing at the time of the game's design.

5. How did the team go about researching (scientific) facts about the augmentations? In videos I heard Will Rosellini saying that he was surprised by how well the team has already researched facts when he joined the team.

We read so many books and online articles and documentation. That's just the kind of core creative team we are. It comes quite naturally to us. It's not something we question or debate about (thorough research) we just dive heads first in it as a group. We order pretty much everything we can find on a given subject and just start reading and brainstorming and having discussions on each book when we are done reading them. We also attended some public talks and conventions on our different transhumanist topics.

6. Were other scientists, institutes or companies despite Rosellini contacted for information as well? If so, which ones?

Hum, good question. I can't remember specifically but I think there were. I know for sure that Will himself chatted and exchanged with some of his peers on the subjects he helped us with.

7. Particularly through scientific descriptions on the Augmentation Screen and E-books about Hugh Darrow, the game boasts a high level of credibility and plausibility. Was the task of

achieving high credibility and plausibility of the augmentations an intentional design goal from the start (i.e. before a science consultant approached the team)?

Yes absolutely. This was something we had all agreed straight from the minute we chose transhumanism as the central focus of the game, that credibility and plausibility were essential and necessary. We truly wanted to make a work of fiction that had real contemporary motifs and messages. DXHR is much more a work of anticipation than pure sci-fi, and in order to achieve a proper anticipation, credibility and plausibility is of the utmost importance. Without them, your anticipation falls flat. All in all, we wanted people to think and reflect on what all this stuff meant for humanity, and mostly, for their own lives.

8. Did it come to any design constraints because of the science facts involved?

I think all in all we pretty much always managed to consolidate what we had in mind and what we thought looked and felt cool, with the scientific facts we had to deal with. In the end, because it's a game, the golden rule was that if it cheated realism a bit but greatly improved the global feel of the game, that we should go for it. And this was not just for the augmentation techs but for everything. For example, the two story city of Hengsha, or the giant tube in the middle of the arctic ocean were probably a bit far fetched for a fiction taking place in 2027. But they added so much flavor, tone, and signature to the game that we chose to go with them anyways. In the end, we strongly believed that it was all about proper balance.

9. Where did the idea come from to relate 'Human Revolution' to the Renaissance? What were the reasons for this?

It actually came from me. Whenever I design an art direction for a game, I always try to make sure that we bring something new to the subject we are treating. Something that will freshen it and make it our own at the same time. While researching during my early art direction stages, I ended up finding Da Vinci's anatomical sketches. Of course I had seen them before, but under my "transhumanism tunnel vision" they suddenly had a new angle. I saw how closely related to our themes they were. So I dug deeper in the Renaissance and all that stuff and realized that thematically speaking, there was a really strong link between this era and a transhumanist one. Almost as if the Renaissance had actually been the first stepping stone to the long journey towards full fledged biomechanical technologies. So from all this research and thematical analogies, we created the foundation for a visually and metaphorically new style of cyberpunk, which we ended up coining "Cyber-Renaissance". It was fitting on so many levels. Even to the point where (at the time of designing the game) cyberpunk had been a rather dead, or at least dormant style. And "Cybe-Renaissance" also meant that we were trying to bring it back.

10. Why was the color palette gold and black chosen? Did that have any specific reasons despite appearing warmer than usual Cyberpunk?

Yes of course. When you look at the paintings of the Late Renaissance and the Baroque, this color palette is quite predominant. Also, it has a very earthy and human feeling to it, which are quite fitting to the game's themes. Gold is very flesh like, very "human" like. Also, black represented the dark, dystopic cyberpunk side of the game, while gold represented the hope and the golden age that transhumanist technologies could bring to our lives.

11. Why was the conflict of human augmentation emphasized in the documentary and testimonial style trailers (Sarif & Purity First) instead of the game's main story?

The game's high level plot had been emphasized in other trailers, articles, and interviews we had given throughout the development years. We felt that it was well understood. What we now wanted to do was to pitch the viewer into "reality". Make him understand that the possible social impacts of such events could be very real and very soon. Not unlike the game's endings; which are live action because we wanted people to understand that all this is very real, and very current. Both with the positives and the negatives, and that it's up to them to decide where they stand. And also, because this was one of the last marketing assets before launch, we wanted to have a wide mass appeal; and going with the live action and the shock value have a tendency to give you that.

12. Was fan-based feedback of Deus Ex 1 and Deus Ex 2 considered? Did that have an influence on the appearance of technology in Human Revolution?

As far as I'm concerned, not much. Things have evolved so much aesthetically and cosmetically since the two first games. I made sure that our game stood on its own and had a contemporary statement. As much as I've always been a huge fan of the series since the first one came out, I've always felt that it was rather visually generic. However, gameplay-wise, we did take some stuff from the previous games and from the fans as well.

11. Abstract

Videogames provide a possibility to experience future worlds or alternative realms where the potential of science & technology is only limited by the capacity to imagine. In consequence, ideas about the future state of science and technology are distributed and may impact the perception of players, who become more and more, as the market for digital games continues to flourish. For this reason, I argue that videogames need to be thoroughly engaged by science & technology studies (STS) and this thesis aims to make a contribution in this direction. It is not only an attempt to combine the interdisciplinary fields of Game Studies and STS, but also tries to show that videogames can be seen as important sites of critical societal reflection on scientific advancements and technological innovations. With the help of methodological approaches akin to STS and Game Studies, I have undertaken a qualitative study of the highly successful, action role-playing game *Deus Ex: Human Revolution*, which is distinctive for its portrayal and utilization of human enhancement technologies in its core gameplay. In addition, promotional material, particularly three trailers, has been considered in a discourse analytical fashion and e-mail interviews with the art director and the science consultant have been conducted to enrich the empirical material. The concept of 'sociotechnical imaginaries' served as the sensitizing concept during the analysis of the representation and performance of enhancement technologies and augmented bodies in the game.

The developers have employed multifarious strategies, such as narrative embedment of the topic and the creation of diegetic prototypes, in order to immerse the player in the topic of human enhancement and to grant high relevance to the central theme of transhumanism. The player experience is augmented by a wealth of information, often scientific by nature, and clues that reveal the imminence of human enhancement technologies in reality. Furthermore, the gameplay includes the dimension of choice and ethical decision-making, which, in the end, enables the player to construct his/her individual sociotechnical imaginary provided by the multiple imaginaries encapsulated in the game. Thus, the game accomplishes to allow players to virtually witness a potential sociotechnical future while interacting with and actively using diegetic prototypes of human enhancement technologies.

12. Zusammenfassung

Videospiele ermöglichen es uns zukünftige oder alternative Welten zu erleben in denen das Potential von Wissenschaft und Technik nur durch die menschliche Vorstellungskraft begrenzt ist. Daraus resultiert, dass Ideen über den zukünftigen Zustand von Wissenschaft und Technik verbreitet werden und in Spielern, von denen es aufgrund des florierenden Markts für digitale Spiele immer mehr gibt, manifest werden könnten. Aus diesem Grund argumentiere ich, dass Videospiele sorgfältig durch das sozialwissenschaftliche Feld der Science & Technology Studies (STS) untersucht werden sollte und diese Arbeit zielt darauf ab einen Beitrag in diese Richtung zu leisten. Nicht nur ist diese Arbeit ein Versuch die zwei interdisziplinären Felder STS und Game Studies miteinander zu verbinden, sondern versucht zu zeigen, dass Videospiele als wichtiger Ort der kritischen Auseinandersetzung und Reflektion wissenschaftlicher Fortschritte und technologischer Innovationen durch die Gesellschaft angesehen werden kann. Mit Hilfe einer Kombination aus Methoden der STS und Game Studies habe ich eine qualitative Analyse des erfolgreichen Action Rollenspiels *Deus Ex: Human Revolution*, welches durch die Darstellung und Verwendung von Technologien zur Verbesserung des Menschen (Human Enhancement) besticht, durchgeführt. Darüber hinaus haben diskursanalytische Betrachtungen des Promotionsmaterials, insbesondere drei Trailern, sowie E-Mail Interviews mit dem Art Director und Science Consultant das empirische Material der vorliegenden Arbeit ergänzt. Das Konzept der ‚sociotechnical imaginaries‘ hat bei der Analyse der Repräsentation und Performanz der Enhancement Technologien und augmentierten Körper als theoretische Basis gedient.

Um das Thema von Human Enhancement sowie die zentrale Thematik des Transhumanismus möglichst relevant für Spieler zu machen haben die Entwickler vielfältige Strategien wie etwa narrative Verstrickung des Themas und Erschaffung diegetischer Prototypen eingesetzt. Die Spielerfahrung ist überdies mit einer Fülle an oft wissenschaftlicher Information und Hinweisen, welche das Bestehen von Human Enhancement Technologien in der Wirklichkeit suggerieren, geprägt. Zusätzlich verlangt das Gameplay Entscheidungen durch den Spieler, welche eine ethische und moralische Komponente enthalten. Dadurch wird es Spielern ermöglicht eine individuelle soziotechnische Imagination zum Thema aus den bereitgestellten mannigfachen Imaginaries zu konstruieren. Folglich erlaubt das Videospiel den Spielern eine antizipierte, mögliche

soziotechnische Zukunft des Human Enhancement durch die Interaktion und notwendige Verwendung von diegetischen Prototypen von Technologien zur Verbesserung des Menschen virtuell zu erleben.

13. Curriculum Vitae

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