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Digitalization in the Manufacturing Sector: Skills in Transition

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QuInnE - ***Qu****ality of jobs and* ***Inn****ovation generated* ***E****mployment outcomes* - was an interdisciplinary project investigating how job quality and innovation mutually impact each other, and the effects this has on job creation and the quality of these jobs.

Drawing on the Oslo Manual, both technological and non-technological innovation were investigated. Through quantitative analyses and qualitative organization-level case studies, the factors, as well as the mechanisms and processes by which job quality and innovation impact each other were identified.

The QuInnE project brought together a multidisciplinary team of experts from nine partner institutions across seven European countries.

QuInnE Project Member Institutions:

- *Lund University, Sweden*
- *The University of Warwick, UK*
- *Universitaet Duisberg-Essen, Germany*
- *Centre Pour La Recherche Economique Et Ses Applications (CEPREMAP), France*
- *Magyar Tudomanyos Akademia Tarsadalomtudomanyi Kutatokozpont, Hungary*
- *Universiteit van Amsterdam, The Netherlands*
- *Erasmus Universiteit Rotterdam, The Netherlands*
- *Universidad de Salamanca, Spain*
- *Malmö University, Sweden*

The project ran from April 2015 through July 2018. The QuInnE project was financed by the European Commission's Horizon 2020 Programme 'EURO-2-2014 - The European growth agenda', project reference number: 649497.

More information about the project and project generated publications and material can be found at www.quinne.eu.

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The QuInnE teaching cases and teaching notes are based on the confidential field research conducted in the context of the QuInnE project. They are written to provide material for training and class discussion rather than to illustrate either effective or ineffective handling of a management situation. Personal names and identifying information from the research cases have been altered for the purpose of confidentiality. The case studies and teaching notes have been developed in cooperation with RSM Case Development Centre of Rotterdam School of Management, Erasmus University (www.rsm.nl/cdc).

Digitalization in the Manufacturing Sector: Skills in Transition

50-year-old Paul Sandberg glanced up from his CNC (computer numerically controlled) turning machine to the computer control office above him on the 2nd floor of the workshop. A new programme had been initiated that morning, and despite earlier tests, something wasn't working well. So he was waiting for Jonas Holm, the 27-year-old computer technician, to come down and fix the problem.

Sandberg had been manufacturing parts as a machine operator for several decades. He had learned machining hands-on, had known what a part should feel like when it was well done, and he had learned to make manual alterations in the machining process to fix problems as they occurred. But all of that had changed about 15 years ago, when new technologies, including 3D CAD/CAM (computer-aided drawing and manufacturing) and CNC machining, had been introduced in the company.

The entire design and manufacturing process had been overhauled. Designs were now made from the viewpoint of assembly, not machining, with 3D manufacturing instructions. Technicians, such as Holm, then developed computer programmes from the 3D instructions for the CNC machines. After testing, the technicians connected their computers on the 2nd floor to the CNC machine on the ground floor, and installed the programme. The technicians were responsible for checking that the machine worked as expected in collaboration with the operator. They also provided the operator with simplified paper working instructions. Overall, the increased digitalization appeared to be good for the skill development of the technicians. As Holm noted:

> Digitalization has developed our competencies. It's positive because that's what the company needs: complex job tasks.

The operators, on the other hand, had to accept a decrease in autonomy and job discretion because of the manufacturing technicians' programming of the machines. Sandberg, as other older operators, was skeptical about the understanding of the processes underlying the 3D drawings and the work of the CNC machines. He argued that:

> The company should try to employ some older people, with more experience...[because]... those my age and 50+… here is a fantastic competence.

When CNC machining had first been introduced, the operators had been trained to programme the machines themselves; now, with 3D CAD/CAM, technicians were responsible for programming and programme modifications. One of Holm's colleagues commented:

> We received many new machines in the years 2013-2014. We started to work extensively to train the operators. They had to learn more, dare to test more, and to take greater responsibility.

As Sandberg could testify, the operator jobs had drifted away from craftwork, to simply setting and controlling the CNC machines. According to experienced operators, the jobs had been "de-

skilled"; knowledge of the craft of machining was disappearing. On the one hand, older employees felt that their hard-earned experience and knowledge had lost importance and become almost worthless; on the other hand, new machine operators could more easily and quickly be trained for the job.

Computer programmes now controlled the process. Sandberg expressed this:

> Like other operators my age, I am experienced in turning. I began my career turning manually. You developed a bit more feeling for what you were doing. You came closer to the material; you could see what was good and what was not good. Youngsters, that only use steered machines, they don't get that feeling. People older than me, they are phenomenal to turn manually. This competence is disappearing; it's a craft that's disappearing here.

There were other drawbacks as well, including a loss of job discretion and potential boredom:

> It's not much problem solving. In case of problems, we call the repairer.

But this also resulted in less stress:

> It's good to escape problem solving. It's stressful, when you know that there is a rush for more...to be produced. If I stand here and try to fix [a problem], nothing happens.

There was some variety of work for Sandberg; with the increasing growth of the company, operators were manufacturing a greater variety of parts, so he needed to adjust the CNC machines more often.

Sandberg's young colleague, Holm, had worked as an operator for seven years before being promoted to computer technician. But he had started his career after the introduction of the new technologies, so he had never had to manually machine a part himself. There was always an absence of this shared experience and knowledge whenever he tried to "speak the same language" as Sandberg or the other older operators. Still, digital technologies for him meant a bright future. The increased variety of components that Flying Parts was manufacturing meant that he was gaining in knowledge and experience in conversion of 3D drawings to manufacturing instructions for programming and to 2D instructions for operators. But it also meant a more stressful job.

> At times, it can be extremely stressful. The psychosocial environment is very tough, I think.