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The role of context in science fiction prototyping: The digital industrial revolution

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ABSTRACT

Fabcreating, a highly sophisticated form of 3D printing, has become ubiquitous by 2033. We outline how digital fabrication might evolve in a science fiction prototype (SFP) and provide a 2033 use case in which consumers produce their own highly customized consumer electronics at home. It shows how consumers virtually select, customize and print mobile phones and highlights how digital fabrication impacts society at large. Our technology outlook is backed by expert interviews. Our story vignette forms a showcase to address the role of technology, creativity and context in SFP. We address the anatomy of SFP and argue that context is important in order to promote opportunity recognition and to envisage game changing technologies and their societal impact. We develop a SFP typology based on a technology prototype and context prototype perspective.

1. Introduction

In our futuristic story vignette in 2033, consumer electronics (CE), an industry once dominated by large multinationals, is characterized by countless players in the market. Fabcreating, an extension of 3D printing and printed electronics, has propelled the digital industrial revolution substantially. Products can now be directly custom-designed without having to undergo time-intensive and expensive prototyping [1]. Home fabcreation fundamentally changes how we approach, design, buy and produce, and how we interact as a society at large. Our story vignette is about how mobile phones will be ordered and customized in virtual stores and printed at home. But what will the future in consumer technology be like by 2033, how will we buy our products and what about production processes?

One may suggest that globalization, technological change and turmoil on the financial markets lead to an increasing level of dynamism that decreases predictability of future developments considerably. According to Mehrmann [2], a defining nature of the market environment for consumer technology is rapid change paired with an exponentially decreasing time to deliver new technologies to market. This goes hand in hand with shortening technology life cycles. Spreng and Grady [3] outline how mobile devices have evolved from early analog models in 1983 to mobile computing devices. Smartphones integrate touch screen, broadband access, camera, video functionality, GPS, high computing power and a seemingly endless amount of applications and serve as an example of a constantly changing environment in consumer technology [3]. Formulating strategy, retaining competitive advantage and innovating in this environment are highly challenging endeavors. Experts largely agree[1] that digital fabrication technology will allow to deliver new applications beyond customer expectations. But can we predict future technology and how consumers and society at large will interact with it?

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Technology forecasting is an established practice to serve this need [4]. According to Martino [4] modeling has become the most widely employed technique by the end of the 1970s. Today, there are models for effective information analysis and forecasting based on publications and patent information (e.g. [5]) and due to advances in computing, models have grown increasingly complex. Expert-driven qualitative methods such as the Delphi method, scenario analysis or mind mapping got developed over decades (for a detailed review please refer to [6]). Some recent approaches are of a very integrative nature. For instance Tseng et al. [7] propose a four-stage method that combines conjoint analysis, scenario analysis, the Delphi method, and the innovative diffusion model in order to forecast TV display technology adoption in Taiwan. It is crucial to understand consumers' needs and to include expert opinion when analyzing new technology developments [7]. Most conventional techniques to anticipate the future are centered on algorithms forecasting events and analyses resting on a quantification of outcomes based on historic information or current trends which do not reach into the future. One of the major challenges in engineering research, design and associated fields lies in starting to build today what will be feasible several product cycles in the future. Futures research is thus increasingly gaining in relevance and also, from a scholarly perspective, in legitimacy [8].

An additional method to established forecasting practice that has recently gained substantial momentum is science fiction prototype (SFP) [9,10,8,11]. In order to support product innovation at Intel, futurist Johnson [12] has introduced SFP, which has a high potential of mitigating several shortcomings (e.g. still sticking with the past context looking into the future) of established forecasting practice. SFP leads to future scenarios in story vignettes (in the form of e.g. short stories, videos, theater plays, comics) and is increasingly employed and established as a method in futures research ([9,10,8,11]). Whereas physical prototyping has become a common tool in foreseeing what is feasible in terms of tangible opportunities [13–15], SFP is surprisingly still under-represented. SFPs are conceptual instead of physical [8]. In a large survey-based study Carleton and Cockayne [15] reveal that (physical) prototyping is conducted only in the later stages of the corporate innovation process. So why do organizations omit the obvious advantages associated with prototyping in the beginning of this process during opportunity recognition? We support recent developments in the SFP field by claiming that this methodology is an adequate tool for corporate innovation processes at the fuzzy front end [16]. It deserves more attention due to its high potential in helping future technology to advance, to foster technology transfer and to anticipate future contexts and social interaction (see e.g. [17,9]). The underlying goal of SFP is to present new perspectives on a technology that can actually feed into its real development [18,12]. Thus, it can provide specific scenarios and illuminate both benefits and pitfalls before they actually occur and can overcome several limitations of quantified trend and future analyses that rest on data from the past.

Wu [9, p.2] introduces an innovation triangle (Fig. 1), which “depicts how an SFP is formed by motivating technology, imagination, and creativity to achieve innovation, which stimulates entrepreneurship to create new ventures” and was developed to improve imagination workshops. We argue that these dimensions are highly relevant but an additional dimension, future context is needed. Only when one or more future technologies intersect with creativity and the relevant future environmental and societal context, can we derive the highest value from SFP (Fig. 2). This is what we will later define as a radical SFP that then fosters opportunity recognition, entrepreneurship, innovation and new venture creation in an optimal combination.

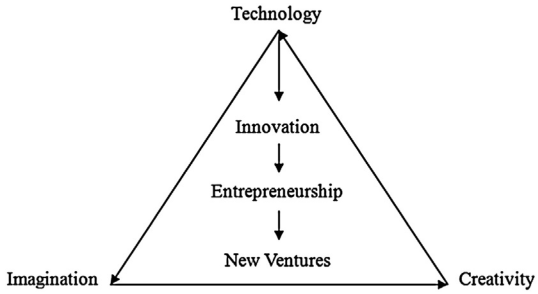

Fig. 1. The innovation triangle: three components of technology-based innovation and entrepreneurship are creativity, imagination and technology. Note: illustration according to Wu [9, p.2].

At hand of a highly transformative technology, we will use SFP as a method. We will outline the establishment of a paradigm shifting radical technological change and envision a potential use case in 2033 affecting society in an interlinked story vignette that stresses the importance of future context. The implications derived from the SFP lead us to a suggested framework that addresses how context is decisive in developing future technologies for future environments. Our underlying goal and third objective is to further advance SFP as a scientific method by enriching it with a proposed typology and linking it as a source of creative inspiration and creative visioning to entrepreneurship and innovation. We advocate SFP as a powerful tool to facilitate opportunity recognition. A shortcoming of most research on entrepreneurship is that it starts investigating the process after opportunities have already been discovered [19].

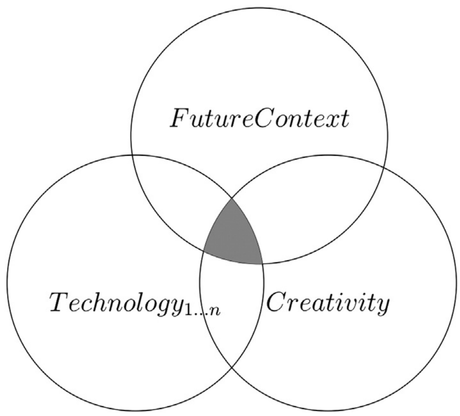

Fig. 2. A lense for SFP. Note: the gray shaded area represents the optimal constellation for high-impact radical SFP. Only in this constellation there is a match of future technology, creativity and relevant context.

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