TRENDS IN RESEARCH JOB POSITIONS AND REQUIRED COMPETENCES

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Abstract. *The article explores current trends in research job positions with corresponding requirements as well as the competencies (skills, knowledge, attitudes and values) for hybrid employees. Based on emerging of new positions such as principal investigators, prompt engineers, data stewards, and research software engineers a summary of new requirements are raised up including revised digital competencies, mathematical competencies and enhanced research competence, management for research competence, research and innovation project leadership, and entrepreneurial competence. Some special attention is focused on skills like traversal, design thinking, and computational thinking. From another perspective, the importance of analytical thinking, understandability, and research abilities extends beyond researchers; society as a whole must be ready to engage in citizen science and open science initiatives for well-being. The effort focuses on optimizing the learning process, content, and learners, who are primarily expected to be working professionals with sufficient maturity who are willing to scale up for new research roles or acquire skills for micro jobs.*

Key words: Research Competence, RM Competence, RSE, Research Careers.

Introduction. Prospects for research careers

This paper's findings, discussions, analysis, and prospects are based on data that was methodically gathered from publications, professional communities, the software industry, and the Indeed job portal (`www.indeed.com`). Because the information provided can be used to promote remote work positions, the conclusions and trend-based recommendations are neither country-based nor regional – they are global. Through Indeed, we can see not only research positions, but also the types of companies that offer them, as well as requirements for candidates and their expected skills. We can also track and analyze salaries through Indeed, Payscale (`payscale.com`), and Paylab (`paylab.com`). The information given has been used for years to mentor students in their career paths and self-evaluation of learning they need in order to go to a specific desired position. This information was very important for the development of new master degree programs in the area of Data Science and AI for Biomedicine.

From the Table 1. we noticed that research positions are generally increas-

ing. Positions with a higher level of analytical skills (high order thinking) are increasing, while those with a lower level are decreasing, due to the automation that has occurred, and the profile of companies is expanding in type.

Table 1. Research Job Positions Biomedicine (www.indeed.com)

Job Position	**2021**	**2025**	**2021***	**2025***
research	88 524	166 000	310	400
research analyst	5 347	7 000	16	300
research scientist	62 043	7 000	179	300
research assistant	47 443	3 000	61	50
research coordinator	5 496	1 000	17	300

*Research positions + biomedicine

Moreover, if we take under consideration the trends for the STEAM-like job positions, where some of them are also research positions it is clear that the variety of research jobs is also bigger. For example, there are a lot of positions not only to do innovations, or research, or data-driven business but also to promote science and research, named communication science positions[1]. Some of them are: blogger, animator, guides, presenter, authors, copy editor, illustrators, etc.

Apart from the anticipated roles, new ones are also being created (data stewards, prompt engineers), which are not directly included in the national job categories and hence appear as necessary abilities. The most recent data stewards check revealed a few, but they will increase for sure due to the growing popularity and usage of `www.go-fair.org/fair-principles`. The change of the numbers for prompt engineering is significant: from 51 (25.04.23) to 102 000 (18.09.25). Another way to search for research-based job positions is to use a keyword a particular technology like NLP (Natural Language Technology). Total number on Indeed platform NLP are 3 000, among them NLP (Psychology) are 75. The positions in which B.Sc. /M.Sc. is required are 1000, and 500 – for PhDs. In comparison NLU (Understanding)/NLG (Generation) positions are 1:2 (19.9.25).

One way to search for research positions is to use keyword (research) or to do semantic search. Another approach is the search for keywords describing analytical activities performed by a researcher, indicated in the advertisement

[1]31 Types of Science Communication Jobs (Plus Salary Info), Updated March 26, 2025, `www.indeed.com`

as skills, paying special attention on skills. The texts for the advertisement can also be analyzed with other methods that are not the subject of this study with the typical practices using NLP to extract keywords, skills, topics, methods based on ontologies, can be used. During the national data mining competition Queryada 2017, one of the competitive tasks for the participating teams was extracting the type of emotion (grading sentiment analysis) in the job advertisements for three cities in the country Sofia, Plovdiv and Varna, published on the national platform jobs.bg. In recent years, a lot of jobs positions have been published and promoted in this platform, but the companies are mainly promoted.

So the research-based positions for the last five years are the following: research assistant, research associate, research scientist, research analyst, research coordinator, researcher, research nurse, research and development and research technician. If we take them literally as a list it is not clear enough the level of complexity, e.g. do candidates have to develop new methods in research or just to apply already known. These level of detail is in the job description and it depends on the type of company is this big or SME, or StartUp, R & D, D & I departments. As usual as the smallest is the company as the requirements for candidates are bigger (more type of skills and activities they have to have in the skill set).

There are also some special positions that are connected mainly with management of research (teams and projects) as Principal investigator (PI) that usually is a person(s) in charge of a clinical trial or a scientific research grant. It is also used in Horizon ERC. The principal investigator (PI) is an academics holding a research grant funded by an independent body and administered by a university. The PI as the research leader ultimately responsible for the grant project is in charge of a team of research scientists who undertake research under his or her supervision (`ukrsa.org.uk`).

Research integrity refers to all of the factors that underpin good research practice and promote trust and confidence in the research process (`ukrio.org`). The UK Concordat to support Research Integrity (2025) sets out five principles for research integrity: honesty, rigour, transparency and open communication, care and respect and accountability. Two important standards that must be sufficiently encouraged and embraced by all kinds of researchers are research integrity and research culture.

An interesting new position that respond to the practices of synergy, ecosystem development is a community engagement manager in STEM. A network of varied roles and a variety of community configurations are necessary

for the creation, validation, and diffusion of knowledge in order to address particular requirements, whether those needs span disciplines, career phases, institutions, or other borders. Communities in science are also essential to the continuous cultural changes in the way science is conducted; from open science to Diversity, Equity, and Inclusion (DEI) initiatives, communities offer spaces for experimentation, repetition, and the adoption of new standards [1].

That's why some scholars are conducting studies to provide analysis of the organizational and individual talents of the hub organization (orchestrator) in an innovation network. It is crucial to have balancing, negotiating, entrepreneurial, and legitimizing skills [2].

The "Research Software Engineer", or RSE, has ten years of experience and it is used to describe people who work in the research community but concentrate on software development. There are several high-level descriptions of what an RSE is, and the phrase has been frequently used. Recent studies on research software engineers update knowledge and specifications, highlight the community's participation, and demonstrate sustainable practices at the conceptualization, tool, and support levels. They examine particular RSE jobs, make suggestions for companies, and provide examples of potential future specializations, that is extremely important for working professionals in IT industry in the era of AI [3]. People who create or improve research software and/or the structures that the software interacts with in the computational environment of a research domain. The Research skills summarized for RSE are: conducting and leading research, understanding the research cycle, software re-use, software publication and citation, using domain repositories/directories. Some specific specializations are given as follows: open science, project/community manager, teaching and user interface/user experience designers for research software [3].

Many frameworks, such as the Innovation-Based Learning (InnBL) framework, are put out to help science and engineering degree programs adopt an innovative culture in the context of Industry 4.0. [4], yet creating productive R & D teams and prosperous companies requires knowledgeable and experienced personnel. Additionally, it is evident that skills are mostly centered on technology, and workforce trends like the hybrid workforce – such as blended work experiences [5] and designing job characteristics for effective hybrid intelligence [6] – must also be taken into account. According to [5] our job is no longer hybrid; instead, human roles, agency, and expertise are being reshaped by AI coworkers, automated decisions, and virtual presence. They contend that this change necessitates immediate attention to work-life boundaries, physical-digital interactions, AI transparency and responsibility, and AI-mediated work practices.

Research competencies

Computational thinking and design thinking are not stereotypes or dogma nowadays, they are necessity. The role of design thinking in building and supporting sustainable research-based networks is very important.

Some researchers investigated design thinking for innovation [7] how it is desirable to apply Design Thinking (DT) to the research phase of the technological innovation process. They investigate the research work of the design center of a global electronics company that uses a design approach called Proxemics to envision future interactions between bodies (people), objects (technology), and spaces (context) [8].

The EU proposed the European Competence Framework for Researchers (ResearchComp[2]) in 2022 in order to develop a sustainable knowledge ecosystem in Europe. In accordance with the ERA Communication and the Skills Agenda, it is stated that the European Skills, Competences, Qualifications and occupations (ESCO) classification has been updated with a taxonomy of skills for researchers.

The European competence framework for research managers, is proposed in 2025 to support Action 17 of the ERA Policy Agenda through advancing and increasing the attractiveness of Research Manager Careers. In the RM Comp there are 7 competence areas (cognitive abilities, doing research, managing research, managing research tools, making an impact, working with others, self-management). Some skillsets for RM selected in brief are: transversal skills, relationship management, project management, financing, contracting, compliance, communication, line management, supervision of others, outreach and community, technical skills, and specialized knowledge. A Knowledge and Community Platform of EU (`rmroadmap.eu`) gives a lot of recommendations including RM ROADMAP Best Practices Guide.

The EC guidelines for enhancing research networks by suggesting behaviors, skills, and competencies are helpful as guidelines and development tools as well as for creating new evaluation instruments. However, still there are insufficient regulations and evaluations for multidisciplinary/interdisciplinary research, scientists, and teams, and all policies, suggestions, and tools are primarily aimed at academic researchers. The Competence Framework 'Science for Policy' for researchers (`knowledge4policy.ec.europa.eu`) is in a right direction but is not possible to be implemented in real case. The only one direction possible to enhance and decentralized research networks and to involve society

[2] `https://horizoneurope.md/en/news/researchcomp-european-competence-framework-researchers-tool-assess-and-develop-researchers`

in citizen science practices is by using crowdsourcing platforms and AI-based practices.

Taking all of these recommendations and achievements in methodology and practices some modern approaches for PhD students' preparation is suggested by authors [9].

Research intuition

The topic of research intuition is fascinating and up to date. It occasionally appears in scientific publications but for the well-being of people and communities, the best scenario is to develop logic and to keep intuition in parallel. Since the topic of logic is well defined, it remains to try to refine the term intuition.

Research skills are well-known abilities required to carry out specific activities (literature review, data analysis). Conversely, competencies consist of skills, knowledge, attitudes, and values. They are holistic, include decision-making, and self-management. One typical way to describe the intuition is based on experience (long-term immersion, reflection). It happens when a researcher can sense patterns or generate ideas without explicit reasoning. Scientific explanation of this from neurobiology perspective involves the brain rapidly finding effective solutions (paths) using implicit knowledge and pattern recognition, rather than slow, conscious reasoning [10].

The main goal in scoping review's is to look into intuition's role in higher education and the role intuition plays in accomplishing disciplinary goals. The findings demonstrate that STEM disciplines are more concerned in the educational aspect of intuition and conceptualize it in accordance with psychological or neurological theories; they believe that using visual elements in experiential learning can help train expert intuition [11].

According to a study on mature intuition in mathematics, intuition can directly and independently improve understanding. Mature intuition is defined as the ability to draw conclusions about a subject matter quickly, fluently, reliably, and insightfully. The development of mature intuition highlights techniques like adding imagery, creating associations, building confidence, and generalizing concepts [12]. An interesting question is how the intuition is related to senses. Cognitive senses are the fundamental ways our brain perceives and interprets the world, extending beyond the traditional senses (sight, hearing, touch, smell, taste) to include internal senses like balance, body position, and even magneto reception. They are the sensory systems that gather raw data, which the cognitive processes then filter, organize, and turn into meaningful

patterns, enabling us to understand, learn, remember, and interact with our environment.

Among key challenges last years is to determine how to effectively track the learning progress of a student through their online interaction with teaching materials – known as the Knowledge Tracing (KT) that can be done with or without LMS platform. In recent years, an increasing number of studies have exploited the development of deep learning KT models from different perspectives as memory structures, attention mechanisms, graph representation learning, textual features and forgetting features [13].

Due to the authors' vision that an objective assessment of learners is obtained after assessing their development, we consider it particularly promising to use modern models for KT to support the monitoring of development and research skills and competencies, in which case their problems, features, and perspectives will expand and naturally become more complicated, especially when taking into consideration multiple modalities.

The intuition could be unconscious and subconscious (lack of conscious efforts to acquire a skill or knowledge that persists). Another interesting object of research is the instinct. The key areas of instinct research are animal behavior, psychology, cognitive psychology ("gut feeling"), and neuroscience. The research intuition is a promising and productive area for future studies.

Conclusions

In the modern research ecosystem, the integration of digital models for tracking knowledge and the development of research intuition outlines new horizons for the training of doctoral students and for the construction of sustainable, open scientific networks. Insufficient regulation and support for interdisciplinary teams indicate the need for more flexible frameworks that reflect the real complexity of scientific activity. The use of AI-based analyses and models provides opportunities for more accurate tracking of the development of competencies, while the study of intuition and cognitive processes contributes to a deeper understanding of the mental mechanisms behind scientific creativity. In this context, future research should focus on integrating these approaches into a single methodological framework that supports scientific progress and public participation.

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