More than new technical devices: a semiotic look at the digital transformation of industry

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During the past decade, various programmatic writings have predicted that industry will undergo revolutionary changes in the course of the digital transformation (Kagermann, Wahlster, & Helbig, 2013; Lee, 2006). New engineering approaches in the context of the internet of things, cyber-physical systems and big data are expected to open up radically new paths of technical development (Gölzer & Fritzsche, 2017; Monostori, 2014). They will not only allow the creation of new kinds of technical artefacts, but also alter the process of technical design. In the future, engineering will accordingly be less concerned with the creation of static devices with a determinate function. It will instead revolve much more around the continuous evolution of larger superstructures whose parts have to be updated and adapted in short intervals (Neely, Fell, & Fritzsche, 2018). A clear distinction between design and maintenance tasks in engineering will become increasingly difficult and the work of engineers will rely much more on interactions with other groups of people involved with technology (Fritzsche, 2017).

In this paper, we study the effects of the digital transformation on manufacturing processes in industry, where a large number of different programmes have been started to support the introduction of novel technology (Oks, Fritzsche, & Möslein, 2017). We focus in particular on transitions in engineering practice from old to new design and maintenance procedures. We propose that these transitions cannot be appropriately described as an adoption of a new toolset of engineering, but that they rather have to be compared to learning a new language (Franssen & Koller, 2016; Fritzsche & Oks, 2016). As such, they require a deeper semiotic study of the way how meaning is attributed to technology.

Observations in different companies allow us to describe the learning process in more detail. All these companies have started projects to implement new technical solutions which involve cyber-physical systems and big data. We look at the way how employees of the companies and their business partners gradually gain “fluency” in the new, digital “language”. We discuss the importance of “active speaking” in contrast to “passive listening”, not only to get a better grasp of the new vocabulary and grammar, but also to motivate the engagement with the new language instead of sticking to the old one. Furthermore, we look at the involvement of new interest groups in engineering, such as maintenance technicians and device users. Their involvement turns the attention to the collective effort necessary to make the transition and the media that allow participation. We present different examples of such media which either support design or maintenance activities.

Our findings let us believe that the language-based approach can add an important new perspective to the study of engineering and technology. Current theories of technical artefacts and their design do not seem able to give a full account of the dynamic and fluidity of the digital transformation, especially when it comes to participatory activities in which engineers engage with other groups of people involved with technology.

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