5 DIACHRONIC ANALYSIS

The following chapter examines the historical perspective and retraces the concept of creativity in large and dominant IT companies. It is shown when and which conjunctures concerning a notion of creativity appeared, what images of creativity were used and, most significantly, how notions of both creativity and IT were mutually shaping each other's perception in the flux of time.

In order to approach the complex emergence and development of the IT-specific narrative of creativity, it is initially important to identify the three main cornerstones that have emerged as such throughout the analytical process. These three cornerstones represent three main types of influences on the narrative: the unique characteristics of Silicon Valley (1), the social transformations and scientific currents of IT self-understanding (2), and the phenomenon of artificial creativity (3). The first two basic currents in particular – which I will discuss in subchapters 5.1 and 5.2, wherein individual evolutionary stages of the concept of creativity in IT are identified and analysed – are neither hierarchical nor isolated in relation to each other. Rather, they are interdependent, partially relate to each other or even overlap to a certain extent. In terms of a diachronic analysis, these conditions are highlighted and set in comparison to each other. An examination of computational creativity in the light of the creativity narrative in IT will conclude the diachronic approach with the chapter 5.3.

There is a wealth of material dealing with the history of IT and in particular the Silicon Valley. While researching this chapter, it became apparent that a surprisingly large number of sources include references to a notion of creativity or related terms such as innovation. This applies in particular to more

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recent sources that deal with the origins of today's IT. By their description, these sources thus help to shape the creativity narrative in IT.[1]

Due to the multitude of reports, analyses and story lines, not all available material can and will be covered within this chapter. This is further justified by the existence of certain redundancies, for example in the founding histories of many Silicon Valley companies, which may be of interest for socio-economic or economic historical reasons, but which do not offer any direct added value to the exploration of the creativity narrative beyond the consolidation of what is already extracted from other sources. In spite of this, a claim to depicting and analysing the most significant evolutionary strides and events of this particular narrative is possible, since certain historical strides can be seen as exemplary for the elaboration of the understanding of creativity. Regardless of the respective individual conditions of each case, this appears to be more purposeful with regard to the concept of creativity.

For the development of the creativity narrative in IT, events and persons are of importance that often have an iconic status within the tech scene but are hardly known outside of IT. It is therefore a purpose of this analysis to take these aspects into account along with the necessary framework conditions as well as stories and above all people who both internally and externally represent and decisively shape the specific narrative of creativity.

5.1 PROVENANCE – THE GEOSOCIAL SETTING OF THE SILICON VALLEY AS PLACE AND CULTURE

"Creativity is high here – it's okay to have dreams and think about them and think maybe you could make them. Here more than other places."
Steve Wozniak

"At its core, Silicon Valley is a culture."
John Battelle

1 Accordingly, the sources have been handled with caution, as it is sometimes difficult to distinguish between what took place originally and what is a contemporary attribution, triggered in particular by the boom in the concept of creativity and its significance for the self-understanding of IT, which is to be worked out in this chapter.

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For this purpose, a focus will be on the region known today as Silicon Valley. That place, then, which is both geographically localisable and exists as an idea and social construct.[2] As will be shown, Silicon Valley is not just one of many places for the IT industry, but its origin and still decisive relevance for the self-image of IT. But contrary to what is often claimed, Silicon Valley is by no means just an idea and social construct. Already in 2000, MIT's Timothy Sturgeon dismissed "the notion that *anyplace can be Silicon Valley*" and that "industrialisation and urbanisation on the scale of Silicon Valley can be quickly induced in other areas".[3] He then continues:

> "Silicon Valley is nearly one hundred years old. It grew out of a historically and geographically specific context that cannot be re-created. […] Silicon Valley was the fastest growing region in the United States during the late 1970s and early 1980s, but that growth came out of a place, not a technology. Silicon Valley's development is intimately entwined with the long history of industrialization and innovation in the larger San Francisco Bay Area".[4]

It is this *intimately entwined* history of innovation – and therefore creativity – that will be the object of investigation in this chapter. A historical reflection is not only valuable in order to understand the development towards today's creativity narrative. Rather, experts concerning the history of Silicon Valley have recognized "that the characteristics of early Bay Area electronics companies closely match the structure of industrial organization so widely hailed

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2 The magazine "Medium", for example, makes a distinction between "Silicon Valley **the location** and Silicon Valley **the idea"** Cf**.** Alex Valaitis, "The Truth About Silicon Valley", *Medium*, last modified 25th February, 2018, https://medium.com/@Alex.Valaitis/the-truth-about-silicon-valley-7ba5de6c36a2 [emph. in original].

3 Timothy J. Sturgeon, "How Silicon Valley Came to Be" in*Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*, ed. Martin Kenney (Stanford: Stanford University Press, 2000), p. 47, [emph. in original].

4 Ibid. Sturgeon is not alone in this opinion. In an extensive article in the renowned journal MIT Technology Review, journalist Vivek Wadhwa explores the question of whether and how Silicon Valley has already been copied elsewhere or can be re-created. Large-scale efforts in New Jersey and Dallas, for example, are cited, but they remained unsuccessful. As for the uniqueness of Silicon Valley, the author states: "Sadly, the magic never happened—anywhere. Hundreds of regions all over the world collectively spent tens of billions of dollars trying to build their versions of Silicon Valley. I don't know of a single success". Cf. Vivek Wadhwa, "Silicon Valley can't be copied", *MIT Technology Review*, last modified 3rd July, 2013, https://www.technologyreview.com/2013/07/03/177476/silicon-valley-cant-be-copied/.

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in Silicon Valley today, albeit on a much smaller scale".[5] Whether and how this also applies to IT's narrative of creativity and how it influenced and was influenced by the development of the *Silicon Valley logic* will be explored on the following pages.

The story of Silicon Valley has been told many times and from various angles.[6] These reports are valuable sources for the following analysis,[7] but whose aim however is not to provide a historical description of the Silicon Valley itself based on fixed dates and years. Rather, the role of creativity in the development of Silicon Valley will be explored, which – as will be shown – is a steady companion of this place's journey towards becoming the most defining technology hub and nucleus of a social norm. Historical hard facts therefore play a subordinate role in the following, if they are not of importance for the relationship between creativity and IT.

Silicon Valley is embraced by an auratic formation of myths, legends and facts that are promoted to a not inconsiderable extent by its own members – but also by outsiders such as *East Coast* journalists or academics working anywhere but in California. Together they form a highly loaded reading of Silicon Valley's history and present. The aspects presented within this chapter will outline why Silicon Valley as a place and idea can be considered a major constitutive element for the development of the creativity narrative in IT. For many Silicon Valley locals and storytellers, there are compelling reasons for the geosocial uniqueness of this area. Some of them are literally related to the geographical space itself, others refer to the idea and mindset behind. In addition, however, they are not only a blueprint for future evolutions on the narrative but remain current and valid to this day. More precisely and as briefly cited above, this means that "the characteristics of early Bay Area electronics companies closely match the structure of industrial organisation so

5 Ibid., p. 16.

6 In addition to the above-mentioned Timothy Sturgeon ("How Silicon Valley came to be", 2000), Stanford's Adrian Daub's "What Tech Calls Thinking" (2020) and Steven Levy's "Hackers: Heroes of the Computer Revolution" (2010) can be given as two examples for such stories about the Silicon Valley that will be discussed in more detail later.

7 From a discourse-analytical point of view, these sources are also of interest for the questions of when and, above all, who wrote them. Since these are discursively relevant sources, it is not only the content that matters, but also the originating author, who, depending on the person or institution, may attach greater value to a statement. If this is the case, the respective role or position of the source is also mentioned.

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widely hailed in Silicon Valley today, albeit on a much smaller scale",[8] as the MIT-based historian Timothy Sturgeon puts it in his study on the origins of Silicon Valley. After conducting research, he concluded that "the key characteristics of Bay Area electronics, set in place so long ago, have proved to be readily 'scalable' as the industry has grown in the region".[9] For this reason they are considered in comparatively greater depth.

5.1.1 SEEDING THE CROPS – POLITICAL AND THEORETICAL FOUNDATIONS FOR A PLACE TO COME

The first of these main origins can be traced back to the year 1870. At this time California and the area of today's Silicon Valley were already part of the USA, but still influenced by the Spanish and later Mexican (from 1821) colonial rule (until 1846).[10] Through this influence the state of California agreed to prevent the enforcement of a covenant otherwise common in most states of the USA: the covenant not to compete. When in force, it "protect[s] a legitimate business interest of the employer" in that it "prohibits employers from suing former employees for going on to a competing company" [11] and thus prevents knowledge and intellectual property from migrating to another company. But while this is being enforced in most states of the USA, the covenant not to compete is not applied in

California, or, in the words of a Silicon Valley entrepreneur, it is "nonenforceable, period".[12] For Scott Hassan, former key developer at Google and founder[13] that is "a big deal. A lot less innovation happens on the East Coast

8 Sturgeon, "How Silicon Valley Came to Be", p. 16.

9 Ibid.

10 Officially, Mexican rule lasted until February 1848, but effectively ended two years earlier, in 1846, after a successful rebellion of American settlers proclaiming the California Republic. The USA initially supported the rebellion secretly, but the idea of a Californian republic was abandoned in the course of the Mexican-American War, which by then had erupted, and California became part of the USA.

11 Adam Fisher, *Valley of Genius: The Uncensored History of Silicon Valley (As Told by the Hackers, Founders, and Freaks Who Made It Boom)* (New York: Twelve, 2018), "Silicon Valley, Explained" section, para. 2.

12 Ibid. This entrepreneur is Brad Handler, known as an early employee of eBay. Cf. Richard Crawford '74, "Brad Handler '95 on eBay, Founding a Travel Empire, and Luck," *UVA Lawyer*, [accessed 19th April, 2019], https://www.law.virginia.edu/static/uvalawyer/html/alumni/uvalawyer/spr12/handler.htm.

13 Fisher, *Valley of Genius*, "Cast of characters" section.

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because they believe in these noncompetes".[14] Well before the first tech companies were established in what later became Silicon Valley and long before today's IT enterprises were founded in garages, the soil for IT's contemporary concept of creativity was thus provided. A prerequisite for a highly competitive but also risk-taking environment was met, also promoting a culture of empowerment, which nowadays is so often tried to be imitated.[15] This "policy difference from hundreds of years ago"[16] is – in Steve Jobs' words – one reason why "people started breaking off and forming competitive companies, like those flowers or weeds that scatter seeds in hundreds of directions when you blow on them".[17] It is the "I-need-to-leave-my-big-thing-to-start-something-small story" that "became an imprint that got repeated and repeated and repeated".[18] It is important to note that the above mentioned statements about the non-compete clause date back to more recent times (the oldest is Jobs' quote, which is from the time between 1985 and 1995[19]) – including the link to creativity. Hence, the creativity narrative of IT contains established concepts of modern and therefore market-oriented economic theories that have been taken up by members of the IT world and used for their context.

5.1.2 ENGELBART – A FOUNDING FATHER OF SILICON VALLEY

This can be illustrated by the example of Doug Engelbart (1925-2013), who, according to IT insiders, had the idea of making computers accessible to all people already in 1962 – at least a decade before the advent of personal computers in the 1970s.

An explanation is needed as to why the figure of Doug Engelbart is addressed here in the section on Silicon Valley. After all, Engelbart could also be presented and discussed in the section on IT's self-image. Namely, because he became particularly famous for his contributions to the above-mentioned

14 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

15 Cf. Julia Löhr, "'Die Deutschen sagen immer nur: Oh Gottogott!'" *Frankfurter Allgemeine Zeitung*, 9th July, 2019, https://www.faz.net/aktuell/wirtschaft/diginomics/wirtschaftsminister-peter-altmaier-im-silicon-valley-16275487.html.

16 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

17 Ibid.

18 Ibid. How this imprint works will be shown in the later course of this chapter with a specific focus on the part of venture capital.

19 Cf. Adam Fisher, *Valley of Genius*, [accessed 20th April, 2019], https://www.valleyofgenius.com/secondary-sources.

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development of the personal computer (PC), especially the computer mouse, and his spectacular and iconic way of demonstrating them. However, regarding the development of the creative narrative in IT, his influential role is not limited to the connection between creativity and the development of the PC but exceeds it: retrospectively, his personal motivation and modes of how and why he developed and implemented ideas were considered to be of greater relevance than the technical development steps he initiated. For the notion of creativity in Silicon Valley, however, Engelbart can be seen as both an archetypal and constitutive person, as will be shown below, which is why this section is located here. The author Adam Fisher can be named as a representative for this opinion, whose first chapter in his book on the history of Silicon Valley reads: "The Big Bang. Everything starts with Doug Engelbart".[20]

Engelbart, a former US Navy radar technician and engineer, presented his broad vision of *working machines* supporting the approach to complex problem situations. For this, he published a study that bears a title reflecting the breadth and the aspiration associated with it in a rather philosophical connotation. It is called: "Augmenting Human Intellect: A Conceptual Framework".[21] According to Engelbart, this augmentation shall lead to an increased capability of a "more-rapid comprehension, […] in a situation that previously was too complex, speedier solutions, better solutions, and the possibility of finding solutions to problems that before seemed insoluble".[22] The study goes on to say that this will be done by "developing means to augment the human intellect. These 'means' can include many things – all of which appear to be but extensions of means developed and used in the past to help man apply his native sensory, mental, and motor capabilities" adding that an augmentation "can best be improved by considering the whole as a set of interacting components rather than by considering the components in isolation".[23] Hence, a conceptual framework is needed to pursuit the approach of this multisensory augmentation method. Engelbart goes on to outline a detailed description and visualization of how such a method might look like, or more specific, he envisioned how a physical *working system* is structured and organised step-

20 Cf. Fisher, *Valley of Genius*, "The Big Bang" section, para. 1.

21 Douglas C. Engelbart, „Augmenting Human Intellect: A Conceptual Framework", *Doug Engelbart Institute*, [accessed 22nd April, 2019], http://dougengelbart.org/content/view/138.

22 Ibid., http://www.dougengelbart.org/content/view/138/#1a1.

23 Ibid., http://www.dougengelbart.org/content/view/138/#1a3.

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by-step, starting with the words: "Let us consider an augmented architect at work. He sits at a working station that has a visual display screen".[24] What follows is a blueprint for some of IT's most ground-breaking developments over the next years: a visual display and the computer mouse among other things. However, it is not only a blueprint for technical developments, but also for a style that will soon be representative of Silicon Valley's self-image: creating *ideas that change the world*, the *next big thing* with the *disruptive* and *transformative* power to make a difference how people act, live, work and think (to mention just a few recent buzzwords). Although engineer, Engelbart is not first presenting his technical innovation and what advantages this development could have. Accordingly, his paper is not about "how to build a small, personal computer". Rather, he conceives the subject from the rear and emphasises on the visionary but intangible character of his text. Engelbart is not asking about the applicability of a new technical idea, but for the means to support the human intellect – of which a smaller, more accessible computer can be one possible approach.

Engelbart's text is remarkable for several reasons. It is not only of importance for the development of Silicon Valley itself, but also for the intertwined evolution of creativity in IT, which can already be traced at this early stage and represents a first indication how creativity is conceived in IT not only at this time but also beyond. For Engelbart, the concept of intellect is also about creativity – in the literal sense of the word. Thus, he continues to write about the advantages of his *working machine* (i.e., the later PC): "You can integrate your new ideas more easily, and thus harness your creativity more continuously".[25] Even before the PC was designed and developed as such, the ability to foster ideas (i.e., the *new*) and creativity in people was already attributed to it. Due to Engelbart's high influence on future protagonists of Silicon Valley, it can be said that this aspect is of considerable value for the connection

24 The visualised description goes on to say: "some three feet on a side; this is his working surface, and is controlled by a computer (his "clerk") with which he can communicate by means of a small keyboard and various other devices. […]. Now he enters a reference line with his pointer, and the keyboard. Gradually the screen begins to show the work he is doing". Cf. Douglas C. Engelbart, „Augmenting Human Intellect: A Conceptual Framework", [accessed 20th April, 2019], http://www.dougengelbart.org/content/view/138/#1a13.

25 Ibid., [accessed 20th April, 2019], http://www.dougengelbart.org/content/view/138/#2a2.

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between PC development and the notion of creativity (for Apple in particular, this was of great importance; an issue that will be addressed later on).[26]

However, it is not only the actual content of the study that is of relevance here, but also the behaviour and biography of the person Doug Engelbart himself. In the years prior to publishing *Augmenting Human Intellect*, he studied electrical engineering at Berkeley out of the drive to do something good to the world instead of living a *normal* life:

> "In 1950 I got engaged. Getting married and living happily ever after just kind of shook me. I realized that I didn't have any more goals. I was twenty-five. It was December 10 or 11. I went home that night, and started thinking: *My God, this is ridiculous*. **[…]** *Well, why don't I try maximizing how much good I can do for mankind?* I have no idea where that came from. Pretty big thoughts".[27]

Engelbart himself is not entirely correct about his biography in this quote, since there is indeed a specific source where these *pretty big thoughts* came from: an essay named "As We May Think", published in July 1945 in the Atlantic magazine.[28] Written by engineer Vannevar Bush, who was the *Director of the Office of Scientific Research and Development* in the USA during World War II, the article asks about the future of science when weapons finally remain silent. Right at the dusk of war, Bush's answer concludes that the power of one's mind rather than the pursuit for physical power should be the focus of new inventions. Bush sketches the concept of a *universal knowledge machine* which is

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26 This is well illustrated by the statement made by Bob Taylor, founder of Xerox PARC's iconic laboratory that will be the subject of interest in the course of this chapter. Regarding Engelbart and his text, Taylor stated: "There was this proposal called 'Augmenting the Human Intellect' […], whom I had never heard of. I loved the ideas in this proposal. The thing that I was most attracted to was the fact that he was going to use computers in a way that people had not: to, as he put it, 'augment human intellect'. That's about as distinct a phrase as I can think of to describe it". Bill Paxton, computer scientist and co-founder of Adobe Systems underlines the importance on the future development of the Silicon Valley by adding: "There were a few people like Bob Taylor who picked up on the idea. And it eventually fed out into Xerox PARC and then Apple to take over the world. But, at the time, Doug was a voice crying into the wilderness". Cf. Fisher, *Valley of Genius*, "The Big Bang" section, para. 2.

27 Fisher, *Valley of Genius*, "Cast of Characters" section.

28 The complete text is archived online and can be retrieved under: Vannevar Bush, "As We May Think," *The Atlantic*, [accessed 26th April, 2019], https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/.

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considered a precursor of the modern PC. Just as Engelbart did decades later, Bush provides a detailed description of how he envisions the way *we may think*: "One can now picture a future investigator in his laboratory. His hands are free, and he is not anchored. As he moves about and observes, he photographs and comments".[29] Similarities to Doug Engelbart's description of his *working machine* in action are quite noticeable in both style and content. Moreover, it is worth noting that Bush also explicitly addresses creativity by pointing out that "creative thought and essentially repetitive thought are very different things".[30] According to Bush, there are already "powerful mechanical aids" for the latter, but "every time one combines and records facts in accordance with established logical processes, the creative aspect of thinking is concerned only with the selection of the data".[31] This is where his idea of a new device fits in, "a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory".[32] Hence, a creative human capacity can be seen as an essential stimulus towards the development of such a machine in this 1945 true blueprint for the development of the later PC and template for Engelbart's visionary text. And again, it seems not to be far-fetched to make a link between both texts in general and Bush's *intimate supplement* of one's memory and Engelbart's approach to *augment human intellect* in particular. The aim here already is to recognise and develop potentials in already given texts or artefacts. The new (i.e., the creativity) here is the continuation of something already known, an innovative process that is more than pure recombination. This form of imaginative anticipation, of adapting and rethinking already available knowledge becomes a common phenomenon within Silicon Valley and will be addressed later anew.

But even beyond that, Engelbart shaped the Silicon Valley prototype when he gave *the mother of all demos* in December 1968 at the national computer conference in San Francisco to show what his computer (that had a keyboard, a mouse, and early programs similar to Skype and e-mail) is capable off. Fisher describes the situation as follows: "To modern eyes, Engelbart's computer system looks pretty familiar, but to an audience used to punch cards and print-

29 Ibid.

30 Ibid.

31 Ibid.

32 Vannevar Bush, "As We May Think", [accessed 26th April, 2019], https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/.

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outs it was a revelation. The computer could be more than a number cruncher; it could be a communications and information-retrieval tool".[33] Andries van Dam, professor of computer science at Brown University attended this *mother of all demos* and remembers this experience as follows: "I was blown away to see this professional system with this unbelievable richness and complexity. It was an otherworldly experience, and in fact, I couldn't quite bring myself to believe that it was all for real".[34]

And although being funded by the *Defense Advanced Research Projects Agency* (DARPA) and therefore the US Department of Defense, Engelbart is said to have detached computer technology from its war-driven origin,[35] therefore making it accessible to a different type of people that would predominate Silicon Valley's habitus for the years to come. In Adam Fisher's words, Engelbart "shattered the military-industrial computing paradigm, and gave the hippies and freethinkers and radicals who were already gathering in Silicon Valley a vision of the future that would drive the culture of technology for the next several decades".[36] As early as the 1960s it was already valid what Silicon Valley in general and Steve Jobs with Apple in particular continued to cultivate over time: it is not enough to have a good idea (or to be more precise: to recognise and adapt a good idea),[37] one must also be able to market it.

The terms *hippies*, *freethinkers* and *radicals* are semantically fuzzy and difficult to sum up in one common understanding. Either single or various of these movements are reflected in various individual concepts, which range from Touraine's *post-industrial society* and *economy,*[38] to Levy's *hacker culture*[39] and later includes notions such as *programmed society* or Castells' *network society,*[40] to mention only a few. Though several parallel movements are implied, they are discursively jointly connected with the concept of creativity via the pop cultural narrative of *counterculture* in a broader sense, in which creativity

33 Fisher, *Valley of Genius*, "The Big Bang" section, para. 3.

34 Ibid.

35 Cf. Fisher, *Valley of Genius*, "The Big Bang" section, para. 1.

36 Fisher, *Valley of Genius*, "The Big Bang" section, para. 5.

37 Cf. chapter 5.1.5.

38 Cf. Alain Touraine, *Die postindustrielle Gesellschaft*. (Frankfurt am Main: Suhrkamp, 1969).

39 Cf. Levy, *Hackers* (Sebastopol: O'Reilly, 2010).

40 Cf. Manuel Castells, *Das Informationszeitalter. Band 1: Der Aufstieg der Netzwerkgesellschaft*. (Leverkusen: Leske und Budrich Verlag, 2004).

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is seen as a means of deviance, with attributions such as freedom or authenticity.[41]

Those *hippies*, *freethinkers* and *radicals* have decisively shaped the notion of creativity in IT with their way of thinking and acting when they became the dominant social power in Silicon Valley.[42] In order to outline this, one aspect that seems indispensable for a better understanding of the connection between hippies, technology and creativity must first be addressed: the constitutive role of the military for early Silicon Valley companies.

5.1.3 *"DIE LUFT DER FREIHEIT WEHT"* – THE STANFORD UNIVERSITY AND THE MILITARY

As being stated above, Engelbart is said to have detached electronics and computer technology from its military origin, allowing alternative lifestyles mostly based on the 1960s counterculture to approach this field in a different manner. At this point, it seems worth considering the military heritage of Silicon Valley. On the one hand, the apparent contrast between the military and the hippie clichés mentioned above seems paradoxical and difficult to resolve without further explanation. On the other hand, the entanglements with the US military also influenced the further evolution of the locally coined concept of creativity to a great extent.

In 1885, Jane Stanford and her husband, the tycoon and politician Leland Stanford decided to found a university named after their deceased and

41 The concept of counterculture here refers to the specific counterculture of the 1960s, which is dealt with more closely in chapter 5.2.2. The connection between counterculture and creativity is part of numerous publications. Cf. only: Paul Perry, *On the bus: the complete guide to the legendary trip of Ken Kesey and the Merry Pranksters and the birth of the counterculture* (New York: Thunder's Mouth Press, 1990); Richard Candida Smith, *Utopia and dissent: art, poetry and politics in California* (Berkeley: University of California Press, 1995).

42 One typical example for this is the book "How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival", in which the hippies as part of counterculture are identified as the driving force behind the changes in (Californian) science during the 1970s. Thanks to them and their endless curiosity, the author says, stagnation and conformity have been overcome in favour of creativity and a rather speculative approach to physics – also thanks to the help of Eastern-mythicist literature or drugs like LSD. Cf. David Kaiser, *How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival* (New York: W.W. Norton & Company, 2011).

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only son to do something for "other people's" [children]".[43] After six years of planning, the Leland Stanford Junior University opened its coeducational and nondenominational doors for the first 555 – female and male – students in 1891. This at the time progressive orientation of the university was further promoted by a linkage to the concept of freedom. More precisely, the term freedom referred to here derives from the German 19th century Wilhelm von Humboldt's university model of *freedom of teaching* and *freedom of learning* that both encouraged and promoted research.[44] The first president of Stanford University, David Starr Jordan, introduced the university's motto, written in German and still valid today: *Die Luft der Freiheit weht* (The air of freedom blows).[45] The exact reasons for choosing this motto and its language have not yet been fully researched. What is certain, however, is that Jordan was influenced and deeply impressed by the German humanist Ulrich von Hutten and the freedom aspirations of the Reformation.[46] While still at Indiana University, Jordan in his inaugural address as president of this university stresses the essential character of freedom for both scholarship and mankind, adding that "The ideas of 'Lehrfreiheit' and 'Lernfreiheit,' – freedom of teaching and freedom of learning, – on which the German university is based, will become a central feature of the American college system".[47]

From the very beginning, the University has been committed to not only educating students for themselves, but to contribute to the greater good through each individual's education. Considering the constituent document,

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43 Stanford University, "The Founding of the University", *Stanford University*, last modified 15th February, 2019, https://facts.stanford.edu/about/.

44 The internal Faculty Handbook literally states: "Stanford University was in the vanguard of American universities patterned on the German model, which stressed research and the freedom to learn and teach". Cf. Stanford University, "Stanford. Faculty Handbook", *Stanford University*, last modified 1st September, 2017, https://facultyhandbook.stanford.edu/1-university#1.1.

45 Gerhard Casper, "Die Luft der Freiheit weht - On and Off: On the Origins and History of the Stanford Motto on October 5, 1995", *Stanford University. Office of the President*, [accessed 22nd April, 2019], https://web.stanford.edu/dept/pres-provost/president/speeches/951005dieluft.html.

46 However, Jordan did not study primary sources from von Hutten, but texts from German theological critic David Friedrich Strauss, most notably Strauss' biography of von Hutten.

47 Gerhard Casper, "Die Luft der Freiheit - On and Off", Stanford University Office of the president, [accessed on 1st May, 2019], https://web.stanford.edu/dept/pres-provost/president/speeches/951005dieluft.html.

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known as the Founding Grant, the following section emphasises this attitude right at the beginning of the first section on nature, scope and purpose of the newly founded university: "Its object, to qualify its students for personal success, and direct usefulness in life; And its purposes, to promote the public welfare by exercising an influence in behalf of humanity and civilisation".[48] Hence, since its foundation, the university in the heart of what later became Silicon Valley has been committed to changing the world for the better. Examining the style of the Founding Grant more closely, the texts by Bush (*As We May Think*) and Engelbart (*Augmenting the Human Intellect*) appear to be in the tradition of a self-image, as was already expressed during the founding of Stanford University. All three (Stanford's, Bush's and Engelbart's) approaches do not aim at the personal and individual pursuit of happiness but have the fortune of the whole (at least American) world in mind. To formulate such a claim presupposes to assume that one is able to understand what the fortune of the whole might be and then to do this.

One of the first to encourage students to find out if they are able to put new ideas into practice was professor Frederick Terman, who is widely regarded as a "father of Silicon Valley".[49] Being an undergraduate student at Stanford himself, went off to MIT for a PhD in electrical engineering (were Vannevar Bush, author of *As We May Think*, was his doctoral advisor),[50] before returning as dean to Stanford's School of Engineering in 1925 where he "promptly launched an aggressive, commercially oriented program in radio electronics".[51] Terman, in particular, seems to have pursued the idea that this *promotion of the public welfare by exercising an influence in behalf of humanity and civilization* stated in the Founding Grant can best be achieved through innovative entrepreneurship. He encouraged his students not to leave it at ideas, but to create something new in the form of locally founded start-ups, where

48 Stanford University, "The Founding Grant with Amendments, Legislation, and Court Decrees", *Stanford University*, last modified 1987, https://wasc.stanford.edu/sites/g/files/sbiybj10311/f/foundinggrant.pdf, p. 4.

49 Cf. Matt Bowling, "Stanford Research Park: The Engine of Silicon Valley", *The Palo Alto History Project*, [accessed on 19th March, 2019], https://web.archive.org/web/20100116012546/http://www.paloaltohistory.com/stanfordresearchpark.html.

50 Cf. C. Stewart*Gillmor, Fred Terman at Stanford. Building a Discipline, a University, and Silicon Valley* (Stanford: Stanford University Press, 2004).

51 Stuart W. Leslie, "The Biggest 'Angel' of Them All: The Military and the Making of Silicon Valley", in *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*, ed. Martin Kenney (Stanford: Stanford University Press, 2000), p.51.

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he would personally invest to keep them in the area. In 1939, Bill Hewlett and David Packard put an idea into practice they had from Terman and founded Hewlett-Packard (HP)[52] – the electronics company that for many is the epitome of the first Silicon Valley start-up. Next to HP, whose founding myth and its effect on the concept of creativity will be discussed in more detail later, many other spin-offs of Stanford University were created on the initiative of professor Terman and others. Nevertheless, companies associated with Stanford remained comparatively small in the pre-war period, mostly exploiting technical niches by developing new products or improving existing ones, as Stuart Leslie points out in his study *The biggest „Angel" of Them All: The Military and the Making of Silicon Valley*.[53] This changed generally with the outbreak of the Second World War in 1939 and especially from December 1941 onwards when the USA actively entered the war against Japan and Germany. The military became increasingly interested in the innovative strength of the area resulting in numerous lucrative contracts with the government: "East Coast giants won the lion's share of the defense electronics contracts, but even relatively small orders could make a big difference for the West Coast start-ups" [54] Leslie continues, revealing an early rivalry with enterprises located at the American East Coast and whose successful economic system served as an antagonist for the blueprint of Silicon Valley, as will be discussed later. HP, for example, "jumped from nine employees and $37,000 in sales in 1940 to one hundred employees and $1 million in sales just three years later".[55] But the end of World War II sees a shift in paradigms, that Terman and others were quick to encounter, though:

> "Yet Terman and his colleagues recognized that the war had advanced more than hopes. [The war] had revolutionized electronics. And since most of that new knowledge had been created under government sponsorship, and would therefore be available to anyone, the East Coast industry would no longer be able to control the field through patents as it had done before the war. More than ever, they all realized, in the postwar world the secret of success was going to be research".[56]

52 Leslie, "The Biggest 'Angel' of Them All: The Military and the Making of Silicon Valley", p. 51f.

53 Ibid., p. 52.

54 Ibid., p. 52f.

55 Ibid., p. 77.

56 Ibid., p. 54.

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The high-tech companies had to continue developing new ideas and products in order to stay one step ahead of their competitors from other regions. And with Terman, who spent the war-time as the director of Harvard's Radio Research Laboratory and returned to Stanford with numerous other military contracts and contacts as well as engineers, the path was prepared to intensify the ties with the U.S. military for which the start-ups created new and innovative products. Accordingly, the focus was not on preserving what was already there, but on further research that comes with appreciating innovations. Abandoning the principle of protection by patents and the corresponding *leading by research* doctrine follows the tradition of rejecting the *covenant not to compete* around three-quarters of a century before. Both concepts abandon the protection of intellectual property in favour of a flexible, but also highly competitive innovation power. From 1870 onwards employees could profit by acting promptly and transforming ideas into new companies (and then, as companies themselves, run the risk of being cheated because of their own employees). And from 1945 onwards, it was the incentives from Stanford University (hence: Frederick Terman) that enabled the companies themselves to act swiftly, recognize the signs of time and escape stagnation by not resting on pre-war patents. Companies affiliated with Stanford grew steady. Nevertheless, this still did not imply a rejection of contracts with the military. The opposite is rather the case, as can be shown by the following example of Varian.

Founded in 1948, Varian is a classic early example of a start-up made by faculty members of Stanford University.[57] Varian's first board meeting took place on campus and several university members were part of Varian's board of directors. In consequence, the company's first commercially successful product, a component for guided missiles is based on the design of a Stanford University consultant.[58] With the Korean War on the horizon, Varian and other electronic companies become "big business".[59] The increasing number

57 Much information in this paragraph is described by Stuart W. Leslie, professor at the department of *History of Science and Technology* at Johns Hopkins University, in his study of the connection between the military and early Silicon Valley. Cf. Leslie, "The Biggest 'Angel' of Them All: The Military and the Making of Silicon Valley".

58 Ibid., p. 55.

59 Ibid. So does the whole area. As Leslie points out, "California's share of prime military contracts doubled during the course of the war, from 13.2 percent to 26 percent. From 1951 to 1953 California received some thirteen billion dollars in prime contracts, overtaking longtime defense contract leader New York State". Cf. Ibid.

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of research and development contracts from the government (thanks to Terman's approach described above) and the ahead coming production contracts show the success of both "of California aerospace and electronics companies in anticipating and cultivating the military market".[60] Varian expanded its range of products with "all but a tiny fraction destined for the defense industry" and "strengthened its ongoing ties to the university by signing on as the first tenant of the Stanford Industrial Park".[61] Varian's products in the 1950s and beyond were nearly exclusively made for the military – and so were research and products of many other already established companies and newly founded spinoffs emerging out of Stanford.[62]

Although Leland Stanford's and Vannevar Bush's goal of working towards a better world of understanding and knowledge continued to survive in the background, the aim to go for profits in dependencies with the military prevailed. Creativity, at this first cold-war episode, is a means to an end. It was used to be one step ahead of competitors in the bid for contracts from the military through new or innovative ideas – purposefully focused on producing a final value. Here, too, a seemingly paradoxical mix of rather idealistic world-improving ideas on the one hand and a competitive purpose-oriented business logic on the other hand was created; a combination that continues to this very day, as will be analysed later on.

5.1.4 A DIFFERENT PLACE – INNOVATING BY BEING DIFFERENT

The above discussed very early historical preconditions laid the foundation for a creativity narrative on which to further build. However, they are not yet an expression of the Silicon Valley's own awareness regarding an indistinctive and genuine notion of creativity. Up to this point, creativity operated more in the background, at the interconnections of tacit structures such

60 Ibid.

61 Leslie, "The Biggest 'Angel' of Them All: The Military and the Making of Silicon Valley", p. 55f.

62 Ibid., p. 56. Varian still exists as a company today, and its headquarter is still in Palo Alto, hence, in the Silicon Valley. However, it is not easy today to draw conclusions about the company's military past. In 1999, the company split into three independent divisions: Varian, Inc., Varian Semiconductor and Varian Medical Systems. The latter is still at home in Palo Alto; the website *www.varion.com* leads to the medically oriented part of the conglomerate. On the website itself there is as well nothing about the past with the military. Neither do the other two companies say or publish.

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as the *nonenforceable covenant not to compete*, while companies (predominantly from the semiconductor industry) emerged in the foreground seeking large contracts with the government – all compliant with given rules and manners. This changed with the ideas and ideals of Counterculture in the 1960s, which opened a new way for some members of IT to understand and develop technology – as it will be analysed in chapter 5.2. In the course of these changes, the external expression and with it the self-image of some entrepreneurs in Silicon Valley also changed, which helped the place to become the geographical and idealistic centre of a symbiosis between counter- and hacker culture. This self-conception was nourished by the demarcation to other, long-established institutions, in particular via "a keen awareness of the region as existing largely outside the purview of the large, ponderous, bureaucratic electronics firms and financial institutions of the East Coast".[63] Hence, self-awareness succeeded through opposition to the existing. In the process of becoming, attempts are made to do everything in exactly the opposite way so as to create the greatest possible dissociation from the established – no longer only in an intrinsic respect, but also in an expressive way.

This is represented by the archetypal co-founder of the games company Atari, the iconic enterprise whose founders and employees "invented a culture and paved the way for today's tech moguls":[64] Nolan Bushnell, the "first t-shirt tycoon" who "also wrote what has become the quintessential Silicon Valley script", [65] as Fisher describes it. He characterises this script as follows: "Young kid with radical idea hacks together something cool, builds a wild freewheeling company around it, and becomes rich and famous in the process".[66] When Bushnell co-founded Atari in 1972, he and his company were different in many ways. Atari is producing consumer electronics instead of "heavy-duty hardware"[67] with which he corresponds to the new dogma of Counterculture: to regard technology as something rather small, individual and interesting; a personal tool and toy that is.[68]

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63 Sturgeon, "How Silicon Valley Came to Be", p. 16f.

64 Chris Stokel-Walker, "Atari Teenage Riot: The Inside Story Of Pong And The Video Game Industry's Big Bang, *BuzzFeed*, last modified 29th November, 2012, https://www.buzzfeed.com/chrisstokelwalker/atari-teenage-riot-the-inside-story-of-pong-and-t.

65 Fisher, *Valley of Genius*, "Ready Player One" section, para. 1.

66 Ibid.

67 Ibid., para 2.

68 Cf. see chapter 5.2.2.

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Furthermore, Bushnell has a main influence on the attire of engineers and computer specialists working in IT. Clothing for employees working with mainframe computers before the 1970s were formal and strict. The dominant culture back then, which embodies a rigid and bureaucratic understanding of technology, is represented by the numerous semiconductor companies based in Silicon Valley but most and foremost by an omnipotent but "flawed"[69] IBM. With its market power and influence, IBM was chosen as an ideal opponent by all those technology-affine movements, communities and individuals that could identify with the Counterculture in one way or another. This eventually led to Stewart Brand, editor of the Whole Earth Catalog,[70] saying in a now-famous 1972 *Rolling Stone* article: "In every computer-business story I've ever heard, IBM invariably plays the heavy".[71] But the general public was also aware of the importance of the company. This was, for example, due to the moon landing in 1969, when numerous IBMers (as the company's employees call themselves), recognizable by the embroidered initials "IBM" on the back of their shirts, were part of the staff team in NASA's *Apollo Control Center*[72] as Figure 1 reveals rather strongly:

69 George DeMet, "The Search for Meaning in 2001", *The 2001 Archive*, [accessed 22nd June, 2019], https://2001archive.org/resources/the-search-for-meaning-in-2001/.

70 Cf. Fisher, *Valley of Genius*, "The Time Machine" section, para. 3.

71 Stewart Brand, "Spacewar: Fanatic Life and Symbolic Death Among the Computer Bums", *Spacewar,* [accessed 22nd June, 2019], http://www.wheels.org/spacewar/stone/rolling_stone.html.

72 Cf. Sam Gordy, "IBM & NASA: Working Side-by-Side to Land on the Moon", *IBM*, last modified 19th July, 2019, https://www.ibm.com/blogs/think/2019/07/ibm-nasa-working-side-by-side-to-land-on-the-moon/.

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Fig. 1: NASA & IBM, the official subtitles are: "IBM engineers monitor data from a Saturn Instrument Unit during an Apollo launch, at Cape Kennedy, Florida. Throughout the manned space program, IBM and NASA personnel worked side-by-side.

(Photo: IBM)", https://www.ibm.com/blogs/think/2019/07/ibm-nasa-working-side-by-side-to-land-on-the-moon/.

In the black and white image, which is not exactly dated, but which, based on the historical background knowledge, can be roughly attributed to the year of the moon landing, 1969, numerous (exclusively male) people can be seen behind contemporary electronic devices, partly operating them and partly engaged in conversation with each other. The equipment is arranged in rows causing the people to stand and act in a certain row as well, albeit casually scattered. At least 80 people can be recognised. The whole scene looks lively and busy. Most men are dressed in white long-sleeved shirts, a few have kept their jackets on, and even fewer are wearing short-sleeved shirts (such as the

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man prominently positioned in the centre-right of the picture). Of a great many of the people pictured, the back view is visible – including two people positioned almost exactly in the centre of the photograph. On their white shirts, the initials "IBM" are clearly visible in large black letters on the back of their shirts. A little to the right of the two men and in the same row is another man with "IBM" initials on his back. He appears to be involved in a discussion with at least two other men who stand in a small circle for this purpose. A fourth individual gives the impression as though he is listening and possibly also taking part in the discussion. Three rows in front of this small group, and thus further away and more difficult for the observer to recognise, are at least two, but probably three, other people with the "IBM" logo on their shirts. Whether there are other people with "IBM" logo in the room is not evident due to the picture's quality and the arrangement of the people, but it can by no means be ruled out.

The picture has been published on the official IBM website for the purpose of the 50th anniversary of the moon landing and is intended to remind viewers of the close cooperation between IBM and NASA. This is certainly conveyed in the picture, although it only represents a single moment in time (which again is the very nature of any photograph). Indeed, it is not only the presence of no small number of IBM employees at the epicentre of the lunar landing, but especially their incorporation and self-evident presence that emphasise the private company's close collaboration with the US public space agency.

This led to the emergence of some pop cultural references reminiscent of a certain unease against the dominance of the company which are widely recognised and iconised by this day.[73] In reflecting the role of *hackers* for the

73 This sentence is referring specifically to the urban myth surrounding the fictious friendly and polite, but ultimately murderous artificial intelligence system called *HAL* in Stanley Kubrick's film "2001: A Space Odyssey" from 1968.The name of this AI, and thus the AI itself, appears to be an innuendo of IBM: If one takes the following letter in the alphabet for each letter in HAL, one arrives at IBM. However, both director Kubrick as well as the film's co-writer Arthur C. Clarke contradicted the assumption that this was intentional. Rather, according to them, it was a coincidence. Clarke actually denounced the fact that they were asked almost every week about the possible connection between HAL and IBM, which both would be very annoyed about in his book *The Lost Words of 2001*. In addition, IBM was involved in the making of the movie and the final play should contain product placements of IBM, but when the company learned that a murderous computer is part of the cast, they made sure

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computer revolution, book author Steven Levy noted in 1984: "All you had to do was look at someone in the IBM world and note the button-down white shirt, the neatly pinned black tie, the hair carefully held in place, and the tray of punch cards in hand".[74] By the early 1970s, IBM was part of the US public scientific establishment – and looked like it, too.

The following visual example (Figure 2) illustrates this more precisely:

Fig. 2: IBM's System/360.

https://www.ibm.com/ibm/history/ibm100/us/en/icons/system360/.

their trademark is in no relation to HAL whatsoever. Cf. DeMet, "The Search for Meaning in 2001," [accessed 21st June, 2019], https://2001archive.org/resources/the-search-for-meaning-in-2001/; Aisha Harris, "Is HAL Really IBM?" *Slate*, last modified 7th January, 2013, https://slate.com/culture/2013/01/hal-9000-ibm-theory-stanley-kubrick-letters-shed-new-light-on-old-debate.html; Arthur C. Clarke, *The Lost Worlds of 2001* (1971).

74 Steven Levy, *Hackers* (Sebastopol: O'Reilly, 2010), p. 30.

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The colour photo from the mid-1960s shows a large room with several computers and cabinets. The floor is tiled, and flat lamps are set into the ceiling, immersing the room in a rather cool light. The mainframe computer is a System 360 from IBM, as can be seen from the inscribed sign above the front calculator cabinet. In the foreground, directly in front of the IBM System 360 branding sign, there is a small, narrow desk at which a man in a black suit sits. The face is not recognisable, it is turned away from the observer. The man's hairstyle looks accurately trimmed; he wears glasses. In his hands he holds a sheet of paper, presented to him by a second man standing to his right. The man standing points out something on the paper to the man sitting. This man also wears a suit and a neat short hairstyle. His face is also turned away, only a part of the profile is visible.

The picture is part of a series on IBM's achievements on the occasion of their 100th anniversary in 2011. The accompanying text highlights the importance of the portrayed System 360 computer, which, according to IBM, generated 20 years of (economic and cultural) dominance in the computer industry for the company from the mid-1960s onwards.[75]

The men seem to be talking about what is written on the sheet of paper. Their posture seems strict and controlled, they seem impersonal by turning their faces away. The whole atmosphere looks very tidy, very clean, almost clinical or even sterile, but also firm and stable, yet inflexible and not very agile due to the apparent massiveness of the mainframe computer and the uniformity of the two faceless (supposed) employees. It becomes noticeable: the picture is about the mainframe computer in the room, the human being is subordinated to it here and only plays a serving role.

The already mentioned cliché of uniform men in black suits representing the dominant power seems to be confirmed in these two images. In response, Nolan Bushnell put on a wardrobe showing to the outside which new spirit prevails at Atari and where this influence came from. In his own words he recalls on this account: "As an engineer I wore a coat and tie to work every day; however, we all had our hippie costumes and we would go to San Francisco and pretend we were flower children. The ultimate posers, we were! The hippie culture was fascinating to us".[76]

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75 Cf. w. A., "System 360 From Computers to Computer Systems", [accessed 20th March, 2020], https://www.ibm.com/ibm/history/ibm100/us/en/icons/system360/.

76 Fisher, *Valley of Genius*, "Ready Player One" section, para. 2.

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In contrast to other influential developments, this like no other before shows a very pronounced awareness of a Silicon Valley-specific *otherness* and the desire to embody and show it externally. References to the difference in clothing and its significance for the overall self-perception of IT appear repeatedly in those pop cultural sources known to be in close relation to the communal spirit of IT or are mouthpieces of the tech world. One example is a detailed story about the emergence of Atari and its first well-known arcade game called *Pong* on the website of the media and technology company *BuzzFeed*, stating both: "*Pong* took video games out of windowless computer labs full of buttoned-up coders and brought it to the masses", and: "the men who created and crafted *Pong* embodied the bootstrap start-up culture that typifies the most exciting edges of today's tech landscape. They were knocked back by old men in drab suits who said games weren't going to be big business".[77] For author David Kushner, the Silicon Valley changed from "essentially men in suits" to "smelly hippies in jeans smoking weed"[78] because of Atari and its new established casual culture: "Atari was the counterculture come to Silicon Valley" ,[79] Kushner says, with which he especially deals with the expression and staging of hippieism and does not further question the possible connection between Counterculture and Silicon Valley.[80]

Not only in terms of workwear Atari pioneered a new work environment, which became progressively shaped by the notion of creativity and initially spread to clusters of the emerging *creative class,*[81] but eventually to almost all areas of western working life. According to the chief designer of Atari and

77 Stokel-Walker, "Atari Teenage Riot: The Inside Story of Pong and The Video Game Industry's Big Bang". The reference to *old men in grey suits* and thus to a stereotyped *old system* is reminiscent of Michael Ende's book "Momo" – the publication of which coincides roughly with the time of Atari's foundation, namely 1974 – and the tale's antagonists, the "grey men", with whom Ende is said to have criticised the existing financial system and the *aging money*, a dictum of Rudolf Steiner. Cf. Michael Ende in Werner Onken, „Die ökonomische Botschaft von Michael Endes 'Momo'. Mit einem Brief von Michael Ende an Werner Onken vom 3. September 1986", *Sozialökonomie.info*, [accessed 23rd June, 2019], https://www.sozialoekonomie.info/Weiterf%C3%BChrendes/weiterfuehrendes-3-werner-onken-die-oekonomische-botschaft-von-michael-endes-momo.html.

78 Ibid.

79 Fisher, *Valley of Genius*, "Breakout" section, para. 4.

80 The specific influences and connections of 1960s counterculture on IT will be discussed in particular in chapter 5.2.2 (The Improbable Affinity of Hippies and Hackers with Technology).

81 Cf. Florida, *The Rise of the Creative Class, Revisited*.

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creator of *Pong*, Allan Alcorn, it was due to the founder's young age and their inexperience the founders did not set up any rules in the first time with Atari. For example, employees did not have to arrive on time for work.

What mattered was whether the work was done or not: "Punching a time clock wasn't the point, it was getting the job done. If you could do it without showing up, so be it!".[82] In direct comparison, the next image (Figure 3) represents a sharp contrast to what is shown in the previous image:

Fig. 3: The PARC Computer Science Laboratory (CSL).

https://www.computerhistory.org/revolution/input-output/14/348/1868.

The photograph from around 1970 shows a scene insight the "beanbag" conference room at Xerox PARC, where laboratory director Bob Taylor held informal meetings for employees to present their new ideas, as stated in the official description of the image. Six people are recognizable who, sitting on beanbags, have formed an almost closed circle and seem to be engaged in

82 Fisher, *Valley of Genius*, "Ready Player One" section, para. 9.

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a discussion among themselves. They are located in a relatively large room which, as far as is recognisable from the detail of the picture, is enclosed to the right by many floor-to-ceiling windows. The back wall of the room is mostly white, though it appears that it has been extensively marked and painted by notes at various spots. Many more beanbags and some cushions can be seen in the room, which are spread all over the floor. Apart from a small wall clock at the back left there is no other visible interior. No other furniture is apparent. All persons suggest a relaxed impression, one laughs, one smokes. One person wears a T-shirt, another a turtleneck sweater. Only one person wears a tie. One person is holding a sheet of paper and studying it.

The presented scene is meaningful for the creativity narrative in IT because of several different aspects. The most obvious are the beanbags as office furniture, which today can also be seen as an exhibit at the Computer History Museum in Silicon Valley. As a limitation, it must be mentioned that Figure 2 obviously portrays a mainframe computer workstation and Figure 3 a meeting room especially designed for informal meetings. However, the architecture of the room itself is the next peculiarity, as the walls can be written on. The room itself is included in the creative process of exchanging ideas – a concept that continues to enjoy great popularity in places of knowledge production today. Finally, by comparing the outfits of the employees present in Figure 2 and 3, the differences in work and corporate culture described above are revealed.

Bushnell himself, in addition, also contributed to the emergence of a Silicon Valley prototype. His "personality established an important paradigm for Silicon Valley entrepreneurs: willful, daring, imaginative, hypercompetitive, […] It's difficult to imagine Steve Jobs without Bushnell before him".[83] Thanks to the success of Pong, Atari made a lot of money and Bushnell developed a very expressive lifestyle, which he exhibited to the outside world. Retrospectively at the end of the 1990s, he gained the attribution of "a myth-feeding embodiment of a flashy entrepreneurial lifestyle that inspired a generation to forgo ties, quit day jobs and change the world".[84]

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83 Henry Lowood in Stokel-Walker, "Atari Teenage Riot: The Inside Story of Pong and The Video Game Industry's Big Bang".

84 Dan Pulcrano, "Back to the Garage", *Metro*, 16th-22nd September, 1999, http://www.metroactive.com/papers/metro/09.16.99/cover/bushnell1-9937.html. This lifestyle was portrayed in detail by the media: Bushnell gave an interview to Playboy, Time magazine had a cover story about him, and Fortune magazine took pictures from him sitting in a hot tub next to a "lady friend". Bushnell owned expensive cars and boats as well. But the new luxury was also recognizable within the company: allegedly the company jet

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This lifestyle, as well as the rejection of formal clothing as an expression of the opposition to the established and the resonant, new own *otherness*, collided with their equivalents in a single moment when Bushnell decided to hire an external manager as CEO, who came from the fashion company Ralph Lauren.[85] Ray Kassar, the manager's name, remembers: "When I arrived there on the first day I was dressed in a business suit and tie and I met Nolan Bushnell. He had a T-shirt on with the printed inscription "I LOVE TO FUCK". That was my introduction to Atari".[86]

Due to the discrepancy between alien management and local employees, Atari was quickly confronted with a clash of cultures. Al Alcorn empathises that Ray Kassar indeed was a businessman. But he has never visited the West Coast before, and therefore could not understand electronic products. Alcorn goes on to say:

> "Ray had an executive parking spot for his chauffeur-driven Rolls-Royce. He had a helicopter landing pad. He had an executive dining room so the executives did not have to rub shoulders with the unwashed. It was a term they liked to use: "the great unwashed." He was really tone-deaf to what was going on around him".[87]

This quote shows the persistent rejection of an established and conservative type of entrepreneur from the East Coast. By contrast, there is the notion of creativity personified in the ordinary Atari employees and their founders. This creativity is also literally brought to the fore against the supremacy of managers in one's own company, as the following short anecdote from programmer and later co-founder of several video game companies, Alan Miller, testifies:

> "I was at one of the very first meetings that Ray had with the entire group. There were probably eighty to a hundred technologists in the room and somebody asked him, 'Well, what kind of experience do you have dealing

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was used to fly in fresh shrimps, the size of which showed how well Atari was doing. This was made possible by the extraordinary and rapid growth of the company. To put this into perspective, as early as 1981 Atari was making 3.2 billion dollars gross, more money than all of Hollywood at that time. Cf. Ibid.; Fisher, *Valley of Genius*, "3P1C F41L" section, para. 2.

85 Fisher, *Valley of Genius*, "Towel Designers" section, para. 4.

86 Ibid.

87 Fisher, *Valley of Genius*, "Towel Designers" section, para. 4.

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> with creative people?' Because, you know, we were creating entertainment. And he said, 'Oh, I've had a lot of experience dealing with creative people. I've worked with towel designers my entire career.' And I don't know about the other people, but I was just flabbergasted when he said that, because it showed he was entirely clueless about the industry and what we were doing".[88]

These sentences show a new self-confidence of the programmers who now start to take pride in their own creativity. They see themselves as smarter than the managers who did neither understand nor seem to be prepared to take on such employees. Programmers saw more in the games they developed and granted them the ability to address geopolitical fears (such as a potential thermonuclear war or the fear that the "society was robotizing)[89] and reflect them in gameplay. Like books or music before, some programmers saw games as a means of expressing these subtle fears: "Games were responding to these floating senses of technological threat that were in the air. There is really something dreamlike about them. They were the poetry of the age".[90] It was also an early celebration of IT's self-proclaiming exceptionism, which is displayed here (especially in the example above by Nolan Bushnell). Alcorn, Bushnell and other members of Atari not only saw themselves as different, but they were also convinced they were better at what they did. And this was made possible by their own *creative ability*, which they not only believed they possessed, but could now also express through the new and informal patterns at Atari and which others from outside their world simply could not understand. The misunderstanding between external managers who take over leadership responsibility within the company and the so far developed inward logic of the creativity narrative was not only about the method of running a company and the underlying differences in culture, though. It could also be found in the discrepancies between a parent company and a subsidiary or branch located in Silicon Valley. Alcorn, in particular, emphasised this opposition consistently. Hence, when Atari was taken over by Warner Communications in 1976 and

88 Ibid.

89 Ibid.

90 Ibid. Stanford's Henry Lowood adds on this point: "The main impact of Pong on contemporary culture is that it had an impact on contemporary culture […]. Before this, connecting games and culture wasn't even a question on anyone's mind". Lowood in Stokel-Walker, "Atari Teenage Riot: The Inside Story of Pong and The Video Game Industry's Big Bang".

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Bushnell left the company in 1978, many were waiting for the next groundbreaking game console. But this never happened. For Alcorn, this was again due to different types of management culture: "You know in Silicon Valley if you don't obsolete yourself somebody else will, right? The Warner guys didn't really understand that. They were from an East Coast company and thought that they had an evergreen kind of product".[91]

However, while Atari's parent company did not understand how to revive local innovation, other companies did not realize their subsidiary's potential in Silicon Valley even when it was fully developed and ready for rollout. The best-known and most important example of this is the case of Xerox PARC, which impressively demonstrates the discrepancy between the existing visionary ideas on the one hand and the lack to fully grasp and appreciate them on the other hand.

Xerox was founded in 1906 in Rochester, New York, and by the 1960s it became the dominant company in the photocopying industry. But competitors were catching up: In April 1970, IBM presented its first copier for office use, "marking the end of Xerox's historic monopoly and introducing a period of painful retrenchment at Xerox". [92] Concerned about losing market power, Xerox opened the Xerox Palo Alto Research Center, Xerox PARC for short, in July of the same year with "one of the most exceptional teams of inventing talent ever assembled in one place".[93] As early as 1972, it was possible to learn about the excellence of the researchers and at the same time about the advanced office equipment (here: a bean-bag chair) of Xerox PARC at *Rolling Stone*:

> "[Distinguished researcher] Ian Kay, 32, child prodigy (National Quiz Kid at ten), former musician and artist […]. Alan shifts comfortably in his office bean-bag chair and appraises his colleagues. 'This is really a frightening group, by far the best I know of as far as talent and creativity. The people here all have track records and are used to dealing lightning with both hands.'"[94]

91 Fisher, *Valley of Genius*, "Towel Designers" section, para. 8.

92 Michael Hiltzik, *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age* (New York: HarperCollins Publishers Inc., 1999), p. x.

93 Ibid., p.xx.

94 Stewart Brand, "Spacewar: Fanatic Life and Symbolic Death Among the Computer Bums".

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In the coming years, several of the most important inventions and developments that form the foundation for the later PC revolution and establish Silicon Valley as the world's leading innovation area for technology were to be developed at PARC. Among other major technological milestones, the first laser printer, Ethernet, the first graphical user interface (GUI) and the concept of the laptop were invented and developed in the premises of this research centre. However, Xerox's management was so focused on the copying industry that, except for the laser printer, they were unable to successfully bring these inventions to market:

> "The scientists' unfettered creativity, not to mention their alien habits of mind and behavior, fomented unrelenting conflict with their stolid parent company. […] Xerox management regarded PARC's achievements first with bemusement, then uneasiness, and finally hostility. Because Xerox never fully understood the potential value of PARC's technology, it stood frozen on the threshold of new markets while its rivals—including big, lumbering IBM—shot past into the computer age."[95]

This 1999 quotation addresses several key elements introduced in this subchapter that have been critical in developing the creativity narrative in IT and which is now represented by the author. It first demonstrates the change in work climate and the ascription of creativity as a decisive distinctive factor, which is also apparent at the Atari example, but which in this quote is not explicitly communicated by means of an informal approach to clothing but is generally described as *unfettered*. In retrospect, the author of the quote also takes a very clear stance against the parent company and evidently advocates the narrative of creativity outlined so far – a narrative that is affirmative of IT but condemns the perspective of the corporate world beyond Silicon Valley in terms of *stolid* or *lumbering*. The author of the quote also takes a very clear stance against the parent company in retrospect, and obviously represents the narrative of creativity that has been sketched so far: in hindsight, the author – like most Silicon Valley chroniclers – refuses to treat the lack of recognising the numerous potentials in Silicon Valley (and here in Xerox PARC) in a neutral way. Rather, he shows no sympathy for those who neither recognised nor promoted creativity before it became a compulsory exercise, as can be seen from the choice of words and the tendentious description.

95 Hiltzik, *Dealers of Lightning*, p. xxii.

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It is significant to note that the innovations came out of Xerox PARC, even though the research laboratory was newly founded by Xerox in Silicon Valley instead of them buying up an existing institute with an already established certain and typical work mentality. Hence, the place's inherent attraction and influence (and thus the kind of people it tempted) was considerably greater than that of the parent company far away in the state of New York.

5.1.5 NO NEED TO INVENT SOMETHING NEW, JUST LOOK AROUND

The geographic presence and close interaction between individual actors[96] in Silicon Valley are another formative influence on the creativity narrative developed in the Silicon Valley. Actors here are not only humans, but also include material things (here especially the agglomeration of tech companies, the corresponding technical infrastructure, the presence of latest technical achievements and the infrastructure to quickly set up new businesses) and semiotic concepts (here especially the political-ideological foundations that frame the logic of a local creativity narrative, the ability to identify new ideas and their connectivity to resulting visions, as well as the opposition to the established East-Coast economy and the awareness of a genuine and general *otherness*).

96 The use of the term "actor" prompts a connection with the actor-network theory (ANT) (Latour 2013). Indeed, there is relevant literature dealing with the question of whether Foucault's concept of a dispositif might have anticipated the basic idea of ANT. After all, according to philologist and communication scholar Simon Ganahl (2016), the dispositif is a network that links discursive and material elements, i.e., it also opens up to the objective world and does not remain in the theoretical – similar to the ANT developed years later. Dutch sociologist and expert on ANT Annemarie Mol quotes Michael Callon (1999), who emphasised that the actor-network theory is actually not a theory (Mol 2010, p. 253) – because just like Foucault's original thoughts on discourse analysis ANT "offers no causal explanations and no consistent method. It rather takes the form of a repertoire" (Ibid., p. 261). Ganahl sees the fundamental difference between the two approaches less in specific differences in content than in the typological quality of an analysis: unlike ANT, a dispositif is always also a political intervention. For this reason alone, a reference to ANT will not be pursued further here. However, for reasons of clarity, some of the terminology (e.g. "network") will be adopted and indicated where appropriate. Cf. Simon Ganahl, „Ist Foucaults dispositif ein Akteur-Netzwerk?" *foucaultblog*, 2016; Annemarie Mol, „Actor-Network Theory: sensitive terms and enduring tensions", *Kölner Zeitschrift für Soziologie und Sozialpsychologie* Sonderheft, no. 50 (2010), pp. 253-269; Bruno Latour, "Reassembling the social. An introduction to actor-network-theory", *Journal of Economic Sociology* (2013), p. 73-87.

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By connecting, hence *enacting, enabling and adapting*[97] with each other, people, things and concepts collectively form *networks* known as Silicon Valley using the site as a metonym that can be further legitimised as such, since it also functions as an superordinate entity, when referring to *the* Silicon Valley (or even just the *Valley*), which *acts* or *thinks* on behalf of (and through) the connected (human and nonhuman) actors.[98] Grammatically speaking, this is a metonymy. It underlines the assumption that a singular predominant reading of creativity exists, since it is not differentiated whether Facebook, or Apple, etc. does or say something when talking about Silicon Valley as a metonym.

In addition, it is important to note that the term *network* is not only meant in a figurative or at least subtle sense, but that it is physically very easily accessible and literally real for insiders – which is why this aspect of IT's creativity narrative is situated in the chapter on its geosocial setting. The former CEO of Yahoo and early employee at Google Marissa Mayer describes this as follows: "I've heard both the founding stories of Google and Yahoo, and for both those companies, the founders didn't even have to get into a car. They could literally go to the law office, the venture capitalists, the bank… on a bike. It's all that close together." [99] Already Doug Engelbart benefited from the presence of all the important elements needed to make his *Mother of all Demos* a success. And Stewart Brand's[100] office when he was publishing the Whole Earth Catalog was "located right across the street"[101] from Doug Engelbart's office, so Brand recalls: "I remember walking over there thinking,*This could be interesting and maybe even important*".[102] For computer engineer and pioneer Lee Felsenstein "the story of Silicon Valley is the story of networks".[103] He continues to say: "There was never any centralized place. They were all what they call local maxima, little mounds of people here and there, and people move between

97 These terms are borrowed from ANT terminology (see note above). Cf. Annemarie Mol, "Actor-Network Theory: sensitive terms and enduring tensions", p. 260.

98 For example, article headlines on the topic of how Silicon Valley *wants* to abolish dying: John Naughton, "Why Silicon Valley wants to thwart the grim reaper", *The Guardian*, last modified 9th April, 2017, https://www.theguardian.com/commentisfree/2017/apr/09/silicon-valley-wants-to-cheat-grim-reaper-google.

99 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

100 Ibid., "The Big Bang" section, para. 2.

101 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

102 Ibid. [emph. in original].

103 Ibid.

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them, that's the important thing. So it's a decentralized set of networks with mobility among them".[104]

Silicon Valley as a whole is not a relatively volatile network – just as it did not suddenly emerge overnight, as the previous subsections of this chapter have already shown. Rather, Felsenstein's mobile *decentralised set of networks* proves to be extremely open to disruption (which again is due to the aspects outlined in previous and upcoming subchapters), so that, although it persists in the external structures, it constantly redeveloped internally[105] and with increasing speed.[106]

The latter has mainly been possible due to a certain type of funding, whose influence on the creativity narrative in IT has steadily increased: the so-called venture capital (VC).[107] The policy framework for this was established in 1953, when the Small Business Administration was established to support small and medium-sized enterprises and granted tax breaks for investments in such enterprises. This led to the emergence of small investment firms that co-financed up-and-coming start-ups. Very early on, Silicon Valley became the focus of investment firms. Fairchild Semiconductor, Intel and Xerox were among the first companies to be (partially) financed in this way.[108] Especially for the risk-hungry engineers, computer scientists and hobbyists in Silicon

104 Ibid.

105 While Silicon Valley has changed fundamentally over time, it has continued to extract the core aspects of today's creativity narrative in IT by introducing additional aspects that have further shaped the narrative. For example, the peak of the video game consoles under Atari's dominance up until the video game crash in 1983 has been referred to as the "first magical wave of Silicon Valley". Cf. Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

106 In this sense, it is again in line with ANT's assumption that networks would quickly emerge and disappear, as the *network of networks* (by means of a structure for Felsenstein's *set of* networks) outlasts the individual decentralized networks in contrast.

107 Venture capital is defined as a financial intermediary. It invests capital of an investor in private companies that are part of a VC's portfolio and then takes on an active role by both monitoring and helping portfolio start-ups with the goal to generate a maximum profit from the initial investment. Cf. Andrew Metrick and Ayako Yasuda, Venture Capital and the Finance of Innovation (September 2010). Venture Capital and the Finance of Innovation, 2nd Edition, Andrew Metrick and Ayako Yasuda, eds., John Wiley and Sons, Inc., 2010. Available at SSRN: https://ssrn.com/abstract=929145.

108 Judy Radler Cohen, "A Brief History of Venture Capital", *Financial Poise*, last modified 21st November, 2018, https://www.financialpoise.com/a-brief-history-of-venture-capital/.

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Valley, who were surrounded by potential innovations, this created a possibility to put an idea into practice: "There were bankers who could loan you money, but they wanted guarantees that could get it back. Venture capitalists expect failure. They discovered that they could gamble big with maybe ten firms…"[109] says Alvy Ray Smith, co-founder of Pixar. With massive growth of technical innovations in the areas of computers and electronics, VC investments in the Silicon Valley also grew rapidly in the 1960s and 1970s. That happened to the extent that the VC method soon became the standard for early financing of new tech start-ups.[110] With further legislative changes in favour of VC firms in the late 1970s, investment rose from $100-200 million in the 1970s to over $4 billion in the late 1980s.[111] The next few years saw a further steady increase in investments, and more and more potential founders were trying to raise venture capital funds – and an increasing number of VCs were trying to find and finance good ideas, bringing in more and more money.

This follows the concept of contingency. In this context, the term contingency is understood in the way that Baraldi presents it in relation to the field of logic: Contingency is the simultaneous exclusion of necessity and impossibility.[112] The concept of contingency refers to the actual matter that what currently is (and thus is not impossible) could also be possible (and thus is not necessary) in a different way. Contingency is the possibility that something might be different than what it actually is.[113] Possibilities can be realised in a way different than expected. Contingency therefore implies the possibility of disappointment and the necessity to take risks.[114]

For the creativity narrative in IT, this is a significant transition as the logic of the place with its vicinity and reciprocal connections is supplemented by a further aspect. With the appearance of venture capital in full force as an additional actor since the 1980s, the Silicon Valley network changes and a new mentality is introduced, as the companies also settled locally and looked for

109 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

110 Ibid.

111 Cf. Paul A. Gompers, "Optimal Investment, Monitoring, and the Staging of Venture Capital", *The Journal of Finance*, no. 50 (1995): 1461-1489, doi:10.1111/j.1540-6261.1995.tb05185.x.

112 Cf. Claudio Baraldi, „Doppelte Kontingenz", in *GLU. Glossar zu Niklas Luhmanns Theorie sozialer Systeme* (Frankfurt am Main: Suhrkamp, 2015), p. 37-39.

113 Cf. Ibid., p. 37.

114 See chapter 6.2.2 for a detailed consideration of contingency and VC.

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new investment opportunities on-site, as the following quote of Chris Caen, manager at Atari demonstrates:

> "So imagine there is more money than God, and it has no place to go, but there are a lot of cocktail napkins with things scribbled on them, and those are what are called start-ups. […] The joke used to be at the time, this being '97 through 2000 — the golden era — was basically all you had to do was stand at the corner with a cocktail napkin, and VCs would throw money at you from a passing car. I loved it".[115]

The mentioned *golden era* falls in the period before the so-called dotcom bubble, when funds were invested not primarily in technical product developments, but in Internet start-ups that wanted to offer and sell existing products on their websites. Two aspects are of particular significance for the creativity narrative's development. First, there are immaterial services that are to be created and no longer products with a physical presence such as new software, hardware or the like.[116] In order to receive funding from venture capitalists, the presentation and the presenter's power of persuasion must be sufficient – not necessarily the idea itself. Hence, a rather transformative idea ahead of its time might be impossible to grasp and to explain and would not receive any funding. Second, these marketplaces (because dotcom companies often were the digital illustration of an analogue sales business) are purely virtual in nature, but without a digital yet new product. In essence, the idea is just another (albeit non-physical) distribution channel that transfers services (such as buying animal feed)[117] from analogue to digital.

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115 Fisher,*Valley of Genius*, "The Dot Bomb" section, para. 2.

116 Even though the software is not physical in this sense it must be stored; so the data carrier became the physical representation of the software, i.e. the product, and with the purchase of software one could hold a real product - namely the data carrier - in one's hands.

117 One of the most spectacular collapses of the dot-com bubble was the company "Pets.com", which ran a commercial at the Superbowl for $1.2 million even before its bankruptcy in 2000. In 1999, the revenues of $619,000 were offset by advertising expenditures of $11.8 million. It also remained uncertain whether there was a market for the brand known through the advertising campaign, so that it collapsed in the course of the dot-com crash. Cf. Kirk Cheyfitz, *Thinking Inside the Box: The 12 Timeless Rules for Managing a Successful Business* (New York: Simon and Schuster, 2003).

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This was known to go wrong.[118] What lasted in the medium and long term was an even greater focus on the place itself and even more venture capital, since after the dot-com crash, more risk diversification was pursued. Start-ups were less and less publicly traded but became privately-owned. For the Harvard Business Review, this was a "silent, seismic shift [that] has dramatically altered corporate ownership and business governance globally. From 1996 to 2015, the number of publicly traded companies in the United States alone dropped nearly 50%".[119] As a result, the pace picked up further: either it worked, or it failed. And more often than not it failed. For founders, the definition of success shifts towards the front: it is no longer the success of the idea on the market that is decisive, but already the sum of investments achieved by VC upstream.

5.2 THE SELF IMAGE OF THE IT INDUSTRY

5.2.1. THE QUANTIFIABILITY OF CREATIVITY

Both Engelbart's text *Augmenting the Human Intellect* and his *Mother of All Demos* fits into a time in which a scientific examination of the concept of creativity has become increasingly popular. A research using Google Scholar, currently the largest online search engine for scientific texts,[120] indicates a general quantitative conjuncture for creativity at this time and beyond. The search engine indexes most scientific documents, whereby it is assumed that Google

118 Already in 1996, Federal Reserve's chairman Alan Greenspan gave a speech in which he used the term *irrational exuberance* (originally coined by Robert J. Shiller), meaning an exaggerated and incomprehensible behaviour with regard to the vast amounts of money invested in dot-com companies. With hindsight this speech was understood as an early warning of the bursting of an exaggerated inflation and the term became an iconic stylistic idiom in the aftermath of the dot-com crash of 2000-2004. Cf. Alan Greenspan, "The Challenge of Central Banking in a Democratic Society", *The Federal Reserve Board*, last modified 6th December, 1996, https://www.federalreserve.gov/boarddocs/speeches/1996/19961205.htm.

119 Dave Ulrich and Justin Allen, "Private Equity's New Phase", *Harvard Business Review*, last modified 9th August, 2016, https://hbr.org/2016/08/private-equitys-new-phase.

120 Michael Gusenbauer, „Google Scholar to overshadow them all? Comparing the sizes of 12 academic search engines and bibliographic databases", *Scientometrics* 118, no. 1 (2019): 177-214, doi: https://doi.org/10.1007/s11192-018-2958-5.

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Scholar has indexed about 80 to 90 percent of all documents published in English.[121] Accordingly, the following figures of documents dealing with creativity indicate an increased popularity of creativity in this time. The number of scientific contributions with "creativity" in the title more than quadrupled in the 1950s: while Google Scholar reports 1930 results for the 1940s[122] (after 829 recorded scientific contributions for the 1930s, which already translates into a doubling in the 1940s), the 1950s now see 8810 scientific contributions.[123] Measured in terms of quantity, it was not a short-term trend since the number of scientific contributions regarding creativity not only maintained the record high, but continued to grow. In the next two decades the number will continue to grow and each double – but not quadruple like in the 1950s – in percentage terms, leading to an overall of 19800 contributions in the 1960s[124] and 47800 published documents during the 1970s.[125] Hence, a minimum of 79169 publications with a material reference to creativity has been published in the time between 1930 and 1979 (considering that Google Scholar indexes about 80-90% of all scientific documents, the actual total number ranges from 87966 (with an estimated 90% coverage by Google Scholar) to 98961 (with an estimated 80%). Thus, of the rounded 80000 results, only a little more than one percent falls into the 1930s, just under two and a half percent into the 1940s, but then already a little more than eleven percent into the 1950s, 25 percent into the 1960s, and finally more than 60 percent into the 1970s.

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121 Madian Khabsa and C. Lee Giles, "The Number of Scholarly Documents on the Public Web", *PLOS ONE*, [accessed 9th May, 2014], https://doi.org/10.1371/journal.pone.0093949.

122 Google Scholar, "1940-1950", [accessed 4th April, 2019], https://scholar.google.de/scholar?q=creativity&hl=de&as_sdt=0%2C5&as_ylo=1940&as_yhi=1950.

123 Ibid., "1950-1960", [accessed 4th April, 2019], https://scholar.google.de/scholar?q=creativity&hl=de&as_sdt=0%2C5&as_ylo=1950&as_yhi=1960.

124 Ibid., "1960-1970", [accessed 4th April, 2019], https://scholar.google.de/scholar?q=creativity&hl=de&as_sdt=0%2C5&as_ylo=1960&as_yhi=1970.

125 Ibid., "1970-1980", [accessed 4th April, 2019], https://scholar.google.de/scholar?q=creativity&hl=de&as_sdt=0%2C5&as_ylo=1970&as_yhi=1980.
In no other decade could a higher percentage increase be achieved than in the 1950s. On the contrary, the number of published articles on creativity decreased for the first time since the 2010s – although the decade has not yet fully passed. However, it has to be remarked that these figures – as mentioned – only refer to the percentage change. A certain saturation is not considered, nor is the ratio to the total number of published scientific documents, which continues to increase over the years.

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The increase in the 1950s and beyond has largely been driven by the American psychologist, intelligence researcher and president of the American Psychological Association (APA) Joy Paul Guilford. In 1950, he published a "landmark address"[126] with only one word as title: "Creativity".[127] In it, he addresses the concern that the subject of creativity has so far been appallingly neglected by his peers.[128] Thanks to this (and thanks to the influence of Guilford as a person), creativity research as a scientific field quickly enjoyed great popularity. However, the propositions outlined by Guilford in this text were only accepted with some reservations by his peers. Though Guilford emphasizes the role of cognitive and social processes in creativity research, "the field stayed rather narrow for many years",[129] Harvard-based researcher on social psychology of creativity Teresa M. Amabile concludes. After exploring the state of research on creativity in the late 1970s, she described her impression about this *narrowness* in the 1950s to the mid-1970s as follows:

> "creativity is a quality of the person; most people lack that quality; people who possess the quality – geniuses – are different from everyone else, in talent and personality; we must identify, nurture, appreciate, and protect the creatives among us – but, aside from that, there isn't much we can do".[130]

Consequently, and in order to locate and compare those individuals having that *creative quality*, the longing for quantifiable creativity arose, which in parts is still valid today and became the predominant notion during the first decades of the 20th century's second half. [131] Nevertheless, other currents existed in parallel, which doubted the binary conception of people that are either creative or not but considered creativity as a skill that can be learned, taught, improved, hence trained if a sufficient training program would be

126 Teresa M. Amabile and Julianna Pillemer, "Perspectives on the social psychology of creativity", *The Journal of Creative Behavior* 46.1 (2012): 3.

127 Joy P. Guilford, "Creativity", *American Psychologist* 5, no. 9 (1950): 444–454, doi: 10.1037/h0063487.

128 Ibid., p. 445.

129 Amabile and Pillemer, "Perspectives on the social psychology of creativity, p. 3.

130 Ibid. In her capacity as an American psychologist, Amabile does not necessarily use the term "genius" to refer to the European-philosophically influenced idea of genius.

131 As an example, Amabile cites the Torrance Tests of Creative Thinking (TTCT), which E. Paul Torrance created and established in 1966 as a standard instrument for the aim of detecting numerous creative abilities and personality structures in individuals. Cf. Ibid., p. 3f.

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available. Plenty of approaches emerged in this time, of which *brainstorming* is one (and arguably the best known and most durable of all programs). [132] First mentioned by advertiser Alex Osborn as early as ca. 1942,[133] brainstorming is based on clear sets of rules, which have been constantly evolved and led to new approaches – for both individuals and groups. By 1958, the brainstorming process had already been applied at eight out of the ten largest American corporations.[134]

For former Apple employee Alan Cannistraro "many of history's best ideas were generated from a process of brainstorming, experimentation, and iteration. This is one of the most important things I took away from my time at Apple".[135] In a blog article for the magazine *Medium* he describes the use of a technique frequently used at Apple named *Random Entry* with the help of which he claims to have filed twelve patents at least: "The goal is to free associate. While brainstorming these ideas, don't even consider which ideas are the most practical or feasible. That step will come later. Just write down what

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132 Amabile distinguishes a total of five *hints*, all underlining – in her opinion – that creativity is not a special quality of only a few persons. Brainstorming and other currents is only one of these hints. Others include journals and autobiographies of allegedly creative persons showing that these people have very *uncreative* days as well; or research on the incoherency of conformity and creativity. Cf. Ibid.; R. S. Crutchfield, "Conformity and creative thinking", in *The Atherton Press behavioral science series. Contemporary approaches to creative thinking: A symposium held at the University of Colorado,* eds. H. E. Gruber, G. Terrell, & M. Wertheimer (New York: Atherton Press, 1962), 120-140.

133 There are several references to the first mention of brainstorming by Osborn, as he first presented and introduced the concept in his advertising company BBDO. First reference figures therefore vary between the years 1938 and 1953, as some figures are based on the official mention in Osborn's publications. The given year 1942 refers to the publication of Osborn's book "How to Think Up", which, however, is not commercially available. Cf. mindq, "What is Brainstorming and how is it helpful?" *Mindq*, [accessed on 4th April, 2019], https://www.imindq.com/uses/brainstorming; Knut Holt, "Brainstorming – From Classics to Electronics", *Journal of Engineering Design* 7, no. 1 (1996): 77-82, doi: 10.1080/09544829608907928; John R. Rossiter and Gary L. Lilien, "New 'Brainstorming' Principles", *Australian Journal of Management* 19, no. 1 (1994): 61–72, doi:10.1177/031289629401900104.

134 Hanisha Besant, "The Journey of Brainstorming Regent University School of Business & Leadership", *Journal of Transformational Innovation* 2, no. 1 (2016), pp. 1-7; p. 3.

135 Alan Cannistraro, "Generating Ideas at Apple", *Medium*, last modified 25th January, 2016, https://medium.com/self-starter/generating-ideas-at-apple-71e575a1e2e3. More about these terms and in particular about the concept of iteration, see chapter 6.2.2.

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comes to mind".[136] However, when Steve Jobs was leading a brainstorming session, it made sense to think first and then speak:

An article describes how Steve Jobs and Bill Gates use the brainstorming process in their respective ways, showing rather different approaches. Bill Gates at Microsoft used the brainstorming process according to elements of the Yale School of Thought. He used a suggestion box to collect thoughts and suggestions from employees and then withdrew twice a year in his so-called "think week" to create his own ideas from these templates in isolation. He would spend these weeks "alone in deep thought in the confines of an isolated cottage where he would not be disturbed. He was occasionally visited by a caretaker who dropped off prepared meals for him".[137] On the other hand, there was the rather mixed approach by Steve Jobs, as recorded by employees at NeXT in 1987. Jobs' employees were informally sitting in the room using flipchart and notepads while Jobs explained an issue. Then the knowledgeable employees began to present "ideas from their knowledge based on past experiences and understanding of the issue at hand".[138] The session considered to be intense: "Steve Jobs was known to break the traditional rules of Osborn's no criticism approach where he quickly turned down topics that he thought were not relevant to the problem at hand in order to stay focused".[139] Whereas Gates first of all considered all thoughts, Jobs demanded quality from the outset and would accept that interesting ideas might slip by the table. However, following the collection, Gates dealt with the proposals on his own, without being accompanied by an alternative point of view.

5.2.2 THE IMPROBABLE AFFINITY OF HIPPIES AND HACKERS WITH TECHNOLOGY

Technology in general and large-scale information technology in particular appeared frigid and as the epitome of the *military-industrial complex* with its

136 Ibid. Cannistraro describes the technique as follows: "Here's how it works: You start with a well-defined problem statement. Then, choose a random word […]. Then spend the next three minutes coming up with as many ideas as possible that associate that word with the problem statement. Discuss the ideas amongst your team, building on them where they stimulate deeper discussion. Rinse and repeat". Cf. ibid. 260 261 262

137 Cannistraro, "Generating Ideas at Apple", p. 4.

138 Ibid., p.5.

139 Ibid.

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cold war bureaucracy,[140] causing an increasingly reluctant stance inside the counterculture communities. Fred Turner provides the 1964 *Free Speech Movement* (FSM) as example, when students at Berkeley University "feared that America's political leaders were treating them as if they were bits of abstract data". [141] Accordingly, Turner concludes that for the students, "computers loomed as technologies of dehumanization, of centralized bureaucracy and the rationalization of social life, and, ultimately, of the Vietnam War".[142] In a famous speech, Mario Savio, the informal student leader of the FSM, articulated the uneasiness of the students who, in his opinion, started to feel like raw materials in a firm rather than human beings in a university. The last part of his speech emphasises the hostility towards the economic involvement and orientation of the university and the underlying desire for freedom among the students:

> "There's a time when the operation of the machine becomes so odious, makes you so sick at heart, that you can't take part! You can't even passively take part! And you've got to put your bodies upon the gears and upon the wheels […] And you've got to indicate to the people who run it, to the people who own it, that unless you're free, the machine will be prevented from working at all!"[143]

With that, Savio ultimately demands something close to what the Stanford family already envisioned for their newly founded university some decades earlier – as it is imprinted in the university's *Die Luft der Freiheit weht* motto. But as already mentioned, however, it is particularly the former Stanford University spin-offs that became long-established companies in the 1960s, and in which the university holds numerous shares. Yet, despite the FSM is seen as a key protest leading to the 1960s counterculture and their state of clear rejection of large-scale technology, "as [members of this counterculture] played

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140 Cf. Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: The University of Chicago Press, 2006), p. 1 and 4.

141 Ibid., p.1.

142 Ibid., p.2.

143 Mario Savio,*Sproul Hall Steps,* 2nd December, 1964, [accessed 11th April, 2019], http://www.fsm-a.org/stacks/mario/mario_speech.html. In the further course of the speech, students were arrested on a massive scale. About 800 professors from Berkeley University then showed solidarity with the protesters and paid the necessary bail so that the students were released again.

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their stereos and dropped LSD many came to believe that small-scale technologies could help bring about an alternative to that world".[144] Hence, technology became embraced and decisively determined by the counterculture of the 1960s – that subculture, which became one of the predominant social structures from the late 1960s onwards and that significantly promoted the prominence of creativity in the tech scene. For this reason, it is relevant to trace the apparent contradiction between rejection and enthusiasm of technology inside the counterculture.[145] This apparent contradiction was already addressed in the first landmark work of counterculture: The "Whole Earth Catalog", a compendium of product reviews, essays and lifestyle info – all for the purpose of living and surviving beyond an adapted and standardised society. First published in 1968 by Stewart Brand (born 1938),[146] who himself became a protagonist of both counterculture and Silicon Valley, the *catalog* provided the (both spiritual and life-practical) manual for a subculture and quickly became the "bible of the hippie movement".[147] Already in the first edition Brand addressed and overcame the apparent contradiction between the idea of a life close to nature on the one side and technology on the other. Now Brand was apparently very aware of this aversion to technology, so he claims: "Amongst the general flow of hippie romanticism, there was an opposition to technology and, by implication, an opposition to science. And I thought that was dreadful".[148] Consequently, the range of products and ideas discussed in the *catalog* is very wide, ranging from fishing equipment to guides such as "Fundamentals of Yoga" to a state-of-the-art Hewlett-Packard programmable calculator for $4,900.[149] Technology became embedded and fertile for a new

144 Fred Turner, "Where the Counterculture Met the New Economy: The WELL and the Origins of Virtual Community", *Technology and Culture* 46, no. 3 (2005): 488, [accessed 22nd August, 2019], https://muse.jhu.edu/.

145 If *counterculture* is mentioned in the following, the term is always limited to the specific counterculture of the 1960s, unless otherwise stated.

146 For publishing the first edition, Brand chooses the Portola Institute in Menlo Park, an area nearby Palo Alto and Stanford University and amidst today's Silicon Valley.

147 Fisher, *Valley of Genius*, "Cast of Characters" section, para. 1.

148 Ibid., "The Time Machine" section, para. 4.

149 Anna Wiener, "The Complicated Legacy of Stewart Brand's 'Whole Earth Catalog'", The New Yorker, last modified 16th November, 2018, https://www.newyorker.com/news/letter-from-silicon-valley/the-complicated-legacy-of-stewart-brands-whole-earth-catalog. It is interesting to note that the Whole Earth Catalog did not distribute the products itself and did not earn money from them. First of all, Turner admits, it seems strange that a community based on anti-commercial principles sees itself de-

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way of life. Computer engineer Lee Felsenstein, who played a decisive role in the development of the PC and is said to have designed the first portable computer[150] said on this account: "You could say you were a hippie and didn't like technology, but what *Whole Earth* was telling us all and we all believed was that you are going to be using technology if you are a human".[151] And despite the *Catalog's* first edition bearing the simple but concise subheading "Access to Tools", Brand is rather concerned with the theoretical mediation of a certain way of life and with that a "vision for a new social order – one that eschewed institutions in favour of individual empowerment, achieved through the acquisition of skills and tools",[152] as *The New Yorker* retrospectively puts it in 2018. The first chapter of the *Catalog* is accordingly called "Understanding Whole Systems" and starts with a review on four books written by

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picted in a catalogue. According to Turner, however, it would be premature to cite the *Catalog* as proof of an early commercialization of counterculture. Rather, the catalog "functioned as a pointer. At the bottom of each listing, after a brief review, usually written by Stewart Brand or a reader, the Catalog listed the item's price and gave information on where and how to acquire it". Cf. Fred Turner, "Where the Counterculture Met the New Economy: The WELL and the Origins of Virtual Community", 485. For Turner, the *Catalog* is rather about expanding an idea, marketing the "core readership's collective worldview to outsiders". Because: "When readers reviewed products in the pages of the Catalog they introduced other readers not only to new goods but also to ways of thinking and speaking-about technology, commerce, information, and community in particular" (cf. Ibid., p. 492). Further, the *Catalog* "marketed not so much goods as a way of looking at how life ought to be lived" (Ibid.). The Whole Earth Catalog thus anticipated an essential feature of the platform economy in an analogous form, in that it did not sell anything itself, but established contacts between buyers or interested parties and sellers.

150 The portable computer in question is the "Osborne 1" from 1981. Though it is not yet equivalent to a modern laptop, its relevance lies in its transformative train of thought to regard a computer not only as a huge stationary mainframe computer but something to carry and use at different places. It is another type of technology with literally more freedom of movement. Hence, it separates itself from the huge mainframes used in enterprises and the military so that it can function as an unbiased and unencumbered concept of a computer. Cf. w.a. "Computers: Carry Along, Punch In, Read Out", *Time Magazine*, 21st June, 1982, ://content.time.com/time/magazine/article/0,9171,925484,00.html.

151 Fisher, *Valley of Genius*, "The Whole Earth ´Lectronic Link" section, para. 2.

152 Anna Wiener, "The Complicated Legacy of Stewart Brand's 'Whole Earth Catalog", *The New Yorker*, last modified 16th November, 2018, https://www.newyorker.com/news/letter-from-silicon-valley/the-complicated-legacy-of-stewart-brands-whole-earth-catalog. These tools include digital technologies. Cf. Ibid.

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Buckminster Fuller (1895-1983) – whose insights are, as it is stated in the very beginning of the reviews – "what initiated this catalog".[153] Fuller, for his part, maintained a Silicon Valley tradition by following in the footsteps of Leland Stanford, Vannevar Bush and Doug Engelbart. What they all have in common is their desire to contribute to the *good in the world* and to make the most of what they themselves can achieve while pursuing this goal. For Fuller, this means to be "determined to make his life 'an experiment to find what a single individual can contribute to changing the world and benefiting all humanity'".[154] It is the renewed return of a philanthropic and generalized ambition to better the world, which has literally at least been in use since Vannevar Bush's essay *As We May Think*. But through Buckminster Fuller as a new role model, Brand succeeds in making this romanticised claim accessible to counterculture and its ideas: "The counterculture movement idolized the Whole Earth Catalog, which symbolized this kind of holistic view of the world".[155] But the *Catalog* is not only a guidance for a person already associated with the counterculture, its *back-to-the-land* movement and a respectively broad interest in various topics instead of a narrow-minded thinking. Rather, it simultaneously provides the needed foundation to become such an open-minded person in the first place. In contemplating on the impact of selected books

153 Stewart Brand, Whole Earth Catalog, p. 3. Before Brand published the catalog, he wrote to Fuller to ask him for help with his project "Why haven't we seen an image of the whole earth yet?" (the question came up when Brand took LSD and he "came to the notion that seeing an image of the Earth from space would change a lot of things" – the request was addressed to NASA and ultimately led to the first image of Earth taken from space, to the cover of the catalog and to its name). Fuller's answer to Brand was rather short. He wrote: "Dear boy, it's a charming notion but you must realize you can never see more than half the earth from any particular point in space." However, Fuller agreed at a meeting to help Brand with his campaign to show that there are only limited resources and no backup for Earth. Cf. Jennifer Leonard, "Stewart Brand on the long view", Jennifer Leonard, [accessed 28th April, 2019], https://web.archive.org/web/20071212213039/http://www.renegademedia.info/books/stewart-brand.html.

154 Cf. Phil Patton, "A 3-Wheel Dream That Died at Takeoff", The New York Times, last modified 15th June, 2018, [accessed 5th May, 2019], https://www.nytimes.com/2008/06/15/automobiles/collectibles/15BUCKY.html?mtrref=en.wikipedia.org&gwh=81F084FFB2375D70DBEF22E236401615&gwt=pay.

155 Fisher, *Valley of Genius*, "The Whole Earth ´Lectronic Link" section, para. 2.

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and magazines on his thinking "about the creative process",[156] science fiction writer and prospective biographer of Buckminster Fuller's life and work Alec Nevala-Lee retrospectively states that the *Catalog*

> "naturally emphasizes the connections between disciplines, […] founded on an awareness of how systems evolve and how individuals fit within the overall picture. Its intended readers, both then and now, are resistant to specialization; interested in technology as a means of enabling human freedom".[157]

Combining a pragmatic gateway to tools with "a running commentary that articulated an entire theory of civilization",[158] the *Catalog* and its readers "helped to synthesize a vision of technology as a countercultural force that would shape public understandings of computing and other machines long after the social movements of the 1960s had faded from view".[159]

It is the combination of this long-lasting influence and the inherent ideas towards a new way of consciousness, which makes the *Catalog* remarkable regarding creativity in IT.

"We are as gods and might as well get used to it"[160] is the first sentence of the *Catalog's* first edition. Within the classical creativity theories, which primarily refer to the theological doctrines of God's creativeness, the concept of the ability to be creative was retained by these extra-worldly gods, as is commonly known from research.[161] It was not until the genius era that people were granted the privilege of being creative and creating something new themselves (cf. chapter 4.1). Brand, however, has no intention of staying with this detour, but elevates humankind[162] to a godlike being (who now only *has to get used to it*).

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156 Cf. Navalalee, "My ten creative books #3: The Whole Earth Catalog", *Alex Nevala-Lee* (blog), last modified 1st August, 2018, https://nevalalee.wordpress.com/2018/08/01/my-ten-creative-books-3-the-wholeearth-catalog/.

157 Ibid.

158 Ibid.

159 Fred Turner, *From counterculture to cyberculture*, p. 6.

160 Stewart Brand, *Whole Earth Catalog* (Menlo Park: Portola Institute, 1968), p. 2.

161 Cf. Boris Groys, *Über das Neue* (Frankfurt am Main: Fischer, 2002), p. 66.

162 Who exactly is meant by Brand's "we are" cannot be answered here. Therefore, the term *humankind* may be too generalizing, but against better knowledge it is used here as interpretation approach.

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The divine myth of creation is credited with the ability to produce the new *out of nothing*. Even if this *nothing* is not understood as the creation of entirely new things, it is often regarded as the origin of absolute freedom of choice in an existentialistic sense, from which every time a new meaning is given, as Groys points out, stating that it was the most radical (and atheistic) programs of the European avant-garde that gladly granted the artist this prerogative of divine creativity out of nothing.[163]

Brand might not be aware of this affiliation with the European avant-garde, but its heritage fits in with the counterculture's self-image to realise itself in opposition to the existing system, therefore not to build on what already exists but to create something radical new – albeit with known means: The worldly gods still need instructions and suitable tools – hence the subtitle: "access to tools". For gods are not subjected, not even to the influential technology of a military-bureaucratic complex, as outlined above and formulated, for example, in Savio's speech at the University of Berkeley. Rather, gods subdue things. If the individual technical knowledge worker is still there to support and operate huge computer and large-scale technology itself, the new gods enthroned by Brand are given the possibilities of small-scale technology, which can help them to realize their own ideas, ideals and conceptions. Technology is seen as a creative tool to promote one's own personal power. For Brand and like-minded people, first and foremost the hackers of the Silicon Valley, technology shall augment the human mind, not the other way round. After all, this form of technology is flexible, handy and personal. [164] Steve Jobs, who later described the Whole Earth Catalog as "Google in book form"[165] and who often mentioned the strong influence of the *Catalog* on his thinking echoes this thought, saying: "We humans are tool builders. We can fashion tools that amplify these inherent abilities that we have to spectacular magnitudes. And so for me, a computer has always been a bicycle of the mind".[166] The *Catalog* was the missing link between the counterculture and the techculture, between technology, economy and "alternative forms of community that

163 Cf. Ibid., p. 66f.

164 Technically, it may still be a long way from here to the PC – the personal computer, which brings with it a liberating feeling of equality and development – but conceptually it has already been walked on.

165 Nevalalee, "My ten creative books #3: The Whole Earth Catalog", last modified 1st August, 2018, https://nevalalee.wordpress.com/2018/08/01/my-ten-creative-books-3-the-whole-earth-catalog/.

166 Fisher, *Valley of Genius*, "The Big Bang" section, para. 6.

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would outlast the counterculture itself and become a key feature of the digital world".[167]

Also thanks to the preparatory groundwork of the other reasons for the origin of the creativity concept in IT – the special policy regulations, the pursuit for a higher purpose by single inventors and entrepreneurs, the aim to quantify creativity, the rise of Stanford University, the role of the military and the reluctance of large-scale technology by a majority of the rising counterculture – Brand creates a blueprint with his now regularly published *Catalog*: the result is a place and an idea in which creativity becomes both a driving force and a legitimation for demarcation. Silicon Valley, a stronghold of successful companies commissioned by the government, becomes a subversive, playful-creative *otherness*.

5.2.3 THE COMPUTER REVOLUTION – TOOLS FOR CREATIVE PEOPLE

If in chapter 5.1 Silicon Valley was used to describe a place that provided the soil for the evolution of a particular creativity narrative in IT, and in the previous parts of chapter 5.2 the inner conception of this narrative continued to develop, the following section now demonstrates how the personal computer as an expression of human creation is the most striking outcome of previous evolutionary steps. The PC could not only be imagined and designed thanks to IT's creativity narrative. Over and above, it is the physical representation of this narrative in the early years of the computer revolution, which in turn further (re)shapes and continues to develop the unique narrative of creativity. Or, to put it metaphorically: first, the seed was sown, then it grew into a plant and blossomed, and now the result of the harvest is considered in this paragraph. [168]

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167 Fred Turner, „Where the Counterculture Met the New Economy: The WELL and the Origins of Virtual Community", p. 488.

168 In principle, the development of the personal computer and the related history of the (micro-, or personal-) computer revolution is of great importance for the creativity narrative in IT's development. However, since a complete account of both aspects would require a very comprehensive consideration and since the literature has already covered them in rich detail, this section is limited to some of the key information necessary for the relationship between them and the creativity narrative. For a profound account of events and developments on the creation of the personal computer and the computer revolution, see esp.: Michael Swaine and Paul Freiberger, Fire in the Valley. The

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A connection between PC and creativity already existed before the actual and not only theoretical advent of personal computers (made possible by the development of computer chips and microprocessors in the early 1970s, in particular by Intel). Already at the beginning of this diachronic analysis it was pointed out briefly that both Vannevar Bush's and Doug Engelbart's outlines of their respective ideas of a *universal knowledge machine* and a *working machine* include the use of computer power for the augmentation of one's own creativity.[169] This was not a matter of course. Even in 1970, computers were regarded as being the very opposite: "They [the computers] were exasperatingly difficult to use, the tools of a cult of professional engineers and designers who seemed to take a perverse pride in making them as obscure and intimidating as the oracles of ancient Greece",[170] as it reads in a 1999 book on the development of the Xerox PARC. This obscure-mythic reference also appears elsewhere, where the term "mainframe priesthood"[171] is used to paraphrase those people working with large mainframe computers. Scientists at PARC, then, were among the first to seek a renewed connection to Bush's and Engelbart's visions of an augmentative machine, thereby requiring that a computer must: "serve the user rather than the other way around. That it must be easy and intuitive to operate. That it must communicate with the user in human terms and on a human scale, even if at supernatural speeds".[172] The PARC engineers therefore not only granted the future users of PCs a somewhat creative capacity, PCs were also especially designed for people attempting to break out of the blunt understanding of technology as the *mainframe priesthood* propagates: "And that is the general bent of research at Xerox, soft, away from hugeness and centrality, toward the small and the personal, toward putting maximum computer power in the hands of every individual who wants it".[173] Hence, PCs were not just smaller and therefore accessible to single users, they also served a completely different purpose than their huge mainframe relatives.

Birth and Death of the Personal Computer (Dallas/Raleigh: The Pragmatic Bookshelf, 2014).

169 Cf. chapter 5.1.

170 Hiltzik, *Dealers of Lightning*, p. xx.

171 John J. Anderson, "Dave tells Ahl - the history of Creative Computing", *Creative Computing* 10, no. 11 (1984): 66, https://www.atarimagazines.com/creative/v10n11/66_Dave_tells_Ahl__the_hist.php.

172 Ibid.

173 Brand, "Spacewar".

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This is also shown by one, if not the first computer journal dedicated to the emerging personal computer revolution that is accordingly called *Creative Computing*. First published in 1974, the journal believed and argued "the idea that computers should be fun".[174] The environment at *Creative Computing* has been described as "intellectually playful"[175], which, from the magazine's point of view, is "the essence of a truly creative environment"[176] and the reason its founder chose this title. When Steve Jobs needed money to fund a trip to India in early 1974, he searched for a possibility to earn money in newspaper announcements and found an advertisement by Atari, which, according to Jobs, read: "Have fun and make money".[177]

The same is true for a well-known regular meeting of technology enthusiasts, developers, hackers and computer scientists, the so-called Homebrew Computer Club. Some of the most known IT actors that later made it to fame started to unfold their interest in PCs at this club, describes as "a remarkable anarchist assembly of engineers, hackers, and fellow travelers [sic!] that began as a genuine counterculture and ended by changing the world".[178]

At the dawn of the personal computer revolution, a PC is hence seen as a (free) tool for hackers, influenced by ideals and ideas of the counterculture. Internally, there were debates about how and whether it would be morally justified to make money with one's own ideas. This is particularly apparent from an event at the first *Hackers conference*, which was actually a book party, but then became a seminal meeting of the IT scene of the 1980s. Here for the first time a real sense of community was conveyed, and ideas were exchanged on a grand scale. The term "Hackers" was already coined before the Hackers conference, when Steven Levy, renowned journalist for technology, published the book *Hackers: Heroes of the Computer Revolution* in 1984, in which a coherent *hacker ethic* (a neologism of Levy, too) was formulated at first.[179] The confer-

174 Anderson, "Dave tells Ahl - the history of Creative Computing", p. 66. There is a general view that *Creative Computing* was one of the pioneering magazines for personal computers, with the journal itself claiming to be the industry's first. Cf. Ibid.

175 Paul Freiberger and Michael Swaine, *Fire in the Valley. The Birth and Death of the Personal Computer*, (Dalles, Texas: The Pragmatic Programmers, LLC, 2012).

176 Ibid.

177 Fisher, *Valley of Genius*, "Breakout" section, para. 4.

178 Freiberger and Swaine, *Fire in the Valley*, p. xviii.

179 The term "hack" in turn was coined by a group of young people at MIT who tried something new with electronic parts from the garbage dump and thereby developed their own jargon: "munged", for example meant "a piece of equipment was ruined"- and "a

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ence "really was a gathering of the illuminati. The important thing was that all the illuminati had never before gotten in a room at the same time"[180] – therefore it became known as "the Woodstock of the computer elite".[181]

A new self-confidence arose, which, in addition to technical aspects, also led to much discussion of issues such as the question of authorship and recognition.

Steve Wozniak on this issue: "Hackers frequently want to look at code, like operating systems, listings, and the like, to learn how it was done before them. Source should be made available reasonably to that sort of people. […] Information should be free – but your time should not".[182] Stewart Brand slightly changed the meaning of Wozniak's statement by saying that information *wants* to be free, "giving information its own desires" as he puts it.[183] A fine line was drawn between economy and freedom, which deal with the moral difficulties of not exploiting the desire for creativity and continuing to offer codes free of charge – but not what is produced by them. A distinction is made between intellectual property (which may be or even wants to be available for free) and craftsmanship, the finished product for which money can be demanded.

This idea lasted quite a while and was used by Steve Jobs, for example, in a marketing speech as a final argument: "A lot of times people think they're crazy. But in that craziness we see genius. And those are the people we're making tools for".[184] On the other hand, for Steve Wozniak, the focus remained on the idea of free distribution of ideas and tools. revealing the conflicting characters of the two Steves: Because Wozniak's "commitment was to the computer rather than to the company. To Woz, the Apple was a brilliant hack, not an investment. It was his art, not his business".[185]

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project undertaken or a product built not solely to fulfill some constructive goal, but with some wild pleasure taken in mere involvement, was called a 'hack'." However, to hack also meant to respect the hacked object. In contrast to more recent approaches, the hackers of the first hour did not want to cause chaos or destroy anything, but primarily change and redesign. Cf. Levy, *Hackers*, p. 9f.

180 Fisher, *Valley of Genius*, "What Information Wants" section, para. 2.

181 Ibid.

182 Fisher, *Valley of Genius*, "What Information Wants" section, para. 2.

183 Ibid.

184 Steve Jobs at *Macworld 1997-Full Version*, YouTube, posted by JoshuaG, March 6, 2006, [accessed 2nd August, 2019], https://www.youtube.com/watch?v=PEHNrqPkefI. [308]

185 Levy, *Hackers*, p. 264.

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5.2.4 THE UNEQUAL YET CONGENIAL PARTNERSHIP

During the computer revolution and the discussion about free information and tools, more and more unequal couples within the computer community arose, which subsequently had a great influence on the creativity narrative in IT. Whether William Hewlett and David Packard (HP), Sergey Brin and Larry Page (Google) or Steve Jobs and Steve Wozniak (Apple): it was often several people who founded one of today's well-known IT companies. Often it was a very unequal couple. One had the role of the hardworking and basically amicable developer. The other knew how to innovatively evolve and market the developments made. This dynamic is evident in the Apple founders Jobs and Wozniak very early on, long before they founded the computer company, as can be seen from their behaviour in the so-called sale of Blueboxes.

Blueboxing was developed by a group led by John T. Draper. Draper is better known by his nickname "Captain Crunch". He adapted the name from a cornflakes package of the Cap'n Crunch brand, which had a small whistle with it. This whistle generated a frequency of 2600 Hertz – the exact frequency that interrupted a telephone connection, as was discovered by a blind man with perfect pitch called Joybubbles in 1957.[186] It was precisely the sound of 2600 Hertz that made it possible to make free calls by apparently ending a free call and then dialling a new number at the old (free) rate. This special kind of hacking has been called "phreaking" since Joybubbles. Draper (Captain Crunch) recorded the sound on tape, thus the Blueboxes were created, whose sale was obviously illegal.[187]

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186 Born as Josef Carl Engressia, he legally changed his name in 1991 after deciding to be only five years old of age from then on forever. Before that, Joybubbles became widely known for his ability to place free phone calls and was featured in a now iconic 1971 article in Esquire Magazine called "Secrets of the Little Blue Box" – the article claims to have inspired Steve Jobs to sell Blue Boxes as well. Cf. Ron Rosenbaum, "'Secrets of the Little Blue Box': The 1971 article about phone hacking that inspired Steve Jobs", *Slate*, last modified October 7, 2011, http://www.slate.com/articles/technology/the_spectator/2011/10/the_article_that_inspired_steve_jobs_secrets_of_the_little_blue_.html.

187 For the subversive Counterculture this was not always easily compatible with its moral concept. To justify this, it was often argued that the telephone fraud actively supported the anti-war efforts, as a special tax on making telephone calls to finance the Vietnam War was imposed. Thus, illegal phreaking could be understood as civil disobedience in opposition to the war. Cf. w.a. "History of the Telephone Tax and Campaigns", *National War Tax Resistance Coordinating Committee*, [accessed 14th May, 2019], https://nwtrcc.org/programs-events/hang-up-on-war/history-of-the-telephone-tax-and-campaigns/.

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Unimpressed by this, the later founders of Apple Steve Jobs and Steve Wozniak nevertheless sold Blueboxes to earn money. In terms of unequal but congenial partnership, the difference was in the division of roles and the respective perception of these roles and their effects. While Wozniak's perspective is as follows: "So I designed this little box and Steve said, 'Oh, let's sell it'", Jobs said: "We built the best blue box in the world! It was all digital".[188] The division of the partnership is already evident here in a condensed form: One partner (Wozniak) is more interested in the idea and the development process itself, whereas the other partner (Jobs) exploits the idea and markets it commercially – but not without attributing a large part of the development process to him- or herself and praising the idea as excellent. The inequality in the partnership became even more apparent when Jobs started working for Atari, presenting a console developed by Wozniak on this occasion there and claiming to have developed it together with him.[189]

Jobs ignores teamplay and the role of Steve Wozniak, who actually did most of the technical work. Even after Apple was founded and although Wozniak was considered a cofounder inside and beyond the tech scene, Jobs promoted the image of the holistic person who both thinks and creates, once again supporting his argument by creating an analogy to a well-known artist:

> "The people who really create things that change this industry are both the thinker and the doer in one person. The doers are the major thinkers. Did Leonardo have a guy off to the side that was thinking five years out about the future? About what he would paint or the technology he would use to paint it? Of course not. Leonardo was the artist – but he also mixed all his own paints. He also was a fairly good chemist. He knew about pigments, knew about human anatomy. And combining all those skills together – the art and the science, the thinking and the doing – was what resulted in the exceptional result".[190]

5.2.5 "GOOD ARTISTS COPY; GREAT ARTISTS STEAL"

Another aspect of the creativity narrative of IT that evolved from previous developments, is the ability to recognize and market the potential of new ideas.

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188 Fisher, *Valley of Genius*, "Breakout" section, para. 2.

189 Wozniak had made a replica of *Pong* because he had the technical know-how to do so. Cf. Fisher, *Valley of Genius*, "Breakout" section, para. 4.

190 Fisher, *Valley of Genius*, "Silicon Valley, Explained" section, para. 2.

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The cases already presented can be used to distinguish two fundamentally different types of individuals and collectives (hence companies) in the process of creating something new. On the one hand, there are those people and institutions who came up with and nurture rather genuinely new and innovative ideas[191] but either do not bring new technologies to market maturity, do not recognize their full potential, keep it to a theoretical thought, or do not sufficiently market their idea or product. On the other hand, there are those who do not directly come up with new ideas but are able to see *more* in the already existing ones. In an iconic 1996 interview with Wired magazine, Steve Jobs described such a "sort of apocalyptic"[192] encounter with a novel product as follows:

> "When I went to Xerox PARC in 1979, I saw a very rudimentary graphical user interface. It wasn't complete. It wasn't quite right. But within 10 minutes, it was obvious that every computer in the world would work this way someday. And you could argue about the number of years it would take, and you could argue about who would be the winners and the losers, but I don't think you could argue that every computer in the world wouldn't eventually work this way".[193]

Hence, this type of people (of which Jobs can be considered a role model) adopt, combine and further develop ideas, thoughts and already given products with a certain vision until these (physical or theoretical) things evolve into something mature – and successful because of the ability to market it and generate a need. In the logic of Silicon Valley, this type of person deserves the greater attention and the attribute of *being creative*. Of these, there are quite a few and, above all, very successful ones: as outlined before, Doug Engelbart gets his idea of *working machines* from Vannevar Bush's *Memex* and rethinks the visions inside Bush's work *As we may think* as presented in his work *Augmenting Human Intellect*. William R. Hewlett and David Packard build their

191 This means neither the emergence of an idea ex nihilo, nor a mere innovation, but something new with a transformative quality. The concept of transformative creativity goes back to Margaret Boden, whose concept of distinguishing creative efforts is examined in more detail in chapter 6.2.3.

192 Fisher, *Valley of Genius*, "PARC Opens the Kimono" section, para. 4.

193 Gary Wolf, "Steve Jobs: The next insanely great thing", *Wired*, last modified 1st January, 1996, https://www.wired.com/1996/02/jobs-2/.

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resistance-tuned oscillators after "an idea they'd heard about from [Frederick] Terman".[194] Steve Wozniak and Steve Jobs transform the subversive and initially anti-commercial notion of phreaking by selling blue boxes for money to enable free long-distance calls for their customers. And there is the well-known above-mentioned case of the Apple management, who visited the Xerox PARC institute where they first saw a demonstration of how a computer mouse is used on a graphical user interface (GUI) – both are concepts that he later adopted and marketed himself (Xerox PARC researcher's in turn did not came up with a concept of a computer mouse themselves either but adopted the idea from Engelbart's prototype of a mouse at the *Mother of all Demos* – Jobs was too young to have seen this demo back in 1968, so he first came into contact with the concept of a mouse with Xerox).[195] Jobs asked a design studio to design him a mouse, who, after admitting that they "had no idea what a mouse was",[196] in turn looked around to find out "and see what ideas we could steal, which is how engineers work – why reinvent the wheel?",[197] as one designer remembers the situation, while one of the founders of the design company expresses how he thinks something new is created – namely not from scratch. Rather: "you take a good idea and run with it and improve it. It's very rare that a lightning bolt strikes and you come up with something that's never been thought of before. It's a lot more taking from this, taking from that, and trying to make something work, and going for it".[198]

In 1972, the "gaming-industry forefather"[199] Ralph Baer designed and demonstrated the first home console based on a television, and one of the games created for the console named *Magnavox Odyssey* was a simple form of tennis. When Bushnell could keep an eye on the game, he was intrigued. Because Atari still needed to develop two more games in order to fulfil a contract, he figured to adapt the tennis game for a stand-alone gaming machine (known as arcade machines). Not personally, though: "He had a plan: Dabney would handle the creation of the pinball machine […]; Alcorn

194 Leslie, "The biggest 'Angel' of Them All: The Military and the Making of Silicon Valley", p. 51f.

195 Cf. Fisher, *Valley of Genius*, "PARC Opens the Kimono" section, para. 1.

196 Ibid., para. 4.

197 Fisher, *Valley of Genius*, "PARC Opens the Kimono" section, para. 1.

198 Ibid.

199 Cf. Stokel-Walker, "Atari Teenage Riot: The Inside Story of Pong and The Video Game Industry's Big Bang".

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would re-create the tennis game for arcades".[200] And so *Pong* was born – and Atari and Bushnell became famous. This example particularly illustrates the mechanisms of creativity narrative because Baer – the true inventor behind Pong – managed to come to terms with this mental theft and tries to put things in perspective: "'Mr. B. didn't 'invent' anything, […] but he started a whole industry, the arcade video game industry. Give the man credit for that achievement. He just simply didn't invent anything'".[201]

This would not have been possible without the specific geosocial effects described in the previous sub-chapter. It took these developments, such as the rejection of the *covenant not to compete* or the tradition of Stanford as an incubator with their associated economic competition, to not only make such *adaptations* legal and socially acceptable, but to regard them as exemplary and aspiring. Again, it is Steve Jobs who come up with a popular quotation (again from the 1996 interview with Wired) that summarizes and ennobles the aspect presented here at the same time. For him "creativity is just connecting things".[202] The quote goes on as follows: "When you ask creative people how they did something, they feel a little guilty because they didn't really do it, they just saw something. It seemed obvious to them after a while".[203] With attributing this approach to a notion of creativity, he also reshapes the meaning of such creativity. Being creative in this sense means recognizing possibilities. With this, both a self-attribution and generalization takes place, as Jobs is indirectly referring to himself as *creative people* while he does not further define or differentiate these *creative people*. Instead, he implies that all people of this type would act like this, albeit feeling *a little guilty*.

In addition, there is another quotation from Jobs which in this context draws closer to an understanding of the creative narrative in IT outlined in this section, while indirectly focusing on the account of guilt. As already briefly mentioned above, this narrative does not necessarily pay the most attention to the actual authors and designers of an inventive idea. This means that creative empowerment is not primarily synonymous with the process of designing or developing something new and unique. Rather, those individuals are esteemed to be creative who have the foresight and vision to put the theoretical potential of an idea into practice by first recognizing

200 Ibid.

201 Ibid.

202 Gary Wolf, "Steve Jobs: The next insanely great thing".

203 Ibid.

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it, then further developing or adapting it and finally marketing and selling it. Steve Jobs' well-known quote "good artists copy, great artists steal",[204] which he ascribes somewhat inaccurately to Pablo Picasso, seems to further prove this attitude in a self-confident manner. In fact, there have been many discussions about the actual meaning of Jobs' 1996 quote. It was presumably originally intended exactly the other way around, meaning that copying was good while *stealing and spoiling* was unworthy of an artist.[205] However, Jobs was not the first to this quote in this manner, though, as others used the phrase in a similar way, like T.S. Eliot in 1920[206] yet it is widely attributed to Jobs. As a possible explanation, Apple's Phil Schiller, who goes with the title *Senior Vice President of Worldwide Marketing*, recalls a conversation with Jobs in which the latter is supposed to have said that copying means *doing the same thing*, while *steal* stands for the ability to "learn, as artists have, from past masters; you figure out what you like about it and what you want to incorporate into your idea, and you take it further and do something new with it".[207] Accordingly, it is no longer be necessary to keep a vacancy for a concept of guilt, as *to steal* stands for *to learn*.

In Steve Jobs' storytelling and legacy, however, Schiller's *something new* is by no means just a mere further development or an innovating process. In an interview in 2000, former Apple CEO John Sculley recalled a joint visit with Jobs to Polaroid co-founder Edwin H. Land, where both allegedly agreed that products need to be discovered and not invented:

> "Dr Land was saying: 'I could see what the Polaroid camera should be. It was just as real to me as if it was sitting in front of me before I had ever built one.' And Steve said: 'Yeah, that's exactly the way I saw the Macintosh.' He said if I asked someone who had only used a personal calculator what

204 Ibid.

205 Cf. W. H. Davenport Adams, "Imitators and Plagiarists (Part 2 of 2)", *The Gentleman's Magazine* 272, June (1892): pp. 627-628.

206 T. S. Eliot, *The Sacred Wood: Essays on Poetry and Criticism* (London: Methuen & Company Ltd., 1920), p. 114.

207 Dan Farber, "What Steve Jobs really meant when he said 'Good artists copy; great artists steal'", *cnet*, last modified 28th January, 2014, https://www.cnet.com/news/what-steve-jobs-really-meant-when-he-said-good-artists-copy-great-artists-steal. Additionally worth noting about this statement is Jobs' (or Schiller's) reference to an artist that, like Jobs' reference to Picasso (and thus a generally known and renowned artist), aims to situate the behaviour of Jobs and Apple in the context of art and its related artistic practices. This aspect will be discussed in chapter 5.2.6.

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> a Macintosh should be like they couldn't have told me. […] I had to go and create it and then show it to people and say now what do you think?"[208]

Thus, in this reading *something new* (and not just a further development) emerges through an imaginative anticipation of a not yet existing thing or idea. Creative development is hence not based on a process of tabula rasa but requires precise knowledge of current developments in order to recognise and further exploit their potentialities (which includes the economic point of view). Nonetheless, Jobs' statement concerning the Macintosh is obviously falsified, because his template for the Macintosh was not only a *personal calculator*, but numerous ground-breaking inventions at Xerox PARC.[209]

This case is therefore an example that the creativity narrative in IT is not limited in appreciating *stealing* more than *inventing*. It also represents an artificial increase in one's own appreciation through one' s creative ability to be visionary in perceiving and connecting more things and ideas than others. This also happens, as shown, through conscious exaggeration or distortion of facts. Steve Jobs embodied this role like no other – a role that continues to be further cultivated and exploited by third parties. This is happening to an extent that tech insiders started to claim: "It's cliche [sic!] to look to Steve Jobs for inspiration in the tech and investing worlds. This inspiration typically shows up in turtleneck-rich wardrobes, unconfirmed fealty to design, and, way too often, being cruel to subordinates".[210] Yet this role attribution still exists and continues to nourish the creativity narrative of IT.

A certain staged role emerges that is not limited to what is but exaggerates the creativity narrative in order to exploit it for itself. Jobs, and with him Apple, adopts a more and more Machiavellian approach, ignoring some unwritten and previously pointed out basic rules of IT. Apple started to *think*

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208 Leander Kahney, "John Sculley On Steve Jobs, The Full Interview Transcript", *Cult of Mac*, last modified 14th October, 2010, https://www.cultofmac.com/63295/john-sculley-on-steve-jobs-the-full-interview-transcript/63295/.

209 Cf. chapter 5.1.2. Since the quote originates from Sculley and not directly from Jobs, it cannot be checked whether Jobs actually said this to Land (nor whether Land said anything similar to Polaroid) or not. Certain doubts are justified, as Sculley talks benevolently and almost submissively about jobs throughout the interview and considers all the mistakes that led to Apple's near-death experience to be his mistakes, presented in the style of a *mea culpa*.

210 Pete Mortensen, "What Matters Next: Creativity is Just Connecting Things", *Medium*, last modified 31st March, 2016. https://medium.com/matter-driven-narrative/what-matters-next-creativity-is-just-connecting-things-ebd5f24fb0fd.

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different – the staging superimposed authenticity and storytelling took precedence over the Silicon Valley legacy: in 1988, Apple sued Microsoft for copying the *look and feel* of the Macintosh's graphical user interface in their newly created *Windows* operating system. But when Jobs accused Bill Gates of stealing, Gates argues that both enterprises had stolen from Xerox,[211] responding: "Well, Steve, I think there's more than one way of looking at it. I think it's more like we both had this rich neighbor named Xerox and I broke into his house to steal the TV set and found out that you had already stolen it".[212] In 2017, Gates added on reddit (in an *ask-me-anything*-session): "The main 'copying' that went on relative to Steve and me is that we both benefited from the work that Xerox Parc did in creating graphical interface – it wasn't just them but they did the best work."[213]

Even though Apple lost the litigation, it shows a fundamental change in the development of the creativity narrative in IT.

5.2.6 THE AFFINITY OF IT TO ART AND THE ARTISTS

Within the framework of the creativity narrative of IT, the reference to art seems both mystified and romanticised. [214] Steve Jobs used various options to associate the achievements of IT (and Apple in particular) with an art narrative. The notion of art is strongly connected to the history of the Silicon Valley and here in particular to Apple, being propagated by its people through clichés of art.

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211 Hiltzik, *Dealers of Lightning*, p. xxi.

212 Walter Isaacson, *Steve Jobs* (London: Abacus, 2015) p. 212.

213 Thisisbillgates, "I'm Bill Gates, co-chair of the Bill& Melinda Gates Foundation. Ask Me Anything", reddit, last modified 27th February, 2017, https://www.reddit.com/r/IAmA/comments/5whpqs/im_bill_gates_cochair_of_the_bill_melinda_gates/dea731b/. In addition, Xerox sued Apple in the course of the case for the same reason Apple sued Microsoft but lost due to a number of legal reasons applied in California and therefore also in Silicon Valley. Cf. Lawrence M. Fisher, "COMPANY NEWS; Xerox Sues Apple Computer over Macintosh Copyright", *The New York Times*, 15th December, 1989, https://www.nytimes.com/1989/12/15/business/company-news-xerox-sues-apple-computer-over-macintosh-copyright.html?scp=3&sq=apple+xerox&st=nyt.

214 The following deals with the contribution of the concept of art to the creativity narrative in IT. Here, adjoining discourses are inevitably excluded, which are nonetheless of great importance for the understanding of the connection between art or artists and IT or economy. Cf. only: Boltanski and Chiapello, *The New Spirit of Capitalism*.

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Jobs often uses certain clichés of art and artists and selects especially well-known but noncontemporary artists for his analogies. His dialectic refers to art as something worth striving for. From his point of view, it is worth highlighting the fact someone is doing some kind of art:

> "In the seventies and the eighties the best people in computers would have normally been poets and writers and musicians. Almost all of them were musicians. A lot of them were poets on the side. And they went into computers, because it was so compelling, because it was fresh and new. It was a new medium of expression".[215]

In addition, the *fresh and new* enhances IT, or rather the development of the PC, by constituting it as a medium of expression and integrating the computer into the exquisite circle of utensils and instruments that represent the artists' tools.

But while in this example Steve Jobs still locates the programmers' credentials as artists in their artistic skills beyond their profession, other scene protagonists no longer distinguish between art on this side and beyond IT. For example, motivation is most important for the renowned computer scientist Andy Hertzfeld, who worked at both Apple and Google in key development teams. "That seeps into the product at every level".[216] He asks why a product exists as a research project in the first place and finds the answer in the existence of basic human values, which "are essentially the architecture of the project".[217] Hertzfeld distinguishes three different sets of values. The first two are rather common and are either money-oriented or of technical interest. He then continues:

> "But then there is a third set of values that are much less common: and they are the values essentially of the art world or the artist. And artistic values are when you want to create something new under the sun. If you want to contribute to art, your technique isn't what matters. What matters is originality. It's an emotional value".[218]

At this point, at the latest, the creativity narrative in IT literally ties in with a discourse on originality. Yet, Hertzfeld remains uncertain as to what exactly,

215 Fisher, *Valley of Genius* "Silicon Valley, Explained" section, para. 2.
216 Ibid.
217 Ibid.
218 Ibid.

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in his opinion, is in fact the *something new* and *originality*. In his approximation, traditional or almost romantically transfigured ideas of art and artists resonate. Instead of conceptual clarity he rather attributes this *set of artistic values* to himself and his fellow programmer, Apple's cofounder Steve Wozniak:

> "Woz might not say that he is driven by artistic values, but if you look at the work—that's what it is. All that crazy creativity in the Apple II was art. Steve was fundamentally motivated by artistic values. I had artistic values. The artist wants to spiritually elevate the planet".[219]

The final sentence of this quote dissolves the exclusively personal component and merges the – in his opinion – artistic values with principles of the Counterculture.[220] Regardless of the actual connection between Counterculture and artists, the artist has no choice here, she involuntarily becomes part of this culture. Above all, however, Hertzfeld's quoted sentence fulfils an aspiration that is deeply rooted in the logic of Silicon Valley, as has already been shown: the artists (and among them now also the programmers and hackers) elevate not only themselves with their art. The focus is not just on the pursuit for personal fulfilment and success, but on the big picture or, with Stewart Brand, on the *whole world*.

For Atari game programmer and founder of Atari's competing game company *Activision*, Al Miller[221] describes this holistic stance towards a notion of art as follows: "we were doing creative efforts much like book authors. In that era it was single-person work. We did all the music. We did all the art. We did all the programming. We did virtually all of the conceptual design as well".[222]

A link to art also takes place in a rather superficial and obvious manner. An example of this is the explanation of how important creativity is for IT, using coders as an example: the website *TechRepublic* agrees that creativity is important for the career success of a skilled worker in IT and metaphorically

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219 Ibid.

220 This particularly applies to the relationship between counterculture and the political and social context. It was external grievances such as the escalating Vietnam War that gave rise to the movement. Accordingly, the ethical motive for resolving these grievances through cultural opposition is constitutive for the Counterculture movement of the 1960s. Cf. Miller, Timothy S. *The Hippies and American Values* (Knoxville: University of Tennessee Press, 2011), p. 87ff.

221 Cf. Fisher, *Valley of Genius* "Cast of character's" section, para. 1.

222 Fisher, *Valley of Genius* "Towel Designers" section, para. 3.

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describes that "[it is] like they all have the same 'palette,' but each coder has the opportunity to use the 'colors' in a different way. If you have the talent to recognize and implement this, then you are going to be more successful".[223]

These compact examples show the ambivalent connection between art and IT. In both connections, the creative narrative experiences a positive charge through the concept of art. On the one hand, however, it is understood as a *quasi-origin* and intrinsic motivation to act (Miller, Wozniak), but also as an additionally amplified kitsch momentum, through which the creations of IT experience a boost that is consistent with both market-economic and countercultural values, as Jobs exemplarily illustrates in the above quotation. The second connection is based on the first understanding, making it all the more difficult to expose the exaggeration as marketing on account of the creativity narrative's roots in the hippie and hacker scene.

5.3 A BRIEF ACCOUNT ON THE CONNECTION BETWEEN ARTIFICIAL INTELLIGENCE AND CREATIVITY

The notion of artificial creativity is another aspect important for the development of the creativity narrative in IT. *Artificial creativity* here is meant as a discourse that incorporates both thought experiments and attempts of practical implementation. Hence, it is not limited to the alleged *dawn of creative machines*, as presented in chapter 4.4, but instead draws on the role of the concept of creativity within the conceptual development of an AI as well: both the IT narrative and computational creativity affect and influence each other in the course of their respective developments, as will be analysed below, so that a diachronic view of the creativity narrative in IT would remain incomplete without this perspective.

Since its inception in 1956, AI as a scientific field of research (whose development in relation to creativity in IT is presented below) is considered to be an interdisciplinary subject, whereby IT has been and continues to be a decisive factor in questions of technical feasibility from a developmental point of view. For this, it is of paramount importance that large IT companies such

223 Toni Bowers, "The short answer to the question posed in that title is yes", last modified 18th December, 2011, https://www.techrepublic.com/blog/career-management/is-there-a-place-for-creativity-in-it/.

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as Google, Facebook, Amazon or Twitter have entered the race for the development of artificial intelligence in recent years or have at least increased their investments in this area.[224] This also includes the attempt to develop autonomous systems with the ability to be creative. The discourse about artificial creativity complements the creativity narrative of IT with an independent and quasi-inverted logic: the fundamental difference lies in the fact that so far, the creativity narrative in IT claims to enable innovative *things* (by means of products, services and ideas) to emerge through creativity. In contrast, artificial creativity is about using these innovative *things* to create creativity itself. In the course of this, parts of IT have come to realize that an understanding of artificial creativity can only be created through a comparative approach to natural creativity, namely human creativity. Those IT enterprises who have already implemented this mindset are now not only confronted with a terminological understanding of the concept of creativity and questions regarding development and implementation, but also with ontological issues regarding the potential of an artificial consciousness, or the exploration of differentiating factors between humans and machines.

As Chapter 4.4 has demonstrated before, this mutual relationship leads to a current climax of the narrative, which now has to consider the ontological query about the meaning of creativity for human self-awareness and identity. Thereby, the term creativity evolved not only into a field of scientific research, but also into a concept of a unique human characteristic that aims to distinguish humans from intelligent machines and systems in the light of the latter's approaches to emulate human abilities: to this day, the concept of creativity is used as a means of defense against the possibility that machines and artificial systems can think independently or even develop a state of consciousness – and the further the technical development progresses, the more attention will be paid to a notion of creativity in the field of artificial intelligence. The concept of artificial creativity therefore appears to be intrinsically and undetachable linked to the exploration of artificial intelligence (AI).[225]

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224 Cf. w.a. "The Race For AI: Google, Intel, Apple In A Rush To Grab Artificial Intelligence Startups, *CBInsights*, last modified 27th February, 2018, https://www.cbinsights.com/research/top-acquirers-ai-startupsma-timeline/.

225 The idea of an artificially created intelligence somehow is as old as mankind itself. Throughout history, people came up with AI-related ideas and concepts of both philosophical and technical nature – long time before technological advancements could realize a physical or digital, non-human entity or system that somehow could be called *intelligent*. The history of AI is hence not only influenced by scientific achievements but

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This results in the phenomenon of computational creativity being closely tied to the special discourse of scientific AI research as well as the superordinate interdiscourse on AI.

This is by no means self-evident: 30 years before the concept of artificial intelligence has been scientifically introduced, the term *robot* was developed by Czech novelist Karel

Capek, who coined it in his 1920[226] iconic play "R.U.R." (an acronym for *Rossum's Universal Robots*, a fictitious company).[227] Robots displace older human-like AI descriptions such as Automatons[228] and became a colloquial term for an AI with a physical presence, mostly in the shape of a human being. Notably, the term derives from the Czech word *robota*, meaning as much as *unfree* or *exploited labour* or *hard work*. Precisely because the robots in R.U.R. revolt and ultimately destroy humanity, the famous science fiction author Isaac Asimov designed his "Three Laws of Robotics" in his 1942 short story *Runaround* to fictitiously prevent such a dystopic scenario and to leave robots (which are aware of their existence in his short stories and are therefore not just a mechanical shell) in the Czech literal sense of the word *unfree*. Long before an AI self-awareness could be a reality in a foreseeable future, related moral and ethical problems become unresolved issues in semi-scientific literature. *Runaround* and other stories by Asimov became a major popcultural impact for society but also for engineers and scientists in their teen years. A whole "generation of scientists […] were tremendously influenced by his writing".[229] Hence, on the eve of the introduction to artificial intelligence

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moreover by socio-cultural conditions at a certain time. Pamela McCorduck points out that origins of AI can already be found in antiquity where it is considered as an ancient dream to recreate gods. Cf. Pamela McCorduck, *Machines Who Think. A Personal Inquiry into the History and Prospects of Artificial Intelligence* (Natick: A K Peters, 2004), p. 4). The idea of an AI has therefore always been related to the etymology of the concept of creativity.

226 Capek wrote the play in 1920, but it was not played before 1923.

227 Cf. Karel Capek, *R.U.R. Rossum's universal robots* (University of Toronto Library, 1920). Capek points out that his brother Josef strikes on the idea of calling the book's mechanical entities *robots* – so technically, he coined the word.

228 The term *automaton* derived from Greek, meaning *acting of one's own will*. It is first used in Homer's *Iliad* to describe an automated door opener.

229 This is how science journalist John Markoff writes in an obituary to Asimov in the New York Times. Among others, the AI pioneer Marvin Minsky has his say on Asimov's influence on him: "I was just beginning my teens and he was only in his early 30's, yet he seemed centuries ahead. I was entranced by his stories about space and time, but

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and creativity research as independent scientific fields, Capek and Asimov in particular set the course for a bipolarity of discomfort and confidence towards AI.

Five years after the psychologist Guilford directed the focus of his scientific field to creativity research, four scientists, with one from IBM among them,[230] created a proposal to conduct an extended conference on AI that should be held in 1956 at Dartmouth College, coining the term *Artificial Intelligence*. The proposal and its related conferences in the course of the summer of 1956 are considered to be the foundation for the scientific consideration of AI development. Within the initial proposal McCarthy et al. defined the essential issues of the upcoming AI research while completely underestimating the needed effort in doing so. Because in the proposal they conjectured:

> "that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer".[231]

The variety of aspects and its holistic view presented in this excerpt emphasises the meaning of this proposal as a foundation for AI development in the second half of the 20thcentury.[232] The proposal then continues to formulate "some aspects of the artificial intelligence problem", that should be considered during the summer study, thereby addressing the above points – among

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the ideas about robots affected me most". Cf. John Markoff, "A Celebration of Isaac Asimov", last modified 12th April, 1992, https://www.nytimes.com/1992/04/12/business/technology-a-celebration-of-isaac-asimov.html?pagewanted=all&src=pm.

230 The scientists are: McCarthy from Dartmouth College; Minsky from Harvard University; Rochester from IBM and Shannon from Bell Telephone Laboratories. Cf. John McCarthy, Marvin L. Minsky, N. Rochester and C.E. Shannon, "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence", last modified 31st August, 1955, http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html.

231 Ibid.

232 Single aspects already farsightedly describe the complexity and difficulties of future AI developments, like the following excerpt: "The speeds and memory capacities of present computers may be insufficient to simulate many of the higher functions of the human brain, but the major obstacle is not lack of machine capacity, but our inability to write programs taking full advantage of what we have". Cf. ibid.

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them, as the last aspect out of seven is *Randomness and Creativity*.[233] Thus, since the inception of scientific AI research, the concept of creativity has been literally taken into account. It does not have a subtle or metaphorical significance only but is an integral part of a total of seven constitutively aspects for the origin of scientific AI research.

With the term *randomness*, the direction in which the concept of creativity is understood in this aspect becomes more obvious. This understanding is made even sharper considering the brief description of *Randomness and Creativity*:

> "A fairly attractive and yet clearly incomplete conjecture is that the difference between creative thinking and unimaginative competent thinking lies in the injection of a [sic!] some randomness. The randomness must be guided by intuition to be efficient. In other words, the educated guess or the hunch include controlled randomness in otherwise orderly thinking".[234]

What is presented here is that the initiators of the Dartmouth Conferences understand randomness to be tamed in order to make it feasible (or efficient in their own words). Creativity is therefore purposeful and orderly, as it can only be distinguished from orderly thinking by complementary randomness. Randomness – according to the quote's tenor – can be controlled to a certain extent.

With the hype around the Dartmouth Conferences and subsequent promising developments, scientists were eager to outbid themselves in predicting the pace in which further developments will occur. The general believe was that in a few years, research would have solved the issue of creating an AI.[235]

It is well known that nothing came of it for the time being. The expectations were far too high. In particular, there was a lack of computer power to process the increasingly demanding calculations. As a consequence, funding for AI research was greatly reduced. This was all the more remarkable since a large US military fund was at the free disposal of the researchers and was not tied to a specific project or purpose. However, the researcher's financial freedom did not seem to be profitable for the military. What follows

233 Ibid.

234 Ibid.

235 Marvin L. Minsky, *Computation: Finite and Infinite Machines* (Englewood Cliffs, N.J.: Prentice-Hall, 1967).

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was the first so-called major AI *winter*.[236] In the 1980s, the idea of an artificial intelligence that would be on a par with, or even superior to, humans in all respects was abandoned for the time being. [237] Instead, research focused on so-called *expert systems*, i.e. systems that can support people in solving more complex problems like an expert by deducing recommendations from a knowledge base.

In 1982, Japan's Ministry of International Trade and Industry launched the "Fifth Generation Computer Systems project (FGCS)" with the goal of building a computer with unprecedented performance that would suffice to create artificial intelligence: "They're going to give the world the next generation – Fifth Generation – of computers, and those machines are going to be intelligent".[238] A new enthusiasm for AI and a new *summer* for research arose – but now with a focus on expert systems, also known as the concept of *Nouvelle AI*. [239]

One of most famous examples of such an expert system is IBM's 1996 *Deep Blue* chess playing computer that defeated chess grandmaster Garry Kasparov in 1997. Successes in AI development remain connected to well-known social games in a media-effective way: in 2011 the Watson system (again from IBM) beats the world's best *Jeopardy!* players in a live show. And in 2016, Google DeepMind's AlphaGo computer program beat the world champion Lee Sedol in the game of Go. The increasing complexity of the selected games shows the evolution of the development of artificial intelligence: Chess has clear, firm rules, Jeopardy! requires a corner-thinking, and Go is "a game that is exponentially more complex than chess and requires, at least among the top

236 The term first appeared in 1984 as the topic of a public debate at the annual meeting of AAAI (then called the "American Association of Artificial Intelligence").

237 This form of AI is also known as strong AI or general AI. The term strong AI was first coined by John Searle in 1980. Cf. Ben Goertzel and Cassio Pennachin, eds., *Artificial General Intelligence.* Berlin/Heidelberg: Springer, 2007; John Preston and Mark Bishop, *Views into the Chinese Room: New Essays on Searle and Artificial Intelligence* (Oxford: Clarendon Press, 2002).

238 Edward Feigenbaum and Pamela McCorduck, "The fifth generation: Japan's computer challenge to the world", [accessed August 19, 2019], http://www.atarimagazines.com/creative/v10n8/103_The_fifth_generation_Jap.php.

239 Cf. Jack Copeland, "What is Artificial Intelligence?", [accessed 19th August, 2019], http://www.alanturing.net/turing_archive/pages/reference%20articles/what_is_AI/What%20is%20AI11.html.

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humans, a certain degree of intuition".[240] In addition, AlphaGo is capable of improving autonomously.[241]

As impressive as the victories of artificial systems over human beings were, they must still be regarded as restrictive. This form of AI always refers to a very limited area only, as e.g. Deep Blue is *only* capable of playing chess. Kasparov, although being defeated in this special domain where a system excels, unites in himself various social practices (his personality is not limited to be a chess player). However, for some years now there have been so-called smart speakers and other speech recognition software, i.e., systems such as Amazon Echo or Apple's Siri. Certainly, they are far off from the diversity of the social practice of individuals. However, they do not exist as many individual systems, but as cloud-based algorithms that conduct millions of parallel conversations and continuously learn from human input and answers.[242] People, on the other hand, remain in the singular experience (maybe omitting certain multitasking abilities)[243] and are physically confined to themselves (even though the digital world brings about a certain resolution).

240 Cade Metz, "Google's AI Wins First Game in Historic Match With Go Champion", last modified 3rd September, 2016, https://www.wired.com/2016/03/googles-ai-wins-first-game-historic-match-gochampion/.

241 Ibid.

242 Matthew B. Hoy, "Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants", *Medical Reference Services Quarterly* 37, no. 1 (2018): 81-88, doi: 10.1080/02763869.2018.1404391.

243 Dario D. Salvucci and Niels A. Taatgen, *The multitasking Mind* (New York: Oxford University Press, 2010).

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