beyond the question of physical harm to others. We believe that in a time when the use of logical machinery is a part of so many of the practices that make up our lives, we need concepts that take into account not only the "effects" of technology on culture, but which recognize that technology *is* a form of culture: embodying not just the homogenous logic of "Gestell," but being continuously differentiated into a plurality of forms, practices, values, and power struggles.

There is a growing amount of empirical work on large software projects to which social scientists have contributed. However, looking at the field of software design we should ask whether our concepts of technology are adequate for grasping the multiplicity of possible connections between methodologies, the artifacts they produce, and the consequences for society. The humanities could take up the task of broadening our still very restrained technological imagination and lead the way towards modes of production that facilitate finding other liaisons between the human and non-human than those marked only by domination, efficiency, and convenience.

4.2   The Technologist Discourse

If we recognize software design as a pluralistic and fractured practice which takes a part in shaping the fabric of the world in which we live, we have to rethink our stance not only as theorists, but also as creators of technology. Terry Winograd and Fernando Flores wrote nearly twenty years ago that "we encounter the deep question of design when we recognize that in designing tools we are designing ways of being" (Winograd and Flores, 1986). A dialogue between the different groups implicated in designing software is necessary to foster awareness of the cultural dimension of their work. A start has already been made: a part of the *open source* community has adopted an explicit stance on the political issues surrounding their technical efforts and the software design community is making a strong effort to link up with the humanities.

The field that is lagging severely behind is education. There is still very little discourse between technical departments and the humanities, and current curricula are neither fit for producing the "culturally-aware technologist" nor the "technically-aware theorist". Herein lies the true challenge of bridging the dichotomy between culture and technology: bringing the more inclusive understanding of technology that is currently emerging to places where it can have an effect.

4.3   Policies

The third area of our discussion is policy, and luckily there is already a very lively debate going on in this area, especially around the questions of software patents and *open source*. The discussion however is strongly centered on economic and juridical questions, treating the cultural aspects as mere collaterals. It is rarely recognized that the creators of technology, operating outside of the classic pathways of established

industry, are a crucial part of civil society in that they actively produce means for expression and action. Only when we understand writing software as one possible way of participating as a citizen can the political issues be properly addressed. The state, as the arbiter in the ongoing battle around software patents, will have to decide whether the amorphous coder communities sprawling on the Web, that put their work at the disposition of the public domain, are of special value to society and therefore worth protecting against the overwhelming financial capacities of the established commercial actors. The new design practices that we have tried to present and theorize in this chapter are by no means inevitable; although the Universal Machine is a strong base for the social and cultural activities surrounding them, the free flourishing of technical creativity is a fragile thing that can easily be reduced to the point of mere hobbyist dabbling, as it was the case with many other technologies. There is (still) democratic potential in the new metamedia and we will have to decide whether we want to nurture it or not.

5   Conclusion

We have entitled this chapter "beyond engineering", because the term "engineering" has come to stand for the technocratic separation between a sphere of technology and a sphere of culture, society, and politics; for a mindset that treats the creation of technical artifacts as a detached and orderly process, closer to calculation than to creativity. The modern ideal of engineering as a politically and culturally neutral process – unspoiled by human motivations and uncontaminated by morals and emotions – appears today to be rather anachronistic. A closer look at software *design* shows that there are multiple methods, strategies, and mindsets guiding the creation of programs, systems, and applications. Our short analysis of the *open source* scene is evidence that extensions to classic methodologies, alternative routes, collaborative approaches, and auto-organized forms of workflow are both possible and effective.

We believe that the fluctuations in how technical artifacts are created are not just minor adjustments but necessary adaptations to the changing place of technology in our societies. As technology infiltrates the practices that make up our everyday lives, culture *stabs back* by invading the terrain of production, bringing all its contingencies, contradictions, and complexities along. Their separation was never clear anyhow, but the level of interpenetration has reached new heights today. The immaterial qualities of software, distributed into space using the global infrastructure of the Internet, affect an increasing number of people, users as well as designers. We have called the resulting space of production, distribution, and consumption an *extended culture industry* where the boundaries between consumers and producers are blurring and social and technical forces are closely intertwining.

While there is some understanding of how to channel social forces in a democratic fashion, it is still unclear how we can achieve the same for the technical part of the hybrid. It now seems evident that in high-tech societies the creation of tools and