

Corvinus University of Budapest

**Doctoral School of Sociology and
Communication Science**

THESIS BOOKLET

Shaping Labor Expectations in Industry 4.0:
Automation, Policy, and Workforce Dynamics in
Turkey's Food Industry

Ayse Aysu Sinik

Supervisors: Dr. Mária Lilla Vicsek and Dr.
Róbert Pintér

Budapest, 2026

I. RESEARCH BACKGROUND AND JUSTIFICATION FOR THE SELECTION OF THE TOPIC

1.1 Research Background

Industry 4.0 refers to the integration of interconnected, automated, and data-driven technologies into industrial production and represents the manufacturing dimension of the broader Fourth Industrial Revolution (Schwab, 2016; Özyıldırım & Özbay, 2019). Technologies such as artificial intelligence, robotics, intelligent machinery, and digital monitoring systems are associated with improvements in productivity, efficiency, and quality control. Their implications for labor extend beyond job creation or displacement to changes in tasks, skill requirements, the value of different forms of knowledge, and employees' expectations about their future occupational positions.

These changes do not depend on technology alone. They also depend on decisions made within organizations, workforce conditions, public policies, and access to training and technological resources. In Turkey, where parts of manufacturing have historically relied on labor-intensive production and cost-based competitiveness, these questions are particularly relevant (TÜSİAD, 2016; Yılmaz, 2016). The introduction of new technologies therefore raises questions about how responsibilities

change and how workers prepare for and adapt to these changes.

1.2 Justification for the Selection of Turkey's Food Industry

The food industry provides a relevant setting for examining these questions. Automation, intelligent sensors, digital monitoring, and data analytics can support efficiency, food safety, quality control, and sustainability (Paoli, 2020; Hassoun et al., 2023). Their adoption nevertheless varies according to firms' financial resources, technological readiness, organizational capacity, and workforce competencies. Earlier research showed that the use of technology differed across subsectors of Turkey's food industry (Kaya et al., 2010). This provides historical context, but does not establish how these differences appear across the sector today.

Food production also involves variable raw materials, seasonal and fluctuating demand, strict quality requirements, and a continuing need for operational flexibility and contextual judgment. These conditions can limit complete or uniform automation in some processes, leaving automated systems and human expertise interdependent.

The selected policy documents connect technological modernization and competitiveness with reskilling, digital competence, innovation, and workforce development.

How these expectations are interpreted by managers and experienced by different occupational groups remains an empirical question. Studying Turkey's food industry therefore allows for a comparison between policy expectations and how managers and workers describe technological change.

1.3 Research Gap, Aim, and Research Questions

The literature reviewed emphasizes technological implementation and competitiveness, with less attention to workers' experiences and expectations or to connections among policy, managerial, and workplace perspectives in Turkey's food industry. This qualitative study addresses that gap by comparing workers' accounts of automation, managerial approaches to implementation and adaptation, and national policy expectations. Its scope is limited to the selected workplaces and documents, rather than sector-wide technological adoption.

The dissertation addresses three research questions:

Research Question 1: How do blue-collar and white-collar workers in Turkey's food industry perceive the impacts of Industry 4.0 technologies on their current work experiences and future employment prospects?

Research Question 2: What implications do Industry 4.0 technologies have for labor dynamics and workforce structures in the food-production workplaces examined,

and how do organizational strategies and future-oriented expectations shape workforce adaptation?

Research Question 3: How are national policy expectations concerning Industry 4.0 interpreted within managerial accounts, and what patterns of alignment and tension emerge when these expectations are compared with workplace experiences in the selected food-production settings?

1.4 Theoretical and Practical Relevance

The dissertation applies the Sociology of Expectations to examine how anticipated technological futures shape present interpretations and actions (Brown & Michael, 2003; Borup et al., 2006). The concept of sociotechnical imaginaries supports the analysis of how particular visions of modernization and workforce adaptability become institutionally prominent (Jasanoff & Kim, 2015). By comparing workers' and managers' accounts with policy documents, the study examines how expectations about future skills, employment, and the value of workers' knowledge shape responses to technological change today.

II. METHODS USED

2.1 Research Design and Data Sources

A qualitative, exploratory case-study design was used to examine technological experiences and expectations in their organizational contexts (Yin, 2018). Research covered two food-production sites within the same business group: one large-scale and one medium-to-large-scale environment. Reported technologies included conveyor systems, digital monitoring, ERP-based planning, and data-supported quality control.

Interviews and selected policy documents and sectoral reports supported analysis across workplace, organizational, and policy levels.

2.2 Interviews and Participants

Twenty-five semi-structured interviews were conducted between July 2022 and September 2023:

- 10 blue-collar workers;
- 10 white-collar employees;
- 5 managers working in factory management, operations, research and development, production, and human resources.

Participant selection sought variation in occupational position, gender, age, education, and job responsibility, with gender balance pursued in the blue-collar and white-collar groups. Recruitment followed these purposive

criteria but also depended on participants' availability and access arranged through management and human-resources representatives.

The interview guides drew on the research questions, the Industry 4.0 and labor literature, and the Sociology of Expectations framework. A common thematic structure addressed experiences of automation, changing tasks and skills, training, working conditions, job security, organizational implementation, and future expectations, with questions adapted to participants' organizational positions.

Interviews lasted approximately 35–50 minutes and were conducted in Turkish, either face-to-face or by telephone. With consent, most were audio-recorded and transcribed by the researcher; otherwise, detailed notes were taken and expanded immediately afterwards. The material was analyzed in Turkish, and quotations used in the dissertation were translated into English and checked against the original transcripts or notes.

2.3 Policy and Sectoral Documents

The core policy corpus comprised 10 documents published between 2022 and 2024 by the Ministry of Industry and Technology, the Ministry of Labour and Social Security, the Turkish Employment Agency (İŞKUR), and the Vocational Qualifications Authority (MYK). Documents were selected for their relevance to

industrial digitalization, technological investment, employment, skills, vocational training, and workforce adaptation. Sectoral reports and studies provided additional context for Turkey's food industry.

The analysis examined how these materials framed modernization, competitiveness, employment, skills, training, and adaptation. From a Sociology of Expectations perspective, attention was given to connections between anticipated technological futures, present policy priorities, and the responsibilities assigned to relevant actors. The documents were treated as institutional and sectoral framings rather than as evidence of policy implementation.

2.4 Data Analysis

Interview and documentary material was examined through reflexive thematic analysis (Braun & Clarke, 2006, 2019). Manual interview coding was primarily inductive, informed by the research questions and the Sociology of Expectations framework. Themes concerning occupational change, adaptation, professional authority, organizational implementation, and future employment were developed through repeated reading and initial coding.

Accounts were compared across blue-collar workers, white-collar employees, and managers. Variations involving age, gender, education, technological

familiarity, and responsibility were interpreted in relation to organizational position, not as independent demographic effects.

Policy documents were analyzed thematically in parallel. Comparison with interview material identified alignment, tension, and issues receiving limited attention across policy narratives, managerial interpretations, and workplace experiences. These materials represented distinct analytical levels and were not used to verify one another.

2.5 Ethics and Scope

Participation was voluntary, and participants were informed about the research purpose, confidentiality, and their right to withdraw. Identifying details were removed, participant codes were used in reporting, and research materials were stored on encrypted devices accessible only to the researcher. Individual accounts were not shared with company management.

Management-mediated, availability-based recruitment may have influenced the sample, while sensitive workplace topics may have encouraged caution. The findings are therefore context-specific rather than representative of Turkey's food industry.

III. SCIENTIFIC RESULTS OF THE DISSERTATION

3.1 Overview

The findings are summarized in six scientific theses based on patterns identified within the selected organizational settings and documentary corpus.

3.2 Scientific Thesis 1: Automation reorganized tasks and generated anticipatory occupational insecurity

- None of the interviewed participants reported immediate job displacement directly attributable to automation in the companies represented in the study. More visible changes involved the streamlining of some manual activities and the growing importance of machine operation, monitoring, troubleshooting, data interpretation, quality control, and technological coordination. Blue-collar participants mainly described changes in production tasks, while white-collar participants more often connected automation with analytical responsibilities and data-supported decision-making.
- Employment continuity did not eliminate insecurity. Blue-collar participants questioned whether manual and experience-based competencies would retain their value, while white-collar participants raised concerns about professional influence and career continuity. Occupational insecurity therefore

concerned more than the possibility of losing a job. It also involved whether workers' knowledge would remain valued, whether they could take on new technical responsibilities, and how much say they would have in decisions.

3.3 Scientific Thesis 2: Adaptation was uneven, and training functioned as both opportunity and pressure

- Adaptation varied according to occupational position, education, previous technological exposure, job responsibility, involvement in implementation, and access to practical support. For some employees, training opened opportunities to take on new technical responsibilities. Others experienced it as another demand they had to meet to remain valued at work. Blue-collar participants emphasized practical and continuing assistance, whereas white-collar employees generally described more structured professional development.
- Managers agreed on the importance of training but differed over whether responsibility for skill development rested primarily with the organization or the employee. Participants' accounts also suggested that education, age, gender, occupational position, and technological familiarity could intersect with access to technical responsibilities. Given the qualitative sample, these are interpreted as context-

specific patterns rather than independent demographic effects.

3.4 Scientific Thesis 3: Automation affected workplace authority and the quality and social organization of work

- Participants linked technological competence with access to particular tasks and responsibilities. The ability to operate or explain machinery could create technically valued roles among blue-collar workers, while white-collar employees associated digital competence with analytical responsibilities and participation in implementation. Some participants nevertheless questioned whether practical experience and contextual professional judgment would receive sufficient recognition alongside digital monitoring, automated evaluation, and performance data.
- Automation also affected work rhythms, autonomy, and workplace interaction. Blue-collar participants valued reductions in physically demanding work, but some associated machine-paced production with more rigid routines or reduced interaction among colleagues. Production could therefore become more efficient while also changing how much control employees had over their work and how they interacted with colleagues.

3.5 Scientific Thesis 4: Food-production conditions supported a gradual, selective, and hybrid pattern of automation

- Managers described technological investment as dependent on financial capacity, compatibility with existing systems, workforce readiness, technical expertise, maintenance requirements, and organizational preparedness. Variable raw materials, fluctuating demand, food-safety and quality-control requirements, and the need for flexibility also limited the suitability of rigid automation in some processes.
- These conditions supported gradual and selective adoption rather than an immediate transition to complete automation. Participants described a hybrid labor structure in which automated systems operated alongside practical experience, contextual judgment, problem-solving, and human oversight. Technological literacy gained importance without eliminating the relevance of production knowledge and flexibility.

3.6 Scientific Thesis 5: Policy expectations were selectively translated through organizational and workplace conditions

- The reviewed policy documents connected digitalization, modernization, competitiveness, and workforce adaptability within a future-oriented vision of national development. Managers broadly shared

expectations concerning technological upgrading, productivity, and skills but interpreted them through organizational finances, production requirements, seasonal demand, workforce readiness, and access to qualified personnel.

- Workers recognized benefits also emphasized in the documents, including efficiency gains, reduced physical strain, and new technical responsibilities. Workers also described concerns that received less attention in the reviewed documents: machine-paced work, unequal access to training and technical roles, and uncertainty about whether their existing knowledge would remain valued. The relationship across the three analytical levels was therefore one of selective alignment rather than direct policy implementation or complete conflict.

3.7 Scientific Thesis 6: Expectations shaped present responses to technological change

- Participants interpreted current developments through anticipated futures concerning employment, skills, authority, and professional inclusion. Participants who saw technological learning as a way to advance their careers or maintain their place at work generally approached training and new responsibilities more positively. Those who expected their existing knowledge to become less valued were more cautious, even when no immediate job loss had occurred.

- Managers' expectations concerning future competitiveness, technological requirements, and workforce needs informed present assessments of investment, training, recruitment, and implementation. Expectations therefore functioned not merely as predictions but as socially situated influences on organizational and workforce responses to technological change.

3.8 Central Scientific Conclusion

In the workplaces examined, automation changed tasks and responsibilities while human expertise remained important. Organizational conditions and expectations about the future shaped these changes. Workers could therefore remain employed while still feeling uncertain about their future roles and the value of their knowledge.

3.9 Observations Relating to the Utilization of the Dissertation

The findings suggest three potential uses:

- For managers, they highlight the importance of practical training, continuing support, and recognition of employees' experiential knowledge when introducing automation. Discussing expectations about future roles may help managers understand workers' concerns even when no immediate job losses are reported.

- For policymakers and training providers, they draw attention to unequal access to learning and technical responsibilities. Workforce adaptation initiatives should consider working conditions and occupational insecurity alongside digital skills.
- For researchers, comparing policy expectations, managerial interpretations, and workplace experiences offers an approach for examining technological change in other organizational settings.

These suggestions draw on the experiences and documents examined in this study; whether they would improve outcomes in practice remains to be investigated.

IV. MAIN REFERENCES

- Borup, M., Brown, N., Konrad, K. & Van Lente, H. (2006): The Sociology of Expectations in Science and Technology. *Technology Analysis & Strategic Management*, 18(3–4), pp. 285–298. DOI: 10.1080/09537320600777002.
- Braun, V. & Clarke, V. (2006): Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, 3(2), pp. 77–101. DOI: 10.1191/1478088706qp063oa.
- Braun, V. & Clarke, V. (2019): Reflecting on Reflexive Thematic Analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), pp. 589–597. DOI: 10.1080/2159676X.2019.1628806.
- Brown, N. & Michael, M. (2003): A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects. *Technology Analysis & Strategic Management*, 15(1), pp. 3–18. DOI: 10.1080/0953732032000046024.
- Hassoun, A., Aït-Kaddour, A., Abu-Mahfouz, A. M., Rathod, N. B., Bader, F., Barba, F. J., Biancolillo, A., Crotova, J., Galanakis, C. M., Režek Jambrak, A., Lorenzo, J. M., Måge, I., Ozogul, F., Regenstein, J., et al. (2023): The Fourth Industrial Revolution in the Food Industry—Part I: Industry 4.0 Technologies. *Critical Reviews in Food Science and Nutrition*, 63(23), pp. 6547–6563. DOI: 10.1080/10408398.2022.2034735.

Jasanoff, S. & Kim, S.-H. (eds.) (2015): *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Chicago: University of Chicago Press. DOI: 10.7208/chicago/9780226276663.001.0001.

Kaya, M., Artık, N., Karakaya, M., Şişik Oğraş, Ş. & Yalınkılıç, B. (2010): *Gıda Sanayinin Teknolojik Analizi*. In: *Ziraat Mühendisliği VII. Teknik Kongresi*, Ankara, 11–15 January 2010, pp. 1113–1123.

Özyıldırım, L. & Özbay, Ö. (2019): *Sanayi 4.0: Bildiğimiz Kapitalizmin Sonu mu? Enternasyonal Sosyalizm*, 4.

Paoli, A. (2020): *Food Manufacture 4.0 – Automation and Robotics at the Service of Food Manufacturing*. New Food Magazine, 10 June. Available at: <https://vb.nweurope.eu/projects/project-search/cotemaco-increased-nwe-competitiveness-through-efficient-machine-collaboration/news/food-manufacture-40-automation-and-robotics-at-the-service-of-food-manufacturing>.

Schwab, K. (2016): *The Fourth Industrial Revolution*. Geneva: World Economic Forum.

TÜSİAD (2016): *Türkiye’nin Küresel Rekabetçiliği İçin Bir Gereklilik Olarak Sanayi 4.0: Gelişmekte Olan Ekonomi Perspektifi*. İstanbul: TÜSİAD.

Yılmaz, F. (2016): Türkiye’de Endüstri 4.0. Endüstri 4.0, 26 November. Available at:
<https://www.endustri40.com/turkiyede-endustri-4-0/>.

Yin, R. K. (2018): Case Study Research and Applications: Design and Methods. 6th ed. Thousand Oaks, CA: SAGE.

V. LIST OF THE AUTHOR'S PUBLICATIONS ON THE TOPIC

Peer-Reviewed Journal Article Accepted for Publication

Sinik, A. (forthcoming): "Labor in Transition: Automation and Social Disruptions in Turkey's Food Industry." *Információs Társadalom*, 2026/3. Accepted for publication on 6 May 2026.