I. The Sensitivity of The New

In the ethnographical examination of entrepreneurial-creative places such as makerspaces, incubators, or living labs, I frequently encountered assertions and explanatory patterns imbued with emotion. Interestingly, these narratives often seem to evade a conscious acknowledgement of their emotional nature. Instead, participants describe experiences as *magical moments*, *visions of a brighter future*, *a flourishing corporate culture*, or *serendipitous discoveries*. When explicitly asked about the emotionality of the innovation process during my research, respondents displayed hesitation, sometimes coupled with expressions of wonder, and asked what I meant or what emotions I was talking about. Perhaps the most frequently posed question in the context of my research was: 'What kind of emotions do you mean?' to which I was expected to pinpoint specific emotions like 'fear', 'happiness', or 'sadness' to elucidate my research question. At this point, wonder usually arose on both sides. I intended to investigate emotions without constraining them within predetermined categories. However, some participants found this approach too abstract, prompting a desire for a more concrete framework. Consequently, I promptly and significantly adjusted my approach.

This anecdote holds particular relevance to the broader research context, especially when investigating the role of emotions as an 'impact factor'. To unravel the influence of emotions on innovation processes or the shaping of prototypes, delving into the (sometimes) imperceptible in the materialisation process becomes imperative. Providing a predefined frame of reference would not align with the research question, as it might inadvertently impose limitations. These limitations could hinder participants from discussing what may be retrospectively recognised as emotional aspects, steering conversations towards what fits within the predetermined frame.

Furthermore, this discovery underscores the intricacies inherent in exploring emotions, shedding light on a broader challenge. Despite the potential for collective character, emotions are frequently subjectively experienced, rendering their scientific assessment complex. Anything rooted in subjective experience or inherently resistant to objectivity has historically faced discrediting and dismissal as non-scientific. The objectification of science, entrenched in the process of rationalisation

with a longstanding tradition(e.g. Daston & Galison, 2007; De Sousa, 1987), further complicates the evaluation of emotions. Consequently, even within an innovation process, inherently a knowledge generation endeavour, participants in innovation-making may not openly accord significant importance to emotionality, particularly when adhering to presumed linear developmental trajectories.

Hence, scrutinising emotions in a knowledge production process like innovation often encounters scepticism, lacking serious consideration. This scepticism is particularly pronounced in the realm of innovation research, typically approached quantitatively by economists or through models rather than qualitatively. Despite this, there is a noticeable paradox: market participants frequently and consciously infuse the concept of innovation with emotion in its external portrayal. This disjuncture is striking. On the one hand, those engaged in knowledge generation may not consciously acknowledge emotions or only do so after persistent efforts. On the other hand, they deliberately leverage and manipulate emotions in the marketing of nascent products. From these ambivalent observations, my research question takes shape: *To what extent do the emotions of participating actors matter in the materialisation of an idea, and how can these emotions constitute a prototype's 'moral economy'*[1]*, providing insights into the society in which it emerges?*

Hence, this book investigates the manifold modes of communication integral to the evolution of a prototype, commencing with its initial conception. Central to this exploration is an emphasis on the emotions experienced by the actors throughout the development process. The germination of an idea for a potential innovation typically springs from a problem embedded in the everyday lives of individuals, grounded in specific experiences. In my inquiry, I meticulously trace the genesis of the idea, contending that it is inherently and already emotionally constituted. The theoretical framework posits that the interplay between *experience* and *imagination*, manifested as reflective forms of interaction, gives rise to *emotion*. Yet, establishing a definitive sequence, whether experience precedes imagination or vice versa, proves elusive. The act of consciously perceiving, observing, or memorising an experience in daily life generates emotional resonance in inventors, empowering them to envisage potential solutions. Consequently, a triad emerges—comprising *experience*, *imagination*, and *emotion*—intertwined and mutually dependent, though not bound by a linear temporal sequence.

Through the involvement of additional actors and team members within the incubator or makerspace, the trajectory from the conception of an idea to the circulation of a prototype becomes a collaborative process. These individuals often carry distinct expectations shaped by their experiences, thereby introducing an emotional disposition that undergoes processing and negotiation within the iterative loops of prototype development. The significance of these expectations lies

1 A site or forum of a prototype's negotiation process (see Chapter III).

in their capacity to offer enduring insights into evaluation patterns and categories within both innovation and scientific research. Moreover, adopting an alternative approach, marked by the emotionalisation of the innovation process, serves as a gateway to alternate narratives concerning motivations for innovation. Contrary to the frequently propagated narrative of linear developmental paths, this study highlights that ruptures emerge and become conspicuous during iteration loops, constituting a substantial aspect of innovation development. These ruptures manifest initially through the erosion of idealisation at the conceptualisation of the idea and continue to evolve in diverse ways.

This research scrutinises emotions and team dynamics through qualitative ethnographic methods, encompassing participatory observation, interviews, 'work-alongs' (in-situ research linked to interviews), and comparative analysis.

To begin with, Chapter II discusses the methodological approach and how the empirical data was collected and analysed, as individual interview quotes already contribute to the theory section in relevant passages. This approach links the theory with empiricism from the beginning, creating a nexus among the chapters that ensures it is clear who participated in the survey and whose words are being quoted.

Accordingly, the first subchapter discusses how I entered the innovation-making field. As with any empirical study, there is an inherent risk of bias or one-sidedness. In addition to avoiding one-sidedness in the present work, my main concern was maintaining flexibility concerning the numerous perspectives in the field of innovation and comprehending the many specialised languages spoken by diverse actors. The empirical work required me to remain in the interplay between myself and the research subjects and adopt a reflexive attitude. Accordingly, I combined grounded theory (GT) with John Law's approach of 'method assemblages' (Law, 2004: 13), aiming to avoid a strictly classical methodological approach. This approach fosters openness in the researcher, enabling the capture of diverse realities without prioritising specific perspectives. This can create the impression of an external 'messiness' (Law, 2004: 18), which, however, turns out to be a complex mosaic for presenting a holistic picture of multifaceted fields. At the latest, the reflexive approach proves its worth when tracing the changing narratives of the same person or different narratives about an artefact simultaneously. These moments are tense, perplexing, and often loaded with emotions, which is precisely why these passages are interesting for research. In subchapter 2.3, I present the empirical sites where I conducted my research. The first site is an incubator where I could get to know two projects, namely *Feety* and *Ellie*, both of which involved developing physical prototypes.

The second site is a makerspace, where I looked at general structures, while the third is a creative space, which takes a different approach to evolving an idea, although the names resemble each other. The fourth site was an established com-

pany that has dominated an entire world market with one novelty. To round this off, I spoke with an innovator who has also been a private investor and thus fulfilled a notable dual role. All sites and interlocutors contribute to observing and understanding the origins of ideas, most of which are related to medical technology developments. Although the theoretical assumption goes beyond the reference to medicine or medical technology, due to the care aspects inherent in the practice of medicine, emotional factors are also involved to a certain extent, which is why it initially seemed more accessible to create an approach to emotions in this area. This assumption is helpful for initial theses but not necessary to trace the origins and general development of ideas.

I ethnographically researched the various interlocuters' work and ideas using different methods. I conducted interviews, observed them at work whenever I could, photographed their activities and emerging prototypes and had them draw work processes.

Subchapter 2.5 refers to the problems encountered before, during, and after the survey in the sense of a reflexive attitude towards the field and the researcher. Particularly noteworthy at this point are the issues of confidentiality, which especially applies to the area of innovation, and the global crisis surrounding the COVID-19 pandemic, which considerably impacted my research. The hurdles of confidentiality and concerns about innovative ideas being exposed by an external researcher, coupled with the challenges of a pandemic that forced teams of developers into isolation and home offices or closed entire creative venues, presented me with particular challenges and significantly limited the possibilities for data collection.

Chapter III serves as the inaugural theoretical segment of this book, meticulously examining an idea's genesis from its phenomenological roots. The central inquiry revolves around the interplay of imagination, experience, and emotion, culminating in what is later termed a 'moral economy'. This concept functions as a dynamic site of negotiation, proving pivotal in subsequent processes of collectivisation.

In retracing the origins of an idea, as expounded in subchapter 3.1, imagination emerges as a critical factor for shaping the future, a space where possibilities of change unfold. Hypotheses and 'what if'-scenarios become vehicles for exploring this imagined terrain. Franz Brentano calls this ability *mental force*. Drawing on his pre-phenomenological insights, the work elucidates how imagination, grounded in personal experiences, establishes a reciprocal relationship with the world. This interplay involves a continuous dynamic wherein the present self mediates between the past self and the external world. Brentano terms this ability to relate to something both inside and outside as *intentionality [Ger. Intentionalität]*. The physical existence of an object becomes secondary to its mental existence; an object becomes real through imaginative envisioning. This unleashes a creative force essential for

idea development, with experience playing a supportive role in releasing imaginative power.

Subsequently, subchapter 3.2 addresses the origin of ideas and the nexus between experience and creativity, drawing on the pragmatist approaches of William James and John Dewey. These approaches integrate feeling into the broader context of thought and action, overcoming the subject-object dualism of modernity through radicalempiricism. By creating a holistic picture of the body and the environment, Dewey, in particular, underscores the relevance of the sensed or subjective aspects. Conscious experience, according to Dewey, materialises through active interaction with the world, fuelling conscious doing and creativity. Everyday actions take precedence in the perspectives of these pragmatists, serving as the fertile ground from which ideas originate.

Moving forward, subchapter 3.3 delves into the emergence of emotions through interaction with a created artefact and their subsequent transmission.Emotions, integral to our modes of communication, exert influence over the process of knowledge production within the communicative realm—an influence that transcends individual occurrences and extends into collective dimensions. Grounded in the foundational premise of communication as fundamentally interpersonal, this subchapter elucidates the incorporation of artefacts into the intricate dynamics of communication. Here, these artefacts assume the role of a projection screen, facilitating the expression and evaluation of emotions between interacting subjects. Within the context of the historical trajectory of emotions in scientific discourse, a distinctive emergence is discerned—the 'scientific self' (Daston & Galison, 2007, p. 191 ff.) assumes agency within this communicative network, actively contributing to the ongoing generation of knowledge through the mediation of feelings, assumptions, and experiences. Emotions, historically relegated to scientific pursuits, underwent a transformative shift with the advent of the *Linguistic Turn* in the early 20th century. The pragmatists of the 20th century played a pivotal role in elevating the status of emotions within the scientific domain. Disciplines like psychology engaged in a rigorous scientific exploration of emotions, giving rise to novel perspectives that displaced the Cartesian view. Consequently, emotions shed the pejorative label of 'irrationality' and became integral subjects of contemporary sociological research. This paradigm shift paves the way for exploring a discernible 'grammar' inherent in emotions, a trajectory applied in my research to unravel the emergence of emotionality within the realms of ideation and innovation-making. Consequently, the crafted artefact transcends its status as a mere mental construct, evolving into an individual frame of reference for the inventor and an active agent within the multifaceted network of interacting actors. It is no longer confined to the realm of mental imagery; it exists as a tangible entity in the world, subject to negotiation and engagement.

In digging into the culmination of subchapter 3.4, we discern the artefact's transformative journey beyond a mere conveyor of emotions to becoming a vessel for values.Within these intricate interaction processes, team members engage in nuanced negotiations amongst themselves, exchanging not only knowledge but also their distinct moral perspectives. Those currently engaged with the artefact become integral actors in an economy that morphs into a vibrant arena, hosting their ideas, emotions, and judgements. This phenomenon, akin to what Lorraine Daston terms a 'moral economy' (Daston, 1995), profoundly influences the scientific landscape, shaping ruminations on what to think, the preferred subjects to explore, decision-making protocols, and the objects under scrutiny. These moral economies illuminate the intricacies of scientists' choices—why certain objects are selected, which explanations gain trust, and the habits or methods that are embraced or cultivated. Such insights serve as a compass, elucidating the emotional impact on key actors and offering glimpses into what they perceive as relevant. In the realm of innovation, diverse actors, despite their disparate origins and technical vernaculars, converge in a collective conversation, forging unity within their pluriverse.

The exploration of innovation structures unfolds in the second theoretical segment of this book (Chapter IV), building upon the preceding examination of experience, imagination, and emotion. Conceptualising innovation as a collective process, particularly in its practical manifestation, necessitates an investigation into its designated locales where the invention is practised in alignment with public understanding (subchapter 4.1). It is within these spaces that innovation, corporate culture, and creative cultures converge, giving rise to expectations. Initially, individual expectations surface, characterised by their ideal-typical nature, before being disseminated and shared within various creative realms for further refinement. The idealised idea encounters supplementary visions, providing a projection surface for diverse thoughts and desires that seek eventual realisation. As these expansions occur, the treatment of the prototype and its narrative undergoes a transformation. Subsequently, subchapter 4.2 examines the origin of an idea and its subsequent evolution, seamlessly weaving it into the object's narrative. Throughout this journey, the artefact remains a projection surface, accommodating the wishes, expectations, and future visions of an increasingly broad audience. These narratives transcend mere storytelling; they are performed and practised, imbued with emotional dimensions. Typically centred around a problem from everyday life, the narrative introduces an emotional component, transforming the problem into a call to action, seeking a solution. Within this context, invoked creativity emerges through the presented problem and the ensuing call to action. Notably, the narrative consistently operates as a founding myth, profoundly entrenched in emotional undertones. These evolving myths are replete with symbols, transcending mere textual content. The act of conveying a message employs a specific language and follows established rules, individually decoded by recipients, inevitably eliciting emotions. Consequently, the in-

novative idea or development thrives solely through its narrative, provided it aligns with the zeitgeist of society.

Ultimately (subchapter 4.3), values undergo a process of comparison, adaptation, and expansion within the context of collectivisation. Framed within the concept of a *moral economy*, a collective entity forms around the artefact, transcending its role as a mere transmitter of ideas and narratives. This collective not only conveys values but also actively shapes a shared morality, encompassing language, customs, and more. As previously suggested, these desires and ideas are inherently emotional, embodying a moral belief that guides how something should manifest its purpose or value at its core. The evaluation of an artefact's value often occurs in the context of success and failure. However, the categorisation of success and failure proves elusive and unpredictable, leading to the frequent invocation of the explanation of serendipity. Despite the potential influence of luck and chance being less significant than commonly assumed, the utilisation of these concepts reveals important insights. Contrary to popular belief, experimental spaces within creative environments such as incubators are tightly controlled, minimising the role of chance. Throughout these investigations, apparent contradictions abound. Whether attributed to chance or not, the field of innovation remains a mysterious black box, resisting easy insights for external observers. Innovation sites, despite being perceived as fragile and vulnerable, are often restrictive and opaque, guarded as precious entities by the entrepreneurial forces that govern them. This intentional closure adds layers of complexity and challenge, turning innovation into an enigmatic realm that demands closer examination. The intricate interpersonal dynamics within these innovation spaces, with their numerous gradients, offer compelling reasons to research their complexities.

Thus, the empirical exploration (Chapters V, VI and VII) substantiates the hypotheses posited in the theoretical framework through illustrative instances derived from the dataset. In this empirical study, the focus is directed towards the data material, drawing upon examples to validate the theoretical constructs. The investigations unfold within diverse settings, encompassing an *incubator* dedicated to biomedical technologies, a *makerspace*, and a *creative space*. Additionally, I observed interactions within an established *company* and gathered insights from a private entrepreneur who wears the dual hats of investor and innovator. The specific context revolves around three developments in medical technology, supplemented by a broader reference to advancements within the biomedical domain.

Chapter V examines the tangible unfolding of ideas—their inception and evolution—wherein the idealisation of these ideas emerges in response to less-than-ideal circumstances, fostering a (moral) purpose and motivation (subchapter 5.1). Ideas and dreams, construed as forms of imagination, aspire to manifest something grander and superior. Within a prototyping lab visited during my research, potential scenarios transform into utopian visions for inventors, serving as realms for self-

realisation. The orientation toward the future in wishful thinking embodies an idealisation immune to disappointment due to its not-yet-finished nature. The utopia unfolding in the lab carries dual meanings: the prototype transforms into an imaginative utopia for inventors' wishful thinking, and the lab itself comes alive as a space for realising possibilities, thus cultivating a creative ambience in tune with the zeitgeist.

In subchapter 5.2, I reference the pragmatist triad of *thinking*, *feeling*, and *acting*, emphasising problem-oriented creativity that necessitates a conscious perception of a problem before it can be solved. Here, conscious perception is akin to *thinking*, and problem-solving aligns with *acting* in the triad. Both contemplating a problem and discovering a solution are emotionally charged aspects that subsequently evoke *feelings*, completing the triad. Throughout this chapter, individuals from a medical innovation incubator predominantly share their everyday experiences in the clinic. The meaningful discovery of problems reflects their exploration of the inventor's environment and the attention dedicated to it.

In the context of subchapter 5.3, along with the interviewees, I explore the significance of various emotions that foster intrinsic motivation in the innovation process, illustrated by the personal concern felt by the innovators based on their experiences. The innovators unanimously express that their work is fundamentally about making a difference through their inventions, positively influencing their immediate surroundings. The omnipresence of the phenomenon of world-changing action is evident in the available data. Subchapter 5.4 digs deeper into the aspect of inventors striving for *moral impact*. Building on the preceding subchapters, interview partners articulate how they navigate themselves and their environment, invoking concepts related to care. This extends to the world, which is dedicated to one's activity in correspondence with the environment, whether it involves medical technology or not. The guarantors share convictions that shape their purpose and beliefs, sustaining motivation over an extended period. Both elements contribute to the narrative presented when persuading others that the invention is worthwhile, urging them to invest in it, try it, or buy it.

In Chapter VI, the exploration focuses on the substantial challenges emerging within the process of idea generation, imbued with an emotional intensity that intricately shapes the decision-making processes. This encompasses consensus-building, the cultivation of shared values within a team, and the continuous emphasis on the central role of trust. The chapter explores the initial processes of reduction, where an idea, initially envisioned as perfect by the inventor, undergoes negotiations within the everyday dynamics of the surrounding collective.

As elucidated in subchapter 6.1, the origin of many problems often stems from the absence of a common language within a team, necessitating the development of an operational language through collaborative efforts. This proves challenging, particularly given the diverse origins and disciplines of team members, as observed in

interviews and interactions. Experiences and resulting knowledge must be shared, and common goals must be developed to establish shared values. Practising one's speaking competence emerges as a crucial lesson in this context.

In subchapter 6.2, the focus shifts to another facet of collectivisation, where actors with diverse perspectives strive to overcome obstacles and unite into a cohesive entity. While a lingua franca can facilitate successful communication, it also underscores the intricate and multi-layered nature of the course of unification. The data reveals that problems are unpredictable and result from the plurality inherent in this collectivisation process, offering insights into the daily dynamics of innovation spaces.

Subchapter 6.3 maintains its focus on the processes of collectivisation, emphasising that overcoming conflicts is contingent on the existence of trust among team members. The fragility of these 'finding processes' in incubators becomes apparent, with the sustenance of trust being vital for relationships to endure or improve. Various perspectives on trust are explored, underscoring the delicate nature of team dynamics in incubators.

The final subchapter (6.4) delves into the potential danger of failure and the coping mechanism encapsulated in the saying, 'Fake it till you make it'. Interviewees share their strategies to persuade others, even when their ideas seem implausible. The saying becomes a deeply ingrained survival strategy in their daily lives, representing a marathon of innovation launch, where maintaining a composed demeanour and envisioning potential success as already achieved become essential until it materialises.

The final chapter (VII) unveils how the once ideal-based innovation process undergoes a sudden reduction for the purpose of out-licensing. The interviews not only bear witness to narrative adaptations but also reveal the emotionalisation of these narratives, strategically enhancing their market appeal. In subchapter 7.1, concrete examples of potential conflicts that could have been avoided are presented, notably focusing on intellectual property (IP) and the intricate questions surrounding legal ownership, interpretation, and evaluation of ideas. These conflicts underscore the evolving evaluation dynamics within the moral economy, where ideals gradually wane over the course of development.

Subchapter 7.2 captures the challenges faced by some interlocutors in asserting themselves against the expectations of financiers. Once the purpose of an innovation is formulated and a need is addressed, the crucial step involves marketing and emphasising its uniqueness. Here, emotions transform into commodities, creating a marketplace that reveals a distinct culture with clear hierarchies.

In the penultimate subchapter (7.3), the narrative shifts to how emotions are no longer exchanged within the confines of a team, incubator, or financiers but are 'performed' to construct a story on demo day. This narrative revolves around the idea and creation of a (not-yet-finished) artefact seeking a market in the audience. The

concluding subchapter (7.4) accentuates the focus on reduction processes, inquiring about ruptures that disrupt the linear trajectory of innovation development but unfold on an emotional level. This marks a growing de-idealisation of development, where a rationalisation of feelings occurs to render a product marketable.

In this book, I extend the groundwork laid by social science and humanities researchers, particularly within Science and Technology Studies (STS). The prototype, as a research subject, has garnered increasing attention in the social sciences in the last decade (e.g. Dickel, 2019; Guggenheim, 2010; Guggenheim, 2014; Kelty et al., 2010; Nold, 2018). The objective of this research was to consider the prototype as an epistemic object: equally, as a materialised promise of the future or, through it, to recognise a form of experimentation inherent in the not-yet-finished thing. The same applies to the concepts of creativity and innovation, which have received no less attention. In a 'Do-It-Yourself (DIY) society' that is not only dedicated to repairing but to creating and has generously begun to share its knowledge and experience on the internet, the concept of creativity has now gained a great deal of importance in the literature (e.g. Florida, 2004; Moultrie et al., 2007; Reckwitz, 2017). In this context, creativity is increasingly perceived as a sensual-affective activity intertwined with innovating, serving as a prerequisite for the emergence of novel creations.

However, determining what qualifies as 'new' is not within the sole purview of innovators or inventors; it involves a negotiation process between society and innovators. The term 'innovation' has become pervasive, used almost carelessly by both scientists and entrepreneurs, possibly influenced by political calls emphasising innovation as a solution to grand challenges (European European Commission, 2010; Pfotenhauer, 2017). From Joseph Schumpeter's initial definition in 1911 to the present, innovation, described as 'destructive creation' (Schumpeter, 1942; Schumpeter et al., 2006), has repeatedly taken centre stage. Scholars from various disciplines have explored innovation, examining its social dimensions, success factors, and impact on various sectors (e.g. Briken, 2006; Curnow & Moring, 1968; Godin, 2017; John, 2012; Moultrie et al., 2007). Even entrepreneurs highlight corporate culture and collaborative joy as crucial success factors (Løw, 2018).

STS typically focuses on the sociality of technological artefacts, critically examining and predicting social developments. However, the analysis often revolves around Foucauldian power asymmetries within socio-material structures (e.g. Maasen, 2019), offering a view of structures but neglecting experiential content. The study of society in various fields, including science studies, the history of science, and sociology, is increasingly emphasising emotions, feelings, and affects as objects of study (De Sousa, 1987; Döveling et al., 2010; Hochschild, 2012; Illouz, 2017; Krüger & Reinhart, 2016). Yet, these elements have not been thoroughly explored as factors in technology development.

Research in the humanities and social sciences on the communicative function of prototypes is still nascent. Therefore, my book ventures into mostly unexplored

academic terrain, utilising qualitative methods to approach the intersection of innovation and emotion. I scrutinise narratives of innovation through the lens of circulating prototypes, considering their occasional 'openness' in iteration loops as conducive to studying innovation processes. This contribution challenges the critical rationalisation of knowledge production processes within innovation and science research. By probing emotionalisation, my work questions evaluation criteria and patterns, providing a different perspective on knowledge accumulation processes in innovation research. As an STS researcher, I posit this book within Responsible Innovation and Technology Assessment, revealing the social mechanisms conditioning the connectivity and acceptance of technical development paths. This work illuminates how ruptures in innovation-making transpire, and prototypes ultimately align with a specific market logic, contributing to the re-enactment of innovation rather than preserving initially present social ideals, which are progressively neglected in the course of development. Through this alternative exploration via emotions, the work identifies moments that emphasise social ideals and highlights instances where they are disregarded.