

Society – Technology – People**Theory-Interviews on the relationship between societal and technological change.*****Interview with Prof. Dr. Richard Münch***

This interview was filmed in Bamberg on 31 July 2018. The interviewer was Michael Tiemann. It is part of a BIBB-research project on „Polarisierung von Tätigkeiten in der Wirtschaft 4.0 - Fachkräftequalifikationen und Fachkräftebedarf in der digitalisierten Arbeit von morgen“, funded by BMBF.

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1 Where do we find sources for technological change and social division of labour?

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3 Let us start by saying that both individual persons as acting as innovators to drive
4 forward technological developments and technology itself are embedded into society
5 and culture. And my assumption is that these four factors, technology, personality,
6 society and culture, form an interactive pool in which technological development is
7 hampered or driven forwards. There are thus cultural factors which foster or hinder
8 technological development. And there are factors in society which are advantageous
9 and disadvantageous in this regard. Society can then be further differentiated into the
10 economy, science, politics and civil society. From my point of view, these form the basic
11 components or fields of society. They can be referred to as sub-systems. Their
12 interdependence can also either foster or hinder the development of technology. Culture
13 and society thus act in combination with existing technology and individuals who are
14 more or less prepared to take risks and have a visionary idea of the future. Let us begin
15 with the innovators. Although it seems tautological, the question needs to be posed as to
16 what innovators are. What prerequisites do they need to bring to the table? What
17 characterises them? First of all, it needs to be said that innovators are predominantly
18 young people who are at a relatively early stage of their professional career. They have
19 the courage to deviate from conventional thinking and norms and are prepared to take
20 risks and also accept failure. We know, for example, that the disparity between the
21 resources available to a person and the objectives which he or she is pursuing provides
22 an initial motive to remove such a discrepancy. One famous typology was particularly
23 propounded by Robert Merton, a great American sociologist whose heyday came in the
24 1950s although he also continued to produce influential work later. His typology deals
25 with types of adaptation to the situation of discrepancy between aims and means. This
26 may initially be overcome by adjusting aims to means, an approach, termed by Merton
27 as ritualism, which involves giving up the objectives. Many people do this and thus, in a
28 certain way, are ready to be satisfied with the opportunities available to them. They are
29 content to lead a modest life. Then we have those who wish to continue to pursue their

Society – Technology – People

Interview with Prof. Dr. Richard Münch

30 aims by using different means. It may be that such objectives are not legitimate. In any
31 case, they will contradict the prevailing knowledge and norms. Merton designates this
32 category as innovation. Innovation may also involve breaking the law. There is thus a
33 commonality between law breakers and those we like to describe as innovators in
34 science, in the economy and in civil society alike. Then there are those who wish to
35 change both the means and the goals. Such people are not satisfied with the existing
36 circumstances and therefore turn to rebellion or revolt. They are also keen to change the
37 political situation. So social movements and political movements seeking something new
38 are innovators within the political sphere. Within this spectrum, we also need to see that
39 innovations are particularly driven forward by individual persons who require the courage
40 to do so, take risks and, and are able to fail. A further distinction may be drawn between
41 those who have major visions and wish to perform pioneering work such as scientific
42 and economic breakthroughs, and those who resolve minor problems by continuing to
43 improve and develop existing technologies. These are two types of innovators. The first
44 could be termed as revolutionaries who operate across all sectors of society, i.e. in
45 science, economics and politics. Then there are tinkerers who work on small problems
46 and engage themselves with the task until the problem is solved. Technology exerts an
47 ambivalent effect on further technological progress. Usually, some kind of technology
48 will be in place from the start. This can be a driver forward to begin with if it is still in its
49 early stages and still offers potential. New areas of application for the technology can be
50 opened up, and connections with other fields can be established. However, the more
51 developed a technology is, the more it will act as an obstacle to technological change.
52 This is because it has occupied a position and cannot easily be removed. One example
53 would be the Transrapid high-speed monorail train system. Germany spent many years
54 and even decades trying to drive forward its development, but the great problem for
55 Transrapid was the presence of competition in the form of existing technologies.
56 Automobile transport, road construction, conventional rail travel and the ongoing
57 development of aviation were all rivals from the outset. At present I would say that the
58 potential of computer technology and microelectronics, which after all have been
59 governing our lives since let us say the mid-1980s, is not yet exhausted. The latest wave
60 of digitalisation, artificial intelligence and robots, is driving technological development
61 further. Then we have the Internet of Things for example, which is still in its infancy. This
62 is something which is of great significance to the economy. Exchange, procurement and
63 distribution of goods can take place in digitalised form and thus avoid the frictional
64 losses of the past. And this is something that will continue to drive forwards. Until
65 something new happens which we do not know about yet. So this is a technology that is
66 still being developed and is covering all the areas of society. We can see here that
67 technology's expansionist force means that it becomes a driver of technological
68 development itself until its potential is completely exhausted. At this point, it tends to
69 become an obstacle to further technological development. Now we come to cultural
70 enlightenment. I have already indicated that this is associated with a high level of
71 individualism and a high degree of dissemination of education. Schooling becomes
72 mandatory and more widespread. This provides us with a starting point for continuing to
73 expand the potential for the development of knowledge. Experiments are, for example,
74 also undertaken on certain value systems which identify the innovativeness of cultures.
75 The field of business economics makes very frequent reference to the social
76 psychologist Hofstätter. He, for example, found out that individualism leads to a

Society – Technology – People

Interview with Prof. Dr. Richard Münch

77 relatively small power gap, where hierarchies could be said to be flat, with equality in
78 terms of the ability to make assertions, exercise criticism and embrace risk. This is seen
79 as characteristic of cultures that are particularly innovative. This brings us back to the
80 innovative personalities which I mentioned at the start. Of course, these do not grow on
81 trees. They can be more or less nurtured within an existing culture. Returning to the
82 ideas of Max Weber, whom I have already mentioned, our culture—let us say the
83 western culture—is marked by a strong contradiction between notions of a good and
84 ideal society and reality. A discrepancy is thus perceived between idea and actuality,
85 and this drives forwards societal development to a certain extent. Reality is always
86 worse than our ideal, but we are constantly seeking to adapt it to fit to this ideal. In the
87 case of society, the thing that I would emphasise at this point is generation dynamics.
88 My picture is of a society that is differentiated into various functional areas rather than
89 consisting of a uniform block. Each of these functional areas exerts its own respective
90 dynamism—the economy, science, politics and civil society. Let us look here at civil
91 society or population structure, succession of generations are also transferred to the
92 other functional areas, the economy, science and politics. It can be said that
93 competition, good chances of advancement and relatively unproblematic generation
94 sequences are driving factors. When upcoming generations have an opportunity to take
95 over key positions, this produces a particular dynamism which translates itself to
96 technological developments. We can say now that we have a problem with regard to the
97 fact that there are fewer and fewer young people. The average age of society keeps
98 rising. Although this means that young people will be in demand in the future, we also
99 have a situation where older people have also occupied the key positions for a very long
100 time. Due to the question of pensions, such people should work for as long as possible,
101 meaning that crucial roles do not become available to the young in a timely enough
102 manner. There are also differences in the various societies. In order to examine these, a
103 detailed study would need to be undertaken of systems in areas such as science and
104 the economy. #00:15:28-4#

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107 **Which consequences will arise from technological change?**

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109 The dynamism inherent in every technological development will, of course, have a direct
110 impact on work. This applies to self-employment, home office use and companies alike,
111 because people are constantly using new technologies. The question is the amount of
112 time people need to adapt to dealing with and using the new technologies. This brings
113 us to the point that the sequence of technological change is becoming more dynamic.
114 Within this context, the idea of lifelong learning is also growing in terms of its actual and
115 perceived significance. Digitalisation will bring about a major change to the world of work
116 and to people's living environments. We cannot yet foresee the specific form that this
117 change will take. The first question that arises is always: Where will jobs disappear and
118 at which qualification level? There is reason to assume that the limit of qualification level
119 is constantly being pushed further and that earlier technology has always replaced
120 simple tasks by making them superfluous. Digitalisation and artificial intelligence, indeed
121 as the name of the latter term suggests, are learning machines. They replace human
122 intelligence to a large degree. A few months ago, I examined a different context by

Society – Technology – People

Interview with Prof. Dr. Richard Münch

123 looking at the development of digital technologies in teaching at schools. The Silicon
124 Valley vision—and now we arrive at the topic of visions—is that a learning programme
125 installed on a tablet enables pupils to experience completely individualised learning. This
126 means that the programmes used are fully tailored to the learning progress made by the
127 individual pupils. The programmes themselves are also able to learn via algorithms.
128 What is left for the teachers to do? Their conventional work in the classroom will be
129 increasingly replaced by the learning programmes, and their role will become more like
130 that of coaches to the pupils. Some calculations indicate that digital learning will reduce
131 the required teacher-pupil ratio from 1 to 25 to 1 to 250. In other words, only ten percent
132 of teachers will be needed. What will the teachers do? Well, they could study psychology
133 and thus be able to offer better assistance to pupils who are struggling with learning and
134 school. After all, there is a shortage of pupil support services. Perhaps we need more
135 social education workers. They would be able to focus more on the social problems
136 which are currently becoming ever more apparent at schools. There are inclusion
137 problems and a major gap in performance levels according to social origin. Social
138 education work is probably more effective at tackling these than a pedagogical
139 approach. Such support services, including mentors providing assistance to families,
140 would open up a new professional area or increase demand within an existing
141 occupational field whilst another professional area would shrink in size. This would be an
142 optimistic approach. Digitalisation of the world of work will occur in the same way as all
143 technological innovations. Certain jobs will be lost, and others will be created. I think we
144 are right to tend towards optimism. #00:20:49-7#

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147 **How are drivers and consequences of technological change connected?**

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149 In principle, the mechanisms are similar. The point is always that knowledge and
150 discoveries are transferred to inventions. This gives rise to technology which must be
151 launched onto the market. A new business area then needs to be opened up. If these
152 transitions do not take place, all new discoveries and inventions will become stuck in the
153 mud. They will not be able to continue the journey, and further development will not
154 occur. There must therefore always be this link from science via technological
155 developments to economic implementation into products which are then disseminated
156 on the market. This may, of course, take place in different frameworks. Mutual
157 intervention by science and the economy is thus crucial. Nowadays, this is particularly
158 driven by regionally concentrated networks. All countries in the world have such regional
159 concentrations. These concentrations initially allow firms to network. As technological
160 development progresses, however, they also need access to knowledge produced by
161 research. At present and over the recent past, we have the paradigmatic example of
162 Silicon Valley. The focus here is less on fixed cooperation networks between firms and
163 industrial companies providing mutual support in the development of products. The main
164 emphasis is rather that many small start-ups are located within the immediate vicinity of
165 one another. This leads to mutual motivation as each company strives to be faster than
166 the others but also enables an exchange of expertise. These are networks which have

Society – Technology – People

Interview with Prof. Dr. Richard Münch

167 developed in a relatively spontaneous way, and their membership changes. They spring
168 up, exist for a certain time and then disappear to be replaced by others. Proximity to a
169 university, Stanford University to the South of San Francisco, is crucial to Silicon Valley
170 and there are many students, who begin to tinker with technology whilst they are still
171 studying. University spin-offs then are also a strong driving factor. This is a mechanism
172 which takes scientific curiosity and knowledge into what we could justifiably term a profit-
173 hungry environment. The people involved, however, are not merely out to earn money.
174 They have visions and a desire to change the world. #00:24:45-9#

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177 **What measures can be taken to steer technological change?**

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179 It depends what sort of development we have in mind. There is, for example, the quiet
180 development of existing technologies in or near the workplace in cooperation of skilled
181 workers and engineers. This definitely benefits from regulated conditions that govern
182 secure jobs and are the result of policies aimed at achieving a coordinated market
183 economy. On the other hand, such an approach makes it harder to encourage disruptive
184 development. This means that opportunities need to be put in place for people who are
185 prepared to take risks, to set up companies which may fail and to start all over again and
186 try something new rather than being fazed by failure. This means that general conditions
187 must be in place to deal with matters such as the winding up of failed companies so that
188 something new can easily emerge. The dying off of old companies and the
189 establishment of new ventures must be possible. From the political point of view, this is
190 more likely to create comprehensive change. The same applies if less private risk capital
191 is available, when policy makers are called upon to provide and fund such capital.
192 Policymaking can also help to boost science by ensuring, for example, that young
193 scientists can be appointed to responsible positions earlier. I believe that we have a
194 considerable need for reform in this regard. I would abolish the professorial teaching
195 structure in favour of a departmental system to bring much more dynamism into science.
196 The sooner young talented scientists are able to work autonomously, the sooner they
197 are able to make their own decisions on methods, theoretical perspectives and
198 instruments to be deployed, the greater the dynamic development of knowledge will be
199 and the faster new knowledge will emerge. Conversely, knowledge will develop less
200 dynamically as long as these young scientists remain dependent on a professor. Or, the
201 wider the spectrum for the institutionalisation of new knowledge, including with regard to
202 the dissemination in teaching, the more effective the implementation of a development
203 will be. Again, a distinction needs to be drawn between the professorial system and the
204 departmental system. In Germany, we have a professorial system with a small number
205 of professors for each subject. A German university may perhaps have fifteen professors
206 in a subject like physics or chemistry. All others are in a dependent position. There are
207 non-professorial teaching staff, post-doctoral scientists, junior researchers and
208 graduates who have been recruited to carry out research projects initiated by these
209 professors and are thus always in a status of dependency. Such a system offers fewer
210 opportunities to implement this research because the focus is on a professor to whom
211 staff are subordinate. Anyone developing something new will find it harder to realise
212 ideas in a professorial structure. In the USA, the departmental system prevails. Each
213 faculty will have between forty and sixty professors. All work autonomously, and

Society – Technology – People

Interview with Prof. Dr. Richard Münch

214 everyone can contribute his or her specialism. If someone is doing pioneering work,
215 there will also be good chances of obtaining a professorial appointment because such
216 specialisation will be in demand at professorial level. In Germany, all specialists have to
217 pass through the eye of a needle, so to speak, because of the major professorial chairs
218 which represent a broader field. This means that there are fewer opportunities for
219 teaching to encompass new developments and differentiations in various specialist
220 disciplines and in intermediate disciplines. All of this can be transferred to causal
221 hypotheses. If the education system makes early experimentation possible and if pupils
222 are able to pursue their own thoughts instead of being indoctrinated, the amount of
223 technological potential emerging from schools will, for example, increase. Perhaps the
224 focus now should be on carefully encouraging schools to move in this direction. This will
225 engender interest, and the process can then be continued at university. Policies can
226 therefore be put in place to foster all of these areas. Schools can take action,
227 universities can support young scientists to drive things forward. Employers can, of
228 course, seek to recruit and encourage the development of particularly creative workers.
229 This means creating incentives to bring about changes in companies. Instead of taking
230 on conformists, firms need to recruit the types of persons who are not afraid of opening
231 their mouths or of questioning and criticising superiors. This means that there will be
232 openness to criticism across all sectors of society and in employment in particular. This,
233 I believe, is an area in which development is required.