4 CONTEXTUAL AWARENESS AND PRECONDITIONS

In this chapter, the contextual framework of the discourse on creativity in IT is mapped out, showing both the further relevance of the topic and its influences and conditions on the part of society and the individual. Although context, what is presented here with reference to the creativity narrative in IT is equally influenced by that narrative as it has further reshaping effects on it. It is to be shown that the discourse on the concept of creativity in IT is framed by four time-specific distinctive characteristics. As will be shown, each characteristic is in itself of considerable significance to current and future societal development – in sum, however, they sketch the presumed interdiscursive scope of the creativity narrative that I expect to be an IT coinage. These characteristics are:

- first, the everlasting creativity as social norm (see chapter 4.1);
- second, the creation of a digital world (4.2);
- third, changing conditions of work and labour (4.3) and
- fourth, the dawn of creative machines (4.4).

All four factors are interrelated and, in some cases, are mutually dependent in their respective development. They reflect the unparalleled distinctness of the present. At the same time, my insight[1] into near, medium and long-term future IT developments indicate a tendency to rather downplay the impact of these characteristics on macrosocial developments even though they are

1 The assumptions I made cannot only be traced back to an internal IT perspective, but in particular to the practical examination of numerous economic, political, academic and educational institutions that visited the THINKLab at IBM Research - an intermediary between research and the "outside world" – in order to discuss current problems and questions and to gain insights into IBM's technology and mindset. This aspect is addressed only in brief at this chapter but is dealt with more specifically in chapter 6.

discussed and evaluated by experts and non-experts alike.[2] Since I expect the concept of creativity in IT to be a decisive driver for these four characteristics, they will be introduced below in order to frame and pave the way for the subsequent analytical process of exploring the distinct notion of IT's creativity narrative.

4.1 THE EVERLASTING CREATIVITY AS SOCIAL NORM

Asking US-American corporations about the meaning and purpose of a company, the official answer until 18th August 2019 would still have been based on Friedman's 1962 doctrine that "corporations exist principally to serve shareholders"[3] – that is, to make profit for those to whom these companies belong.[4] Due to increasing criticism of this orientation and fundamentally changing socio-economic conditions, this approach no longer seemed officially justifiable for "the most influential lobbying body for U.S. business interests, the

2 This paradoxically seeming claim will be further explored in the respective sub-chapters.

3 Thomas Koulopoulos, „181 CEOs of the Largest U.S. Corporations just altered the Role of Corporations for Decades to come", *Inc.*, last modified 19th August, 2019, https://www.inc.com/thomas-koulopoulos/181-ceos-of-largest-us-corporations-just-altered-role-of-corporations-for-decades-to-come.html?cid=hmside3.

4 Cf. Milton Friedman, *Capitalism and Freedom* (Chicago: University of Chicago Press, 2002). Milton Friedman's ground-breaking 1962 book *Capitalism and Freedom* is considered a major turning point in management literature, though it has since been subject to increasing criticism. In a nutshell, Friedman considers competitive capitalism and the free markets to be the most effective if not the only way to achieve political and personal (and of course economic) freedom. However, the positions negotiated in Friedman's book are by no means new but had been in practical use decades before. Nevertheless, Friedman laid the theoretical groundwork to which reference was still made in 1997 in the former proposal of the Business Roundtable. The criticism that CEOs in the new proposal are now considering and committing themselves to, at least in marketing terms, is of course older than Friedman's postulate *Freedom of the markets = personal and political freedom.* Industrialization, in particular, gave rise to a critique of capitalism that continues to this day, as it has for instance been presented in the form of Marxist theories. The Marxist school continues to evolve and is seeking (and finding) connections to rather contemporary currents, such as the work of Foucault, as attempted by the Italian philosopher Antonio Negri. Cf. Antonio Negri, *Marx and Foucault. Essays Volume 1* (Cambridge: Polity Press, 2017).

Business Roundtable".[5] The *Business Roundtable* consists out of 193 CEOs (Chief Executive Officers) who represent large companies such as Coca-Cola, Citigroup, Dow, FedEx, General Motors, Johnson & Johnson, KPMG, Mastercard, Pfizer, PricewaterhouseCoopers (PwC), Procter & Gamble, Siemens, United Airlines, Walmart, but also military corporations such as Lockheed Martin and Northrop Grumman as well as some of the largest global IT companies such as Amazon, Apple, Dell, Facebook, IBM, Oracle, SAP and Xerox.[6] The number and selection of enterprises shows that if all these corporations, despite their heterogeneity and different orientations, gather behind one lobbying body, it carries a lot of significance. From an economic point of view, it doesn't really get any more official and generally valid.

On 19th August 2019, 181 out of these 193 CEOs published a short account called "New Statements on the Purpose of a Corporation"[7] to meet the changing conditions on paper at least. The very first sentence of the very first paragraph reads as follows: "Americans deserve an economy that allows each person to succeed through hard work and creativity and to lead a life of meaning and dignity".[8] This means that whether military, IT, banking or beverage companies, they all see the main purpose of their very existence in creating an economic world in which all (American) people can be successful not only through their work (in order to lead a good and dignified life, it should be noted; not to enrich shareholders) but explicitly and literally through their own creativity. Remaining in this logic it follows that the entire economy mainly serves to provide jobs and enable the creativity of each individual.

In fact, the *Business Roundtable* is quite late in responding.[9] The extent to which a semantical notion of creativity[10] has already seeped into almost all areas of work and life without gaining any definitional sharpness can be seen,

---

5 Koulopoulos, **"***181 CEOs of the Largest U.S. Corporations Just Altered the Role of Corporations for Decades to Come***"**.

6 Business Roundtable, "*Statement on the Purpose of a Corporation*", August 2019, https://opportunity.businessroundtable.org/wp-content/uploads/2019/08/Business-Roundtable-Statement-on-the-Purpose-of-a-Corporation-with-Signatures.pdf.

7 Business Roundtable, "Statement on the Purpose of a Corporation".

8 Ibid.

9 This applies both to developments and to the criticism directed at these developments.

10 The phrase semantical notion of creativity here means that only because creativity is of value as a communicative concept, it does by no means say anything about the actual relevance of creativity beyond linguistic use.

for example, in the assumption that creative craftsmen will have a clear advantage over their non-creative colleagues in finding their niches to work in the future like the following illustration shows: As role models for this, *good shoemakers* and *committed hatters* are given as examples in an interview with a subject-matter expert – but without the expert making it clear how creativity is to be understood in these cases and how creativity helps a shoemaker to became a *good* shoemaker.[11] Following John Dewey, Hans Joas describes creativity as a characteristic of human action and therefore as an everyday phenomenon.[12] His interpretation is not to be understood in the sense of a neoliberal idea but is based on Dewey's view that when people are confronted with problems, they begin to search for possible causes, means and solutions and in doing so become creative. Thus, creativity as described by the *Business Roundtable* is not seen as a mere everyday phenomenon that could help to solve problems, but, in contrast to Joas, as an unavoidable optimization tool. It seems to be indicated to somehow use the concept of creativity with a semantic indefiniteness, no matter if a however defined creative ability helps a shoemaker in her daily routine. What is more, the indefiniteness might even strengthen an argument due to its flexibility and semantic adaptability.[13]

This "paradox of creativity"[14] predominates within business literature, which indeed acknowledges and indicates the union between the concept of creativity and art (in a broader sense), but strives to detach creativity from the arts, thereby somehow democratising it: "On the face of it, 'creativity' seems like a skill useful only to artists, designers, writers, or marketers. Truth is – creative skills are indispensable for *all* professionals".[15] Hence, despite its scientific indetermination, the notion of creativity is widely perceived as an imperative dictum whose polarisation constrains opposing opinions. As introduced in chapter 2.2, it trickles down into many other fields of business

11 Nikolas Pelke, „Kreative Handwerker sind die Zukunft", Mittelbayerische, 16th July, 2018, https://www.mittelbayerische.de/region/nuernberg-nachrichten/kreative-handwerker-sind-die-zukunft-21503art1670797.html. [emph. in original].

12 Cf. Hans Joas, The Creativity of Action (Chicago: University of Chicago Press, 1996).

13 Cf. the reference to Saussure in chapter 1.

14 Gerald Raunig, „Kreativindustrie als Massenbetrug", in Kritik der Kreativität, in eds. Gerald Raunig and Ulf Wuggenig (Wien: Turia + Kant, 2007).

15 Michael Tomaszewski, "Creative Thinking: Definition, Examples & How to Boost Creativity Skills", *zety* (blog), 5th July, 2019, https://zety.com/blog/creative-thinking-skills .

and social aspects of life: a call for self-restraint and -regulation translates into a longing for self-formation and individual freedom.[16]

Within this environment, IT enterprises appear to act as a kind of lobbyist for its understanding of creativity, propagating creativity in fields that do not initially belong to its core areas. The software company Adobe, for example, has published a study on the role of creativity in education systems.[17] The study concludes that creative problem-solving competence pioneers the future, but outdated curricula lack imagination to pass on this competence.[18] The ubiquity of creativity (with its related family of concepts[19] as well as critical voices directed at them) with the resulting set of special- and interdiscourse indicates: creativity is not a hype anymore but a matter of course, a social norm that applies to many social fields.

4.2 THE CREATION OF A DIGITAL WORLD

Creativity as a social norm of the contemporary working world exists in the presence of the fundamental and universal process of the digital transformation. To refer again to a statement by Dirk Baecker, the *project of digitisation* has dramatic consequences for society just as the introduction of language, writing and book printing has.[20] Moreover, this transformation is taking place at

16 Isabell Lorey, "Vom immanenten Widerspruch zur hegemonialen Funktion. Biopolitische Gouvernementalität und Selbst-Prekarisierung von KulturproduzentInnen", in *Kritik der Kreativität*, eds. Gerald Raunig and Ulf Wuggenig (Wien: Verlag Turia + Kant, 2007).

17 Adobe, "Adobe Studie: Kreative Problemlösungskompetenz ist Wegbereiter der Zukunft, doch überholten Lehrplänen fehlt dafür die Fantasie", *Adobe Newsroom*, last modified 19th February, 2018, http://www.adobenewsroom.de/2018/02/19/adobe-studie-kreative-problemloesungskompetenz-ist-wegbereiter-der-zukunftdoch-ueberholten-lehrplaenen-fehlt-dafuer-die-fantasie/.

18 Cf. Ibid. Quite obviously, the study is backed by Adobe's financial and economic interests: among other findings, the study shows that "Global educators believe technologies like Adobe Creative Cloud can help students develop creative problem solving skills" and that "Educators that use Adobe Creative Cloud say creative problem solving often plays a role in their curricula, and their students are more prepared to put these skills to use".

19 Cf. chapter 2.1.

20 Dirk Baecker, *4.0 oder die Lücke die der Rechner lässt*.

an unprecedented speed and with unrivalled growth[21] with billions of people being connected via social media networks and massive investments to keep up with the pace of the digital transformation.[22] The transformative process itself is therefore sparked by technical innovations that, as Hans Ulrich Gumbrecht presumes "change – sometimes behind our backs, sometimes against our wills – the way we think, and with that the foundations of human existence".[23] In principle, the progress of civilization can originally be interpreted as a continuum: According to a quote by the philosopher Ernst Kapp on which Hans Blumenberg's work on the world's increasing mechanization refers to, the entire history of mankind, when examined closely, finally dissolves into the history of the invention of ever better tools.[24] This continuity seems to keep its validity, though, but is challenged in parts by the emergence of a parallel existing *digital otherness*. For Gumbrecht, the per se normal process of technologies that change epistemologies is now disrupted and "thinking is confronted with a maybe decisive and until recently not imaginable challenge".[25] This is due to the fact that technologies themselves became the backbone of a rather radical and all-embracing change, as "electronic technologies, which have long been seen as simple optimisations, are not just transforming the institutions of our communication in fundamental ways but also structures of society and politics".[26] Technical developments such as Personal Computers (PCs) and the Internet are creations of IT – and so is the creation of all things digital. The emerging *digital world* can therefore be seen as a creation of IT as well. The resulting central position of IT draws attention to

21 IBM, 2015. IBM also points out that the growth of data is exponential and accordingly incomprehensible to human minds (ibid.).

22 For schools in Germany alone, the costs of digitisation amount to 2.8 billion euros per year according to a study by the Bertelsmann Foundation. Cf. Dirk Zorn and Christian Ebel, "IT-Ausstattung an Schulen: Finanzierung ist eine milliardenschwere Daueraufgabe," *Bertelsmann Stiftung*, last modified 2nd November, 2017, https://www.bertelsmann-stiftung.de/de/themen/aktuelle-meldungen/2017/november/it-ausstattung-an-schulen-finanzierung-ist-eine-milliardenschwere-daueraufgabe/.

23 Hans Ulrich Gumbrecht, "Das Denken muss nun auch den Daten folgen," *Frankfurter Allgemeine Zeitung*, last modified 12th March, 2014, http://www.faz.net/aktuell/feuilleton/geisteswissenschaften/neue-serie-das-digitale-denken-das-denken-muss-nun-auch-den-daten-folgen12840532.html?printPagedArticle=true.

24 Hans Blumenberg, *Wirklichkeiten in denen wir leben: Lebenswelt und Technisierung* (Stuttgart: Reclam, 1981), p. 9f.

25 Ibid.

26 Ibid.

options for opportunities that indicate both a potential domination and lack of control. These are both eminently political and public issues with a corresponding large public resonance. It is a *res publica* in literal terms, as expressed in the title of the well-known digital conference *re:publica*, whose organisers and participants playfully use the selected name to indicate public participation in matters of digitisation. The topics range from questions about privacy on the Internet, participation in democratic processes and digital citizenship to ways of earning money by exploiting technology.[27] However, participants of *re:publica* have to pay less attention to the existing rules of the game and framework conditions developed by politics and society. Rather, they have to play by and consider IT's rules.

Because large IT companies are not only creators of the new digital world they also participate in it themselves. A condition that is not only perceived critically in Europe, but also in IT's home territory, the U.S. "Code is law"[28] concludes Harvard-based scholar and popular critical voice Shoshana Zuboff. And even when original decisions are made by people, it is all too often algorithms that ultimately decide whether a user's contribution can be published or not. Geographical classifications, national borders and regulations, distance and physical space by itself, physicalness and many other aspects that have been seen as immutable lose their validity in the digital sphere. The resulting opportunities (and responsibilities) have led IT companies to be accused of behaving like the barons and kings of a new world, which they themselves have created.[29] Even if more and more voices are joining the chorus calling for state regulation or even the breakup of entire companies, IT enterprises have so far only been obligated to themselves, without any higher authority that could judge them: "You alone are Google over all the kingdoms

27 Kai Biermann, „Zweifel als Motor des Fortschritts", *Zeit Online*, 14th April, 2010, https://www.zeit.de/digital/internet/2010-04/republica-2010-berlin.

28 Shoshana Zuboff, *The age of surveillance capitalism: the fight for a human future at the new frontier of power* (New York: PublicAffairs, 2018).

29 Olaf Groth in a panel discussion at the Robert Bosch-Stiftung in Stuttgart, 20th February, 2019. Cf. also: Shoshana Zuboff, she calls the "men at Google" today's "digital barons", referring to the infamous "Gilded Age robber barons" and stating: "Like the men at Google, the late-nineteenth-century titans claimed undefended territory for their own interests, declared the righteousness of their self-authorizing prerogatives, and defended their new capitalism from democracy at any cost" (p. 105). It is unclear if Groth borrows the term "barons" from Zuboff's work. However, the connotation is quite similar.

of the earth" states Jaron Lanier,[30] American computer scientist, composer and a founding father of the field of virtual reality on that point,[31] revealing a rather critical dimension of the discourse quite beyond the limits of polemics. Yet, the digital world is not only a tendentious slogan under which all relevant technologies gather in order to disrupt (for better, for worse) the existing order. At the same time, it is a parallel existence which will continue to grow and develop its own laws and legalities. As founder and sovereigns, IT companies will consequently have a major right to a say in the emergence of future values, norms and the determination of what is perceived as right and wrong. Even if individual governments or a federation of nations step up their efforts to regulate the services offered by IT companies, the latter will probably remain the operators and providers in the future as well.

4.3 CHANGING CONDITIONS OF WORK AND LABOUR

The nature of how people work and the conditions under which they do so is discussed and negotiated in an ongoing vivid and highly expressive discourse. For the French sociologists and economists Luc Boltanski and Ève Chiapello, the course of the discourse was more and more driven by the desire for social justice and the critique on the suppression of the autonomous subjects' self-activity, as they have examined in their book "The New Spirit of Capitalism" in 1999, by which they further accelerated this course over the last two decades through the influence of the book.[32]

On this basis, IT's developments have not only contributed to further changes in working conditions, for example through new tools. Rather, in the course of digitisation and the emergence of the digital world, the concept of work itself is in the process of being called into question and renegotiated. At first, however, people are confronted with very tangible problems: in their influential and frequently cited study of 2013, Carl Benedikt Frey and Michael

30 Jaron Lanier, "Whoever owns our data will determine our fate". A comparison with Foucault's concept of disciplinary power appears to be consistent here and is drawn on in the actual work.

31 Maureen Dowd, "Confirm or Deny: Jaron Lanier", *The New York Times*, last modified 8th November, 2017, https://www.nytimes.com/2017/11/08/style/confirm-or-deny-jaron-lanier.html.

32 Cf. Luc Boltanski and Ève Chiapello, *The New Spirit of Capitalism* (London / New York: Verso, 2007).

A. Osborne from Oxford University raise the claim to compare and examine how susceptible jobs are to computerisation, considering more than 700 occupations. Their then mentioned number of 47 percent of U.S.-based jobs being endangered by machines and algorithms in the next ten to twenty years has made a huge impact in both scientific and non-scientific communities. Seeing nearly half of all jobs at stake raises the question how people can distinguish themselves from machines and systems that apparently do tasks faster, cheaper and more efficient. *To be creative* has been a solution for this supposedly existential threat. This is pictured in various studies, such as a 2010 study in which the ability to act creatively is considered the most important attribute of a successful leader by 60 percent of 1541 executives from all over the world.[33] Figures by a 2012 study conducted by Adobe support this. According to this survey, eight out of ten people are convinced that creative potential must be released for future economic growth.[34] However, only a quarter of the respondents see their own creative potential fully utilised.[35] Hence, literature on *how to become creative* experiences a sustained boom (whereby this aspect refers back to the aspect discussed in Chapter 4.1, *The everlasting Creativity as Social Norm*). The demand to focus on creativity in order to be prepared for changing conditions of work is already reflected in the context of educational discourses, as the above-mentioned study commissioned by Adobe has demonstrated exemplarily. Thus, an IT journal contribution in the course of this study also considers creative abilities to play an essential role in order to survive in the future digital world of work, referring to an outcome of the study stating that job profiles in which it is important to continuously solve new challenges creatively are less affected by the trend towards automation.[36]

---

33 BJ Lombardo and DJ Roddy, "Cultivating Organizational Creativity in an Age of Complexity," *IBM Institute of Business Value*, last modified September, 2010, http://cdn.creativityatwork.com/wp-content/uploads/2011/08/IBM-creative-leadershipstudy-2011.pdf.

34 w. a., "Study Reveals Global Creativity Gap," *Adobe*, last modified 23rd April, 2012, https://www.adobe.com/aboutadobe/pressroom/pressreleases/201204/042312AdobeGlobalCreativityStudy.html.

35 Ibid.

36 Christian Schinko, "Kreativität als Schlüsselkompetenz der Zukunft: Schulen stehen unter Zugzwang", *Cancom info*, last modified 28th May, 2018, https://www.cancom.info/2018/05/kreativitaet-an-schulen-dasmuss-bei-der-foerderung-beruecksichtigt-werden/.

A quote by filmmaker, artist and internet pioneer Tiffany Shlain can be seen as an exemplary conclusion for the reasoning of using a notion of creativity as a distinct human factor, which therefore protects skilled people's jobs from becoming obsolete:

> "There's all this hysteria about AI taking over. But here's the thing: The skills we need most in today's world – skills like empathy, creativity, taking initiative, and cross-disciplinary thinking – are all things that machines will never have. Those are the skills that will be most needed in the future, too".[37]

Whether this assessment remains correct or not far into the future is almost impossible to predict on the basis of current knowledge and would inevitably remain pure speculation, although the determination in which the adverb *never* is used in this context should at least be called into question. From a discursive point of view, however, this question is not of great significance. Instead, it is of greater importance that the theoretical potential of AI already has the effect of strengthening the emphasis on creativity as a (manifestly acted) unique human characteristic. The answer to changing conditions of work and labour (further fostered by already given and potential AI developments) once again seems to be found in creativity as a social norm which is again further strengthened hereby.

4.4 THE DAWN OF CREATIVE MACHINES

But with both the promise and threat of allegedly creative machines, the distinctive human factor of being creative appears to be at stake as well, leading to another contextual aspect to be considered when dealing with the notion of creativity in IT: the possibilities and limitations of an artificial intelligence system to be by all or no means creative. The question of whether and how the possibility of artificial (or computational)[38] creativity could exist involves

37 Fisher, *Valley of Genius*, "The Endless Frontier" section, para. 2.

38 In research as well as in marketing both spellings exist for this phenomenon: either it is called artificial creativity, or computational creativity. Within this work I prefer to use the term artificial creativity to emphasize the linguistic opposition and the (presumed) difference to human respectively natural creativity. However, this equally includes computational creativity.

questions of what this implies for IT, society and the individual person. Computational creativity is therefore a subject of both semantic and ontological nature. In a recent panel on the topic of *Artificial Intelligence and Art*, a researcher of the Alexander von Humboldt Institute for Internet and Society (HIIG) describes the phenomenon of computational creativity "as uncreative art, which today is also to be found in music and literature",[39] deducing numerous fundamental questions about authenticity and authorship, originality, origin, aura and atmosphere, about art production or art reception, and finally about the creation of meaning and (human) values themselves. Yet, the scientist concludes, the "answer that we as humans are still superior in creativity, human interaction and reproduction and in working on so-called wicked problems is certainly a reassuring thought".[40] Given the significance of AI development, in whose waters the phenomenon of artificial creativity is to be found, such a reassuring answer seems to be of great importance: For Google's CEO Sundar Pichai, AI is "more profound than electricity or fire".[41] For Gerhard Vollmer, the idea of an artificial model of the mind can even be considered as one of the *insults of mankind*.[42] It thus ranks alongside illustrious *insults* such as the Copernican turn or the Darwinian system of evolution. Based on a thesis by Sigmund Freud, these *insults* are created when overturning scientific discoveries question people's self-concept – just as Copernicus brought about the cosmological insult by claiming the Earth (and thus humankind) was indeed not the centre of the cosmos.[43] Vollmer expands the count to a total of ten *insults*, beginning with the child, recognizing itself as

39 Humboldt Institute for Internet and Society, *Digitaler Salon: Zahlen, die malen*.

40 Ibid.

41 Harry McCracken, "Google CEO: AI is a bigger deal than fire or electricity," *Fast Company*, last modified 19th January, 2018, https://www.fastcompany.com/40519204/google-sundar-pichai-ai-is-a-bigger-deal-than-fire-or-electricity.

42 Cf. Gerhard Vollmer, „Die vierte bis siebte Kränkung des Menschen. Gehirn, Evolution und Menschenbild", http://www.gkpn.de/vollmer.htm. Vollmer hereby refers to a book by Sherry Turkle, in which she asked as early as 1984: "Are Smart Machines Alive?" Cf. Sherry Turkle, *The Second Self: Computers and the Human Spirit* (Cambridge: MIT Press, 2004), p. 33.

43 In addition, Freud considers a biological (Darwinism) and a psychological (triggered by himself) insult of mankind. Cf. Sigmund Freud, "Eine Schwierigkeit der Psychoanalyse", *Imago. Zeitschrift für Anwendung der Psychoanalyse auf die Geisteswissenschaften*, Bd. V (1917), 1–7.

part of the world, and ending with the still pending neurobiological dissolution of a body and mind's dualism. But before this final dissolution stands the prospect of artificial intelligence that attains and even surpasses a human's intellectual accomplishments – and therefore also the previous invulnerability to be creative. Paradoxically, an AI that outflanks the human mind would be the first insult that would not be due to a more precise observation or a better understanding (of nature and the environment, for example), but would be created by humans themselves.

The underlying ontological aspect in thereof resulting debates connects the pursuit for an understanding of both computational as well as human creativity. To get ahead, further deliberation on the very nature of creativity seems appropriate,[44] which is why IT attempts to understand computational creativity by conducting research on human creativity in close collaboration with different perspectives, such as psychology or neuroscience. Indeed, creativity is seen as a "final frontier"[45] from an IT's perspective, with human creativity as "something of a mystery, not to say a paradox".[46]

These four pillars, presented in chapters 4.1 to 4.4, thus form the backdrop on which a notion of creativity in IT is mapped and at the same time has a decisive influence on. The following diachronic analysis therefore proceeds in the knowledge of the characteristics of contemporary times presented here and seeks to provide evidence for the resulting presumption of an entanglement between the four aspects and a conception of creativity in IT.

---

44 Margaret A. Boden, „Creativity and artificial intelligence", *Artificial Intelligence* 103, no. 1 and 2 (1998): 347-356, doi: 10.1016/S0004-3702(98)00055-1.

45 Simon Colton and Geraint A. Wiggins, "Computational creativity: The final frontier?" in *Frontiers in Artificial Intelligence and Applications* 242, January (2012): pp. 21-26, doi: 10.3233/978-1-61499-098-7-21.

46 Margaret A. Boden, *The Creative Mind: Myths and Mechanisms*.