

COMPARISON OF TWO UNIVERSITY RESEARCH CENTERS AND TRANSFER OF THEIR RESULTS AND NEW KNOWLEDGE INTO TEACHING

Miloslav Kepka¹, Petr Kavalíř², & Tetjana Tomášková³

¹Faculty of Mechanical Engineering, University of West Bohemia in Pilsen (Czech Republic)

²New Technologies – Research Center, University of West Bohemia in Pilsen (Czech Republic)

³Faculty of Education, University of West Bohemia in Pilsen (Czech Republic)

Abstract

The contribution presents two research centers from an industrial region that are organizationally integrated differently within the university. One operates as an independent university research center, the other is part of a specific technical faculty. The structure of their achieved R&D results is compared. Possibilities for transferring research results and knowledge into teaching are discussed in the context of the missions of both research centers.

Keywords: *Teaching-research nexus, educational and non-educational research centers, transferring research results and knowledge into teaching.*

1. Introduction

A modern university fulfils multiple roles. First of all, it passes on existing knowledge to students, but at the same time it also creates, verifies and applies it. At technical universities, this fact is particularly pronounced because teaching takes place in an environment of constant technological changes, such as production automation, material innovation, digitalisation, and, in recent years, the use of artificial intelligence. All this with high pressure on sustainability. Therefore, the quality of technical higher education cannot be based on a stable curriculum and established pedagogical practices. It must be continuously confronted with the findings of current research, with the current instrumentation infrastructure and with the needs of the application sphere. In technical fields, it is not only about what is taught, but also about the research and institutional environment in which the study takes place.

2. Theoretical foundations

The relationship between research and teaching is referred to in the professional literature as the "link between teaching and research". A well-known meta-analysis by Hattie and Marsh (1996) showed that there is no automatic, linear relationship between the research productivity of academics and the quality of their teaching; research performance alone does not guarantee better teaching. However, most universities seek to create and implement strategies that actively strengthen this link. This requires appropriate organisational and infrastructural measures. Current technical challenges in advanced materials, manufacturing technologies, energy systems, digitisation, etc., do not respect the boundaries of traditional departments. The institutional answer to scientific and technical requirements can be university research centers and their laboratories.

The development of research centres is also related to the transformation of the internal management of universities. The importance of external funding is growing and higher demands are placed on research management than in the past. Research performance depends not only on the quality of individual staff, but also on how well the institution organises cooperation, shares infrastructure and links research objectives with personnel and education policies.

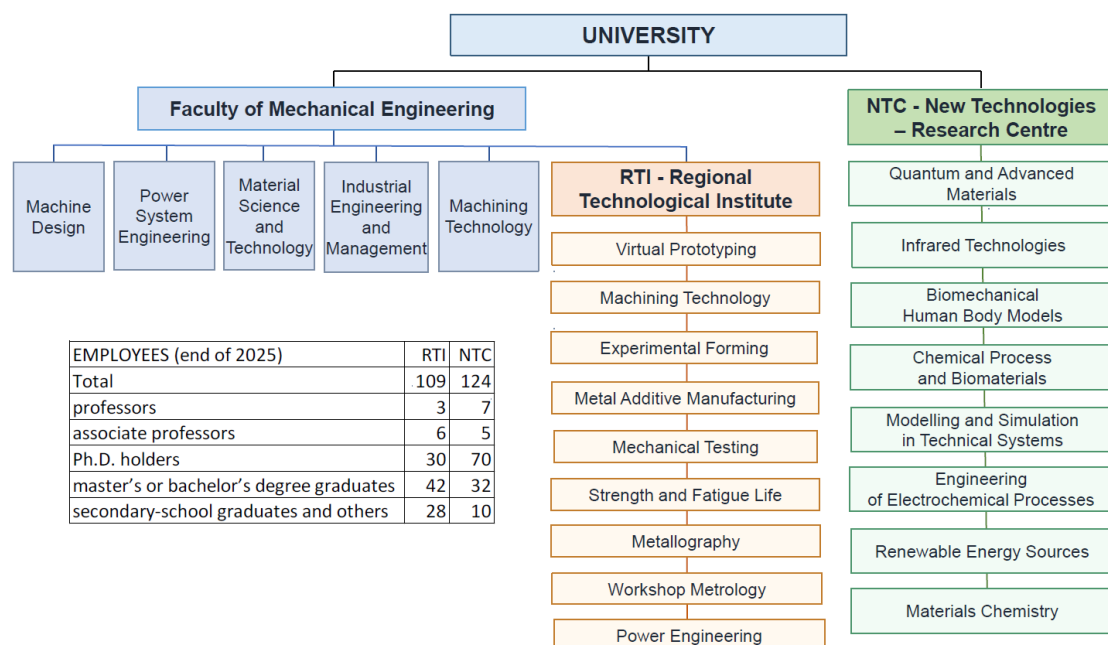
Against this background, the question of whether it is more advantageous for a research institution to be organisationally integrated into the faculty or to hold an independent position at the university can be understood primarily as a question of institutional design, rather than as a simple hierarchy of "better" and "worse" models. A centre integrated into the faculty usually has a structurally closer relationship to study programmes, departments and day-to-day pedagogical operations. Therefore, we can expect easier

projection of research results into teaching, more direct involvement of students in laboratory and project work, and closer personal links between research and pedagogy. At the same time, however, such a working environment can be more strongly shaped by the disciplinary logic and administrative routines of the host faculty. On the other hand, an independent university institute can more easily develop an interdisciplinary profile, build its own institutional identity and create broader partner or international networks, but it must consciously create mechanisms that keep it in touch with the study programs and educational mission of the university. Thus, the key is not "autonomy" or "integration" itself, but the harmony between the organisational model, the mission of the department, the profile of the field, the research infrastructure, the funding structure and the method of personnel management. See the literature of Ponomariov and Boardman (2010), Bennetot Pruvot et al. (2023), Gläser et al. (2022).

3. Case study

For the above reasons, the case of the University of West Bohemia in Pilsen is analytically valuable precisely because the two models exist side by side within one institution. Even the central website of the UWB lists RTI as "Regional Institute of Technology – Research Centre of the Faculty of Mechanical Engineering", while NTC as "New Technologies – Research Centre – Independent University Institute". The basic organisational chart of this situation is shown in Figure 1.

Figure 1. Organisational charts of the RTI and NTC research centers within the university.



The difference is also reflected in the more detailed self-presentation of both workplaces. RTI defines itself as a modern engineering and technological research center of the Faculty of Mechanical Engineering. The superior Faculty of Mechanical Engineering offers all 3 levels of education with strongly business-oriented study programs at its departments: bachelor studies (Mechanical Engineering and newly Environmental Engineering and Technologies), follow-up master's studies (Design of Power Machines and Equipment; Design of Production Machines and Equipment; Machining, Additive Technology and Quality Assurance; Materials Engineering and Production Technologies; Industrial Engineering and Management) and doctoral studies (Manufacturing and Materials; Theory and Construction of Machines; Industrial Engineering and Management). RTI is then presented as its research unit, on the infrastructure of which the most talented students can carry out their theses. NTC presents itself as a university research center focused on energy and technological transformation, adaptation to climate change and quality of life, which combines basic and applied research with an emphasis on interdisciplinary cooperation. In cooperation with individual faculties, it offers the education of talented students in the following scientific areas: physical sciences; chemical sciences; mechanical engineering and materials engineering. NTC has an independent scientific council, the Faculty of Mechanical Engineering, which is superior to RTI, and has an industrial council in addition to the scientific one.

Table 1 presents the results of the first analyses carried out by the managers of both research centers. Cumulative bibliometric indicators, benefits and outputs from contract and applied research for the period of 10 years (2016 to 2025) are empirically compared with regard to the relatively stable personnel situation of both units. The main source of new RTI employees are graduates of all study programs of the superior faculty. NTC is (must be) much more liberal in the personnel area. It actively seeks quality human resources in the external environment, including experts and talents from abroad.

Table 1. Quantitative comparison of R&D results in the RTI and NTC research centers over the last 10 years.

Main categories of results achieved in the evaluated periods of 2016-2025	RTI	NTC
Publications	698	1239
of which registered in WoS or Scopus	217	669
Applied results	589	173
of which patented	88	31
Contractual research (thousands of EU)	7 619	5 494

At first glance, the table shows the prevailing orientation of NTC on fundamental research, which can be better "materialised" in the form of prestigious scientific publications. RTI, on the other hand, produces a larger number of application results and a higher volume of contract research. Which is logical considering its greater connection to the industrial sphere.

4. Discussion

A comparison of RTI and NTC makes it possible to compare two different ways of linking research, infrastructure, field anchoring, cooperation with practice, and links to education within one university. In order to avoid simplified judgments based only on absolute numbers, it is necessary to interpret the identified differences through the prism of a different organisational model – i.e. as the difference between a center firmly anchored in the structure of the faculty and a workplace with a separate university status. Such an approach has made it possible to avoid simplified judgments based only on absolute numbers. If we assess the performance of these two research institutes in relation to the type of mission they fulfil, the forms of cooperation they develop, and the way in which they connect research with education and with industrial or social importance, we can conclude that both centers fulfil their role. How effectively would be decided only by a multi-criteria comparison with other similar (especially foreign) research centers.

Acknowledgments

The contribution was created with the financial support of the Ministry of Education, Youth and Sports of the Czech Republic (financial resources for the long-term conceptual development of a research organisation).

References

- Bennetot Pruvot, E., Estermann, T., & Popkhadze, N. (2023). *University Autonomy in Europe IV: The Scorecard 2023*. Brussels: European University Association. Retrieved from <https://www.eua.eu/downloads/publications/eua%20autonomy%20scorecard.pdf>
- Gläser, J., Ash, M., Buenstorf, G., Hopf, D., Hubenschmid, L., Janssen, M., Laudel, G., Schimank, U., Stoll, M., Wilholt, T., Zechlin, L. A., & Lieb, K. (2022). The Independence of Research—A Review of Disciplinary Perspectives and Outline of Interdisciplinary Prospects. *Minerva*, 60(1), 105–138. <https://doi.org/10.1007/s11024-021-09451-8>
- Hattie, J., & Marsh, H. W. (1996). The Relationship Between Research and Teaching: A Meta-Analysis. *Review of Educational Research*, 66(4), 507–542. <https://doi.org/10.3102/00346543066004507>
- Ponomariob, B. L., & Boardman, C. (2010). Influencing Scientists' Collaboration and Productivity Patterns through New Institutions: University Research Centers and Scientific and Technical Human Capital. *Research Policy*, 39(5), 613–624. <https://doi.org/10.1016/j.respol.2010.02.013>