

Chat Questions and Comments from October 9th Summit Attendees

Skills Expectations & Needed

I think data science should be higher up

Do you have an idea why communication skills drop? Do they become less important, or do they become a background assumption - e.g., like we assume everyone can use MS Word and Excel?

It is surprising to see communication and collaboration skills dropping in importance. Can you comment on that.

What are the different types of industries where this data was collected?

Why do you think that communication skills fell down the list by so much?

Systems thinking is listed as a Skill Today, where does it fit into the Skills Future?

The research we have conducted at the Ohio Manufacturing Institute is that systems thinking in relation to digital skills is important, understanding the interoperability of these technologies. Are you witnessing that?

What about security?

Understanding the need for security integration at multiple levels

We are finding that how a company follows a continuous improvement discipline (for example, lean) determines their flexibility in dealing with the COVID-19 crisis. Have you found that?

Do you see a trend of soft skills being downgraded and technical skills being emphasized from an employer's perspective?

What about what citizens need? Is education only a training ground for work, or does it have more to offer? I don't disagree with disruption drivers, but it is only part of the story of education, right?

Should we push the engagement of students in the Research Enterprise within the university ecosystem?

How do you balance the training students need for jobs now versus what they might need later? How do we make sure their training isn't too narrow, so they only are qualified for one job that could disappear?

Can you please provide specific examples of bridging the gaps?

Engineers also need to recognize, value, and communicate effectively with all stakeholders. Those skills are tough to develop solely through online coursework. Current online platforms need further innovation to facilitate collaboration across populations, i.e. students + community members.

To serve students well, they need skills for both their first jobs and their entire future career trajectory - including changes in companies/industries, the ability to start their own companies,

whatever pathways they want to follow - which may NOT be what someone else would choose or envision for them.

Higher education is not training. I do believe that students need broader education to understand the context of the problems they are solving. If industry only wanted skills, they could hire high school students for very little and train them themselves. How do we provide relevant education to prepare students for the modern workforce?

Role of Industry in Education

I have 20 years of industry experience prior to my academic career. I saw the continued erosion of training availability during my career. What responsibility do you see falling on employers to keep engineers in the field over the long term?

We are finding that how a company follows a continuous improvement discipline (for example, lean) determines their flexibility in dealing with the COVID-19 crisis. Have you found that?

Many companies are trying to offer online training, how do we find pathways to collaborate with them in our areas for training development

From an academic standpoint, one of our problems is that 'employers' are not at all monolithic. If you ask them what skills are important, there won't be much commonality other than the typical communication, group work, etc.

How do we communicate the value proposition of graduate level professional programs with industry faculty and working professional students - at the research focused university?

My experience in industry taught me to value fellow workers who had a deep knowledge of theory AND a hands-on aptitude. Now a professor, I look for the same in grad students. I agree that teaching must get more priority and must improve but would not like to dilute theory. Deep knowledge leads to innovative disruptive thinking.

What advice would you give to students interested in starting a program next year, post-pandemic?

Curriculum Content / Program Structure / Instruction Delivery

Should these skills be part of the general education? Quantitative for all? It's not only engineers who need these skills.

What elements of an engineering education best prepare students to become adept at problem framing and asking the right questions?

Would you suggest adding units to graduation to accommodate additional digital tools, or would you suggest replace current units?

How important is understanding of the environmental and user impacts of digital technologies?

We are piloting a program called NEET. During the evidence gathering stage a few years ago, we heard that 'the ability to sell an idea' was a critical skill --- convincing and engaging others, your 5th takeaway.

How important is Industry 4.0 certification at this point in time? Are industry really looking for these? Do you see a BS major in "Industry 4.0" as a future for creating talent in this area? Most majors already have upwards of 125 or 130 credits and no room to include all these new requirements?

What BS major in Industry 4.0 would include?

You've mentioned software engineering several times. Do the needs for digital transformation hold up in other engineering strands such as chemical, nuclear engineering?

Would you suggest adding units to graduation to accommodate additional digital tools, or would you suggest replace current units?

Given that curricula are already crowded what should we drop? Also, what can industry do help engineering education in this space?

I love the "stackable content" as a term. How long in your opinion should these be? 5 min OR 10 min where is the threshold?

What are your thoughts on a 5th year of engineering education focused on personal teamship skills and systems/software thinking/engineering?

Is the current academic structure of 3-credit based lecture courses that last for a semester and 8 such semester that make up a degree program, still the right model?

Any thoughts you can share with Career Technical Educators (technicians)? Thanks!

To improve remote function, do we need increasing VR (Virtual Reality), AR (Augmented Reality) over simply 2D screens like today?

Faculty often focus on theory because it's generalizable, which facilitate adapting new skills in the future.

How about the students that do want theory. they may be a minority, but how do we balance the two types of students we may have?

Faculty need to help students understand the value of theory by bridging it to practical application.

Linking Irene's and Michaels' talks: How do we make mathematics education "stackable"? To reduce the length of coursework and focus on skills that are typically required for all students when many, especially technicians in the workplace, do not need math that is beyond Algebra I. Now, so many

students are disenfranchised by courses and topics in math that they will never need and they wind up dropping out.

How to you affect ABET accreditation when you disrupt the gaps?

What could disruption of engineering education mean for licensure?

How to teach students skills?

STEM has already kicked Liberal Arts to the curb too much (e.g., English, communication, art, etc.,). How do we forge a more workable system that merge all of that into the world of industry need?

Role of Educational Institutions and Resources

Where would the funding for such "stackable" initiatives come from? Courses can generate income through enrollment, but what's the economic model for these "snackable" snippets? Faculty are already "doing more with less" so there's something overwhelming about adding more?

What is your suggested financial model of "Stackable content" generation?

What do you think is the root cause for tuition increases?

Is disruption of higher ed as salient in Europe, where the cost of higher education is covered by the state?

German model of education (trade, technical, university) maybe does it better? What aspects could or should be implemented here?

Do we just blow the system up and start all over? OR, do universities partner with community colleges on a brand new model of learning that's more competency (skill-)based and less about letters on a wall (i.e. BS, MS, etc)?

The Morrill Acts of 1862 and 1890 enabled the establishment of the majority of technical post-secondary educational institutions in the US, as did The Committee of Ten, as a working group of educators in 1892, established the structure and curriculum for public K-12 education. What should education look like for the 4th industrial age? It took 150 years to build the current structure, how long will it take to adapt to a new one?

If universities are going to change there needs to be a higher level of transparency of the challenges financial and otherwise that the institution is experiencing. This includes financial literacy and regular active communication.

Germany has same model of education as US- B and M degrees.

How can Universities justify their tuitions in a remote learning world?

Students as Customers - Relationship

Corporate America doesn't understand any relationship other than customer and seller.

To Bob's point, students are in a sense the product, but how many industries charge the product for the privilege of being produced? It's a very twisting thought experiment.

Are students really customers?

The student is not the customer - employers and society are the customer.

Students are not customers. An education is not a product.

Students pay for coaching/mentoring, academic programs, and experiential learning opportunities - from parties to research to football to internships! They are at the center.

It depends on what you define as customer. In my opinion someone who pays for a value irrespective of what the value is a customer. Students are customers. They pay to earn skills (needed by employers).

Education is absolutely a product. If you don't see it that it, it is problematic

Students are a different type of customer - there's a difference between buying a product, like a computer, and paying for a personal service; e.g., patients are customers for doctors, but that doesn't mean that we demand the doctor tell us only what we want to hear or give us whatever we think we need. Part of paying for expertise involves sometimes hearing things you don't want to hear, but NEED to hear.

Unlike many other services or products - education and students do not fall in "customer-service". I think education has much more than that and students are the future of our generation (not customer for the university).

So we have many customers ... students, employers, society ...

Students are more than customers but they are customers. Another customer is the hiring companies and institutions.

Promotion / Tenure / Faculty Reward Structure

How should P&T criteria change to accommodate this? If universities don't reward something, it won't happen. Faculty will do what they get rewarded for.

I agree with this: If universities don't reward something, it won't happen. Faculty will do what they get rewarded for." That is why I am on a committee to add diversity, equity and inclusion work into the annual report, promotion and tenure rubrics. Don't use this as a reason to do nothing - find a way to make a change that matters!

Information / General Comments and questions

I'm curious about the "people driving complexity" aspect. In what way?

I think the "trusting" should have verification. I am sure when people do their own verification, they will have more trust in what the "blackbox" or algorithm give out

Vanessa Svihla, of UMN, has an NSF CAREER grant that is focused on developing engineering students' ability to frame problems, and she's got quite a bit of work on this piece.

<http://www.vanessasvihla.org/>

How much of the short life span of companies on the S&P is attributable to demands from investors, rather than competitive pressure?

Interesting! I have just completed my studies at Harvard Business School on "Disruptive Innovation" (Professor Christensen - in his legacy).

I believe that there is a misconception that technology is driving the digital transformation. The real key is the people. If industry does not support the workforce to spend time to adapt and transform, the organization won't adapt. "The Technology Fallacy" is a great book on this topic.

Can you please explain more this slide: what is diffusion and what does the network represents?

@MichaelArena - would you be open for a 15 min virtual talk for educators @Global STEM Education Center and @GlobalSTEMClass? THANK!

Is it possible that a person with only a high school degree could end up teaching college and post graduate courses?

With respect to the cost of education, student to staff ratios are ~ 3:1 vs student to faculty ratios of 15:1. Check it out: <https://nces.ed.gov/programs/digest/d99/d99t229.asp>

Thank you for your presentation. Would you mind explaining the connection of Agile and the Adaptive Space? Is Agile "THE" practice to master to foster adaptive spaces?

Educational bureaucracy, the same thing that kills company's.

This DOE Stackable Credential Toolkit may be of interest to program managers on this call:

http://s3.amazonaws.com/PCRN/docs/Stackable_Credentials_Tool_Kit_rev_9.17.2018.pdf

@ Alice Squires, This is the exact question I am trying to answer while developing a MS program in Manufacturing Engineering at UMass.

What is the current content of the programs launched at Siemens? (not sure if it was mentioned)

@Friederike, you can get a summary on this site:

<https://www.plm.automation.siemens.com/global/en/our-story/partners/academic/>. Please reach out to me for more.