Comments on IEEE Framework on Metrics and Benchmarks for Quantum Computing

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The main question left open in my mind after reading the framework is who are the intended users of these metrics and benchmarks? Clarity on this point would help considerably and make it more likely useful progress can be made. Are they intended for researchers actively developing quantum computation? Are they for corporate management at companies with quantum computing research? Government funders? Prospective buyers of quantum computers?

The traditional application of standards is usually for the benefit of prospective buyers and implicitly for those selling to those buyers. They enable buyers to usefully evaluate and compare products from different companies and ensure that the devices they are buying meet their needs. However, there really are no prospective buyers for functioning quantum computers at this time, at least none that would really be considered end users. Any buyers in the near future will be buying only for the purpose of evaluating quantum technologies, building in-house expertise for a more distant future where useful devices are available, and perhaps conducting research of their own. These applications are more in line with the needs of researchers than traditional buyers of commercial technology.

Government funders and corporate management have some use for standards as well, to evaluate progress being made towards the development of quantum technologies. These are the users which are most likely to want to compare devices from different companies and even using different technologies. If these are the main users of these metrics and benchmarks, it is most useful for them to have a small number of relatively simple ones which are relatively platform-independent. However, an overly rigid structure or choice of metrics could potentially do great harm to the field, either convincing funders that no progress is being made because the chosen metrics are not improving much, or conversely driving researchers to try to improve the chosen metrics at the cost of other aspects being ignored, potentially leading to stagnation.

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Finally, researchers have no strong need for standards. While it can be helpful to have a consensus about how to measure certain things, research proceeds best when there is no single field-wide focus, but rather the ability for different groups to focus on different aspects of building a quantum computer. This argues strongly in favor of either no standards, or very open and flexible ones, capable of being updated as needed.