**Q1**: These are three experimental demonstrations of quantum simulations. Noting its relative date of publication, describe your chosen paper's impact in the business trade press. Do you feel it had the largest influence of the three? Why or why not?

**C1:** For chosen paper, enumerated the number of business press related to it and classified the variety of impacted audience. Identified the magnitude of business opportunities related to each technology. For both other papers, classifies the variety of impacted audience and identifies the magnitude of business opportunities related to each technology.

**A1:** For most non-technical people everything about Quantum Computing sounds very complex and outlandish. That's why, most mainstream publications tend to not report any achievements in the sphere, if there's no specific real world use case tied to it. Such was the case for the 2017 paper by researchers at the University of Maryland, describing their "Observation of a Many-Body Dynamical Phase Transition with a 53-qubit Quantum Simulator". The news was mostly covered by a number of scientific newspapers and websites (e.g. LiveScience, MIT News, Phys.org etc.) the main audience of which, presumably, are people who are invested in the world of QC to some capacity. The only standout report on the subject was made by International Business Times, which tried to shed light on it from a business perspective, yet the consensus was very similar to the others: this is a significant step towards working, scalable quantum computers, but as is, does not present any use.
A year prior, Google "accurately simulated a molecule for the first time." In addition to the scientific news sources, this finding was also covered by not-so-scientific Atlas Obscura, Tom's Hardware and IBT (again). The general audience of these websites are, again, technical people, but not necessarily in tune with the quantum computing world, as they cover a wide range of tech topics. The general sentiment of the articles was also different, as the headlines depicted the study as "revolutionizing". It was also tied to real world problems in chemistry, biology etc. with the most common one being the simulation of fertilizer production by bacteria (given enough qubits). Other use cases include advances in battery and solar panels technology, medicine etc. The fact that the solution is fully scalable was also strongly conveyed by the reporters.
The most popular article however, was about IBM's simulation of beryllium-hydride.This was covered by a lot of mainstream publishers like Engadget, The Next Web, Venture Beat, which even though are tech related publishers, have a huge following of non-technical people, such as gamers, TV-show fans, gadget fans etc. The articles here don't go into much details, but just highlight that even though this is something that modern supercomputers can accomplish, with enough scaling (which is claimed to be possible) will far surpass any traditional computer's results. The business impact presented in the articles seems to overlap with Google's: fertilizers, batteries, medicine.

**Q2:** Two of the papers employ superconducting qubits, and were from research at large corporations, while one paper describes research using atomic qubits, performed at a research university. Based on how these results were received in the news press, can you see how the technology, and the research institution, made a difference in expectations for future developments?

**C2:** Compared which organization has more social and business impact: The university or the two large corporations. Gave an opinion about why the difference between them.

**A2:** The nature of the research provided by academia varies from the ones provided by the tech corporations, so the differences in their perceptions could be attributed to the content, rather than the authors behind them. However, there are differences on how the results from each sector were presented to the audiences.

Of course, the discoveries from both fronts were significant advances in the world of quantum computing, but so it happened that the results of Google's and IBM's research received far wider coverage in the news than the results of the University of Maryland. To understand the social and business impact, we need to look at two things, how were the findings presented and who was in the target audience of the articles.

The research that utilized atomic qubits, as mentioned previously, was predominantly covered by science news websites and publications. And unsurprisingly, the articles contained a lot of technical details of the research, as well as the researchers' quotes about their approaches and solutions. Apart from the claims that the research was a "significant step towards scalable quantum computers", no business case or real life usage was provided. The narrative of the articles was that this is a theoretical accomplishment and there's still a long way to go until it yields a real life usage. This undertone fails to invoke excitement in people not invested in the quantum computing world.

The two other studies, conducted by tech giants Google and IBM, received a different treatment in the media. Many mainstream tech and business news websites published stories about the discoveries and in majority, the business cases were presented right there in the headlines, even though these also had a long way until yielding a real world usage. In comparison, the articles didn't get into much of the technical details, but rather gave an overview of quantum computing in general and jumped to the conclusion, to appeal to the non-familiar masses.

A headline that contains household names like Google and IBM, along with the business use case builds up more excitement and hype than something like "Quantum simulators wield control over more than 50 qubits, setting a new record". It's pretty obvious which article will get more impressions among casual/non-technical/business folks.

Reasons for the differences in reception could be many, but one thing that stands out is the presentation from the author organizations themselves. Tech giants like Google and IBM have a pretty big marketing and press teams, which diligently craft every message that gets out about the company. Everything has to be calculated, precise and to the point, having the target audience in mind. Meanwhile, universities usually don't have such big press teams, and the

ones that do, usually have a role of just connecting the authors to the publishers. It's impressive how the presentation of the result can impact the coverage as much as the result itself.
**Q3:** Imagine that you are responsible for investing the money of a company or a funding agency interested in the further development of quantum computation. Would you invest your money in your chosen paper's project? Why or why not?

**C3:** Gave three arguments on why they would or would not choose their chosen paper's particular project to invest.

**A3:** As a person who is in charge of investing a large amount of money to facilitate the development of quantum computation, I would choose the University of Maryland's project. Although all three projects are very promising contenders for the "future of QC", investing in the research that uses atomics qubits would make more sense from a business side.
Firstly, atomic qubits are superior to the current alternatives, namely the superconducting qubits, primarily used by companies such as Google and IBM. "The great thing about atomic qubits is that they are perfect", said C. Monroe during one of the interviews for their research. And indeed, atomic qubits tend to preserve their information for a long time, as long as they are undisturbed. This is indeed a good quality in terms of advancing the quantum computation field.
The second reason in favor of this project is the institution behind it. The tech giants behind the other two projects have tens of billions of revenue per year, which allows them to allocate enough resources to fund their research in this field. Meanwhile, the research team at the university gets their majority of finances from grants and donations, which won't really compare to the tech companies. Dealing with limited resources could make the researchers spend a lot of unnecessary time to try to stay within the budget and cut corners, instead of focusing only on advancing the project.
Finally, it makes more business sense to pick your competitors wisely. If the technology that is being used (i.e. superconducting qubits) is the same as in competitor companies, it is fair to assume that you are in a race with them. And as has been proven from time after time, competing with tech giants is usually a bad idea, as the difference between resources will make a significant impact on the long run. So investing in something which uses another approach (atomic qubits), will not make you a direct competitor of them, which will give you more room "to breathe".

**References:**


1. https://www.sciencedaily.com/releases/2017/11/171129131434.htm
2. https://www.theregister.co.uk/2016/07/21/google_tests_a_quantum_computer_its_own_both_qubits_of_it/
3. https://www.technologyreview.com/2017/11/30/241630/a-quantum-boost-for-a-different-kind-of-computer/
4. https://gizmodo.com/two-incredible-new-quantum-machines-have-made-actual-sc-1820840375
5. https://www.sciencemag.org/news/2017/09/quantum-computer-simulates-largest-molecule-yet-sparking-hope-future-drug-discoveries
6. https://www.chemistryworld.com/news/quantum-computer-tackles-its-first-triatomic/3007979.article
7. https://www.sciencealert.com/ibm-has-simulated-the-most-complex-molecule-yet-with-a-quantum-computer
8. https://spectrum.ieee.org/tech-talk/computing/hardware/tiny-quantum-computer-simulates-big-molecules
9. https://phys.org/news/2017-09-molecule-energy-quantum.html
10. https://cen.acs.org/articles/95/i37/Quantum-computing-goes-beyond-hydrogen-and-helium.html
11. https://www.ibtimes.co.uk/google-boasts-quantum-computing-breakthrough-first-display-real-world-use-1571823
12. https://www.sciencealert.com/google-s-quantum-computer-is-helping-us-understand-quantum-physics
13. https://phys.org/news/2016-07-scalable-quantum-simulation-molecule.html
14. https://thenextweb.com/insider/2017/09/14/1076900/
15. https://venturebeat.com/2017/09/13/ibm-simulates-chemical-reactions-on-a-quantum-computer/
16. https://www.engadget.com/2017-09-14-ibms-simulated-molecule-could-lead-to-drug-and-energy-advances.html