Team Knowledge Primer

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Introduction

In this era of rapid digital transformation, the confluence of the social sciences, economics, and technology emerges as a critical area of study, offering profound insights into reshaping global cultures, societies, and geopolitical landscapes. This paper embarks on an analytical journey, drawing from the seminal contributions of Bruno Latour, Richard Dyer, Mar Hicks, and Gary Chapman, alongside the contemporary insights of Azeem Azhar and Adrian Daub, to dissect the multifaceted impacts of technological advancements on societal norms and structures.

Latour's exploration into the sociology of mundane artifacts challenges us to reconsider our relationship with technology, positing that even the most ordinary objects play significant roles in shaping human behaviors and societal configurations. This perspective is crucial for understanding the subtle ways in which technology influences daily life and societal norms. Dyer's discourse on "whiteness" and its inherent power dynamics provides a lens through which we can examine technological adoption and diffusion's cultural and societal implications. It critically examines who benefits from technological advances and at whose expense. Hicks's historical analysis of technological ascendancy offers a cautionary tale about the socio-economic factors that can influence a nation's technological trajectory, reminding us of the importance of equitable and inclusive technological development. Finally, Chapman enriches this analysis by questioning the prioritization of technological advancement over societal values and well-being, offering a critical lens through which to examine the ethical dimensions of our digital age.

This paper, therefore, seeks to advance a nuanced discourse on the role of technology in society, to analyze, develop, and demonstrate an informed understanding of the influence of social sciences and economics on technological development. It aims to probe the relationships and interactions disrupting and reformulating societal norms and structures. Our paper critically examines the diverse perspectives shaping our understanding of technology's role in global cultures and societies. As we navigate these discussions, the paper will emphasize that technological advancement is not merely a linear progression toward a more efficient and

connected world. Instead, it is a complex, multifaceted phenomenon encompassing ethical, cultural, and political considerations.

The urgency and relevance of this inquiry are underscored by the current global context, where digital technologies are increasingly intertwined with every aspect of human life. The Fourth Industrial Revolution, characterized by blurring boundaries between the physical, digital, and biological spheres, has catalyzed profound shifts in how we live, work, and interact. These shifts are not merely technological but are deeply embedded within the social fabric, influencing everything from individual identities to global economic systems. The paper will delve into the dynamics of a multigenerational workforce, highlighting how different generations' divergent experiences and expectations regarding technology can inform broader societal attitudes toward innovation and change.

Furthermore, the COVID-19 pandemic has been a critical inflection point, accelerating digital transformation and exposing the fragilities and inequalities within current sociotechnical systems. The pandemic has prompted an urgent reevaluation of how technology can serve as a lifeline in times of crisis. Still, it has raised pertinent questions about access, equity, and the digital divide.

In dissecting the impact of technological advancements, we leverage the insights of Azeem Azhar and Adrian Daub. Azhar’s concept of the Exponential Age and Daub's reflections on "What Tech Calls Thinking" provide contemporary perspectives essential for understanding the current technological zeitgeist and its societal implications. Through the combined lenses of people, technology, and economics, the paper will illuminate the complex interplay between technological innovation and societal evolution, aiming to foster a deeper understanding of how digital transformation influences cultures, societies, and geopolitical forces.

Chapter 10 – Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts (Bruno Latour) – Section by Jose Palma Gregorio Calma

PRIMARY CONCEPTS AND COMPONENTS

People

The missing masses are about these metaphysical narratives that may give light to developing adequate social theories that articulate our relationships with the technologies that we use in broader contexts. One social theory that may be appealing is called Anthropomorphism, which is the attribution of human characteristics, behaviors, or emotions to non-human entities in a way that resembles human traits, which can include emotions, intentions, or consciousness. For how we can explain that the knob of the door needs our holding and turning, or that a button seems to call our finger that itches to press it if not for our anthropomorphist inclinations that we assign what is meant for this and that. Normatively, as we look around us, these nuanced narratives are absent, unseen, and embedded, the author claims, and he emphasizes the importance of comprehending the dynamics of artifacts and social theories of pre-existing inscriptions embedded within them.

The article consists of several components that explore the sociology of everyday objects, such as examining the inscriptions of builders and users within a mechanism and the concept of delegation of competencies between humans and non-humans. It highlights how non-humans can take over the selective attitudes of those who engineered them, such as a door closer that doesn't hold to open longer that discriminates against the elderly and blue-collar employees that churn trash or cargo.

Technology

The article is an eye opener on the saga of non-human and human interactions, which are implicit and explicit, and the gradient of narratives that are employed as they are co-joined

into one experience that continuously unfolds, which may at times be prone to gaps, miscommunication, and at times a disconnect.

A hump made to slow down cars, a traffic stop sign, and a policeman at the crossing are all antiprograms for the car driver. This descriptive hierarchy would be the gradient of metaphysical narratives on how driving is technologically managed on the road. A hump force you to act to slow down lest you damage your car, the stop light signal that says “slow down” is a representative language that we learn in driving class to help affirm the suggested action, and a human sensor in the form of a policeman to make sure our laws get followed, creates a compounded role to the driver’s expected action.

These are mundane artifacts around us that assign us roles, all of which we may not necessarily agree with, lest no antiprograms won’t be needed if a car had sensors to slow down autonomously and realign with the legal protocols of our streets.

This is an important article on the relevance of social theories on the history of technology development as it motivates inquiry into our human psychology and language, which may demystify and add value to more innovative technology development. A hump that doesn’t destroy a car’s assemblage, on the assumption that the driver cares for his vehicle is a role assigned to us and is premised on our caring, would all be unnecessary if there were a sensor that applies the car to slow down or a kind of chassis that doesn’t get affected by any form of hump impact. It makes us realize that technologies are produced in a format of the historicity of programs and anti-programs with human and inhuman artifacts having a symbiotic or adversarial relationship that is assigned implicit and explicit responsibilities by the engineers who created them.

Economics

The article represents the economics of the total efficiency of the artifacts around us, which are composed of human and non-human actors, and the roles that are interchanged across stakeholders, including physical stakes, expresses an economics of efficiency of role-playing, role execution, and role building, which economic precepts that are reliant on our comprehension, agreement, and support. The missing masses are about the rationale of the

roles, whether they belong to non-human or human actors; the economics are the efficacies of the role adaptation and the underlying technological value itself. The more committed the role of the actors in the artifact's narrative, the more efficient economics can be expected from the design.

Being a technologist made me realize the missing premises that are private from user perspectives and that the interfaces designed for us to be agents or actors in the Technology's agenda require some public inquiry. It provides me with a critical thought point of agreeing or disagreeing with the premises and the personal reflection either to take part in the narrative that I may not be in support of or to disregard and decide to disrupt it totally. When provoked, this kind of rebellious attitude can be totally void of the expected economics of the engineers who created them.

RELATIONSHIP TO COURSE MATERIAL

People

The impact of people from each vantage point differs. The exponential gap provides work and income value exchanges among enterprises; the virus robs us of our human decency, while the Silicon Valley counterculture promotes the advancement of mediocrity and personal virtues. This article provides people with a contemplative motivation to start on our personal social epistemologies, whichever theoretical path it lands.

Technology

The main books that were assigned to us dwell on Technology's existentialism to put it succinctly. "The Exponential Gap" (Azhar, 2011) is about the rallying of enterprise cooperation towards the acquisition of a capability, the "Virus in the Age of Madness" (Levy, 2020) is about the deterioration of human value that power systems brought about from Technology's essence, and finally "What Tech Calls Thinking", suggests that Technology is grandstanded merely from our personal whims that brought about mediocrity in communication, value exchange, disruption, and all sorts of banality. These are the varying vantage points on

Technology's existence. Hence, this article enlarges the gaps for all these vantage points as each would correspond to an assigned "anthropomorphological “context per human being.

Economics

The impact on economics for each vantage point of the assigned books differs as well. The exponential gap pegs on industrialized organizations. Meanwhile, the virus is about a disruption in our daily lives, and Silicon Valley's counterculture is the vacuum of economic value from personal grandeur. The article, meanwhile, dwells on the value perceived by the human being to adapt to the role of the programs set forth, which I would classify as the microeconomics of a proposed technology model.

KEY TAKEAWAYS

People

Deskilled Workers and Machines: The article challenges the biases against machines and deskilled workers, highlighting the exchange of properties between human and non-human actors, and reminds us of how Technology can play a coercive role against humans using power relationships that are evident during a crisis (2021 Levy).

Technology

Engineers as Authors: Engineers are portrayed as authors creating plots and story scenarios with delegated and interlocking characters within technologies, which reminds us of how the technopreneurs in Silicon Valley objectify everything merely on the qualifications in their ivory tower (2020 Daub).

Economics

Artifacts as Mediators: Artifacts are described as taking on the contradictory wishes or needs of both humans and non-humans, thus acting as mediators in societal interactions to fill some communication gaps; this reminds us that inefficient social constructs can be applied between non-human and human artifacts as it is arranged in a harbinger scenario as explained

in the book, The Exponential Age (2021 Azhar) - could be represented as some form of economic wastes.

RELATIONSHIP TO INDIVIDUAL WORLD

People

It provided me the curiosity to see their user experience design map prior to product development, as I am interested to see the premises they have developed for human consumption and society. Problems are always solved with a background of historicity, which is why there will always be an anti-program to a program or vice versa. Agility is growing to be an acceptable feature of human destiny.

Technology

Prior to any conceptualization and representation, a technology domain must be defined and established in existence in terms of its ontological beings. Ontology is formally defined as an information science as a formal model of naming types, properties, and inter-relationships of the entities that are fundamental for a particular technology domain. The domains that are involved in the built environment (BE) could be defined multifariously that are composed of our mundane artifacts from concise outward domains such as about “Production of Places” (Reeve, 1993), or an encompassing system of global variables as described by (Suberi, 2022) which covers a study of roles and their influences that affect seventeen (17) global variables: 1. Participation, 2. Material Characteristics, 3. Ecological Footprint, 4. Justice and Fairness, 5. Enabling Conditions, 6. Incentive Mechanisms, 7. Value Addition, 8. Spatial Dynamics, 9. Utility Facilities, 10. Energy Efficiency, 11. New Materials, 12. Procurement Standards, 13. Job Availability, 14.Technology Support, 15. Awareness Creation, 16. Life Span, 17. Human Wellbeing. In the article, signages, user interfaces, and product instructions are all around us in our built environment and we build habits around these beings which carry metaphysical content. These non-human artifacts are better coupled with communication ports like a programming interface. It provided me with a lead on the origins of failure and poor adaptation as oftentimes when technological failures occur,

we miss sociological importance and social constructs which are imperatives for value exchanges. In other words, this article is the missing piece for our design thinking on our built environment.

Economics

The article was published in the early 1990s, but it reminds me of how deep learning models recently worked regarding feature property exchanges. Anthropomorphology, as explained earlier, is also about featured property exchanges that are embedded and imply the communication of the roles of humans from non-human artifacts, which are mysteriously comprehended or apprehended against. The learning would be about what the engineer expects from the human to act upon based on a feature property emitted by a non-human feature artifact. The entire learning architecture of, including biases, accuracies, and other functions, would be a good representation of the inquiry on what these missing masses would be all about (2017 Baduma).

APPLICATIONS OF INSIGHTS

People

Where do our anthromorphological theories come from, and how will they evolve in the future? Is it from previous accumulated experience or is it something that is innate? Will a caveman have the same learning curve in driving a Tesla compared to a first-time driver of today born in the era of gadgets? I don't know for sure as this cannot be experimented, all we can do is to have better introspection to our human nature.

Technology

This article made me think about the relationships of society to Technology, which are represented by their own anthromophorlogical inner voices. It made me realize that Technology can also be framed on role embeddings that could be attached to the human being and not just a presenter like how a typical product works.

Economics

The appreciation of economics in the article is about the efficiency of the roles that we play. The surplus of roles that we can place above our anthro morphological theories provides a view on the limitation of the product's lifecycle as well. When the roles it offers are no longer given value or respect, the product will have a good reason to be discarded. On the other side of the coin, if the role demanded is too complex, the user experience is also diminished. This tension and area of sensitivity can be a good framework for design thinking work and product planning for myself.

CONCLUSION

Human nature is not vague nor mysterious; it is just a dynamic essence that cannot be simply contained, technologically speaking. When we think this way, this summarizes all forms of inefficiencies of adaption, product success, and outcomes. Products are only bridges and patches of the human condition - to correct spills of misuse, repair failed outcomes, etc. In the end, all of them are technological constructs provided by all theories of truth, Technology's existentialism, sociology, and other sciences expressed in programs and anti-programs composed of human and non-human artifacts and actors. Without these strivings, curiosity, or discontent, our humanity will also have nothing to do, nothing to aim for, nothing to achieve, and nothing to suffer from. Technology's secrets, truths, divinity, science, and the rest of the bandwagon of our human interests are better taken as a provision from God rather than centered on a product defined by our humanity. Our human strivings will just frustrate us in the end as we are still scratching the surface after all these millennia. But when taken as a provision, the roles that we choose to deploy ourselves will be more relaxed, less coercive, and endearing, from programs that will be more timeless and truthful.

Chapter 14 – White (Richard Dyer) – Section by Siddharth A. Pai

This is a review of Chapter 14 from the book Technology & Society, entitled “White,” written by Richard Dyer. The chapter comprises pages 229 to 235 (Dyer, 2021). The author embarks upon a study of the lighting techniques and film stocks used in early photography to make the case that the technological development of these film stocks, and indeed the lighting techniques used to photograph people (while taking their portraits), showed a strong bias to the optimum representation of the “White” or “Caucasian” skin tone. This, he argues, was because the photographing public was predominantly Caucasian (people), and the development of film stock into rolls of film that could easily be distributed at large to all photographers marked the “money spinner” moment (economics) in the development of photographic technology.

PRIMARY CONCEPTS AND COMPONENTS

People

In Dyer's article, there is a preconceived idea of history and an interpretation of its racial significance. He speaks of colonial biases, including how people of the time (meaning colonialists) liked people to be represented in photographic images. There was a view of "us" (that is, the colonizers) and the "other" (that is, the colonized). Given the many historical facts supporting this view, the ethos of the early consumers of photographic images is probably correctly represented.

Technology

The author then describes the history of various film stocks and reactions to different colors. Here, the chemical composition of the film stock would undoubtedly have had different characteristics concerning their ability to pick up and register light of different wavelengths, i.e., would have reacted differently to different colors as their chemistry evolved and advanced.

He embarks on a study of film stock development and how these early film stocks showed different sensitivities to distinct colors of light used in "prop" lighting for photography.

He starts by stating that different skin colors reflect light to varying degrees. He quotes Kris Malkiewicz from his book "Film Lighting" published by Prentice Hall in New York in 1986, as saying, "A Caucasian face has about 35 percent reflectance, but a black face reflects less than 16 percent." (Malciewicz, 2012)

The author captures some of these attempts by early photographers to manipulate how the white face was represented in his description of how these photographers used various lighting sources to render white skin "whiter" (Dyer, 2021). While it is valid until today that multiple lighting sources are used in photography, this is more to tune the specific type of photograph being taken, which is only sometimes a face. Nonetheless, he offers a fascinating description of the use of lighting during the early years of photography, reflecting that even early photographers paid more attention to light than the subject.

The primary driver here was a societal response to the state of the art of the technology, and all the descriptions by the author show economic and people-based reactions to a technology that did not consciously discriminate among skin types.

Economics

The economic implications of this racial/color-based "discrimination" are easy to understand. The earliest cameras and photographic film producers were American or European, both societies that were primarily white Caucasian in their makeup. It stands to reason that their earliest customers were also, in the majority, white Caucasian. Naturally, the techniques applied to correct or enhance color for an audience that was predominantly white Caucasian were an adjustment to the tastes of the primary market for these products.

RELATIONSHIP TO COURSE MATERIAL

People

Like Hicks' article covered by my colleague on this team, the intersection of Dyer's article with "The Exponential Age" by Azeem Azhar and "What Tech Calls Thinking" by Adrian Daub is prominent in the analysis of the people involved in technology. Dyer discusses the racial biases in the early photographic technology era, reflecting on how societal norms shaped how the

technology was manipulated. This aligns with the problems presented by facial recognition technology – especially concerning intentional bias, such as perpetrated by China's government on its citizens, and unintentional biases that have found their way into the technology (Ma, A. 2018). These problems have proven so intractable that in 2020, three American Big Tech companies announced they would pull back their facial recognition programs.

Technology

The National Institute of Standards and Technology (NIST), a federal laboratory that develops standards for new technology, found "empirical evidence" that most facial recognition algorithms exhibit "demographic differentials." They lose accuracy based on a person's age, gender, or race. NIST's analysis examined most of the industry's leading systems, including 189 algorithms voluntarily submitted by 99 companies, academic institutions, and other developers. (National Institute of Standards and Technology, 2023) (Pai, 2020)

NIST found that facial recognition algorithms sold in the US were 10-100 times more likely to misidentify Asians, Africans, and Native Americans than they were to misidentify Caucasian people. This racial bias has caused lawmakers in the US to slow down the use of this technology. As an aside, Amazon, IBM, and Microsoft all said that they are either cancelling their programs or placing holds on police departments using their facial recognition algorithms, which appear to discriminate against black people. (Hao, 2020). These works show that the bias has lived on, probably in the data being fed to Artificial Intelligence Algorithms in use for facial recognition technology, a problem explored by other readings in this course.

Economics

In essence, the convergence of these works through the lenses of People, Technology, and Economics provides a comprehensive understanding of how societal biases and norms affect the development and application of technology and its economic implications, as stated by my colleague in this team.

Where the exit of a large competitor creates a market void, it is natural that upstarts will step in. Amazon, Microsoft, and IBM's exit has allowed many smaller companies to enter the

void – since buyers still exist – such as police departments looking to crack down on crime. (Greig, 2021). Self-regulation by big tech companies to stop bias in computing is a lost cause, either because they will never self-regulate sufficiently or because upstarts will step in if they do. What is needed is more intelligent regulation that tightens the screws on the acceptability of bias in the development of technology.

KEY TAKEAWAYS

People

The people aspect of Dyer's article only reflects societal attitudes at the time. It is unlikely that the narrative of "discrimination" had taken hold in a world where colonists ruled during the early days of photographic technology development. (Orthochromatic film, which was developed around 1873, was not able to deliver all colors in the light spectrum accurately, and the adjustments through lighting, facial make up, and development of exposed film corrected for this lacuna from an admittedly "white" perspective)

Technology

The researcher, an amateur photographer who has taken photography seriously for almost 40 years, finds this statement being presented out of context. It unnecessarily emphasizes a point that, when taken out of context, can color a discussion. Light is impartial to color. It is colors that react differently to light. A simple reading from even a high school textbook on physics would reveal that different colors appear differently to the human eye because they reflect colors in different proportions. The color white (as opposed to the “white” skin tone) reflects all wavelengths of light and, therefore, appears white (or a similar reflected color from the light source) to the eye. Black absorbs more light than it reflects, therefore appearing black to the eye. The author then goes on into a more extensive description of the history of various film stocks, and their varying reactions to distinct colors. Here, the chemical composition of the film stock would undoubtedly have had different characteristics concerning its ability to pick up and register light of different wavelengths. It is certainly possible that the

early chemistry of black and white film stocks reacted differently to distinct colors as their chemistry evolved and advanced.

There is an old saying in photography: "The amateur looks at the equipment, the professional at the money, while the master looks for the light." Light is the king when it comes to photography, and all technological advances in photography have come, to this day, from the manufacturer's attempts to allow photographers the ability to "write with light," which is quite literally what "photography" means.

There is a further discussion of the use of carbon arc lights versus incandescent light and the dynamics associated with the "warmth" of each type of light source when compared to sunlight (which is neutral). While this is informative and useful, it does not point to any discrimination; to the researcher, it simply shows that photographers have always been in search of authenticity.

Dyer further claims that photographic technology and media innovation have taken the human face at its touchstone (Dyer, 2021). This is a tall claim. Indeed, in today's world, portraiture is only a subset of the photographic milieu, which covers landscapes, wildlife, architecture, "street" or "reportage" photography, industrial photography, food photography, aerial photography with drones, and so many more. Claiming that the human face is the only touchstone seems far-fetched.

Economics

Consumer preferences drive technological development. The early consumer demographic of photographic images was predominantly white Caucasian, so the attempts by early photographers to bend the technology to suit the tastes of their majority market were only a natural extension of what their market expected.

RELATIONSHIP TO INDIVIDUAL WORLD

People

It is not at all surprising that the initial preference was for white skin to be rendered “whiter” by photographers. It is a natural extension of a small market with distinct preferences.

What was surprising, however, is how these biases have lived on, even subconsciously, in how we approach facial recognition technology today.

Technology

The phenomenon of orthochromasia and the resulting blindness to red in orthochromatic films was a revelation to the researcher. It is obvious that the researcher's assumption that film stock was a faithful reproducer of color (and of how colors affect black and white images) was incorrect. The "blindness" of orthochromatic film to red light and its long reign as the primary film medium (1873 to 1906) was not something the researcher had ever considered as a photographer, given that the researcher was not alive when the orthochromatic film was widely used.

Economics

The consumers of photographic images now come from a much broader demographic dynamic. To me, bias has yet to work its way out of the application of such technology despite the market being much larger and more diverse than it once was.

There is possibly a case to be made that early color films used pink Caucasian faces as the basis on which to judge color accuracy, thereby making the rendering of non-Caucasian skin less accurate than it could have been. Kodak was the first company to begin the mass marketing of film to consumers, and they used Caucasian subjects to set the tonal quality of their films. This is directly connected to both people and economics. Eastman Kodak was headquartered in Rochester, New York, with a majority white population and was focused mainly on the US market, which was still majority white at that time (1960s). It was only in later years that the US's racial component began to change dramatically.

Fujifilm (of Japan) was a later entrant into color films and only began to gain prominence in the 1980s, some 20 years after the first color films had started to be marketed. Many photographers (interestingly Caucasian ones) feel that Kodak film produced a better skin tone than Fujifilm (TAHUSA, 2021). To the researcher's mind, Fuji's color science is the stuff of legend

and has lived on in their massively successful Fujifilm digital cameras. It remained the gold standard long after both Kodak as a company (and film in general) died out.

As stated, Fuji was later to the party than Kodak and introduced a 'colder' tone. Technically, the color temperature was more bent toward greens and blues than oranges and reds. Per the discussion above about the "pink" Caucasian skin type, a colder tone would, therefore, be better at accurately reproducing non-Caucasian skin colors than Kodak's "warmer" tone would have been (since it would have placed less emphasis on the pink). What is striking, however, is that this removal of bias from the technology itself has yet to result in the removal of bias from men's minds. (I use men as a collective noun to refer to humankind in general).

APPLICATION OF INSIGHTS

People

The main takeaway is that there may be long-standing biases in the application of technologies that have lasted for more than a century and that one needs to look more at contemporary experience as far as bias is concerned. It is essential to understand the source of this bias and that the bias itself may be insidious in a particular type of technology. Therefore, studying the technology's history is essential to understanding how societal preferences may have shaped it.

Here is a representation of Ernest Shackleton and a party at the South Pole using orthochromatic films. Shackleton, a British explorer, was the first to reach the antipode – and in this picture, we see a Union Jack hoisted at the site. As we can see, the red colors in the flag show up as black, and curiously, so do the (all-white) men's weather-beaten faces.

Figure 1: Digital rendition of a picture taken with orthochromatic black & white film and impervious to the red spectrum[1]

Technology

Remember that gray is a mixture of black and white. 18% gray is the average that most photographers use while calculating the luminance of light. In other words, 18% gray is the average in most scenes, and tones of gray (whether black – which is 100% on the spectrum of black to white that defines gray or white, which occupies the other end of the spectrum) are what is rendered in a black and white image. According to greatphotography.com (Great Photography, 2016)

> By definition, 18% gray is the "mid-point between black and white on a logarithmic or exponential curve." Think of it this way; it is simply halfway between black and white. It is the average in terms of scene brightness and has

[1] Picture credit By Tannatt David (1858, †1934) - Shackleton, Ernest Henry, et al. (1909). The Heart of the Antarctic. J.B. Lippincott Company, Public Domain.

for many years been the one constant thing that photographers use on which to base their exposures on.

Given this, we can safely deduce that the introduction of panchromatic film in 1906 would have removed all the "negative" bias that orthochromatic film would have had to white skin since the incorporation of red, blue, and green light would have been even. Therefore, skin toes would have been faithfully reproduced for their departure from 18% gray.

In the researcher's opinion and observation, black and white remained the medium of choice for most "serious" photographers well into the 1970s, despite the introduction of color film on a mass basis around the end of the 1960s. Color was considered suitable for amateurs only. Unlike black and white, which only had to be recorded in tones of gray and had only one layer of silver halide, color emulsions needed three layers to count for red, blue, and green.

As a photographer, the researcher will now look beyond just the interaction of light and shadow on the representations I make of the human face. One technique that the researcher has long been using is a red filter to cut out red light while making portraits in black and white. Received wisdom is that a red filter renders skin tone more pleasingly in black and white photography, since it covers many blemishes in the subject's skin. The researcher now recognizes that this technique recreates some of the orthochromatic biases prevalent in the late 19th century. If a serious photographer is in search of verisimilitude, then this practice must stop.

Economics

Economically, the lessons from Dyers' article highlight the pitfalls of focusing on a single demographic. Exporting this micro-demographic view to a larger, global consumer set is dangerous.

Also, as stated earlier, the self-policing of Big Tech is not an answer to discrimination in how an image is represented or analyzed. Smaller companies will enter the void if a market exists. What is needed, then, is regulation of such markets such that an equitable outcome can be reached.

CONCLUSION

To quote Thorsten von Overgaard, "To give you the full picture, the cameras used at that time were large boxes that absolutely did not fit into the pocket of a jacket, and often they required tripods and extra film plates of glass (one for each picture)" (Overgaard, 2021). To quibble with the original chemistry and the attempts to make a film that could pick up on luminescence is a disingenuous way of going about this analysis. Early film chemists (mainly in Rochester, NY, where Eastman Kodak was headquartered) were more concerned with whether their film stock would pick up any light at all. Per DBpedia, "In black-and-white photographic film, there is usually one layer of silver halide crystals. When the exposed silver halide grains are developed, the silver halide crystals are converted to metallic silver, which blocks light and appears as the black part of the film negative." Black and white film progressed to panchromatic film around 1906 from the earlier discovery of orthochromatic film by William Henri Vogel around 1873. (DBPedia, 2024)

Orthochromatic film was given to the phenomenon of orthochromasia, which meant that the film's chemistry rendered it sensitive to only blue and green light and insensitive to red light. (Hulfish, 1970). Later, panchromatic film (sensitive to red, green, and blue) was developed. (As a point of reference, the "Bayer" filter in today's digital cameras contains pixels that register in one of these three colors – red, blue, or green- hence called RBG filters. Combining these total pixels allows the photographs to be rendered in a full spectrum of color). Bayer filters are named after Bryce Bayer of Kodak, who invented the digital sensor (Brian Wendell, 2003).

Digital cameras became widely available by the end of the first decade of the 2000s, and the shift to digital from film is now almost complete. In the researcher's estimation, digital has removed all bias. Most digital cameras today (except pure black and white digital cameras, which are an oddity) are based on sensors that have two layers. One layer reads luminance – or the amount of light available when the picture is taken. A second layer, the Bayer sensor, which is laid on top of the luminance sensor, is a layer that reads each pixel as either red, green, or blue. Combining these red, green, and blue layers provides the color output in full spectrum. (Elsevier BV).

Most importantly, we have moved from chemistry to physics (and electronics) in the representation of the photographic image. All previous biases instilled by the chemistry of film stocks are now just a vestige in the world of photography. Physics and light now rule, and they rule impartially.

However, the problem with lighting still exists since indoor lighting, such as tungsten and fluorescent light, has a different color cast than daylight. Modern digital cameras correct for these through a setting called "White Balance." (White here refers to the color of the light source and not Caucasian skin). What is important to note is that light's color cast is also not partial to skin tones. Light is light, and though it may have several color casts, that is just its nature. Diverse colors (including skin colors) react differently to these color casts. However, today's technology can correct this quickly, and photographers value the ability to digitally play with their files to achieve an optimum look that defines their vision of the art they are practicing.

Thankfully, today's digital world lends itself to authenticity in the representation of color if manipulative practices around the color of light being cast on the image (or being collected from the image via blocking by color filters) are not used.

It appears, however, through the study of the development of facial recognition technology and the attempts of some Big Tech companies to stay away from it, that early biases still need to be ironed out. Important to point out here is that it is the recognition algorithms that are potentially biased and not the images themselves (which are produced by the impartial actions of light and physics through an electronic medium). There is a distinction between the impartial physics of digital sensors and the bias that may be implicit in the computer programmers who write the computer code that performs recognition routines on the digital image.

It is up to us to individually look for verisimilitude and attempt to correct this *post-facto* bias as best as we know how. This is in addition to regulation since, as pointed out before, self-policing by certain companies does not mean that other companies will not step into the void created by a self-policing company that abstains from further development of a discriminative technology.

Chapter 34 – When Winning Is Losing: Why the Nation that Invented the Computer Lost Its Lead (Mar Hicks) – Section by Francisco Campbell

INTRODUCTION

The rapid evolution of technology, underscored by the exponential growth highlighted by Azeem Azhar, juxtaposed with Adrian Daub's critique of tech culture, frames a complex landscape where diversity and innovation intersect. This section, drawing upon Mar Hicks' examination of systemic biases within the tech industry, endeavors to explore this nexus, mainly through the lens of cybersecurity in the financial sector, which is of profound relevance to this author.

Hicks' historical insights into the exclusion of women and minorities in computing provide a sobering backdrop against which the current challenges and opportunities in technology can be assessed. Azhar's "The Exponential Age" posits that we stand at a pivotal moment where technology's growth could either exacerbate existing inequalities or offer a path to a more inclusive and equitable future. Daub's "What Tech Calls Thinking" further complicates this picture by revealing the ideological underpinnings that have shaped tech culture and, by extension, the development of technology itself.

Through the critical lenses of People, Technology, and Economics, this section aims to dissect how the legacies of exclusion have impacted the tech industry and identify ways that could enhance innovation through diversity, particularly in cybersecurity. With its increasing reliance on digital technologies and the pressing need for robust cybersecurity measures, the financial sector is a critical focal point for this analysis. The intersection of these themes—historical biases, the pace of technological change, and the cultural milieu of tech development—sets the stage for this analysis.

PRIMARY CONCEPTS AND COMPONENTS

Hick's article can be summarized around six key themes: Innovation and decline, government policies, gender and labor, economic factors, technological ecosystem, and global competition. A brief description of these six key themes is provided in the following sections:

Innovation and Decline

Mar Hicks elucidates the paradoxical journey of the United Kingdom, the birthplace of computing, charting its trajectory from pioneering innovations to a consequential decline in global technological leadership. The narrative centers on how the exclusion and undervaluation of women technologists, combined with structural sexism within the computing industry, significantly contributed to this downfall. Hicks argues that the sidelining of a rich talent pool based on gender not only compromised the industry's innovative capacity but also underscored the broader societal implications of gender biases in technology. This systemic oversight ultimately hindered the UK's ability to maintain its competitive edge in the evolving digital landscape, illustrating a critical lesson on the importance of inclusivity for technological progress and sustainability.

Government Policies

Great Britain's government approach to addressing the computer labor crisis of the 1960s is a pivotal theme. As Britain faced a shortage of qualified computing personnel, government strategies evolved, initially resisting the inclusion of women in higher technical grades despite their competence. The government's eventual acknowledgment of women's contributions, albeit limited and not indicative of a broader policy shift towards gender equality, reflects a nuanced response to labor demands. Moreover, the government's efforts to centralize computing operations under the Ministry of Technology's guidance, leading to the forced merger of British computer firms into ICL, illustrates a strategic but ultimately flawed attempt to navigate the technological landscape. This intervention aimed to consolidate the UK's computing prowess but inadvertently stifled innovation by focusing on mainframe technology at a time when global trends shifted towards decentralized computing. This governmental

approach, rooted in the era's prevailing gender biases and economic strategies, highlights the complex interplay between policy decisions and technological development trajectories.

Gender and Labor

Mar Hicks delves into the historical gender dynamics within the UK's computing industry, highlighting the systemic sidelining of women despite their significant contributions. Initially, computing was a feminized field, where women played crucial roles due to the lack of men available during wartime. However, as the field gained prestige and importance, women were steadily pushed out or overlooked for promotion in favor of men despite possessing the necessary skills and knowledge. This exclusion was not just a loss for the women involved. Still, it represented a broader failure to capitalize on a diverse talent pool, leading to stunted growth and innovation within the sector. Hicks argues that this gendered restructuring of the workforce contributed to the UK's decline in the global technology race, underscoring the long-term impacts of gender bias and discrimination in shaping technological progress and industry competitiveness.

Economic Factors

The article discusses the profound economic implications of gendered exclusion in technology. Hicks illustrates how the systemic sidelining of women and individuals like Alan Turing, who did not conform to gender norms, resulted in a significant loss of talent and innovation. This exclusion had far-reaching economic consequences, limiting the potential for technological advancement and competitiveness on a national and global scale. The financial cost of discrimination thus extended beyond the immediate industry, impacting national economic growth and development. Hicks' analysis serves as a reminder of the intertwined nature of societal norms, technological innovation, and economic growth, demonstrating how discrimination based on gender, sexuality, and race has not only moral implications but also hampers technological and economic progress. This analysis underscores the importance of inclusivity and diversity in the tech industry, highlighting the need for a more equitable approach that embraces all talents, regardless of gender, race, or sexuality.

Technological Ecosystem

A comprehensive technological ecosystem encompasses not just the technology itself but also the policies, economic conditions, gender and labor dynamics, and the broader societal attitudes that influence the development and adoption of new technologies. In the context of Hicks' analysis, the failure to create an inclusive and supportive ecosystem that leverages the full spectrum of talent and innovation, particularly by excluding women and other marginalized groups, illustrates a missed opportunity for the UK. This oversight contributed to its decline as a leader in computing technology.

An effective technological ecosystem requires government policies that encourage innovation, economic strategies that support technological development and commercialization, and a labor force that includes diverse perspectives and skills. The lack of such an ecosystem in the UK, as implied by Hicks' discussions on government policies, economic factors, and gender and labor dynamics, hindered its ability to adapt to and lead in the rapidly evolving technological landscape.

Global Competition

Hicks centers on the UK's unique challenges and internal dynamics that affected its standing in the global computing industry. Hicks delves into the UK's early innovations in computing technology and how these initial advancements were not sustained due to a variety of factors rooted within the country itself, all of which were discussed in the prior themes.

Hicks underscores that the UK's approach to computing technology, influenced by its industrial, educational, and governmental policies, failed to foster an environment conducive to adapting and thriving in the face of global technological shifts. The focus is on the missed opportunities and strategic missteps that characterized the UK's engagement with computing technology, leading to a decline in its global technological leadership. This analysis highlights the importance of inclusive practices, strategic foresight, and the need for a supportive ecosystem to nurture and sustain technological innovation and competitiveness.

These six themes can then be brought into the critical lenses of people, technology, and economics, as shown below:

People

In Mar Hicks' article, the people aspect delves deeply into the socio-cultural constraints that hindered the progress of computing in Britain. The tragic story of Alan Turing, a pioneer of modern computing, exemplifies the harsh impact of societal norms on technological advancement. Turing's contributions, vital to the development of early computers and to breaking the Enigma code during World War II, were overshadowed by his persecution due to his homosexuality, which was illegal in the UK at the time. His subsequent chemical castration and untimely death (*Alan Turing - Computer Designer, Codebreaker, Enigma | Britannica*, n.d.) serve as a stark reminder of how societal prejudices against non-conforming gender identities and sexual orientations can stifle innovation and lead to tragic personal outcomes.

Technology

The technological lens in Hicks' article is intricately linked with societal gender expectations. The marginalization of women and non-heteronormative individuals like Turing reflects a broader trend where prevailing gender norms shaped the early computing era. These norms not only dictated who could participate in the field but also influenced the types of contributions that were recognized and valued.

Economics

The economic implications of this gendered exclusion in technology are profound. The systemic sidelining of women and individuals like Turing, who did not conform to gender norms, resulted in a significant loss of talent and innovation. This loss had far-reaching economic consequences, as it limited the potential for technological advancement and competitiveness on a national and global scale. The financial cost of discrimination, thus, extended beyond the immediate industry to impact national economic growth and development.

Finally, the works of Azhar, Daub, and Hicks can be compared and linked in this context through the following table:

Critical Lens	Hicks' Article	Daub's Book	Azhar's Book
People	Focuses on the role of gender and labor practices in the decline of Britain's tech industry.	Analyzes cultural ideologies and biases in tech, particularly regarding gender.	Broadly addresses societal impacts without a specific focus on gender dynamics.
Technology	Discusses the early achievements in computing and subsequent loss of leadership.	Examines Silicon Valley's influence on perceptions of technological progress.	Highlights technological advancements and their societal and economic impacts.
Economics	Analyzes the economic and policy decisions that affected Britain's tech industry's growth.	Questions the economic benefits and distribution of tech innovations.	Discusses the economic transformations driven by exponential technologies.

Table 1: Summary and linking of the works of Hicks, Daub, and Azhar.

RELATIONSHIP TO COURSE MATERIAL

People

The intersection of Hicks' article with "The Exponential Age" by Azeem Azhar and "What Tech Calls Thinking" by Adrian Daub is prominent in the analysis of the people involved in technology. Hicks discusses the gender and sexuality biases in the early computing era, reflecting on how societal norms shaped who contributed to technology. This aligns with Daub's critique of the ideological leanings within Silicon Valley, illustrating how prevailing cultural and societal attitudes influence who is allowed to participate and lead in technological fields. Similarly, Azhar's work, which emphasizes the rapid transformation in technology and its impact

on society, resonates with Hick's narrative on the exclusion of crucial contributors due to societal prejudices. These works collectively underscore the importance of inclusive practices in harnessing the full potential of human capital in technology.

Technology

In terms of technology, Hicks' article, Azhar's "The Exponential Age," and Daub's "What Tech Calls Thinking" converge on the theme of technological progress and its societal impacts. Hicks' detailed account of Britain's early computing developments and subsequent decline due to gender bias provides a historical context to Azhar's discussion on the rapid evolution of technology. Both works imply that technological advancement is not just a product of scientific discovery but also of the societal context in which it occurs. Daub's examination of the ideological underpinnings in tech culture complements this view, highlighting how societal biases can skew technological development and its applications.

Economics

Hicks' analysis of the lost potential due to gender biases in Britain's computing sector correlates with the broader economic themes in Azhar's and Daub's works. Azhar's depiction of the exponential age underscores the financial implications of rapid technological change, while Hicks' article illustrates how societal biases can lead to economic stagnation and lost opportunities. Daub's critique of the economic structures and ideologies within the tech industry further elucidates how technological economic outcomes are deeply intertwined with societal and cultural dynamics.

KEY TAKEAWAYS

People

The people aspect of Mar Hicks' article brings to light the profound impact of gender and sexuality biases in the early computing era. It highlights how societal attitudes towards women and individuals like Alan Turing affected their personal and professional lives and the broader technology field. The key takeaway is the crucial role of inclusivity and diversity in

technological advancement. The article emphasizes that recognizing and valuing diverse contributions is essential for fostering a dynamic and innovative tech industry. This aspect underscores the need for societal change in attitudes towards gender and sexuality, advocating for a tech culture that embraces diversity in all its forms.

Technology

In terms of technology, Hicks' article demonstrates how Britain's initial advancements in computing were overshadowed by a failure to leverage the potential of all its human resources fully. The key takeaway is that the diversity of its creators significantly influences technological innovation. When certain groups are marginalized, their unique perspectives and contributions are lost, leading to a stagnation in innovation. This point is crucial in understanding that the progress and evolution of technology depend not merely on technical and scientific capabilities but also on the inclusivity and diversity of the workforce. A prime example of the bad outcomes that the lack of diversity and inclusion can bring to a product is the 2015 Google Photos fiasco, where machine vision algorithms labeled black individuals as gorillas (Barr, 2015). Google's solution, still standing today, is to block search results for gorillas, chimpanzees, apes, and other primates (Grant & Hill, 2023).

Economics

Economically, Hicks' analysis underscores the cost of discrimination and bias within the tech sector. The key takeaway is the economic implications of gender and sexuality biases, which extend beyond moral and social concerns. The article highlights that such biases can lead to a loss of competitive edge and hinder national and global economic progress in the tech industry. It argues for reevaluating policies and practices in tech companies and national strategies to ensure that talent is not wasted due to systemic biases. This economic perspective is critical in understanding that inclusivity is not just a social or moral imperative but also a financial necessity for sustained growth and innovation in the tech sector.

RELATIONSHIP TO INDIVIDUAL WORLD

People

The revelation of how deeply societal biases affected technological advancement in early computing is startling. This underscores the importance of diversity in addressing complex security challenges in cybersecurity. Cybersecurity teams benefit from diverse perspectives to anticipate and mitigate various threats. This is particularly relevant in the financial sector, where understanding and guarding against diverse security risks is crucial. The lesson from Hicks' historical analysis is that inclusive teams are better equipped to handle the multifaceted nature of cybersecurity threats.

Technology

The article's insights also highlight the technological repercussions of homogeneity. In cybersecurity, diverse teams lead to more innovative problem-solving strategies. This diversity is not limited to gender or sexuality but extends to different educational backgrounds, work experiences, and cognitive approaches. The historical oversight in early computing underscores the risk of a one-dimensional approach to cybersecurity, which could lead to vulnerabilities and blind spots in security systems, especially in the dynamic and high-stakes realm of financial cybersecurity. Explaining the complex nature of cybersecurity is much like trying to explain a story to a 5-year-old; simplicity is key. Consider the wisdom from the movie "Shrek," where it is famously said that "ogres are like onions," layered and complex.

Similarly, effective cybersecurity is not a single layer of protection but a multi-layered strategy akin to an onion. Just as ogres have layers, cybersecurity relies on a defense-in-depth approach, where multiple security controls and measures are implemented to protect data and networks. This strategy is essential for creating a heterogeneous defense system that, unlike a homogenous one, provides varied obstacles against attacks, ensuring that if one layer is compromised, others stand ready to defend. Making cybersecurity understandable and relatable through such analogies can help demystify its complexities and turn a field often perceived as impenetrable into a more approachable and welcoming one.

Economics

Economically, the article illustrates the cost of discrimination in the tech industry, a lesson that directly applies to cybersecurity in the financial sector. Diverse teams in cybersecurity are not just moral imperatives but also economic ones, as they are crucial for protecting financial assets from various cyber threats. The economic impact of cybersecurity breaches can be devastating, and the strength of a diverse team in predicting and preventing such breaches cannot be overstated.

APPLICATION OF INSIGHTS

People

The insights from Mar Hicks' article have profound implications for modern work environments, especially in emphasizing the value of diversity and inclusivity. In today's tech industry, there is a growing recognition of the need for diverse perspectives, not just in gender and sexuality but across all dimensions of diversity. This is rooted in the understanding that diverse teams bring varied experiences and viewpoints, leading to more creative problem-solving and innovation. The article's retrospective look at the early computing era is a cautionary tale, reminding us that excluding any group based on gender, sexuality, race, or other factors can significantly hamper progress. In the modern work environment, fostering an inclusive culture is not just a moral imperative but a strategic one for attracting and retaining top talent.

Technology

In the realm of technology, the application of Hicks' insights lies in recognizing the value of diverse perspectives in driving innovation. As technology evolves rapidly, the need for diverse teams capable of thinking outside the box and approaching problems from different angles becomes increasingly essential. This is particularly true in fields like AI and machine learning, where biases in data can lead to skewed results. Ensuring diversity in the teams that build and manage these technologies is crucial for mitigating these risks and developing fair and practical solutions.

Economics

Economically, the lessons from Hicks' article highlight the potential cost of homogeneity. Companies that must embrace diversity in a globalized economy may find themselves at a competitive disadvantage. Diverse teams are better at problem-solving, understanding, and catering to a diverse customer base. This economic lens underscores the importance of diversity as a social good and a key driver of business success. Companies prioritizing diversity and inclusivity in finance, technology, and other industries are better positioned to innovate, adapt, and thrive.

Applying the insights from Hicks' article in the modern work environment involves a commitment to fostering diversity and inclusivity across all levels of an organization. This approach is crucial for creating a more equitable and just workplace, driving technological innovation, and ensuring economic success in an increasingly competitive and diverse global market.

CONCLUSION

Cybersecurity in the financial sector is a critical line of defense, safeguarding not only monetary assets but also the privacy and trust of millions of customers. Reflecting on Mar Hicks' insights, one can appreciate the crucial role that diversity plays in fortifying this defense. Diverse teams bring multiple perspectives essential in predicting and mitigating cyber threats, ensuring robust protection against various vulnerabilities (*Reinforcing Cybersecurity: Start with a Diverse Workforce - National Cybersecurity Alliance*, n.d.). The historic overlook of women and minorities in technology, as detailed by Hicks, serves as a stark reminder that when we fail to tap into the full spectrum of talent, we not only undermine innovation but also jeopardize security.

From a cybersecurity standpoint, the implications of biases like those mentioned in Hicks' narrative are far-reaching. Incidents such as the misclassification errors in Google's Photos app highlight the potential for algorithmic bias, which can have severe repercussions in the financial realm. These biases could manifest in discriminatory lending practices or flawed fraud detection systems, leading to ethical and economic consequences. Law enforcement in the US is

using facial recognition systems irresponsibly, landing innocent individuals in jail (*Facial Recognition Technology Jailed a Man for Days. His Lawsuit Joins Others from Black Plaintiffs*, 2023).

Therefore, it is imperative for institutions, especially within the financial sector, to pursue and cultivate diversity within their cybersecurity teams actively. This pursuit is not just a moral imperative but a strategic one, as a diverse team is more vigilant and effective. Including diverse perspectives is equally vital, as it ensures the development of products and services that resonate with a broader customer base, driving innovation and growth (*Delivering Growth through Diversity in the Workplace | McKinsey*, n.d.).

Chapter 35 – Shaping Technology for the “Good Life”: The Technological Imperative versus the Social Imperative (Gary Chapman) – Section by Lara Taylor

The "good life" can mean something different to so many people. The "good life" is either primitive, modern or in between. We love technology, even when we complain about it. But some also thrive on being off the grid. Technological advances or social values can shape invention and innovation. Both imperatives are meant to co-exist.

PRIMARY CONCEPTS AND COMPONENTS

Globalization

Globalization has led to instantaneous forms of communication. Globalization also enables one area of the world to have a profound impact on another area of the world. A scientist in Ohio could make a decision that affects farmers in South Korea. An engineer in France could have a breakthrough that affects manufacturing in China or Mexico. How do we know that what works well for one society will work well for all? How does the impact of technology advance some areas and hinder others? Is globalization the key to providing healthy, growing economies for every culture and society? What if a culture or society values societal norms over advancement in technology and science? Where is the balance? This exploration by Gary Chapman has tackled such questions. Chapman argues that if “we make technology our primary goal, then many of the values we hold dear may be lost in the mix” (Chapman et al., 2021, p. 543).

Chapman’s idea cemented the concept of a technological imperative that has always existed. A technological entity is represented in "macro-phenomena such as the market, and individual technologies such as semiconductor circuits or bioengineered organisms" (Chapman et al., 2021, p. 544). Technological inventions carry germination for more innovation to arise, and these future innovations span across a trajectory that may only be realized in hindsight. The process accelerates across time, causing more and more technology to accumulate. The thought is that this will eventually lead to an "increasingly uniform and adaptive global civilization"

(Chapman et al., 2021, p. 544). This idea is terrific if that is the primary goal of every society on earth: to participate in a uniform and adaptive global civilization. But how do primitive societies fit into this? How do societies that value preserving historical, cultural, and demographic differences more than building technology incorporate this ideology?

Anti-globalization

A growing number of people question this view of globalization and whether it is suitable for long-term sustainability. There is one central principle that unites the anti-globalists. The future is not preordained by a "technological imperative expressed via global corporate capitalism" (Chapman et al., 2021, p. 544). Anti-globalists are not inherently against capitalism. They long for a pathway where diversity is the key to how people adopt, use, and refine technology. This is very much a statement about how people want to control the direction of technology. At the same time, society as a whole may find technology to be useful in other ways than its initially intended idea.

If the technological imperative wins, society may be along for the ride. This idea has been posited before. Stewart Brand, author and guru, wrote, "Once a new technology rolls over you if you're not part of the steamroller, you're part of the road" (Chapman et al., 2021, p. 544). It is a fundamental question of whether technology shapes a society or if a society shapes technology. Indeed, both can and do happen, but which process ultimately wins? Does there have to be a clear distinction between one or the other? A lack of societal control may allow technology to progress in both anticipated and unanticipated ways. This could be beneficial if one believes that technology can autonomously shape itself. The influences of society or individuals always seem present, though. Having clear directives and uses for technology can also help avoid problems and pitfalls, which may speed up the progress of more technological advancements. What the anti-globalists are seeking is a balance between the two.

Moore's Law and the Technological Imperative

Gordon Moore co-founded Intel and pioneered computer chips and semiconductor electronics. In 1965, he released a theory known as Moore's Law. Moore's Law was a prediction

that microprocessor computer power would double every eighteen months. This prediction was Moore's forecast for the next ten years but has continued for over thirty-five years. The longevity of his prediction has become a phenomenon in computer and technology circles.

It should be noted, however, that Moore invested Intel's time and efforts in making sure that this prediction was, in fact, a reality. Still, the fascination with Moore's Law has been discussed for over four decades. There are theories that it will eventually fizzle out. However, there are also theories that it will continue because every time technology seems close to being unable to fulfill Moore's Law, another technological advancement propagates it forward again. Moore's Law is why so many believe computers will one day be more innovative than humans. The technological imperative has Moore's Law as a cornerstone of the ideology.

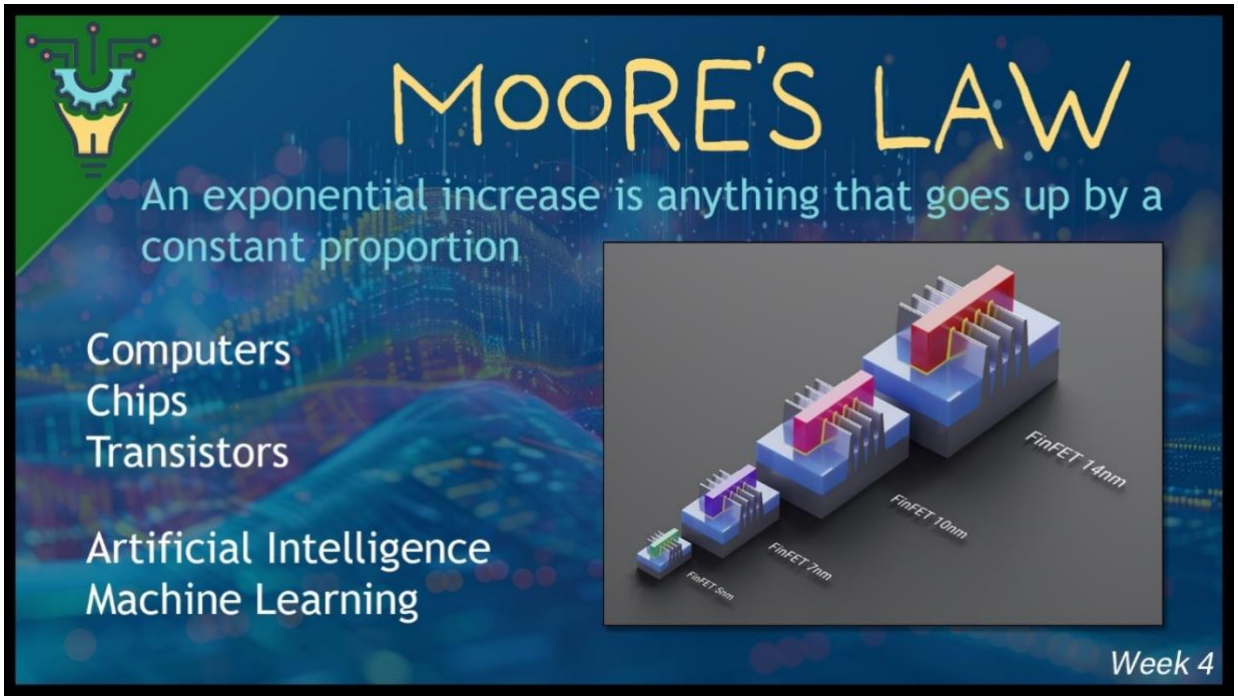

Figure 2: The effects of Moore's Law are seen in the decrease in the microprocessors' size[2]

Science and technology have long been captivated by the increasing longevity of human existence. Some believe that technology and computers will provide that immortal existence many seek. They are working towards making computers and technology "think" like humans.

[2] Illustration created by Lara Taylor, image from Adobe Stock through an educational license.

And as the technological imperative predicts, each technological advancement should bring us closer to this reality. Nothing about Moore's Law claims this will be a reality, though. Moore's Law is looked upon as a natural law, much like Newton's theory of gravity. But one day, the predictive nature of Moore's Law may very well cease. This will not be an end to technological advancement, though. It will be more of a shift in the belief that "society must invest whatever it takes to improve a technology to its maximally feasible rate of improvement" and instead take more of an approach that society should invest in what creates a balanced and beneficial mix of technology" (Chapman et al., 2021, p. 546).

Among those who think computers will pass human intelligence are Bill Joy, the co-founder of Sun Microsystems, and Ray Kurzweil and Hans Moravec, two technologists who have also written about the technological imperative. They all see a future where "humans will either evolve in a way that competes with machines or else disappear by transferring consciousness to machine receptacles" (Chapman et al., 2021, p. 546). While this theory may seem like the Borg in *Star Trek*, Joy believes it could become a reality. He claims that "unless we stop research dead in its tracks, on ethical grounds, we may create dangers for which we will be eternally guilty" (Chapman et al., 2021, p. 546). It is also worth noting that Ted Kaczynski, the Unabomber, also held these beliefs and that Joy and Kurzweil quoted Kaczynski in their musings. There may be a more balanced approach to what society seeks than the technological imperative alone.

The Slow Food Movement in Italy

In 1986, Carlo Petrini, a Roman food critic, started the Slow Food Movement in Italy. With over 65,000 official members, the Slow Food Movement is a worldwide concept that seeks to preserve life's most basic pleasures amidst a world of hurried technology. The official logo of the Slow Food Movement is a snail, and it can be seen in the windows and door fronts of participating restaurants. The idea is that food should be enjoyed and not rushed; it is the antithesis of the American fast-food movement. Petrini hoped to preserve the recipes, cooking techniques, and the nearly extinct natural foods that all cultures have. The movement has been linked to other industries, such as gastronomy, ecology, history, and economics. The Slow Food Movement promotes "organic farming, responsible animal husbandry, community-based skills

for the preservation of regional cuisines, and celebrations of convivial ceremonies such as food festivals and ecotourism" (Chapman et al., 2021, p. 547). It has also led to another phenomenon, the Slow City Movement.

The Slow City Movement has charter states, among many other things, that slow cities "promote the use of technologies to improve the quality of the environment and the urban fabric" (Chapman et al., 2021, p. 548). They also mention communication technology's benefits in distributing and globally sharing information. Both movements look to technology for specific purposes such as “leisure, taste, ecological harmony, the preservation and enhancement of skills and local identities, and ongoing taste education” (Chapman et al., 2021, p. 549). These movements want to see their ways of life preserved by the technological imperative. They want to maintain "the good life."

RELATIONSHIP TO COURSE MATERIAL

People

The Exponential Age by Azeem Azhar was this contributor's introduction to Moore's Law. Moore's Law was juxtaposed against the author's desire to own a computer in 1970s Zambia. Azhar claimed that "the exponential spread of technology defines life in the age of Moore's Law" (Azhar, 2021, pg. 14). He used various examples of the first web-based social media platforms, SixDegrees, Linkedin, Friendster, and MySpace as examples of how fast technology can grow, adapt, and travel. Facebook demolished them all in its growth, with over one million users in just fifteen months. ChatGPT was released on November 30, 2022. In five days, ChatGPT had over 1 million users. By January 2023, ChatGPT “reached over 100 million users, making it the fastest-growing consumer application in history” (Perplexity, 2024).

A colleague pointed out that Facebook is an example of technology created for one purpose that was changed by societal usage. Zuckerberg created Facebook to rate and rank profiles of college students in campus directories. But society has turned it into the talk show of modern civilization, somehow harkening vague memories of *The Jerry Springer Show*. Facebook can promote and disseminate knowledge among users at a rapid rate. But so can X (formerly

known as Twitter) and Instagram, and the countless news sources on the web. We now have technology that brings us condensed versions of this on our wrists.

Technology

One example discussed among colleagues was how smartphones and smart watches technology has advanced. Phones used to be stationery and are now carried in our pockets. More than that, smartphone technology is now available on our wrists as a smartwatch. We can play music, reply to texts, and browse the internet without pulling our phones out of our pockets. This progression shows us the technological imperative in action. A specific path was set for these technologies, and for the most part, society followed along with the intended uses. But through the ability to add other applications to our phones and watches, we can customize them to be precisely what we want or need them to be. People use their watches to monitor their heart rate, blood sugar, or pulse. It is not easy to know if these were the intended uses, but the technology is now advancing with the needs or desires of the users. And this keeps stirring the economy.

Figure 3: Technology has advanced through the years

Economics

As new uses are created for invented technologies, sometimes newer technologies are invented, and occasionally older technologies are adopted. In the case of smartwatches, the uses are predicated on the invention. Essential fitness apps on phones and watches led to innovation in smartwatch designs that incorporated the ability to take a user's pulse or track other biological statistics. Undoubtedly, there will be even more advances in the technology behind smartphones and smartwatches as the way consumers use them changes and progresses.

KEY TAKEAWAYS

People

Chapman tied the Slow Food Movement to The Open Source and free software movement. The open-source and free software movement is "linked to grassroots struggles over intellectual property laws and to the challenge of balancing hard-won skills and ease of use" (Chapman et al., 2021, p. 551). In 2022, OpenAI released ChatGPT. Without any prior knowledge, the world dove head-first into ChatGPT in five days (Marr, 2023, para. 6). We now have new Artificial Intelligence (AI) programs added to the world daily, thanks to OpenAI's open-source release of ChatGPT.

Technology

Intel, Nvidia, AMD, Meta, OpenAI, and Amazon are a few of the companies now making AI chips. Computers will soon have AI processors. This is an example of technological imperative and Moore's Law because Intel is involved. Computer companies are producing their first AI computers. "We're going to take these large language models…and put them into every device, every PC for the future, and it's going to drive a revolution," Intel CEO Pat Gelsinger said at Intel's recent event announcing its new server chips and its next generation Intel Core Ultra "Meteor Lake" chips. "We're bringing AI into every platform and every experience" (Miller, 2023, para. 3).

Economics

AI is driving the economy right now. It is what cryptocurrencies were two years ago. It is a hot new thing, and money can be made. Companies are already monetizing AI capabilities. There are paid premium services for most of the different AI available. There are already jobs to teach others how to write prompts for AI chatbots. Anyone can get an AI certification online in hours. The availability of AI and the fact that the source code is free has boosted the technology economy.

RELATIONSHIP TO INDIVIDUAL WORLD

People

When the COVID-19 world began, the good life ended. Since then, humans have wanted company but have also learned to be adaptable to solitude or isolation. We relied on our communication devices to feel normal when we could not physically be with others. We had video chats with each other. We still prefer the Facetime app over face-to-face time. We binge-watched the same shows. We did whatever we could do to feel connected in our separateness, and technology did that. At the same time, we saw a return to gardening, baking, and animal husbandry as people worried about the future. Life slowed down, and people spent time doing things we had forgotten as a society.

Technology

We saw giant technological jumps with COVID-19, including many medical advances. We could mass-produce tests, masks, and eventually vaccines. The quickness with which vaccines were developed was astonishing, but the entire world population was at risk. The earthly population was working to solve a common problem using technology. These were advancements that were born of necessity and the social imperative but required technological advances to achieve.

Economics

The world shut down to stop the virus. This did damage to every economic system in modern society. We saw businesses close their doors permanently. We saw people struggling to pay bills or buy food. We saw a restructuring of the office job when remote and hybrid work became very real. Some people have never returned to the office, and the economic impact is still being felt globally.

APPLICATION OF INSIGHTS

People

We have endured change and challenges just in the last few years. We saw the rise of a world pandemic and then the introduction of AI in a practical, applicable way. Sir Issac Newton developed calculus during the great plague of London in 1665. It makes sense that ChatGPT and generative AI would come in the wake of a pandemic. But if Moore's Law is still in effect, we will immediately see more significant leaps forward.

Technology

The AI chips, vaccines, other medical discoveries, computers, and energy have all progressed rapidly. We are at the beginning of a technology with open-source AI chatbots and other AI programs. The emerging techs of the future include transparent TVs and computer screens. We will imagine better self-driving vehicles with cleaner energy sources. And we will delight in lab-grown meat and robots that can cook our fast food, not our slow food.

Economics

The economy of the technology industries should remain strong. 2023 saw a frenzy of startup AI companies that received funding, and many of those startups will bring significant changes to the world. Tech companies' workforces are changing faster than the weather on a winter Mississippi day. Any given day may see half of Google's employees quit to work for a competitor. Every major tech company is working to build its AI presence and advance its

hardware to accommodate the changes. This is the good life for invention and innovation across all fields of technology, brought by both technological and social imperatives.

CONCLUSION

We endure. As humans that is what we do. Sometimes we come face to face with a catastrophic fate and sometimes we are creatures of our own demise. We create. Sometimes our creations are transformed in a way we never imagined. It may be the technological imperative that leads us to the "good life." Of course, the social imperative could lead us there as well. We have already seen both at work this century. Thankfully, this is not a competition. It is a dance.

Overarching Concluding Thoughts

Society and technology have only sometimes had a symbiotic relationship. We can strive for unbiased innovation, but our thought processes and beliefs shape our output. Whether intentional or not, biases exist in everything we create. We desire for our inventions to showcase our prowess, our intentionality, our motivation, and even our ethics. But it is that very desire that taints every possibility.

We want to give human traits to our inventions. We name them. We talk to them. We begin to think of them as humans. And we expect them to respond. This has been the pattern for decades and centuries. We have adopted an anthropomorphic attitude towards our creations. But what if that were to change due to a new invention or imperative?

With the current advancements in AI and other technologies, a decline from anthropomorphism is rapidly becoming a reality. Neuralink, an Elon Musk startup, has given society the first human to have a brain chip transplant. It is reported that the patient is moving a computer mouse with thoughts (Mullin, 2024, para. 1) – telepathy through better computing. We have now moved into a stage of life imitating AI.

We have been moving towards this from the very beginning of civilization. Before imagining building technology that interacts with us, we took basic artifacts and assigned human-like traits and behaviors. Biases that have grown for generations are being transferred to the computer programs we write, the algorithms we choose, and even how we snap a photograph.

In taking a picture, we see a long history of biases tainting how people are reproduced in photographs. This bias was based on economic factors more than a desire for anthropomorphism. While these biases have not crippled a medium, it has given us reason to create newer and better ways to take pictures. We have progressed from film to digital imaging. And with that switch, we lost a chemically sealed bias into an inanimate object.

A gender bias very well could have been the reason for an entire country falling behind the rest of the world in technology. England was once a hotspot of technological innovation, especially in computing. However, a societal bias against women left England with a declining workforce. England could not keep its status as number one because an equitable and just

workplace is needed to foster innovation. This is an age when countries must be ahead of technology, not trying to keep up. With invention comes great opportunities for cybercrimes.

It seems like criminal profiles change with each new technology. The cybercrimes of tomorrow will be very different from the chain letters of the 20th century. Criminals can now rob an unsuspecting person without ever meeting the victim in person. Cyberattacks are more creative now with the help of AI. How does society protect the financial sector from cyber-attacks? Is the modern economy's infrastructure able to withstand financial collapse due to technological access? Hopefully, our biases will not be our complete downfall as a society.

Technology and society can exist and even co-exist in a way that is safe and unbiased. As was pointed out earlier, there is no bias in a digital image. The right step in creating a diverse and inclusive path forward is the ability to adjust that image and make the colors look as they should be. If this can happen, then other areas of technology can also foster a brighter age of invention.

The main themes of this study are technology, people, and innovation. Throughout all presented concepts, there have been common themes that document our progression as a society. Which drives which? Is it technology that drives people to invent even more? Is it the people, with their biases, desires, and hopes, that will foster another age of invention? Or is innovation simply a juggernaut, with society along for the ride? Hindsight will be the ultimate testament to our victories and failures in this golden age of AI and innovation.

Annotated Sources

GENERAL SOURCES

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In "The Exponential Age," Azeem Azhar discusses the rapid acceleration of technology and its disproportionate impact on society's ability to adapt. Azhar provides insights into the challenges and disparities created by this pace of change, making the book a valuable resource for understanding the societal implications of living through unprecedented technological advancement.

Daub, A. (2020). *What tech calls thinking*. Farrar, Straus, and Giroux.

Adrian Daub's "What Tech Calls Thinking" critically examines Silicon Valley's philosophical and cultural narratives, arguing that the tech industry's proclaimed innovations often repurposes old ideas. The book serves as a critical lens on the impact of tech industry ideologies on societal norms and expectations, making it essential reading for those interested in the cultural critique of technology.

Johnson, D., & Wetmore Jameson. (Eds.). (2021). *Technology and society, second edition: Building our sociotechnical future* (Inside Technology). The MIT Press.

"Technology and Society, Second Edition," edited by D. Johnson and Wetmore Jameson, delves into the complex interplay between technological advances and societal dynamics. This collection of essays from leading scholars explores critical issues such as privacy, work, and sustainability, making it a vital resource for those interested in understanding and shaping the future interaction between technology and society.

Mullin, E. (2024, February 21). Neuralink's first brain implant is working. Elon Musk's transparency isn't. Wired. https://www.wired.com/story/neuralink-brain-implant-elon-musk-transparency-first-patient-test-trial/

This article featured on Wired.com looks at claims that Neuralink has successfully added a computer chip to a human brain. The computer chips are called a Brain-Computer

Interface or BCI. The test subject has been kept anonymous for privacy reasons. The article criticizes Musk for using X (formerly known as Twitter) to release information about the process, even though Neuralink has issued a white paper and online demonstrations through various testing phases. While not much information has been given by Musk, other scientists and companies are working on similar technology, so there is no denying the possibility.

CHAPTER 10 ANALYSIS SOURCES

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A dystopian view on Technology's revelation during the coronavirus reveals the fault lines of contemporary society in the era of contagion.

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A comprehensive definition of the encompassing scope of the built environment artifacts and a methodological process of assessment and performances.

Reeve, A. (1993). THE ONTOLOGY OF THE BUILT ENVIRONMENT: THE PRODUCTION OF PLACES AND BUILDINGS IN A CULTURE OF HISTORICAL AMNESIA. In Making Better Places (pp. 30-34). Elsevier. https://doi.org/10.1016/B978-0-7506-0536-6.50011-7

An article on a concise ontological definition on our built environment and its place making definitions.

CHAPTER 14 ANALYSIS SOURCES

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This is a blog site of general interest for amateur and professional photographers. It is a combination of the work of two professional photographers – Rob Hull and Tony Corbell. The blog covers a variety of topics that are of interest to the photography community.

Greig, J. (2021, May 26). *One year after Amazon, Microsoft and IBM ended facial recognition sales to police, smaller players fill void*. Retrieved from zdnet.com: https://www.zdnet.com/article/one-year-after-amazon-microsoft-and-ibm-ended-facial-recognition-sales-to-police-smaller-players-fill-void/#google_vignett

ZDNet is a news service website that covers technology advances, research and general news.

Hao, K. (2020, June 12). *The two-year fight to stop Amazon from selling face recognition to the police*. Retrieved from MIT Technology Review: https://www.technologyreview.com/2020/06/12/1003482/amazon-stopped-selling-police-face-recognition-fight/

MIT Technology Review is a periodical published by the Massachusetts Institute of Technology It is available as a print and electronic subscription magazine. This article focuses on the inaccuracy and bias inherent in facial recognition algorithms.

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This 1970 edition of a work originally compiled in 1915 is a general treatise about the movie industry. It covers several topics related to film, including orthochromasia.

Ma, A. (2018, April 18) *China has started ranking citizens with a creepy 'social credit' system – here's what you can do wrong, and the embarrassing, demeaning ways they can punish*

you. Retrieved from Business Insider: https://www.businessinsider.in/china-has-started-ranking-citizens-with-a-creepy-social-credit-system-heres-what-you-can-do-wrong-and-the-embarrassing-demeaning-ways-they-can-punish-you/articleshow/63666457.cms

Business Insider is an American business magazine. This article covered the specifics of China's Social Credit system, which relies heavily on face recognition to enable automatic punishments or rewards for its citizens under the country's social credit system.

Malciewicz, K. (2012). *Film Lighting.* Noida: Simon & Schuster, Touchstone.

Film Lighting is a book that provides an inside look (through several interviews of leading cinematographers) at how cinematographers and film directors establish the visual concept of the film and use the lighting to help tell the story.

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The National Institute of Standards and Technology (NIST) is part of the US Commerce Department. Apart from research and coverage of newer technology topics such as Artificial Intelligence and Quantum Science, NIST also provides standards, measurements and legal metrology for the US.

Overgaard T.v (2021) The Art of Loving the Leica Q2. Copenhagen, Thorsten Van Overgaard

This is an e-book by photographer and photography teacher Thorsten Van Overgaard. He travels the world giving photography lessons. He also provides guides for certain types of equipment, primarily the Leica cameras made by Ernst Leitz Gmbh of Germany.

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Siddharth Pai is a weekly columnist for Mint, The Wall Street Journal's joint venture in India. This column calls out the failure of facial recognition technologies In China at the onset of Covid 19.

Tahusa. (2021, April 15). *Kodak vs Fujifilm*. Blog by photographer Tahusa. Retrieved from tahusa: https://tahusa.co/guides-and-tips/kodak-vs-fujifilm-comparison-between-the-tones-and-characters/

This is an extensive blog by a Hong Kong-based photographer who, like Overgaard, is a photography teacher who holds workshops worldwide. He specializes in film photography.

Wendell, B. and Silversteen L. *The Science of Color* Elsevier 2023

This book "focuses on the principles and observations that are foundations of modern color science. Written for a general scientific audience, the book broadly covers essential topics in the interdisciplinary field of color, drawing from physics, physiology and psychology" per Amazon.

Yang, Z. (2022, November 22). *China just announced a new social credit law. Here's what it means.* Retrieved from MIT Technology Review: https://www.technologyreview.com/2022/11/22/1063605/china-announced-a-new-social-credit-law-what-does-it-mean/

MIT Technology Review is a periodical published by the Massachusetts Institute of Technology. It is available as a print and electronic subscription magazine. This article focuses on the legal changes enabling China's Social Credit System.

CHAPTER 34 ANALYSIS SOURCES

Adamson, A., & Jenson, V. (Directors). (2001). *Shrek* [Film]. DreamWorks Animation.

"Shrek," directed by Andrew Adamson and Vicky Jenson, revolutionized animated films with its blend of humor, sophisticated computer animation, and a satirical take on fairy

tales. Praised for appealing to audiences of all ages, it challenges traditional narratives and societal norms, establishing itself as a significant cultural milestone in animation.

Alan Turing—Computer Designer, Codebreaker, Enigma | Britannica. (n.d.). Retrieved February 4, 2024, from https://www.britannica.com/biography/Alan-Turing

This article comprehensively overviews Alan Turing's life and contributions to computer science and cryptography. It highlights his role in developing theoretical computer science and his crucial work during World War II in breaking the Enigma code.

Barr, A. (2015, July 1). Google Mistakenly Tags Black People as 'Gorillas,' Showing Limits of Algorithms. Wall Street Journal. http://blogs.wsj.com/digits/2015/07/01/google-mistakenly-tags-black-people-as-gorillas-showing-limits-of-algorithms/

Barr's article discusses a significant error in Google's photo-tagging algorithm, which misidentified Black people as 'gorillas.' This incident underscores the limitations and ethical considerations in developing and deploying artificial intelligence technologies. The piece helps explore bias within AI algorithms and the importance of ethical AI development.

Delivering growth through diversity in the workplace | McKinsey. (n.d.). Retrieved February 4, 2024, from https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/delivering-through-diversity

This McKinsey report examines the correlation between diversity in the workplace and company performance. It presents data showing that companies with more diverse workforces perform better financially. This source is valuable for research on the impact of diversity on business outcomes and can support arguments for increased diversity and inclusion in corporate environments.

Facial recognition technology jailed a man for days. His lawsuit joins others from Black plaintiffs. (2023, September 25). AP News. https://apnews.com/article/mistaken-arrests-facial-recognition-technology-lawsuits-b613161c56472459df683f54320d08a7

This article from AP News discusses the case of a man wrongly arrested due to inaccuracies in facial recognition technology. It highlights the growing concerns over the use of such technology, especially its disproportionate impact on Black individuals. The piece is pertinent for discussions on civil liberties, racial bias in technology, and the need for regulatory oversight.

Grant, N., & Hill, K. (2023, May 22). Google's Photo App Still Can't Find Gorillas. And Neither Can Apple's. The New York Times. https://www.nytimes.com/2023/05/22/technology/ai-photo-labels-google-apple.html

Grant and Hill report on the continued struggles of major tech companies to accurately label photos of gorillas without misidentifying Black people. This article sheds light on the ongoing challenges in AI image recognition and the steps companies are taking to address these issues. It helps understand the complexities of AI development and the ethical considerations in technology.

Reinforcing Cybersecurity: Start with a Diverse Workforce—National Cybersecurity Alliance. (n.d.). Retrieved February 4, 2024, from https://staysafeonline.org/career-education/reinforcing-cybersecurity/

This piece from the National Cybersecurity Alliance advocates for the importance of diversity in cybersecurity roles. It argues that a diverse workforce can provide a broader range of perspectives and skills crucial for effective cybersecurity strategies. This source is relevant for discussions on the intersection of cybersecurity, workforce development, and diversity initiatives.

CHAPTER 35 ANALYSIS SOURCES

Chapman, G. (2021). Shaping technology for the "good life": the technological imperative versus the social imperative. In J. M. Wetmore & D. G. Johnson (Eds.), *Technology and Society: Building our sociotechnical future* (2nd ed., pp. 543–554). Book, The MIT Press.

This chapter explores the excellent life of technology. It also asks the question of what motivates advances in technology, a technological imperative or a social imperative. It examines the relationships among technologies, societies, values, strategies, and challenges. There are different authors for each chapter with views that provoke challenging questions.

Marr, B. (2023, October 5). *A short history of chatGPT: how we got to where we are today*. Forbes. https://www.forbes.com/sites/bernardmarr/2023/05/19/a-short-history-of-chatgpt-how-we-got-to-where-we-are-today/?sh=51fd4be6674f

This news article on Forbes's website gave a brief history of chatGPT. It begins with the inception of OpenAI in 2015 and walks the reader through the various stages of chat-GPT, from chatGPT 1 to chatGPT 4. The article also looks at how Microsoft is moving into the AI chatbot space with Copilot, which has been rolling out on Windows platforms recently.

Miller, M. J. (2023, December 22). *Do you need an AI PC*? PCMAG. https://www.pcmag.com/articles/do-you-need-an-ai-pc

Written by Michael Miller, this is a short article on the rise of the AI PC. The giants of computer processing, such as AMD, discuss Neural Processing Units, or NPUs, which will be the core for running AI applications directly on the computer instead of the cloud. Miller looks at the transformations to come in AI chips and NPUs as a basis for the decision to wait on purchasing an AI PC.

Perplexity. (2024). When did ChatGPT become so popular? day, month, year?. Perplexity.ai (AI Chatbot) [Large language model]. https://www.perplexity.ai/search/

Perplexity is powered by several Large Language Models (LLM). It was initially based on the open-source software by OpenAI but has built its LLMs. It also has a search engine that pulls content from the web and provides the sources it uses.