Preparing to enter the Quantum Workforce

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Questions to answer

What are the jobs opportunities in the quantum industry?
What skills and knowledge are needed by for these jobs?
What degrees help to prepare one for working in the quantum industry?
Studies of the Quantum Workforce

Study 1
- University of Colorado/ RIT
- Qualitative (interviews)
- Fall 2019
- Rich information
- Open ended
- 21 companies

Study 2
- Quantum Economic Development Consortium (QED-C)
- Quantitative (survey)
- Fall 2020
- Multiple choice
- 56 companies
Question #1
What jobs currently exist in the quantum industry? What is the distribution of jobs predicted to be?
What are the current career opportunities?

Percent of the 21 companies employing people in these roles

(a) Job type
- Engineer: 95%
- Experimental scientist: 86%
- Theorist: 57%
- Technician: 43%
- Application researcher: 33%
- Sales: 19%
- Business development: 10%
- Technical support: 10%

(b) Engineer job type
- Electrical engineer: 71%
- Software engineer: 52%
- Mech. engineer: 43%
- Optical engineer: 29%
- Systems engineer: 24%
- Research/senior engineer: 14%
- Systems operator: 10%
Future of Quantum Jobs

Number of companies hiring in 3-5 years and in 2 years for various roles:

- Computational Chemist
- Control Systems Engineer
- Error Correction Scientist
- Theoretical Physicist
- Cryogenics Engineer/Scientist
- System Assembly/Maintenance Technician
- DevOps/Database Engineer
- Device/Component Engineer
- Circuit Designer
- Data Scientist
- Test/Measurement Engineer
- System Architect/Designer
- Photonics/Optics Engineer/Scientist
- Technical Support/Marketing
- Product Sales/Marketing
- Software Developer
- Applications/Solutions Architect
- Quantum Algorithm Developer
- Experimental Physicist
Question #2
Do quantum related jobs require a broad or narrow set of skills?
Of these consensus skills, what fraction are quantum-related?
What broad skills are valued by the quantum industry?

**Common skills across quantum jobs**

- Coding: 90%
- Statistical methods for data analysis: 90%
- Laboratory experience: 81%
- Electronics: 76%
- Troubleshooting and problem solving: 71%
- Materials: 67%
- Quantum algorithms: 62%
Consensus Skills

Consensus defined as ≥ 50% of respondents to that job type said it was a primary skill

Number of Consensus Skills
Question #3
Are there well-defined categories of jobs based on skills and knowledge required?
Correlations of Skills and Knowledge

Red = positive correlations
Blue = negative correlations

Three distinct categories of jobs
1) Hardware
2) Business
3) Software
Question #4

What degree levels are needed for the different job types?
What are the routes into specific jobs?
Recommendations for students

US Quantum industry is growing, and there are a variety of future positions available, not all require a lot of specialized quantum knowledge/degrees.

Hands-on experiences is desired: internships, research experiences, and formal courses are useful for many job roles.

Not all working in QIST need a PhD in physics: consider becoming “quantum aware” by taking (1-3) courses in QIST.

Still focus on traditional STEM skills as they are in demand too.

Don’t worry about trying to become a “Quantum Engineer.” This is not a well-defined role and can mean many things to employers. Apply based on skills not titles.