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SMART CONSTRUCTION: INCREASING OPPORTUNITIES FOR SMALL BUSINESSES IN INFRASTRUCTURE

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Questions for the Record:
- None.

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- None.

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SMART CONSTRUCTION: INCREASING OPPORTUNITIES FOR SMALL BUSINESSES IN INFRASTRUCTURE

TUESDAY, NOVEMBER 19, 2019

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
SUBCOMMITTEE ON CONTRACTING AND INFRASTRUCTURE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:03 a.m., in Room 2360, Rayburn House Office Building. Hon. Jared Golden [chairman of the Subcommittee] presiding.

Present: Representatives Golden, Chabot, Balderson, Hagedorn, and Stauber.

Chairman GOLDEN. Good morning, and thank you for joining us. I look forward to having a good conversation here about the future of the construction industry and how we might be able to make some necessary improvements.

I think we all know that America's infrastructure needs some pretty focused investment in order to catch up to where we should be. And everyone knows the statistics from the American Society of Civil Engineers, both nationally and in their specific home states. It lays out a clear map for improvement and where we are falling behind.

This is one reason why there must be a strong infrastructure agenda in Congress, and in particular, one that focuses on investing in outdated roads, bridges, rails, water systems, housing. I could go on and on.

Doing this not only increases opportunities for small businesses in construction, manufacturing, engineering, and many more small businesses, but it also will help create good paying job opportunities and increase our competitiveness as a Nation.

The current administration I think shares this understanding that we need to invest in our infrastructure and that this should be a top priority, as well I think as both parties in Congress. So really sometimes we are not sure what is holding us back but we need to continue to have these conversations and be pushing our leadership to go ahead and move forward with an infrastructure spending package. Not just roads and bridges. We need a comprehensive infrastructure package that incorporates information technology and communications so that our Nation not only has the fastest and most efficient infrastructure, but also the most modern.

With the Internet, things like artificial intelligence and cloud computing offer new opportunities for smart applications in many new industries, and old.

In particular, technology has the ability to reshape the construction industry by creating digital construction solutions where small firms can help lead the way.

From GPS-enabled equipment to advanced digital modeling, smart tools are making projects less expensive more ecofriendly, and more efficient. More importantly, digital construction helps level the playing field for small contractors. Through investing in digital tools, small businesses can write lower bids and compete for larger projects.

Smart tools also pay for themselves. Increased business and timelier project completion allows small contractors to bring in more business. Early adoption of digital technologies creates a competitive advantage. In fact, almost 70 percent of owners say poor performance is the single biggest reason for project underperformance and only 25 percent projects have come within 10 percent of their original deadline in the past 3 years.

Digital tools also give contractors access to powerful data that can help them make informed decisions about materials and design to make structures safer. Smart buildings enabled by digital tools help civil engineers, developers, and architects reduce a building's carbon footprint and increase sustainability.

Inspecting structures, like bridges and tall buildings was once a dangerous, time-consuming task. Now, prop tech sensors are built into buildings that can help assess when there is damage and when buildings need to have some maintenance.

Drones also offer a way to survey buildings and terrain after natural disasters is just one example. These cutting-edge solutions cut costs and save lives.

I hope that today's discussion will help shed a little light on the many ways that digital construction can benefit small businesses and encourage broader adoption of digital tools.

I want to thank each of the witnesses for joining us today, and I look forward to your testimony.

I would now yield to the Ranking Member, Mr. Stauber, for an opening statement.

Mr. STAUBER. Thank you, Chair Golden. And thank you for holding this important hearing. It is a pleasure to work with you on this Committee.

On our modern day worksites, you might see workers studying a 3D printed model instead of blueprints, or remotely operating an autonomous crane in the safety of an office. Stakeholders might prefer a virtual reality or aerial tour instead of physically touring the project. No longer limited to R&D engineers, construction workers at all levels are harnessing digital technologies to optimize productivity, quality, and safety.

These technologies have brought the worksite into the hands of its operators. Smartphone apps can not only link employees to each other but also enable access to vital project data stored in the cloud. The data may be sourced by drones, artificial intelligence, virtual reality, and 3D modeling.

Digitized construction technologies and processes can have a significant impact on a construction company's productivity, but many small firms lack the resources to invest and maximize potential of these technologies.

Similarly, regulatory and administrative burdens have restricted implementation across Federal, state, and local agencies. Without greater usage by small business and government agencies, no infrastructure modernization strategy will meet our Nation's needs.

As Congress continues to work on infrastructure modernization legislature, including the Surface Transportation Reauthorization and WRDA, we must focus on facilitating a regulatory environment that allows for new technologies to be deployed in the field. These reauthorizations usually are a fairly long-term 5 year authorization. Technology is changing so rapidly that we risk falling behind if we are too technology prescriptive in legislating.

We have the opportunity to empower small businesses to lead the charge on modern construction technologies, a charge that will lower costs, increase sustainability, increase productivity, and being more efficient, allow more projects to be built and maintained with less money.

For example, in my home state of Minnesota, the Department of Transportation is pioneering the use of drones to inspect over 13,358 bridges. They have also developed robust lifecycle cost analysis standards and practices, and are working with industry partners to prepare Minnesota for an autonomous vehicle future. By going high-tech, the state will maximize every dollar of infrastructure investment.

In addition to this Committee, I serve on the House Transportation and Infrastructure Committee. It is incumbent upon these two Committees to take steps towards investing in a technology-forward infrastructure plan and ensure that small businesses are positioned to help in its execution.

Thank you to our witnesses for being here today. And Mr. Chair, I yield back.

Chairman GOLDEN. Thank you very much.

I do not know how often the four of you have sat in front of Committees here in Congress, so I will quickly go over some of the rules around timing.

Each of you will get 5 minutes to testify. Members will get 5 minutes for questions as well. There is a lighting system in front of you. The green light will be on when you begin, and the yellow light will give you a 1-minute warning while you are reading through your opening remarks. The red light comes on when you are out of time, and we would ask that you try and stay as best you can within that timeframe.

I would now like to introduce our first witness. Mr. Andersson is an architect with a degree in engineering from Sweden and a Master's in Architecture from Savannah College of Art and Design with over 20 years of experience. He has applied virtual design construction and operation methodologies on a wide variety of building typologies. He is the director of VDCO, at the LiRo—did I get that right? LiRo Group, and teaches at Pratt Institute in New York, where he is leading a collaborative BIM studio between architects, construction and facilities managers. Welcome, Mr. Andersson.

Our next witness is Mr. Ryan Forrestel, president at Cold Spring Construction Company based in Akron, New York. I was about to say Ohio there. I got that wrong. Cold Spring Construction was founded 108 years ago by Mr. Forrestel's great grandfather and has completed numerous large and small scale projects across New York. He is also a Co-Chair of the Fair Apportionment of Infrastructure Committee of West New York, a nonpartisan advocacy organization whose primary goal is to ensure that Western and Upstate New York receives their fair share of transportation funds distributed by the State of New York. He has earned a Bachelor's degree in Biology and Biomedical Sciences from Brown University and a Master's degree in Civil Engineering from Penn State University. Thank you for joining us today, sir.

Our third witness, Mr. Shephard, vice president of the Construction Solutions Group at Trimble. Trimble is a company whose mission is to transform the way the world works by delivering products and services that connect the physical and digital worlds. He has been a part of the executive team at Trimble for the past 20 years and has worked in 30 years on six continents and managed more than 3,000 employees. Before Trimble, Mr. Shephard served Copeland and Booz Allen Hamilton helping clients solve strategic problems all over the world. He holds a B.A. in Business Studies with a foreign language from the Manchester Metropolitan University and a Master's degree in Management from Northwest University. Welcome, Mr. Shephard. Thank you for joining us.

And I would now yield to our Full Committee Ranking Member. No, I would not. I am sorry about that.

I do have the introduction prepared. Wonderful. I will yield to Ranking Member, Mr. Stauber, for introducing our final witness.

Mr. STAUBER. Thank you, Mr. Chair.

Our final witness is Phillip Ogilby. Mr. Ogilby, I was going to refer this to Ranking Member Chabot to introduce you, but since he is not here you will have to take this Minnesotan's word for it.

Mr. Ogilby is the chief executive officer and co-founder of STACK Construction Technologies. Founded and headquartered in Cincinnati, Ohio, STACK Construction Technologies is a leading cloud-based preconstruction collaboration platform. After a decade owning a construction company, Mr. Ogilby entered the construction tech industry with his son, Justin, who was only 14 years old at the time. Using Justin's coding skills, and Phil's entrepreneurial spirit, the father-son team have created multiple construction technologies and startups since 1995. With a 262 percent 3-year growth rate—I want to repeat that. With a 262 percent 3-year growth rate, STACK is one of the Nation's fastest-growing private companies. Thank you for coming here to represent high-tech family business and the innovative spirit of Cincinnati.

Chairman GOLDEN. Thank you very much, all of you, for joining us. We will go ahead and do our opening statements.

And we would start with Mr. Andersson, you are recognized for 5 minutes.

STATEMENTS OF LENNART ANDERSSON, RA, DIRECTOR OF VIRTUAL DESIGN, CONSTRUCTION AND OPERATIONS (VDCO), LIRO GROUP, PROFESSOR, PRATT INSTITUTE; RYAN FORRESTEL, PRESIDENT, COLD SPRING CONSTRUCTION; CHRIS SHEPHARD, VICE PRESIDENT, CONSTRUCTION SOLUTIONS GROUP, TRIMBLE, INC.; PHILLIP OGILBY, CEO AND CO-FOUNDER, STACK CONSTRUCTION TECHNOLOGIES

STATEMENT OF LENNART ANDERSSON

Mr. ANDERSSON. Thank you very much, Chairman Golden, Ranking Member Stauber, and members of the Subcommittee. And thank you very much for inviting me here.

As said, my name is Lennart Andersson. I lived in New York City now for 20 years. I originally come from Sweden, and I have been working in the infrastructure sector in New York City for these 20 years. And I am appearing here today on behalf of the American Society of Civil Engineers. I am representing the 150,000 members.

ASCE is the Nation's oldest national engineering society. And the construction industry I am representing as well. And it has provided leadership and vision and problem-solving skills for construction design professionals for the past 20 years.

I appreciate the opportunity to be here today to discuss this smart construction and increasing opportunities for small businesses. ASE is eager to work with Congress to find ways to improve project delivery at all stages, including planning, funding, design, construction, operations, maintenance, and decommissioning on projects.

All phases of construction are poised to change and evolve in the coming years, incorporating traditional tools of the trade and new technologies that could transform the way projects are completed. The industry has a lot to gain from these new innovative technologies so that we can build better buildings and infrastructure and communities.

Today's construction design can be slow to adapt to change and incorporate technology because of the complexity and long duration of projects.

In 2017, the McKenzie Global Institute released a report that stated that efficiency of architecture, engineering, and construction, often called AEC, the efficiency dropped 26 percent since 1991 to 2017, while the average non-AEC business in the United States increased its efficiency by 48 percent. That is actually a 100 percent difference.

So the tools and processes used in the infrastructure construction are still largely analog and manual. And if properly implemented, the very latest technology will enable the construction industry to achieve higher quality results.

And on projects in New York City, we have been testing the very latest, actually, we are sort of seeing that you are achieving much better results.

The virtual design and construction not only creates assimilation of the project but as a part of the construction process it helps to create budgets and schedules as projects go through funding approval and access a single repository for all project scope and de-

sign documentation. It simplifies owner-engineer collaboration through interactive processes and manages in duration of the projects' budget, schedule, and design. And it creates detail estimates and schedules by managing documents, changes, and forecasts, and drives field productivity from anywhere with mobile solutions.

Virtual design and construction also enables access to a single searchable repository for as-designed or as-built information to facilitate construction, maintenance, and operation activities.

Just one example of East Side Access, a new station underneath Grand Central Terminal in the United States in New York City where I have been involved for the last 7 years, and it is the largest infrastructure project in the United States. And we had four people modeling the whole project. It is 6 miles, 125 complex models. It was documented the traditional way, so over 100,000 drawings. And so we were able to actually create a model that everybody can see the complexity. By applying automated reality capture and digitization of documentation, processes, and common-sense standards, it is possible to realize the digital twin of infrastructure before construction. This model is used for planning and augmenting the design for all stakeholders through interactive interfaces. The digital copy is also used for traffic simulations, virtual mockups, staging, planning, construction phasing, site safety analysis, as well as community outreach, which also help accelerate decision-making and optimize execution.

BIM increases transparency and fosters an environment of participation for all stakeholders. This method of virtual design sets the stage for more collaborative forms of project delivery methods. BIM also coincides with lean construction and public-private partnership projects, where timely coordination and accurate information is paramount.

So we have an opportunity to use small businesses as change makers of infrastructure. Innovation is often more difficult to implement in larger organizations, while small businesses are inherently forced to innovate in order to be competitive.

So ASCE looks forward to working with the House Committee on Small Business and Congress to find ways to improve America's built environment so that every family, community, and business can thrive. So thank you very much.

Chairman GOLDEN. Thank you, sir. And we look forward to getting a little more out of your testimony through the Q&A phase of things.

Mr. ANDERSSON. Sure.

Chairman GOLDEN. So thank you.

Mr. Forrestel, we now recognize you. Thank you.

STATEMENT OF RYAN FORRESTEL

Mr. FORRESTEL. Thank you.

Good morning, Chairman Golden and Ranking Member Stauber.

My name is Ryan Forrestel, and I am the president of Cold Spring Construction. We are a 4th generation family business based in Akron, New York, outside of Buffalo. We have been performing civil and heavy highway construction projects in the west-

ern half of New York State and Northwestern Pennsylvania since Cold Spring was founded in 1911 by my great grandfather.

We employ about 120 people in our peak season, and as a family business, we are not just a family in terms of the long-term establishment and operation of the business, but we are a family business in terms of the families that we employ. We have multiple members of many families working for our business, and we treat our people like family. We care about them like family. We would not have the success that we have without them. So things like today are very important to us to continue that success and to do everything that we can to take care of those people in our families.

We have done projects ranging in size from a few hundred thousand dollars to $130 million, large projects relative to the size of our company. That is one of the things that we focus on in terms of developing our people to be able to do that and leveraging technology and other resources so that we are able to compete at those kinds of levels.

One of the things that we have invested in in the last 15 to 20 years is technology related to digital models and automated machine guidance. These technologies have allowed Cold Spring to handle projects that would have been difficult or impossible without the utilization of these technologies. In addition, we have been able to complete these projects more accurately and on tighter schedules than if we had not been using these technologies. And this has been something that we have seen over the last 10 years with greater frequency that we have been able to hit schedules or exceed schedules pretty dramatically. And this is largely contributed to by the use of technology.

I have heard arguments from other contractors of the years that implantation of digital technologies as was alluded to earlier, is too expensive and it is just for large corporations. It is too expensive for smaller businesses not to invest in these technologies. When we are seeing increases in efficiency of 20 percent or many times that in some instances businesses that do not make these investments will not survive. And I think as we are going to talk here today, it is important that these technologies are not only allowed but encouraged, and so everybody needs to get on board and this needs to be pushed forward.

I will talk a little bit about the advantages that these technologies offer. The first most obvious is efficiency. Everybody wants to be more efficient. These technologies are pushed forward as offering that efficiency, which they do. But some of the more subtle aspects of the benefits are the access to information that these technologies provide. One of the big problems in the field when things are done the old-fashioned way with pieces of paper is changes are made and people in the field do not know what those changes are. Using digital technology and life-time information, when changes are made, everybody knows what they are and they are implemented right away. Nobody starts out doing the wrong thing and then has to go back and do rework, which is one of the most expensive things in construction.

And in that same vein, we can avoid problems. If we are building a digital model that incorporates all aspects of the project and all of the things around it, we can see conflicts and the way that new

construction interfaces with existing infrastructure before we build it. Whereas, oftentimes in the past we begin construction and then we encounter a problem partway through, which again requires rework, it is expensive, it is time-consuming, and it is certainly not the most efficient way to do work.

And another big factor is safety. We have numerous people. Historically, we have had numerous people on the ground around heavy equipment checking grades, laying out construction, and for example, in pipe trenches as well. A guy is down in a hole checking grade, putting pipe in. Now, we have the opportunity to do all those things from in the cabs of machines. It takes those people out of harm's way. Takes those people out of trenches, which eliminates one of the most dangerous aspects of construction being trench collapses. And another thing it allows which contributes to efficiency as well is where it was impossible to do work during dark hours, during nighttime hours without huge amounts of lighting, now we can take those people who are on foot out of the construction site. Only the machines are operating. It makes it much safer and gives the ability to be much more efficient.

So to briefly wrap up, I want to say that Cold Spring works cooperatively with owners and agencies to implement these technologies but a lot more can be done to help move this along and bring forward some of the small businesses that have not engaged in this. Project design from inception to completion should be done in a way that complements the use of digital data. Specifications should be written and revised to allow technologies to foster their adoption their adoption and use. These actions are only a benefit to agencies and taxpayers as they allow projects to be completed more accurately, more timely, and more cost effectively. Thank you.

Chairman GOLDEN. Thank you very much.

Next, we will hear from Mr. Shephard.

STATEMENT OF CHRIS SHEPHARD

Mr. SHEPHARD. Thank you. And good morning, Chairman Golden and Ranking Member Stauber.

My name is Chris Shephard, and I am the vice president at Trimble. I have been with the company for 21 years, and as you can probably tell from my accent, I am based in Dayton, Ohio.

Trimble is a global technology company—I am an American citizen, do not worry—focused on transforming the way work is done through the use of intelligent integrated technologies and innovative solutions.

Trimble innovation enables economic breakthroughs while enhancing safety, increasing productivity, and reducing environmental impact. Our software, hardware, and services are transforming industries, such as agriculture, construction, and transportation and logistics.

As my colleagues have already mentioned, the construction industry is ripe for innovation. We are talking about a $10 trillion global industry. And McKenzie was referenced earlier a couple times, their estimate is that about 10 to 15 percent of that $10 trillion is waste. That is a lot of money.

The industry has historically used size and scale to do its work. Bigger machines, more machines, more people, more nails, more ce-

ment, more tools. This reliance on scale creates a major disadvantage for small businesses who do not have the capital or volume of work to be able to absorb these inefficiencies.

Today, ineffective planning communication and collaboration cause the most problems and drive up project costs. The use of digital construction technologies provide small businesses with the information they need to better manage their costs, schedules, and resources, and levels the playing field so that they compete with their larger rivals.

A few examples of digital construction technologies would include application software and modeling that allows contractors to remotely monitor site progress from their office and create design models that can be sent to the machine operators and crews in real-time. Machine control and guidance systems that provide machine operators real-time positioning for guidance and control of their machines, allowing them to accurately grade, compact, and pave to specification. And site positioning systems allow contractors to measure, check, manage, and inspect all the phases of their efforts and paving operations.

When these technologies are used on infrastructure projects the results are significant and measurable. Machine productivity increases by 30 percent. Rework can be reduced by up to 50 percent. And overall project delivery costs are improved by up to 30 percent.

And technology does not just increase the bottom line. It also improves environmental sustainability by reducing the use of fuel and the loss of resources to waste.

Small businesses are the lifeblood of the construction industry. And technology is allowing them to compete against the larger players in the industry. I would like to highlight just a couple of examples of small businesses that are achieving success using Trimble technology.

First of all, Mr. Chairman, your home state of Maine, the Shaw Brothers of Gorham, Maine, are using GPS machine control systems to improve the efficiency and equality of their work which has generated savings in project times and overall costs. And on larger jobs, the state DOT will sometimes use Shaw Brothers' 3D files to inspect and keep a record of the work that has been done, making the DOT's work more efficient, too.

The second example, Ajax Paving in Detroit, Michigan. Ajax Paving was able to keep a machine moving through dense fog while paving a highway project in Northern Michigan, preventing a shutdown that would have wasted 200 feet of concrete that had already been dumped in front of the paver.

Our 50 state DOTs have a high level of awareness of the benefits of digital construction. However, investments in these capabilities compete for scarce resources with much needed infrastructure projects in each state which has in many cases limited the pace and scope of adoption of the systems and capabilities which would support enhanced management and oversight of the projects themselves.

Resources provided by the Federal Government would accelerate the advancement of these project delivery efficiency tools. Trimble supports a provision in the Senate Infrastructure Bill which creates incentives for states to upgrade the technical skills of the engineers

and technicians who we all count on to enable digital construction delivery. This will result in safer roads, better lifecycle costs, and less disruptions to commerce in communities across America.

Small businesses will also benefit from states adopting the use of 3D models through the construction lifecycle as it allows them to fully realize the benefits from their investments in digital construction technologies.

So in conclusion, I would say the construction industry is often criticized for its inefficiency and waste, but today we have the technology to ensure the projects are delivered on time and on budget. Increasing the adoption of digital construction technologies not only leads to better quality infrastructure delivered at a lower cost and with less environmental impact, but it also levels the playing field for small contractors to compete with the larger players in their industries and to grow their businesses. Thank you.

Chairman GOLDEN. Thank you very much, sir.

And in closing, we will give the last 5 minutes to Mr. Ogilby.

STATEMENT OF PHILLIP OGILBY

Mr. OGILBY. Hi, everybody. Thanks.

First of all, thanks for the opportunity. I very much appreciate it. I appreciate the kind words at the opening as well. I have got a fair amount to say, so I tend to talk fairly quickly and it is going to take that to get through this in 5 minutes.

My background is in construction. I was a contractor in the very early days. I have started now two significant technology businesses, STACK being the most recent, and we have thousands of customers worldwide.

Our customers are small businesses. So fundamentally, I love the direction of the whole hearing today. This is about our customers. That is who we are talking about here. So, I have got some words about why pay attention to me. Much of that has already been covered.

You know, the construction industry represents 6 percent of the global GDP worldwide. Construction is the single largest consumer of raw materials worldwide as well.

You know, one of the big challenges as I was doing research for this, it was very interesting to find people are moving into urban areas at a very, very rapid pace, and it is creating a huge demand for infrastructure worldwide. Not only in the U.S., but worldwide. In fact, the U.N. estimates that by 2050, there could be as many as 7 billion people living in urban areas. That would be up from 3.5 billion people today.

Autodesk, the world's leader in design software, in fact, estimates that that could create a demand for as many as 1,000 new buildings a day over the next coming decades just to meet the demand for infrastructure worldwide. This continuing trend requires a massive amount of new construction and renovations to be done.

U.S. construction spending in 2017 topped $1.27 trillion. It is expected to reach $1.5 trillion by 2023. The bigger problem here is the industry cannot keep up, candidly. The industry, the current pace of construction productivity cannot begin to keep up. There have been studies already referenced, productivity gains across the industries outside of construction have exceeded 10 or 15 times or

more. The actual productivity level of construction has dropped over the last 80 years. A big part of that is the complexity of the projects, but the failure to adopt technology is also a drain on the system.

We also have an enormous labor shortage. So while we cannot affect that personally with technology, I could not go through this process without at least addressing the labor shortage. But there is a high failure rate of construction startups as well that is also a problem within our industry. Again, we focus on the small businesses, candidly, and I was shocked at this statistic. If you start a new construction company in the U.S. today, 25 percent of you will be out of business next year, within 12 months. Seventy-four percent of all new businesses started in construction today will be out of business within 5 years.

One big simple drain on this or cause, if you will, is poor adoption of new technology. There is a tremendous amount of very powerful technology available today, but candidly, the construction industry adopts technology at a very slow pace. If you look at studies that have been done across all industries, construction is at the very bottom in terms of the adoption rate of new technology.

Digitization, adopting new technology is the answer that we can bring to the table today. There has been a study, the World Economic Forum did a study that predicts an increase in savings and cost savings as much as 20 percent by full digitization of our industry as an impact. Globally, this could unlock as much as $1.2 trillion in costs.

I have a couple of asks for the Committee today. One is obviously to find creative ways to help the industry adopt new technology at a much faster pace.

Consider mandating the use of technology on government-funded projects and not just at the general contractor level but push that all the way down to the subcontractor level.

And then my last ask is interesting. It is consider directly impacting adoption for contractors by extending grants to construction technology providers such as ourselves that we can use to subsidize the cost for the smallest companies who need to make that move into technology. Thanks again very much.

Chairman GOLDEN. Thank you all very much for the testimony that you have shared with us today.

I am going to very quickly go a little bit out of order just because I want to point out that my wonderful wife Isobel is visiting. She is sitting over here. She snuck in once we got started. So she is here to make sure I am on my best behavior during the Q&A.

So I thought one of the first things I would ask, just to go ahead and go right at one of the more potential political questions that you might expect someone to ask when talking about going digital, talking about automation and other things, always there is a real fear out there about the replacement of middle class, good blue collar construction jobs and others. I think, Mr. Andersson, you kind of directly said it in a positive light where you said the very latest technology will enable fewer people to do more and achieve a higher quality outcome. Of course, there are some people who might fear that this could pick winners and losers out there in the construction industry. And I just wanted to give, I thought Mr.

Andersson, and maybe Mr. Forrestel an opportunity to talk about this because, obviously, like you said, you are a family business. You want to take care of your entire family. And I know you all want to keep people working. So just your thoughts in general about those who might have concerns about job loss.

Mr. ANDERSSON. If you look at the needs of infrastructure in this country, I think we need to become much more efficient because I think if you look at New York City, I think there is a huge issue because there are cost overruns traditionally. It makes it hard to make new initiatives. We need new tunnels. We need so much in New York City. But I think because of all these cost overruns there have been issues that actually hurt industry. And I think the efficiency, we can do much more to a high quality.

Mr. FORRESTEL. Well, I think to reference what Mr. Ogilby said, there is a huge shortage of tradespeople for the construction industry in this country. I mean, it is widely acknowledged by the Associated General Contractors of America that construction employment is a real problem in terms of companies finding good workers. And I think the one point that Mr. Andersson made about the technology reducing the number of people because of the increase in efficiency which we need to see in the industry for many reasons is a big deal, but I think it is also an opportunity to attract more members of the younger generations into the industry. They do not want to dig ditches with shovels. They want to be involved in something interesting and engaging. And this technology, a lot of these technologies offer that opportunity for the younger generations who are used to engaging in those technologies, or technologies similar to what we are using in the construction industry. So I think it provides real opportunity not to exclude people who might want jobs that actually include——

Chairman GOLDEN. And do you think your workforce or potential future workforce is getting the kind of training opportunities and exposure to the kind of competency in digital technologies or, you know, new equipment, more modern, forward-leaning equipment?

Mr. FORRESTEL. No, I do not think the adequate training is out there. I think there is some movement to head in that direction, but we are not seeing it yet. It hit our people in the field, so a lot of our training for that is once we hire people, but it is an opportunity. And I think it is an opportunity to take an industry that has been considered dusty and dirty and dangerous over the generations to be something that is really an opportunity. It is an opportunity for people to make a fantastic living doing really interesting work and really meaningful work. I mean, I know our people take enormous pride in traveling around Western New York, telling their kids about the projects they worked on.

Chairman GOLDEN. Oh, yeah, these are great jobs. I think a lot of people back home in Maine also take pride in being a part of the construction industry.

One of the things I love most about your testimony, sir, was talking about the distribution of information in the field and preventing rework. The Marine in me, they put a big emphasis on, you know, if you do not get information out into the field, how can peo-

ple make frontline decisions and not make mistakes. So it makes a lot of sense to me in terms of the digital stuff.

Mr. Shephard, I want to give you in the closing time I have here, an opportunity to field a question.

As people were talking about the expenses of new equipment, automation, digital technology and others, I was thinking about the BETE tax exemption programs for equipment that I became familiar with back home in Maine, if you know what I am talking about, the Better Equipment Tax Exemption Program which I imagine would cost something like an automated bulldozer. But would it also include things like digital technology upgrades that would improve the efficiency and planning phase? Could a company write off those types of investments as well under that program?

Mr. SHEPHARD. I am not sure, Mr. Chairman, but if it does not, it ought to.

Chairman GOLDEN. Mr. Andersson?

Mr. ANDERSSON. It actually does. Yes, we bought this $250,000 laser scanning equipment and it is a write-off. And it has made a huge difference for us, so.

Mr. SHEPHARD. Do I have a second just to comment?

Chairman GOLDEN. Yes.

Mr. SHEPHARD. I think what is important to Bill and what Lennart said in his opening remarks as well, we need to go from the beginning to the end of the process; right? We make systems that can be used all the way throughout the process, but if you do not start with a digital beginning, a design, and then pull it all the way through, that is where you get the real advantage all the way through the construction process.

Chairman GOLDEN. Thank you very much. I am out of time, so I am going to go ahead and yield to Ranking Member Stauber.

Mr. STAUBER. Thank you, Mr. Chair.

Your testimony, all of your testimonies were fascinating to me. You talk about digital technologies, where it is at.

In my hometown, in Hermantown, Minnesota, small town, we put up a health and wellness center, and it had to be bonded. And to make people understand what it was going to be like, you put the goggles on and you literally walked through the health and wellness center and it was amazing. And so you talk about the technologies you are putting forward. I think this is absolutely where it is at.

There are a couple of questions, Mr. Shephard, for you first. I am aware that the Minnesota Department of Transportation and Trimble have worked together on intelligent compaction and a tool called Eroutes. Could you expand on what these projects look like and what came out as a result of the collaboration with MnDOT?

Mr. SHEPHARD. Yes. Sorry about that. I have to press the button.

Actually, I am glad you brought that up because the Minnesota DOT now mandates the use of intelligent compaction on its projects. And what that does is it guarantees the quality of the finished product by knowing that you are compacting to the right specification every time that you do the compaction. So that is a use of technology on the compaction material, on the compaction equipment, the compactors that can make the right number of

passes at the right, provide the right, I keep saying the word "compaction." Sorry. It is all about compaction. It gets the compaction correct without having to do any more rework or guessing or missing spots in the place. So it really gets the quality you have done the first time accurately and you can be assured that it is okay.

Mr. STAUBER. Which maximizes the investment.

Mr. SHEPHARD. Well, it improves dramatically the quality of the finished project, the road or the pad or whatever it is. You get it built right to the design and there is no guesswork.

Mr. STAUBER. I just want to put a plug in for the Minnesota Department of Transportation. I was the Chair of Public Works and Transportation for a county and I am extremely proud of that relationship the counties and MnDOT have built to maximize that investment using these new technologies. Very critical.

Another question I have, in March—this is for Mr. Ogilby. In March, I introduced H.R. 1890, the Preserving America's Infrastructure Dollars, the PAID Act, which would require states to conduct a lifecycle cost analysis on infrastructure projects that use more than $30 million in Federal funds. How do digital technologies reduce lifecycle costs for larger infrastructure projects?

Mr. OGILBY. Push the button. That is a great question.

From the infrastructure standpoint—I am not confident that I can answer correctly.

Mr. STAUBER. Anybody? Can anybody answer that? Go ahead, Mr. Andersson. And then, Mr. Ogilby, you can finish your sentence.

Mr. OGILBY. Sure, thanks.

Mr. ANDERSSON. So we work with B&T, Bridges and Tunnels in New York City. A lot of existing facilities. The vast majority is nine facilities. And there we actually are scanning and modeling all the existing facilities and then the asset management piece is a huge, sort of unknown as far as I think their budget is $2 billion the next 3 years just to maintain these facilities. We have found multiple steps of inefficiencies. They cannot find the records to maintain this. People move much more in the workplace than they used to so you do not have the guy that worked there for 30 years that know where these things is. So we are digitizing everything so you can actually quickly find a piece of equipment. And you are talking millions in savings every year. Just alone, just to find things and now what to do so you can fix something quickly.

Mr. STAUBER. Thank you.

Mr. Ogilby, finish. Thank you.

Mr. OGILBY. Actually, I wanted to touch on something Mr. Golden brought up earlier which was around the workforce. And so just some stats that I had dug up.

There were 300,000—according to the U.S. Bureau of Labor Statistics, 300,000 vacancies in the construction industry in June of this year, expected to climb to 757,000 by 2026. So, yeah, there is more labor needed dramatically, and I would not place that as a concern——

Mr. STAUBER. Okay. Thank you.

Mr. OGILBY.—regarding technology adoption at all.

Mr. STAUBER. Interesting.

Mr. Forrestel, with your company, it sounds like very well respected, 4th generation. Can you tell us, give us an approximate

amount that your company invests per year in digital technology to stay competitive? Just a rough estimate.

Mr. FORRESTEL. It has varied some. We were fortunate to be an early adopter when we had a lot of work that the technology was applicable to. But I would say on average the technology across the board, we are investing 5 percent——

Mr. STAUBER. Okay.

Mr. OGILBY.—of sales in technology.

Mr. SHEPHARD. That is 2-1/2 times the industry average.

Mr. STAUBER. That is 2-1/2 times the industry average. Okay.

Mr. OGILBY. But at the same time, we are seeing enormous returns on that. Very fast return on investment. And then everything above and beyond that ROI is profit or being able to bid projects at a lower price and procure more work and do it more cost effectively for the owners.

Mr. STAUBER. I think you mentioned in your testimony that small businesses cannot afford not to invest in this technology to stay competitive. And Mr. Ogilby, you talked about, I could not believe this stat, but one out of four construction startups will be out of business in one year.

Mr. OGILBY. Yeah, that is correct. And it is really stunning. And we see it. I mean, these are our customers, and so we see it, unfortunately. But that is the case today.

Mr. STAUBER. Right.

Mr. OGILBY. One thing I would just like to add on, too, I think it was Mr. Golden asked about the current tax breaks that are in place. I think most of that we find is around hardware and equipment. So just from the pure technology standpoint, I do not think there is much out there available today.

Mr. STAUBER. Okay. Thank you very much.

Chairman GOLDEN. We would now recognize Mr. Hagedorn, from Minnesota's 1st Congressional District.

Mr. HAGEDORN. Mr. Chairman, I am happy to defer to our Ranking Member Chabot.

Mr. CHABOT. Go ahead, please.

Mr. HAGEDORN. Are you sure?

Mr. CHABOT. Yes.

Mr. HAGEDORN. Okay.

Thank you for the opportunity. I appreciate it.

I take it that this technology, this digital technology helps you be more precise. Would that make some sense? And your planning, reduce costs, things like that, certainly, it could be an advantage if you are bidding on contracts, you are probably going to be viewed as the team that is going to maybe have the best deal or at least be the closest to the end.

So Mr. Forrestel, what is your experience? How much can you save in these areas? How important is it to be efficient by using this type of technology?

Mr. FORRESTEL. It depends somewhat on the type of project. Some projects it is easier to leverage the technology for cost savings than others. We were fortunate——

Mr. HAGEDORN. Give us an example of a difference. Different type of projects.

Mr. FORRESTEL. So big earthwork projects are sort of the natural fit for the automated machine guidance type work where you are moving huge quantities of dirt. You can move it more quickly because everybody who is working on the site in a machine knows when they are getting close to what the finished product needs to be. They are not getting somewhere in the ballpark and then the survey crew has to come out and check grades again. They are grading to the finished grade and they are done. So that is where some of the biggest efficiencies lie.

I gave an example in my written testimony of roadway grading where the efficiency has improved in the neighborhood of 500 percent with automated machine guidance. And so on long expressway-type projects that are new construction or full reconstruction, the savings are astronomical. And initially, we were fortunate because not knowing what those savings were going to be, we realized a lot of those as profits which allowed us to cover our costs of implementing the technology early. Now, we are competing against more contractors who are sharing in the same advantages, so now those savings are being passed on to the agencies and ultimately the taxpayers.

Mr. HAGEDORN. That is good.

Is it considered now the industry standard that you have to do this or are states requiring it to make bids?

Mr. FORRESTEL. There are not requirements. There have been more changes in the specifications to allow it. Initially, we saw resistance from a lot of the agencies because it was just unchartered territory. They did not have the same reference points to look at that they used to, oftentimes being stakes in the ground. That was all information on a computer screen, so they had trouble adjusting to that. But we are getting there in terms of allowing it. I think now it needs to be encouraged or required.

Mr. HAGEDORN. Now you have kind of proven the technology a little bit and they see the benefits.

So Mr. Ogilby, you talk about workforce issues, and I happen to be somebody that agrees with you 100 percent. For a long time in this country we almost discouraged people from getting into a vocational trade certificate program, skilled labor. Told them if you did not go to a 4-year college you are just not going to amount to anything. That turned out to be not such a good thing. And now we are trying to get folks to the point where they have a choice. And whatever they choose to do, whatever is in their heart, they should be fostered, enabled to do that.

A piece of legislation that I have introduced with Congressman Van Drew of New Jersey, it is bipartisan, it is called the American Workforce Empowerment Act, and it would make it so these 529 education savings accounts could be applied to certificate programs, apprenticeships, skilled labor type fields, the purchase of tools and equipment. Is that the type of legislation that you might be able to help us with?

Mr. OGILBY. Oh, that is fabulous. I love that. Yeah, that is fabulous. Yeah, 100 percent. You know, there has been a stigma around it and we have alluded to it. My friend from the AGC I am sure would confirm. I mean, it is probably, aside from, you know, the adoption technology, we have an enormous lever with tech-

nology where we can really drive efficiency, and this Committee is doing the right thing. But on the labor side it is the single number one biggest problem and challenge for the construction industry as a whole today without question.

Mr. HAGEDORN. Does anyone else have a comment on the skilled workforce issue? You pretty much agree?

Mr. SHEPHARD. Yeah, definitely. We are testing in New York actually the apprenticeship model, sort of reverse mentoring. It is sort of a generational thing. The kids growing up, they just run with this technology. But the people that are really experienced are not so familiar with it. So teaming a young person up with an experienced, and we have seen some really interesting results on that.

Mr. HAGEDORN. Thank you. That is H.R. 4469. So thank you very much. I appreciate it.

Mr. OGILBY. Yeah, thank you for that.

One thing I will add is that technology can be a carrot here as well, right, for adopting, for getting new people to want to move into the industry. The more we adopt technology as an industry, I think the more attractive it becomes to young people. And a couple other fellows made that comment as well.

Mr. HAGEDORN. Thanks very much. I yield back.

Chairman GOLDEN. Thank you very much.

We will now call upon the Full Committee Ranking Member, Congressman Chabot, from Ohio's 1st Congressional District.

Mr. CHABOT. Thank you very much, Mr. Chairman.

And Mr. Ogilby, I will go to you if I can. Welcome, again. I understand my colleague from Minnesota introduced you. I hoped to be over here but unfortunately, around this place, things always come up and change plans.

Mr. OGILBY. No worries. No worries. Thank you very much.

Mr. CHABOT. The best laid plan. But it is great to have you here, as well as it is the other witnesses.

Your company, STACK, has experienced some really incredible growth in a relatively short period of time. Could you talk about the types of financing that you have secured to facilitate that growth? I know you talked about going to 20 different cities and being told no by various venture capitalists.

Mr. OGILBY. You have done some research.

Mr. CHABOT. Yeah. So if you want to talk about that, perhaps, and also, what availability did you find in our community in Cincinnati that you found helpful in growing your business?

Mr. OGILBY. Yeah, sure. Well, first of all, my story goes back probably, well, 2 decades now. So when I started iSqFt, which was my last startup, now employs more than 1,000 people. It is known as Construct Connect, still based there in Cincinnati. A lot of those war stories around raising money and traveling around the country, I finally found an angel investor in Cincinnati to help us fund that business and get it off the ground.

Mr. CHABOT. What would you say America's greatest city is again?

Mr. OGILBY. That would be Cincinnati.

Mr. CHABOT. Thank you. I appreciate that. Go ahead.

Mr. OGILBY. Thank you, Mr. Chabot.

And by the way, the State of Ohio was very helpful with additional financing to get our young, very young business off the ground 2 years ago or 3 years ago.

Mr. CHABOT. Greatest city and the greatest state. I am just saying. But go ahead.

Mr. SHEPHARD. If I could jump on the bandwagon, my daughter goes to the University of Cincinnati. So I would just like to jump on.

Mr. CHABOT. Oh, excellent. Our daughter is a graduate of the DAP program there and my wife is a graduate there as well, so great school in a great city. No, go ahead.

Mr. OGILBY. Thank you for the opportunity. I could expand but——

Mr. CHABOT. So anyway, on the financing and——

Mr. OGILBY. Yes.

Mr. CHABOT.—Cincinnati, and how you went through this process.

Mr. OGILBY. Sure, sure, sure.

So, well, very early on, again, I literally traveled the country. There was some resistance. Everybody I met with it seemed like told me this was the greatest idea. They could not believe nobody was doing it already. I was in San Francisco many times. You know, New York, Chicago, many, many times. And at the end of the day, I was able to secure angel financing in Cincinnati, and we had a very friendly angel who helped us to continue that business even when we were still hearing no locally. We did finally secure financing from a local Cincinnati venture firm in River Cities Capital and Chrysalis Ventures out of Louisville. That was my last startup.

Today, we have funding out of the City of New York, the great state of New York with Level Equity, but you know, it is all money very, very well invested. And driving technology into this industry is not for the faint of heart but it has been a very rewarding experience as well. I love hearing the stories about the impact of technology. We literally have hundreds and hundreds of testimonials from customers who tell us how it has impacted their business and their family lives and the impact of their family of their employees. And it is just very, very gratifying. So this is near and dear to my heart what you folks are putting together here, the concept.

Mr. CHABOT. Thank you. And it is my understanding that STACK provides colleges and universities with free access to its pre-construction tools. How do these partnerships help with industry workforce development, and what impact has that had on your business?

Mr. OGILBY. You know, it is something we have debated through the years. Being a relatively small business still today we do not always feel like we have the resources we need to do that but it has been a tremendous program. So we do that. As you have explained, we offer free technology, our solutions free for universities, and it has been a powerful thing for the ones who have adopted it. And obviously, the goal being we want to seed the market with experienced operators of the technology as they go into the workplace.

Mr. CHABOT. Very good. And then finally, how do platforms like STACK integrate with other tools that are offered by other companies? How do businesses learn how to fully utilize these tools?

Mr. OGILBY. Yeah, that is a great question. Training is a whole another issues, and training is getting easier and easier with the modern tools and the modern design. Training today is not nearly what it was 25 years ago with desktop software solutions. So training is less and less of a challenge for us every day.

But one of the things that we do focus on is integrating with other platforms. We are not everything to everybody, and we do not intend to be. And I think most solutions are the same. So we see a tremendous amount of value in integrating. So we have an API behind our platform but it is really a set of hooks that other software can use to pull and push data in and out of our platform. I know Trimble has the same sort of things. And it is becoming more and more common in the industry to do that, but I think ultimately success and widespread adoption across the industry of technology is really going to require that kind of interconnectivity between apps.

Mr. CHABOT. Thank you very much.

Mr. Chairman, my time has expired. Thank you.

Mr. OGILBY. Thank you.

Chairman GOLDEN. Thank you very much.

We will now move on to Congressman Balderson, also of Ohio, and Ranking Member of the Subcommittee on Innovation and Workforce Development.

Mr. BALDERSON. Thank you, Mr. Chairman. And thank you, panel, for being here today. I have never talked this much about Ohio in a long time. I am glad to hear that we all agree.

And this question is broad for the whole panel, so anybody can go in any particular order you would like to go. But I want to thank you again all for being here today.

I sit on this Committee, and also the T&I Committee, like our Ranking Member, Representative Stauber also sit on the T&I Committee. So I know how critical it is to fix our Nation's crumbling infrastructure.

In your written testimonies, each of you highlighted the rate of adoption, or rather the lack of thereof of new technologies by small construction businesses, as well as the state departments of transportation. Would each of you share some of the reasons this is the case? And have there been any cases we can look at in which states or small businesses have done a good job of adopting innovative technologies?

And as I said, you all make this—whoever is ready to go, go right ahead.

Mr. ANDERSSON. One of the issues we are finding is rate of adoption, I have been at this for 20 years now, is that a lot of the standards and requirements are outdated. So when you get a project from an agency, you are supposed to use CAD 2D drawings and submit the piece of paper. So the effect that you have to maintain a legacy system and innovate on the new side becomes very expensive. So it will be much easier if agencies start mandating these new technologies and then you can actually make the decision without maintaining the old system.

Mr. SHEPHARD. If I can just add, you know, representing a manufacturer that develops these tools, the software, the hardware, et cetera, back at Woodland it says we do not want people to mandate our specific products. I do not want the world to be mandated to be Trimble products. That would be nice but that is not what is needed. We are happy to work with everybody to increase the adoption broadly and then all boats rise on the tide. And we will take our chances individually as which consumer prefers the right solution. And we work collaboratively with people that we compete with in the marketplace every day to try and find innovative ways to increase adoptions so that we can gain all these efficiencies that we have all testified to today. So we are happy to do that. It is really about seeding the mindset to ease the adoption.

Mr. BALDERSON. Would anybody else like to add? If not——

Mr. FORRESTEL. Sure.

Mr. BALDERSON.—my follow up—oh, go ahead. I am sorry.

Mr. FORRESTEL. I can add a little bit from the construction industry side in terms of resistance to adoption. I think it has been alluded to some today but our industry is old school. You know, guys who start construction companies like to buy their iron, their equipment, and technology does not necessarily fit the same mold. So I remember when we were getting into it, my father was questioning the expense of investing in the technology. He said, well, that stuff does not move dirt or put pavement on the ground. Well, no, it does not, but it helps you do it a lot faster and a lot more accurately and a lot more efficiently. So it is getting over the hump for some people of understanding exactly what it does and how much it does benefit. And that it is not exactly getting the work done but it is helping you get the work done so much more efficiently. And that is just what I have seen in the industry and through personal experience in terms of being an impediment to adoption is just that that perception that it is not the nuts and bolts stuff that we have always done.

Mr. BALDERSON. Okay. Thank you for your answer, all of you.

My follow up in the brief time I have here left, to the best of your knowledge, are there Federal regulations preventing these types of systems or technologies from being adopted?

Mr. FORRESTEL. I can name one off the top of my head.

Mr. BALDERSON. One is one, so.

Mr. FORRESTEL. For FAA work, paving on airports where the owner of the project is the FAA, they mandate paving with string lines. That is their specification. And there has been some success by us and others to convince them in certain instances to be able to use machine automation which in paving, whether it is blacktop or concrete, is way more efficient. And especially in the tight timeframes that are often required for airport work, that is a big deal. And it is just an antiquated specification that does not allow for new technology.

Mr. BALDERSON. Thank you very much, panel.

Mr. Chairman.

Chairman GOLDEN. Thank you all very much.

I am going to go ahead and do another round. I do not know if there are other members who might be interested.

One thing, talking about the workforce training opportunities, and it sounds like you are doing a little bit of this, Mr. Ogilby. In Maine, when I was in the Maine legislature, we went ahead and put a little bit of state money into a training program working in the logging industry where we do see a lot of technological advancement in the equipment, but it is very expensive to have. Hard for a community college or a training program, apprenticeship program to purchase half a million dollar pieces of equipment or more. So really, we are having a hard time getting youth opportunities to get in and get trained with that equipment which then made it harder to hire them because you are dealing with a pretty expensive piece of machinery that requires extra training. So the industry actually was willing to kick in some of that equipment so we did not have to purchase it and now we had like a nice public-private partnership where our young loggers were able to get in and get enough hours working new equipment so that they were entering into the workforce not just trained on one piece of equipment which was kind of the industry standard, but on multiple pieces of equipment. Now they had a more dynamic, more flexible workforce, and more likely to be hired more quickly into the jobsite and be more valuable. And if a piece of equipment went down, they could just hop on another one.

So I do not know if you all have seen anything like that but even with the digitization side of things, helping to pool resources for training opportunities I think is a big part of getting a trained and ready workforce.

I did want to ask if any of you have anything to say about potentials around 3D printing in the construction industry. The University of Maine Advanced Structures and Composite Center, I just have to brag about, they now have the largest 3D printer in the world, and they are working with all kinds of neat stuff. You know, hybrid manufacturing, 3D printing, using long fiber reinforced tapes. They are doing thermoplastics, bio resins and other things. You can think about cross-laminated timber for the construction industry. They are making lightweight tougher than steel axels for equipment and other things. It seems to me like the sky is the limit but I am curious what you are seeing with 3D printing in the construction industry.

Any of you. Go ahead.

Mr. SHEPHARD. Just a quick comment on that. We are a partner in a venture fund which is led by the Hope family who own the Caterpillar dealership in Texas. It is a broad fund that is focused on construction technology. And they closed 3 or 4 months ago. We had the first meeting a couple of weeks ago, and one of the businesses they are looking at is a business that actually 3D foot homes. Like 1,200 square foot homes. It is remarkable. And they are focused on affordable housing where you can go into plots of land in underprivileged areas and these are really affordable, properly built, durable homes and it is a startup out of Texas that is doing that.

This is an explosion in this area. It is really where, you know, one of my soap boxes is this is the fusion of what you call just normal manufacturing principles and technology brought to the construction space. This is how people have been building cars, cutting

metal chips all across the Midwest for years. So now we are applying these principles, and 3D printing is no more than taking a CAD file and putting it on a lathe or a machine, a C&C machine that cuts metal to print a house the same way.

Just one quick comment on your education, Mr. Chairman. And it ties two things together about the job loss or the fear of job loss. We actually work very closely with the unions. We have a collaboration, a partnership with the International Union of Operating Engineers where we use their facilities, we donate equipment, we bring customers to train. The union loves it because they can upscale their people. We love their facilities and we can use the space and their equipment to show our customers and showcase. And it has been a very symbiotic relationship where they get something out of it. We get something out of it, too. And it helps the workforce.

Chairman GOLDEN. That is great. Thank you very much. The 3D printing aspect, you know, I find very interesting. They just did, like I said, the largest 3D printer in the world for now. I think we are going to continue to see advancement. But I think they did a 30 or 40 foot boat in under 72 hours. If you stop and think about that, that is pretty amazing. They started it up on Friday and came back in to a finished—it does float, yes. I actually got into it.

Mr. STAUBER. Mr. Chair, I will let you know, my staffer asked the question. I did not.

Chairman GOLDEN. Yeah, that is right. So, you know, more to come on that. And thanks for sharing the training partnership with operating engineers.

Go ahead, Mr. Stauber. Thank you, Mr. Chair.

If Ranking Member Chabot were here I would ask him to have a conversation about which state is better because I will take Minnesota any day.

I have got just a couple of comments.

First of all, thanks for your expertise in sharing this with us. I think that by using digitized technologies we can save money. That is the investment from the taxpayers. The projects, the lifecycle can be longer because of, for instance, the compaction is perfect.

And then one of the things that we talk about is the safety. And Mr. Forrestel, you talked about working at night. The safety of the men and women that are putting the projects together, it is critically important that we invest in these. And I am excited.

Mr. Forrestel, you had mentioned the FAA mandates paving with string lines. I am on the Aviation Subcommittee, and I turned to the Chair to my staffer here. And I said, this is something that we can implement in the RFPs.

My hometown airport of Duluth, Minnesota, just did a complete paving of the runway 927. And if that saves the taxpayer money and does it quicker because it is also our F-16 base. And so these are some things that you as experts can bring to us that we can help change and do things better, more efficient, maximize the taxpayers' investment. So I really appreciate your comments and considerations today. Thank you for your time. I hope you felt it was valuable because I know we did.

And to the Chair, thanks for putting this together. These are the type of really nonpartisan or bipartisan things that we, in Congress, can do to help small businesses succeed. So thank you, Chair Golden.

Chairman GOLDEN. Of course, always a pleasure to work with you.

I would say as well, Mr. Andersson, you were talking about having to have two different platforms, you know, drawings and sketches, and then also having the 3D option. And it makes me think of the need to invest in an advanced workforce within government as well, whether that be DOT or other agencies and departments at the Federal and state level. If we are not investing in a workforce that is able to keep up with the private sector, then it will inevitably hold us back. And we all know the large role that government plans in regard to the procurement of services, many of which you provide in construction, particularly with roads and bridges and others. So we have got to be looking to that as well. And I am interested in the FAA piece as well, Mr. Stauber.

So I want to thank you all for joining us today. Please feel free to send us more info if you have it, or if you think you want to add in more or you did not get some of the questions that you really wanted to answer, let us know, and we are happy to have that information.

I think it has been a worthy hearing where we have learned a little bit about how digital construction tools can help our small businesses find opportunities to cut costs and compete for more business. Nimble small businesses need a level playing field to contribute cost-saving services as we begin to spend Federal dollars to improve our Nation's infrastructure. But small businesses cannot unlock these opportunities if they fail to adopt cost-saving equipment, which is why the members of this Committee are looking to raise awareness of the value of digital tools and encourage small businesses to actively adopt them in construction, design, and engineering.

I look forward to working on this issue with the Ranking Member and members of the Subcommittee and Committee. Some of you had some ideas on how we could incentivize some of these things and we will be looking back at your testimony and advice. So thank you for joining us today.

And I would go ahead and ask unanimous consent that members have 5 legislative days to submit statements and supporting materials for the record.

Without objection, so ordered.

And if there is no further business to come before the Committee, we are adjourned. Thank you very much, gentlemen.

[Whereupon, at 11:17 a.m., the subcommittee was adjourned.]

APPENDIX

Washington Office
25 Massachusetts Avenue NW
Suite 500
Washington, D.C. 20001
(202) 789-7850
Web: http://www.asce.org

Smart Construction: Increasing Opportunities for Small Businesses in Infrastructure

Tuesday, November 19, 2019

Subcommittee on Contracting and Infrastructure

Committee on Small Business

U.S. House of Representatives

Lennart Andersson, A.M.ASCE

American Society of Civil Engineers

Introduction

Chairman Golden, Ranking Member Stauber, and members of the Subcommittee, thank you for inviting me today for this important discussion on smart construction and the future of the construction industry. My name is Lennart Andersson, and I am an engineer and licensed architect. For the past 20 years I have applied virtual design and construction methodologies on a wide variety of projects from large scale projects such as bridges, tunnels, and municipal buildings all the way down to small scale projects.

At Pratt Institute in Manhattan, New York, I teach a collaborative course on Virtual Design, Construction & Operation (VDCO) methodologies alongside designers, construction managers, and facilities management graduate students. I also serve as director of Virtual Design, Construction & Operations at the LiRo group and I am the founder of FormD, a next generation architecture, engineering, construction, and owner/operator (AECO) startup which works to accelerate the digitization of the built environment.

I received the Digital Edge 50 award in 2018 and the CIO 100 award in 2019. I am a member of the International Facility Management Association's (IFMA) Environmental Stewardship (ESUS) committee, have been a member of the Center of Architecture's professional practice committee—developing the next generation of connected documentation, and am currently developing webinars for ASCE on the digital transformation of civil engineering.

Today, I am appearing on behalf of the more than 150,000 members of the American Society of Civil Engineers (ASCE). Founded in 1852, ASCE is the nation's oldest national engineering society representing the civil engineering professionals who serve as stewards of infrastructure here in the U.S. and around the globe.

I also represent ASCE's Construction Institute (CI), whose mission is to advance the construction industry. Construction engineering is a professional discipline that combines design skills with planning, supervision, and management of construction projects. CI members are made up of everyone from owners and facility managers, architects and engineers, contractors and subcontractors, project managers, to consultants, governmental agencies, lawyers, and many other support services. As a part of ASCE, the Construction Institute has been a leader in providing vision, leadership, problem-solving skills, and unique continuing education for the past 20 years.

ASCE appreciates the opportunity to discuss smart construction and increasing opportunities for small businesses. We also thank the U.S. House Committee on Small Business for examining this important and ever evolving area. ASCE is eager to work with Congress to find ways to improve the project delivery at all stages including planning, funding, design, construction, operation, maintenance, and decommissioning of projects.

All phases of construction are poised to change and evolve in the coming years, incorporating traditional tools of the trade and new technologies that could transform the way projects are completed. The industry has much to gain with these new and innovative technologies so that we can build better ,more cost effective buildings, infrastructure, and communities.

Current construction design can be slow to adopt new technology, therefore slowing project delivery. In 2017, the McKinsey Global Institute released a report that stated that the efficiency of

Architecture, Engineering, and Construction (AEC) sector dropped by 26% since 1991, while the performance of average non-AEC industry increased by 48% during the same time period. The tools and processes used in infrastructure construction are still largely analog and manual. If properly implemented, the very latest technology will enable fewer people to do more and achieve a higher quality.

Examples of innovation can be seen in the following areas:

- Construction artificial intelligence (AI) systems, which may recommend to a builder what materials, specific design languages, and costs are needed to create the home based on available data—all within seconds.
- Incorporating smart robotics to save time and money.
- Using virtual and augmented reality simulators, which can serve as training tools to improve operating proficiency or design efficiency on projects.
- Commercial drone technology has come a long way and extends beyond capturing project images and video. Systems are now using thermal imaging and sensor technology to deliver quantifiable data about materials, processes and personnel on site.
- 3D printing has the potential for use in both component manufacturing and building applications.

Virtual design and construction not only helps to create 3D and 4D models of a project, but as a part of the construction process, it helps to create budgets and schedules as projects go through funding approval and access a single repository for all project scope and design documentation. It also simplifies owner/engineer collaboration through interactive processes and manages iterations of the project's budget, schedule, and design models; creates detailed estimates and schedules by managing documents, changes and forecasts, and drives field productivity from anywhere with mobile solutions. Virtual design and construction also enable access to a single searchable repository for as-designed and as-built information to facilitate construction, maintenance, and operations activities.

For East Side Access, only four people were needed to model and code what is considered the largest (Building Information Modeling) BIM project in the world. By applying automated reality capture and digitization of documentation, processes, and common-sense standards, it is possible to realize the digital twin of infrastructure before construction. This model is used for planning and augmenting the design for all stakeholders through interactive interfaces. Prior to actual construction, BIM is used for accurate cost estimates, schedules, finding requests for information (RFIs) prior to construction, and then automatically connects progress tracking and reporting. The digital copy is also used for traffic simulations, virtual mockups, staging planning, construction phasing, site safety analysis, as well as community outreach—which all help to accelerate decision-making and optimize execution.

Primarily, the Digital Twin is an integral component for proper life-cycle management through data connectivity to computerized asset management systems and geographic information systems (GIS). Coupled with the emergence of robotics, machine learning, and automated progress tracking, it is possible to revolutionize infrastructure productivity while working towards a sustainable future. The gradual recording of underground utilities enables connectivity to Smart City concepts, which is needed to effectively manage cities in the 21st century.

BIM increases transparency and fosters an environment of participation for all stakeholders. This method of virtual building sets the stage for more collaborative forms of project delivery methods (in contrast to the traditional design-bid-build) such as design-build, integrated project delivery, and at-risk construction management methods. BIM also coincides with lean construction and public-private partnership projects, where timely coordination and accurate information is paramount. As multiple alternatives can easily be studied and shared, it provides optimized understanding of value engineering.

We have an opportunity to use small businesses as changemakers of infrastructure. Innovation is often more difficult to implement in larger organizations, while small businesses are inherently forced to innovate in order to be competitive.

Congress must support and foster these new processes and technologies by:

- Drafting and passing legislation and policies that encourage development of innovative technologies and processes;
- Encouraging research to accelerate the development of existing technology and develop new technology in the fields of design, materials, construction, maintenance, rehabilitation, and operation of the infrastructure, while understanding the need for reduction of life-cycle costs, and improved sustainability and resilience;
- Allocating appropriate funding for research at the federal level in conjunction with state/local agencies, universities, and the private sector;
- Supporting the identification and dissemination of information about federal, state, and local governments, academia, and private sector construction research and development activities;
- Encouraging implementation of innovative technology;
- Creating opportunities for academics and practicing engineers to conduct basic and applied research and development activities; and
- Developing and implementing new strategies and technologies to mitigate the impact of disasters on the nation's infrastructure.

In addition, Congress must continue and expand funding to ensure that that National Institute of Standards and Technology (NIST) can carry out its mission of promoting U.S. innovation and competitiveness by anticipating and meeting the needs of the U.S. building and fire safety industries for measurement science, standards, and technology. Congress must also expand the research efforts at NIST in man-made and natural hazards, their effects on structures and building equipment, and the mitigation of their impacts—including new metrics to enable proper assessment of infrastructure resilience and life-cycle performance. Such new metrics are needed to properly assess life-cycle performance of buildings and other structures.

Tackling our Nation's Infrastructure Challenge

Every four years, ASCE publishes the Infrastructure Report Card, which grades 16 major infrastructure categories using a simple "A" to "F" school report card format. Through this format, ASCE educates the public on the current state of our nation's infrastructure system.

ASCE's 2017 *Infrastructure Report Card* graded the nation's infrastructure at a D+. Gaps between identified needs, investments needed to rehabilitate our public infrastructure, and public commitments to meet those needs widen every year. If expansion of the infrastructure to accommodate sustainable performance, resilience and growth is also considered, the gaps are even wider. The most cost-effective method to close these gaps and raise the grades is to enhance innovation throughout the construction industry, thus improving the efficiency of available resources.

Examples of innovative practices, technologies, and procurement policies might include: the use of performance instead of prescriptive criteria in procurement policies; emphasis on life-cycle costs during procurement; emphasis on innovation as a selection factor for procurement; reduced liability connected with innovation; and maximization of commercial rights to innovative intellectual property developed during construction projects.

Incorporating and embracing new approaches, materials, and technologies will help to ensure our infrastructure is more resilient – to more quickly recover from significant weather and other hazard events – and sustainable – improving the "triple bottom line" with clear economic, social, and environmental benefits. Specifically, we must:

- Develop active community resilience programs for severe weather, seismic events, and other hazards to establish communications systems and recovery plans to reduce impacts on the local economy, quality of life, and environment.
- Consider emerging technologies and shifting social and economic trends – such as autonomous vehicles, distributed power generation and storage, and larger ships – when building new infrastructure, to assure long-term utility.
- Improve land use planning at the local level to consider the function of existing and new infrastructure, the balance between the built and natural environments, and population trends in communities of all sizes, now and into the future.
- Support research and development into innovative new materials, technologies, and processes to modernize and extend the life of infrastructure, expedite repairs or replacement, and promote cost savings.

The engineering community is also committed to improving innovation within the industry. The ASCE Grand Challenge is a commitment to rethink what's possible in our industry. The goal is to work towards reducing infrastructure life-cycle costs by 50% by 2025. This can be done by focusing on four main areas:

- **Resilience:** Civil engineering projects must account for long-term environmental factors that America's infrastructure must withstand. Designing and building for resilience is a key component of the Challenge because it allows the industry to plan for potential infrastructure emergencies rather than rely on large cash flows when there is a disaster.
- **Life-Cycle Cost Analysis (LCCA):** This methodology is used for determining the total cost of ownership of an asset – from acquiring, planning, permitting, engineering, procuring, constructing, owning, operating, maintaining, and disposing of an asset. The LCCA approach is essential for ensuring that a project is the most sustainable and cost-effective choice over its lifetime.

- **Innovation:** Building a culture of innovation will lead the way for investment in smarter materials and processes. It is important for engineers to embrace innovation at every level and at every project stage. To successfully "launch" innovative approaches across the board, we need to reduce barriers in thought leadership. Hypothesis, examination, testing, and refinements are essential to the successful implementation of new ideas.
- **Performance-Based Standards:** Migrating standards and practices from prescriptive- to performance-based requires the development of new solutions and approaches. Performance-Based Design encourages innovation across the civil engineering profession.

Research shows that LCCA can lead to significant cost and resource savings. To paint this picture, here's an example:

Michigan Department of Transportation (MDOT) implemented an improved efficiency and new technology-focused plan that saved the department time and money. MDOT estimates the agency has saved approximately $12 million annually due to better efficiency, along with six million pieces of paper — thanks to their new process initiatives. The agency also used new-to-market paperless technology on a recent $150 million infrastructure project, the reconstruction of I-96, to help manage 55 firms and almost 500 construction workers, completing work in about seven months and ahead of schedule. The productivity gains alone are estimated to have saved Michigan over $1 million.

Codes and Standards

ASCE supports, as an import cornerstone of construction innovation and resilience, the development, adoption, and enforcement of up-to-date building codes. The role of the federal government includes enacting and funding incentive programs encouraging state and local agencies to adopt building codes and support funding for research that is necessary for the development of model building codes.

Both responsible design and construction are essential to improve the quality of life, assure safety and durability, and reduce vulnerability of the nation's infrastructure. The purpose of a building code and the consensus-based standards is to establish minimum requirements necessary to protect and improve public health, safety and welfare in the built environment. Model building codes provide for protection from fire, structural collapse, general deterioration, and extreme loads related to man-made and natural hazards. They are also created to conserve natural resources, reduce owner costs, and preserve the environment by establishing minimum building standards. Safe and sustainable buildings are achieved through performance-based, code-based design and construction practices, in concert with a code administration program that ensures compliance.

Research and Development

A robust federal research and development program (R&D) can lead to new approaches, materials, and technologies to ensure more innovative, resilient, sustainable, and cost-effective built environment. It will also lead to more sustainable development by improving the "triple bottom line" with clear economic, social, and environmental benefits.

ASCE supports basic and applied R&D programs, coupled with demonstration and

commercialization programs, structured to meet needs for:

- Revitalizing the nation's public works infrastructure to protect citizens by improving function and reducing life-cycle costs;
- Enhancing environmental quality and fostering sustainable development;
- Increasing the application of identifying, proving, and fielding emerging technologies, materials and processes to improve security, durability, disaster resilience, sustainability, and performance of engineered systems;
- Advancing the business performance of the practice of civil engineering and the industries supported by civil engineering services through Quality Based Selection (QBS) to improve the nation's competitiveness; and
- Enhancing the security, safety and resilience of critical infrastructure to protect the safety and economic vitality of the nation against natural and man-made hazards.

Conclusion

ASCE thanks the Committee for holding this hearing on a topic that affects the quality of life and livelihood of every American. Our world is constantly changing, and we must embrace these changes by ensuring we are using the most modern and technologically advanced construction materials—in addition to considering life-cycle costs—when making investments that will last for decades or longer.

Civil engineers are the stewards of infrastructure and have a leading role in planning, designing, constructing, operating, and maintaining the built environment. We understand the significant benefits to society of infrastructure renewal and construction innovation. Careful thinking about likely future realities is what civil engineers do every day when planning, designing, and implementing their projects.

We are designing our infrastructure systems to last for 50, 100 years or more. It is critical we think about solutions that will fit our future world. We can prepare now by utilizing new approaches, materials, and technologies to ensure our infrastructure is more resilient – to more quickly recover from significant weather and other hazard events – and sustainable – improving the "triple bottom line" with clear economic, social, and environmental benefits. We must commit today to make our vision of the future a reality – an American infrastructure system that is the source of our prosperity.

ASCE and its 150,000 members look forward to working with the House Committee on the Small Business to improve America's built environment so that every family, community, and business can thrive.

Ryan Forrestel
President, Cold Spring Construction, Akron, New York
Testimony before the House Small Business Subcommittee on Contracting and Infrastructure
"Smart Construction – Increasing Opportunities for Small Business and Infrastructure"
November 19, 2019

Good morning, Chairman Golden and Ranking Member Stauber.

My name is Ryan Forrestel, and I am President of Cold Spring Construction in Akron, NY. I am proud to sit before the Small Business Committee today to talk about how digital construction technology has benefitted our industry, and to talk specifically about the benefits that our small business has realized as a result of integrating these technologies.

Cold Spring Construction was founded by my great grandfather in 1911, and my father was President of Cold Spring before me. Our work entails just about every aspect of heavy highway construction – from heavy earth moving, to blacktop paving, concrete paving and bridge work.

Cold Spring Construction is a small business, with about 120 employees. And we are also a family business. I take great pride in continuing a family business that's been around for four generations. But when we talk family, we don't mean just blood relationships. Our employees are part of the family – we've got a lot of husbands and wives, sons and daughters that we treat as part of the Cold Spring family.

Cold Spring is proud of the high-quality work that we have performed throughout New York State, with many signature projects finishing ahead of schedule and within budget. Some recent examples of these projects include Rehabilitation of the Buffalo Skyway, I-390/I-490 Interchange in Rochester, Route 219 Expressway Extension in Springville and I-86/I-99 Interchange in Painted Post. We look forward to continuing to perform exceptional work well into the future.

The Digital Transformation of Cold Spring Construction

When my great grandfather founded Cold Spring back in 1911, all of the dirt was loaded by hand, and site measurements were done with an eye level. One worker with a pick and shovel can move ten cubic yards of dirt in a day – that's the production that my great grandfather strove for. Ten yards in ten hours.

As the business changed and we started to integrate heavy machinery, it became possible to move thousands of cubic yards of material in a shift versus tens of yards.

When Cold Springs first got involved in automation, our main focus was to increase efficiency and productivity in earth moving operations. The thousands of yards began to approach ten thousand cubic yards per shift, with the same crew size. In grading of earthwork, the gains have been even more significant. Before the advent of machine guidance and automation, a five-person finegrade crew could grade about 1000 feet of expressway, to prepare for paving, in a day. Now, utilizing automation, a three-person crew can grade over 5000 feet of the same roadway in a shift. That is an improvement of over 500% when accounting for labor.

Today, Cold Spring Construction is using software that enables us to utilize digital models. We've always gone out to the job site during the bidding process so that we can view the site conditions and plan how to build the job. The software now enables us to go out and actually view the design which will be constructed and see that design overlaid on the actual site conditions in real time. The ability to actually visualize what is going to be constructed before it happens is an enormous advantage. It's expensive to find a conflict and then go back and make that change. This technology allows us to look at the design before any work is done. We most recently utilized this technology on the I-390/I-490 Interchange project in Rochester, allowing us to further optimize earthwork preparation and planning.

Benefits of the Digital Transformation for Small Business

Cold Spring Construction is a small family owned business, and integrating these technologies was a big investment initially. But the investment in these technologies pays for itself quickly. With full time use of these technologies, most will pay for themselves within the first year.

In a competitive contracting environment, these precision technologies are critically important to our business because they help enable Cold Spring to remain competitive against bigger contractors. Automation helps us to deliver optimally on every aspect of projects, to produce accurate, high-quality work the first time, to get our jobs done on time, and to get our jobs done on budget.

The benefits of these technologies include:

1. ***Efficiency and Productivity.*** Our main focus when we first got into automation was to increase efficiency and productivity in earth moving operations. Technology has allowed us to complete a greater volume of work with the same resources. Embracing technology at the front end, allows us to be as competitive as possible while overseeing more work activity with the same management. Technology also helps us to gather and organize information with fewer man hours invested, enabling increased efficiency in terms of both production and cost.

2. ***Accuracy.*** Modeling allows you to trust that a project will be built exactly as planned, and automated technologies enable increased accuracy as a result of having access to the most up to date job design files in real time. While accuracy used to be ensured by a four-person survey crew, now the same tasks can be performed by a single person, in less time.

3. ***Access to information.*** When it comes to things like document tracking and tracking RFI's, the biggest value of everybody having access to information from anywhere, at any time, is avoiding mistakes caused when somebody doesn't have that information in the field. The costs can be astronomical. Digital construction management systems create transparency and visibility for everyone who is involved in a project, and help to avoid these types of costly mistakes.

4. ***Anticipating and avoiding problems.*** One of the biggest cost drivers in construction is rework – it costs time, manpower, and materials. Using automation and a digital model gives us constant data flow which allows us to ensure that the project is being built exactly as it was designed. We are able to anticipate problems and avoid them. And when we do run into an issue, the 3D model allows us to immediately begin working in another area while the problem is worked out. So we don't lose time and money with downtime for machinery and manpower. For our business, this is probably what I see as the greatest benefit of the technology.

5. ***Safety.*** Safety is one of the greatest unexpected benefits that Cold Spring has realized from the integration of automated technology. Automation has reduced the number of workers who are on the ground (and potentially out of the sight of the drivers) around these big pieces of heavy machinery. We don't have grade checkers on the ground around machines like we used to. We are also able to perform work at night without the safety risk of having workers on the ground checking grade and directing the heavy machinery in low visibility conditions.

Challenges Facing Small Businesses Implementing Technology

There is a perception that the greatest challenge facing small businesses that want to integrate digital construction technologies is the cost. While it's true that automation is a big investment, the benefits of the technology are so immense that the technologies can pay for themselves in a very short amount of time. Automation technology is also very scalable – efficiency and productivity gains can be made quickly with a relatively modest initial investment.

The greater challenge facing small businesses that choose to invest in these technologies is the slow rate of adoption of these technologies across the construction industry as a whole. Cold Spring is working with some of the most advanced equipment in the industry. Maximizing the benefits of our equipment means that all of the owners, operators, and managers involved in a project need to understand the potential of the equipment.

Let me offer you an example. Cold Spring was selected as a contractor for three year I-90 construction project. In order to manage the size and complexity of the project, Cold Spring invested in technology that would allow us to meet deadlines and produce the best pavement. We used to perform concrete paving work by guiding the paver off of two strings, that needed to be meticulously placed and aligned by a survey crew. On this project we used 3D stringless technology, allowing the paver to be guided wirelessly, with survey instruments utilizing the 3D model for the roadway directly. Collaboration on a project of this size and scope means that a variety of companies had to come together to pre-plan the project and troubleshoot throughout the project. We ran into some interface issues with this state-of-the-art technology, but we were able to overcome by everyone understanding that we were in uncharted territory, with potentially enormous benefits, and all working together to resolve the challenges. This technology has become part of standard procedure for Cold Spring.

Like any other change, the adoption of these technologies has been met with some resistance. In some cases, it is because of lack of familiarity and agencies failing to adjust specifications to allow for its use. In other cases, it has just been resistance to new methods. We have even seen some of that within Cold Spring. When we first began implementing automation technology, we had employees who thought it would never work as well as what we had always done. Now, we don't have any employees wouldn't be up in arms if they didn't have the technology available.

Broader adoption of technology across the industry and increased understanding of technology by state and federal agencies would reduce these interface issues. Cold Spring supports the creation of the Accelerated Implementation of Advanced Digital Construction Management Systems in Section 3005 of S 2302, the American Transportation Infrastructure Act. This provision would provide $20 million per year from FY21 through FY25 to increase state and local use of digital construction management systems, practices, performance and benefits. The program would support technology adoption that would enables State and local governments to integrate the adoption of digital management systems

and technologies in contracts; weigh the cost of digitization and technology in setting project budgets; advance training and workforce development to build the capabilities of project managers; better manage projects; measure and reward technology adoption across projects. The program would also allow states and localities to update regulations to allow project sponsors and contractors to report data in digital formats and fully capture the efficiencies and benefits of the technology.

Education and training are huge issues when we start projects with advanced technologies and equipment. Providing funding to increase the understanding of state and local governments will support our efforts to ensure that the equipment is incorporated into the planning phase, that the benefits of the technology are factored into bidding opportunities, and that we are able to take full advantage of all of the efficiencies and benefits of our investments.

Conclusion:

When my father and grandfather first got involved in this business, they never would have dreamt of the capabilities of digital construction technologies. What they did know was the key to our success: continuing to embrace our philosophy in terms of how hard we work, and how we treat our people. I believe that we need to embrace technology in order to advance these things that we've historically been good at and live up to those keys to success.

Every decision that we make as a small business is about doing the best work that we can do. Leveraging digital construction technologies has enabled Cold Spring Construction to do a better job of delivering good quality projects on time and on budget. That means getting more work, keeping more people working and providing a good living for these people.

Chris Shephard
Vice President, Construction Solutions Group, Trimble
Testimony before the House Committee on Small Business
Subcommittee on Contracting and Infrastructure
"Smart Construction: Increasing Opportunities for Small Businesses in Infrastructure"
November 19, 2019

Good morning, Chairman Golden and Ranking Member Stauber.

My name is Chris Shephard, and I am the Vice President for the Construction Solutions Group at Trimble. Headquartered in Sunnyvale, California, Trimble is a global technology company focused on transforming the way work is done through the use of intelligent, integrated technologies and innovative solutions.

About Trimble:

Across industries and around the world, Trimble innovation enables economic breakthroughs while enhancing safety, boosting compliance, increasing productivity, and reducing environmental impact. We do this by delivering products and services that connect the physical and digital worlds. Core technologies in positioning, modeling, connectivity, and data analytics enable customers to improve productivity, quality, safety and sustainability. Trimble software, hardware and services are transforming industries such as agriculture, construction, and transportation and logistics.

For over 40 years, Trimble has created unique solutions that help customers increase productivity and profitability and grow their business. Trimble solutions are used in over 150 countries around the world. Employees located in more than 40 countries, coupled with a highly capable network of dealers and distribution partners, serve and support our customers.

Trimble is also a founding member of the GPS Innovation Alliance, a Washington, DC-based organization dedicated to protecting, promoting, and enhancing the use of the Global Positioning System (GPS), a critical public resource used by nearly every segment of the U.S economy, including smart construction.

About Trimble Construction:

The civil engineering and construction industry builds and maintains the world's road, rail, port, airport, pipeline, power and other critical infrastructure. So much of this work is performed by small businesses - the project owners, contractors and engineers who conceive the projects, invest in the design, move the dirt, construct the road or rail, manage the jobs, and pour the cement.

Our founder, Charlie Trimble, would always tell us to listen to the problems that our customers are trying to solve. Because that is where innovation will come from. When Steve Berglund became our CEO, he advanced that philosophy to knowing the industry. By knowing an industry, you can improve productivity, quality and safety across that industry. That means that the Trimble team that is helping to develop and advance solutions for construction is out in the field alongside the small business owners who are building our bridges and paving our roads. Our hands are dirty, and our shoes are often muddy because we are out on the job site. That's what it takes to understand the construction industry and deliver technology solutions for the small businesses who are building our nation's infrastructure, and to make their work less costly, more productive, more efficient, and more safe.

Technology integration has the potential to transform how the construction industry works through sophisticated planning and design, advanced automation solutions, precision machine control, site positioning, mobile technologies and real time connectivity. These solutions offer project owners increased visibility and traceability at every phase of a construction project so they can stay on track for success. Advanced technology solutions enable all stakeholders to optimize the design, construction and operation of federally funded projects and easily collaborate to ensure that projects are delivered on time and on budget. Accelerating technology deployment would deliver savings to the US taxpayer, and free up resources for the many pressing infrastructure needs of our country.

Infrastructure: What is the problem that Trimble is trying to solve?

The construction industry is ripe for innovation. With $10 trillion in annual revenues – approximately 6 percent of GDP - construction has historically used scale to do its work: bigger machines, more machines, more cement, more nails, more tools and more people. This approach has left the construction industry with plenty of room to improve. At least 10 to 15 percent of that $10 trillion is waste:

- 15 percent of all materials are wasted
- 6-9 percent of total project costs are rework
- 50 percent of all labor costs create no value
- 50 to 70 percent of workers' time is wasted
- 90 percent of projects are late

A recent McKinsey & Co. article claims that large projects across three major asset classes (mining, infrastructure, and oil & gas) typically take 20 percent longer to finish and are up to 80 percent over budget (Imagining Construction's Digital Future – McKinsey & Company, June 2016).

The "scale" approach also creates a major disadvantage for small businesses that don't have the volume to be able to absorb these inefficiencies.

Trimble's Solution: Using Technology to Increase Efficiencies, Reduce Costs, and Improve Productivity

Technology is transforming how we construct roads, bridges, and airports through the optimization of the entire construction lifecycle: planning, design, construction and operation. Trimble's experience in the construction industry has taught us that ineffective communication, planning and collaboration are causing the most problems and driving project costs. This is why the use of digital construction technologies is so important to small businesses because it enables small businesses to better manage their costs, schedules and resources. Examples of Digital Construction technologies include:

Application Software and Modeling. Trimble solutions allow contractors to better manage their processes, resources and assets, wirelessly transfer data in real-time, create 3D constructible models, and prepare and manage design data for intelligent, on-machine use. Contractors can synchronize data and remotely monitor site progress from the office, and create design models that reach machine operators and crew in real time. These solutions allow for transparency, information sharing, and improved communication and decision-making, resulting in on-schedule and on-time project delivery.

Machine Control. Trimble machine and paving control solutions provide machine operators with in-cab, real-time positioning for guidance and control of the machine, allowing them to accurately grade, compact and pave to specifications. Trimble Grade Control Systems help contractors to finish faster with less rework, less staking, less checking, reduced costs and fuel use, less downtime, less re-work and improved material yields. Trimble Paving Control Systems allow contractors to build a smoother surface, reduce material usage and significantly improve productivity and quality.

Site Positioning. Site Positioning Systems allow customers to measure, stake, check, manage and inspect all phases of their earthworks and pacing operations. Contractors can share information, track results instantly, make smarter decisions and manage multiple job sites with ease.

Project Delivery Systems. The gains from investing in technology can be wasted, however, unless they are part of an integrated project delivery system. When a project delivery system is utilized, construction processes are linked, and information generated at one stage becomes the foundation for the next stage of the process, eliminating the waste and inefficiency created by information loss during the hand-offs between the different stages and parties involved.

The return on investment of implementing digital construction technologies is well documented. When technology is used on infrastructure projects, the results are significant and measurable:

- Machine productivity increases 30 percent
- Rework is reduced by 50 percent
- Overall project delivery costs improve by up to 30 percent

Technology doesn't just increase the financial bottom line - increased productivity and efficiency also improve environmental sustainability by reducing the use of fuel and the loss of resources to waste. Reduced rework means less material is discarded. Increased efficiency means that machines run only when they are needed and less fuel is required to run them. Enhanced project delivery reduces the fuel lost to traffic congestion.

Use of alignment planning software can also assist states and localities in optimizing environmental sustainability during the planning of road and rail projects. The Trimble Alignment Planning System enables officials to simultaneously consider environment, community, engineering and cost issues within a single analysis. For example, Trimble was commissioned to assist in the planning of the 16 mile Southern California Foothill Transportation Corridor-South project with significant results. The system saved an estimated 6 to 12 months of planning time and identified alternatives far superior to the options identified using traditional systems. The improvement over the original options reduced the wetland impact by 58 acres; reduced the impact to sensitive species; reduced landslide risk; reduced residential displacement; and minimized the impact on existing utilities (resulting in few utility relocations to undisturbed areas).

Trimble's Commitment to Small Business

Trimble technology is changing how construction work is performed, allowing contractors of all sizes and with mixed equipment fleets, to bid with more confidence, reduce rework, eliminate downtime, improve quality and manage costs. Small business are the life blood of the construction industry, and

technology is allowing small businesses to reduce costs and inefficiency so that they can compete against the larger players in the industry.

At Trimble, we recognize that the decision to implement Digital Construction technologies can be a significant investment for a small business. That is why we try to make the experience as simple, as efficient, and as cost effective as possible. Through our dealer and partner network, our skilled professionals are ready to provide local support and service to our small businesses. Our equipment is rugged, dependable, and easy to use. We work hard to provide personalized training, local service solutions, and comprehensive technical support to ensure that small businesses get the training and support that they need. We also recognize that productivity is absolutely critical – time is money, and small businesses cannot afford to have costly downtime with their machinery. Our dealers and partner network are responsive and help small businesses ensure that they have the tools and support they need to keep their machinery up and running.

I'd like to highlight just a few examples of small businesses that are achieving success using Trimble technology:

> ***Shaw Brothers of Gorham, Maine*** is a heavy earthwork/heavy civil construction firm that does a lot of work for the Maine Department of Transportation. Using machine control to deploy GPS dozers, excavators, and graders has improved their efficiency, precision and accuracy which has generated time savings and cost savings. The State of Maine will sometimes request to review their 3D files for larger jobs, knowing that this data is loaded directly into the machines to deliver the product.
>
> ***Silver Spur Construction of Haskell, Oklahoma*** improved their accuracy and grading productivity by 20 percent using 3D grade control. These improvements enabled the company to branch into commercial site work which often involves more complex designs and elevation changes.
>
> ***Ajax Paving in Detroit, Michigan*** was able to go completely "stringless" and deliver one millimeter accuracy for paving. In one situation, the team was able to keep a machine moving through dense fog while paving a highway project in Northern Michigan, preventing a shut down that would have wasted 200 feet of concrete that had already been dumped in front of the paver.

In addition to the technologies that allow contractors to increase their efficiency in the field, Trimble's software solutions are enabling small businesses to streamline the entire construction process by better managing variables at the site and in the office. These solutions integrate operations across the office, team and field to manage risk and more effectively collaborate across the broad construction ecosystem. To develop this software, Trimble needed to develop an understanding of the construction continuum, the people and resources needed for each task, and insight into how best to collaborate and/or coordinate the process and people through the use of technology. Trimble's Viewpoint software integrates a contractor's financial and resource management to their project operations and to their jobsite and field. The integration across the office, team and field enables contractors to effectively manage and have visibility to data and workflows that span the construction lifecycle from pre-production planning, to product operations and supply chain management, and then to project hand over and asset operation and maintenance.

Haldeman-Homme, Inc. (HHI), a contractor based in Minneapolis, Minnesota, is a great example of a contractor that recognized that their existing business management tools were creating a bottleneck within the organization and threatening the company's growth. The company's data existed in silos, and the HHI team was using spreadsheets to work around their system, and battling the inefficiency of duplicate data entry and slow processes. HHI transitioned their systems to Trimble's Viewpoint. All of the company's contracts and job costing information are now easily accessible, and the software shares data between accounting, estimating, project management, sales and other departments—removing departmental silos and creating a one-stop construction management solution for the company to work from. The system has allowed the company to grow without increasing administrative overhead.

The Challenge: Lack of Incentives for States to Adopt Technology

Our fifty state Departments of Transportation have a high level of awareness of the benefits of digital construction techniques and management systems. However, investments in such capabilities compete for scarce resources with much needed infrastructure projects in each state, which has in many cases limited the pace and scope of adoption of the systems and capabilities which would support enhanced management and oversight of the projects themselves.

Much work remains to be done to fully realize the benefits of these technologies not only for small businesses in the construction industry, but also for the American taxpayer. Resources provided by the federal government would accelerate the advancement of these project delivery efficiency tools, speeding up and reducing costs across the spectrum. Congress has a once-in-a-generation opportunity to transform the federal investment in infrastructure by incentivizing states to adopt modern, commercially-proven, and competitively acquired digital construction management systems and processes for infrastructure projects.

Trimble supports the creation of additional incentives for states to upgrade the technical skills of the engineers and technicians who we count on to maximize value in project delivery. This will result in faster, less costly and overall more efficient project development, delivery and construction in communities across America resulting in safer roads, better lifecycle costs and less disruptions to commerce.

We recommend for your consideration a program included in the Senate Environment and Public Works Highway reauthorization proposal. Section 3005 of S. 2302, America's Transportation Infrastructure Act of 2019, provides funding for states and localities to adopt and implement digital construction management systems that will support more effective management of the bidding, design and execution of infrastructure projects. This will significantly decrease the costs of projects and improve the timeliness of project delivery, freeing up resources for other priority infrastructure needs.

Small businesses, including Cold Spring Construction in New York, Shaw Brothers in Maine, Ajax Paving in Michigan and Haldeman-Homme of Minneapolis, Minnesota will also benefit from enactment of this provision of S. 2302. This provision will support State adoption of efficient processes and management of 3D design models throughout the construction life cycle, and it will also reduce bureaucratic barriers that prevent full realization of the efficiencies that 3D design models and other digital construction technologies provide. It will also ensure that the officials who manage competitive bidding opportunities fully appreciate the benefit of small business investment in these technologies.

Finally, Trimble also supports H.Res. 219, a bipartisan resolution affirming the importance of continuous availability, accuracy, reliability, and resiliency of the GPS constellation. High-precision GPS is one of the most critical tools for enhancing the efficiency of the construction process.

Conclusion:

Trimble is working to deliver innovative technologies and software applications that transform the construction workflow. Understanding our customers' needs and workflows helps us to provide better solutions. We are focused on giving owners increased visibility and traceability - from engineering to construction - so they stay on track for success. And we are providing every contractor with the confidence to get the job done right, on time and under budget, with a holistic continuum of solutions for every phase of the project. We are proud that our advanced technology solutions are enabling small businesses to operate more efficiently, to optimize the design process and easily collaborate with all stakeholders, and to deliver high quality construction projects built with confidence.

Witness Testimony

Smart Construction:
Increasing Opportunities for Small Businesses in Infrastructure

Tuesday, November 19, 2019

Submitted By

Phillip Ogilby
Founder and Chief Executive Officer

Submitted To

Jared Golden, Chairman

The Committee on Small Business
Subcommittee on Contracting and Infrastructure

Introduction

Thank you Chairman Golden, Ranking Member Stauber, Congressman Chabot and all members of the subcommittee for the opportunity to testify today. On behalf of STACK Construction Technologies, I'm honored to speak regarding Smart Construction and Increasing Opportunities for Small Businesses in Infrastructure. Most importantly, thank you for allowing me to share my background, the STACK story and a view of how technology can help contractors to succeed and shape future efficiency and productivity for the construction industry.

My Background – Laborer, Contractor, Technology Entrepreneur

My name is Phil Ogilby, and before I became the Founder and CEO of STACK – a construction technology company focused on helping contractors to complete more work, in less time and with a higher level of accuracy, I spent more than two decades working with, building and growing construction firms.

After high school, I started my construction career as a union sheet metal worker.

Not long after, when the economy tanked in the early 1980s, I found myself with a growing family, a mortgage and an unemployment check. So, I bought a book and taught myself how to roof my own house and eventually started a residential roofing company. Within a few years, we'd shifted our focus to commercial work and employed more than 55 people. It was during this period that I really learned how commercial construction works.

In the early 90s, I co-founded a company that supplied metal roofing and wall panels to contractors called Metal Panel Systems Inc. This company is still in existence today and serves owners and contractors throughout the Midwest.

Next came the internet and when my oldest son Justin was just 14, his interest and skill in computer programming became quite clear. His passion for technology paired with my desire to find more efficient ways to run my construction business fueled the development of our first estimating software solution. After selling more than $500,000 worth of this software to others in my network, I made the transition from contracting to providing technology solutions to contractors.

Fast forward to 1999, and I launched iSqFt, the first ever web-based solution that allowed General Contractors to distribute blueprints and specifications for currently bidding projects to their subcontractors, via the Internet. iSqFt experienced unprecedented industry adoption, grew rapidly and was eventually acquired. It exists today at part of

ConstructConnect, headquartered in Cincinnati, Ohio, and with more than 1,000 employees throughout the US.

I launched STACK Construction Technologies in 2015, with a goal to provide new and better tools for contractors to bid work faster and with a higher degree of accuracy from digital blueprints. Today, our STACK software is used worldwide by thousands of construction contractors.

The VERY BIG Construction Picture – Reality from 30,000 Feet

According to the World Economic Forum report from May of 2016, The Engineering & Construction (E&C) industry strongly affects the economy, the environment and society as a whole. It touches the daily lives of everyone, as quality of life is heavily influenced by the built environment surrounding people. The construction industry serves almost all other industries, as all economic value creation occurs within or by means of buildings or other "constructed assets". As an industry, moreover, it accounts for 6% of global GDP. Construction is the largest global consumer of raw materials,

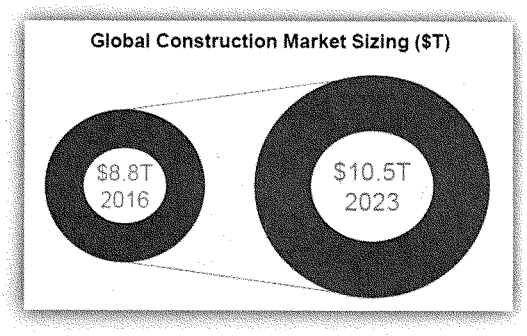
The population of the world's urban areas is increasing by 200,000 people per day, all of whom need affordable housing as well as social, transportation and utility infrastructure.

In fact, the UN estimates there will be 7B people in cities by 2050, up from 3.5B today. For context, it took 6,000 years to get to 3.5B people globally, highlighting the massive surge in urban population over the next 30 years.

As a result, a huge amount of new construction and renovation is and will be needed both here and worldwide to meet demand. In fact, the global construction industry is projected to grow at a compound annual rate of 4.2% and reach $10.5 Trillion dollars by 2023.

Construction spending in the US alone reached $1.2T in 2017 ($951B private; $280B public).

Autodesk, the world's leader in design software for construction, estimates that another 1,000 buildings a day will need to be added to the existing stock, in order to keep pace with urban population growth – a gap that



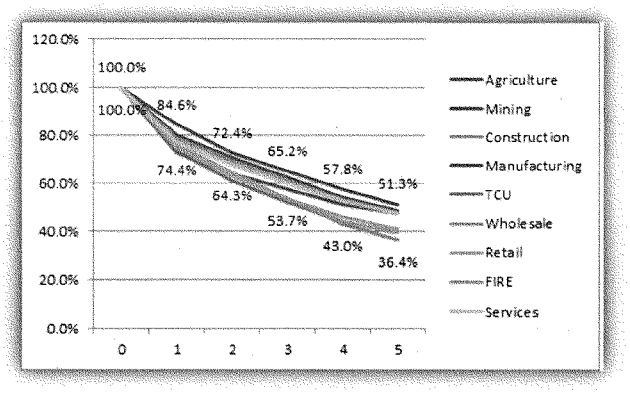
will take many decades to bridge given the current low level of construction productivity and output.

Compared to many other industries, the construction industry has traditionally been slow at technological development. It has undergone no major disruptive changes. As a result, efficiency gains have been meagre. In the United States over the last 40 years, for example, labor productivity in the construction industry has actually fallen. The construction industry today is unable to effectively address current demand, much less satisfy future growth.

Construction Problems and Challenges – The Major Headwinds

- Acute Labor Shortage
  This type of testimony would not be complete without reference to the lack of skilled labor. This is a major problem for the industry and one that will continue to impact future infrastructure needs. According to the U.S. Bureau of Labor Statistics, there were about 300,000 vacancies in the construction industry as of June of this year. It's expected to need 747,000 more employees by 2026.

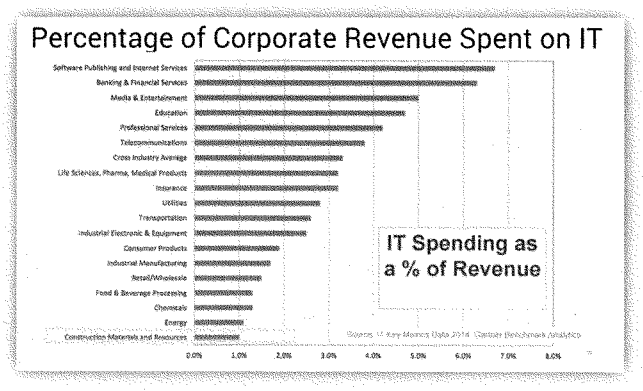
- High Failure Rate for Construction Startups
  Historically the industry has a low barrier to entry, which results in a highly competitive environment that also contains a high level of risk by its very nature. All of these factors combine to make success for these companies difficult to achieve. Reducing the failure rate is possible when proper technology and tools are introduced and leveraged early in the lifecycle of a new business.



Source: Created from data from the Census Bureau's Business Dynamics Statistics

- Lack of Technology Adoption
  Despite a plethora of intelligent and intuitive productivity-boosting solutions available today, the construction industry remains very slow to adopt new technology. More broadly, IT is massively under deployed, representing just 1% of total construction spend, most of that in wages.

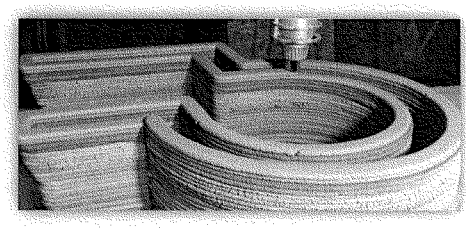
  According to a Gartner Analytics report from 2014, at 1% of total operating costs on average, IT spending at most construction organizations tends to be an afterthought. Compared to 10%+ for manufacturing and a 4%+ average for other sectors, it's clear that the industry will continue to struggle without deliberate investment in new technology.



Technology Solutions – Reducing Headwinds by Improving Efficiency

Construction tech solutions all revolve around real-time access to data and ultimately aim to keep project costs under budget, improve productivity and keep project completion ahead of schedule.

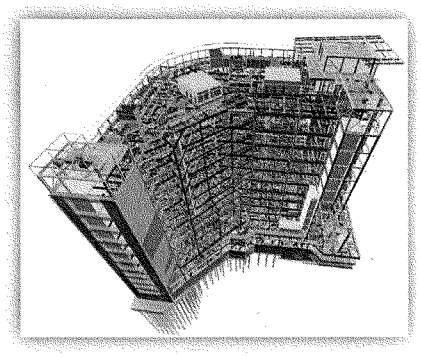
Progressive solutions, like 3D concrete printing and brick laying robots are emerging to automate the construction assembly process, yet it remains one of the least digitized of the major economic sectors, ahead of only agriculture and hunting.



A recent report from McKinsey & Co. finds that "While many U.S. sectors including agriculture and manufacturing have increased productivity ten to 15 times since the 1950s, the productivity of construction remains stuck at the same level as 80 years ago. Current measurements find that there has been a consistent decline in the industry's productivity since the late 1960s."

The complexity, cost, network of constituents, degree of project customization, and sheer volume of construction projects has grown significantly in recent years, putting pressure on a regressive industry to begin adopting technologies that provide the levels of control, transparency, efficiency, collaboration, and productivity that are already common place in other industries.

In order to overcome the myriad of challenges faced today and, in the future, the construction industry must undergo major technological and cultural changes.

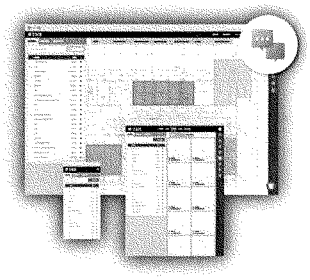


Digitization - How STACK Can Help

From years of experience as a contractor and as a supplier, I've developed an absolute passion for building technology tools to help contractors to find success, in a very difficult business.

Despite the *best economic climate for construction that I've personally ever seen*, the current environment continues to be a difficult one for new and small construction firms to succeed.

In fact, according to the Bureau of Labor Statistics, a full 25% of all new construction companies close their doors in the first year of operation and only 36% remain in operation after 5 years.



The facts are simple. The barrier to entry for the construction industry is low, but the risk is high. Even in a "white hot" market, profit margins are under constant pressure as emerging, small construction firms compete for the same projects. Without access to and adoption of tools and solutions to improve fundamental workflows, the small firms will continue to find the deck stacked against them from startup and the chances of survival, let alone continued growth, next to impossible.

Our goal at STACK is to empower contractors to succeed by providing tools to make them more efficient in their preconstruction process, more accurate in their estimates, and more productive with their limited resources.

Digitization - Help and Influence Needed

According to Michael Buhler, the Head of Infrastructure and Economic Development for the World Economic Forum, "Full-scale digitization has the potential to help the industry to improve productivity and generate estimated savings of 12-20% while potentially unlocking an estimated $1.2Trillion in annual cost savings, for the construction industry." This includes lower cost over-runs for owners, as well as increased efficiencies for construction firms by way of collaboration and resource management, optimization of labor, streamlined supply chain operations, increased project transparency, and better data management and utilization.

Digitization represents one of the first and most actionable steps toward modernizing construction and touches every stage of the construction value chain. Digitization will drive both monetary return on investment and clear gains in efficiency, helping to unlock the latent potential in the system so that it can ultimately keep up with infrastructure demand.

My asks of this subcommittee are:

- Get creative and to explore all opportunities to provide contractors with access and means to adopt construction technology at an increased rate.
- Join the hearing panel members and the industry as a whole to help educate about the benefits of working smarter using technology and to encourage adoption at a faster rate.
- Consider mandating the use of certain technology solutions for all government funded projects, not just at the General Contractor level, but all the way down to the Subcontractors participating in the project.
- Consider how tax incentives might be used to encourage the slow-moving industry to make new investments in technology.
- Consider directly impacting adoption for subcontractors by extending grants to construction technology providers to help subsidize the cost of the tools they need to be efficient and successful in helping to rebuild America's infrastructure.

On behalf of STACK Construction Technologies and the thousands of small businesses we support with our software, thank you for allowing us to share our perspective on advanced construction technology and its impact on building and improving America's infrastructure.

November 20, 2019

The Honorable Jared Golden
Chairman
House Committee on Small Business
Subcommittee on Contracting, and Infrastructure
Washington, DC 20515

The Honorable Pete Stauber
Ranking Member
House Committee on Small Business
Subcommittee on Contracting, and Infrastructure
Washington, DC 20515

Dear Chairman Golden and Ranking Member Stauber:

On behalf of Associated Builders and Contractors, a national construction industry trade association with more than 21,000 members, I write to commend the House Committee on Small Business Subcommittee on Contracting, and Infrastructure for holding the hearing, Smart Construction: Increasing Opportunities for Small Businesses in Infrastructure.

ABC and the construction industry are fueled by small businesses. According to the most recent census data, businesses employing fewer than 100 employees account for 99 percent of all construction firms. In an industry of 7.8 million construction professionals, 89 percent of ABC member companies earn annual revenues of $20 million or less.

While these small businesses face many concerns, productivity and maximizing the potential of their resources are essential to competing in the construction industry, which can be especially challenging for small and medium-sized businesses.

ABC members embrace emerging technologies such as building information modeling (BIM), drones, pre-fabrication, automated construction and 3D printing, all of which can increase productivity and reduce waste. Efficiencies gained from utilizing emerging technologies will be an essential part of building a safe, skilled, and productive workforce that that can help address the construction workforce shortage of 440,000 workers that are needed in 2019 alone.

ABC is doing its part to bring more Americans into skilled construction careers and to help companies find the workers they desperately need. ABC member contractors invest an estimated $1.6 billion per year in workforce development to educate and upskill nearly 1 million course attendees annually.

During the subcommittee hearing, Rep. Hagedorn mentioned H.R.4469, the American Workforce Empowerment Act, which would expand 529 education savings plans to be eligible for apprenticeship programs, covering both Department of Labor-registered and industry-recognized apprenticeship programs. Policymakers must follow the example set in this bill to provide an all-of-the-above strategy for workforce development. Apprenticeships, both industry-recognized and government-defined, should have equal access to incentives to encourage more Americans to explore skilled construction careers.

Although funding exists to advance the adoption of emerging technologies in the construction industry, more can be done to ensure that small businesses are able to compete and educate the construction professionals of the future that they desperately need. Again, we appreciate your attention to this important matter and look forward to working with you to expand opportunities and help rebuild our infrastructure.

Sincerely,

Kristen Swearingen
Vice President, Legislative & Political Affairs

440 First St., N.W., Suite 200 | Washington, DC 20001 | (202) 595-1505 | abc.org

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STATEMENT OF JIM LYNCH
VICE PRESIDENT & GENERAL MANAGER, AUTODESK CONSTRUCTION SOLUTIONS

BEFORE THE
U.S. HOUSE COMMITTEE ON SMALL BUSINESS SUBCOMMITTEE ON CONTRACTING AND INFRASTRUCTURE

HEARING ON "SMART CONSTRUCTION: INCREASING OPPORTUNITIES FOR SMALL BUSINESSES IN INFRASTRUCTURE"

NOVEMBER 19, 2019

Chairman Golden and Ranking Member Stauber,

Thank you for the opportunity to provide this statement to the Subcommittee in conjunction with the hearing you are holding on "Smart Construction: Increasing Opportunities for Small Business in Infrastructure." This is an important topic and I commend the Subcommittee for holding this hearing.

Our global population is expected to climb to 10 billion people by 2050, resulting in the need to build an average of 13,000 buildings per day around the world to accommodate the expected growth.[1] We will need more housing, more schools, more hospitals – more of everything. To meet this challenge, the construction industry must – and indeed is – undergoing a radical shift from analog to digital processes, from rolls of paper plans to multi-dimensional digital designs, and from construction trailers blanketed by Post-It Notes to manage the chaos of construction to cloud-based software connecting entire teams from design through construction through operations.

I am proud that Autodesk is helping to drive this transformation of the construction industry with digital design and construction management software that helps improve quality and safety and reduce time and costs on the jobsite. These digital construction tools are accessible to architecture, engineering and construction firms of all sizes.

[1] https://www.autodesk.com/redshift/building-the-future/

Autodesk, Inc.
23 Dry Dock Avenue, Boston, MA 02210
PHONE +1 857 263 5401 | FAX +1 857 263 5403 | www.autodesk.com

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When construction firms start with a digital model-based process for the project like Building Information Modeling (BIM) they can more easily integrate construction management technology to manage all project-related documents like change orders, requests for information (RFIs), submittals and issue reports. And they can apply machine-learning tools to analyze historical project data to reduce the chances of missing important risk exposures and the opportunity to avoid them.

Safety is one the biggest challenges facing the construction industry. According to OSHA, 20% of all work-related deaths in this country come from construction, amounting to nearly 1,000 deaths each year.[2] For each death, there are hundreds or thousands of near-misses and small incidents that never get reported. Anything a general contractor can do to reduce risk, to make sure workers leave the jobsite safely every day, will have a huge impact on its bottom line. Tools like Autodesk's Construction IQ, which uses algorithms to sort through hundreds or thousands of project issues and categorizes and prioritizes the highest risk projects and issues that need attention each day, can help make the construction process safer for construction firms of all sizes.

Windover Construction, an employee-owned Beverly, Massachusetts-based construction management firm, with projects throughout New England, is an example of a company using many different digital construction tools. Recently recognized by Autodesk's global AEC Excellence Awards program, Windover won the small project of the year award for the company's use of a cutting-edge combination of modular construction techniques and Virtual Design and Construction (VDC) applications on a mixed-use, transit-oriented apartment community covering 153,000 square feet in their hometown of Beverly.[3]

This method of modular construction requires the project to run like clockwork – and to ensure it did, Windover took an advanced, tech-first approach using drone mapping, laser scanning (with an accuracy of ±3mm), 4D sequence planning and mixed reality. These tools and methods allowed Windover to reduce risk and improve quality. However, these aren't hypothetical outcomes. In fact, the project is currently on budget and

[2] https://www.osha.gov/oshstats/commonstats.html
[3] https://excellenceawards.autodesk.com/#canvas/

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scheduled to be completed three months earlier than would be expected using conventional construction methods.

Similarly, Factory_OS, a Vallejo, California-based start-up is building multi-family modular buildings more efficiently and at lower cost in a factory on a repurposed military base.[4] By combining digital technology with manufacturing methods at an off-site facility, they can develop housing with higher quality controls that is 20% less expensive and 40% faster to complete. In addition, precision-cutting and indoor material storage reduces construction waste by more than a third, and reduced transportation requirements lower carbon emissions, making this one of the greenest building methods available today.

These advances in construction technologies are benefiting the design and construction of public infrastructure too. An increasing number of construction firms that develop civil infrastructure are using digital construction technologies.[5] The same is true of state Departments of Transportation, who understand that these technologies will help develop better infrastructure in ways that maximize taxpayer dollars.[6]

These are just some of the technological advances that we see in the construction sector. Autodesk works with construction firms of all sizes to utilize these affordable and easily accessible tools. They are not just for large multi-national companies with experienced IT departments.

I thank the Subcommittee for allowing Autodesk to contribute to this discussion and invite you to visit our Boston Technology Center where we are collaborating with our customers, researchers, and entrepreneurs on innovative technologies for the construction industry. Also, I would be pleased to introduce you to construction firms deploying the technology I have mentioned so you can hear directly from them on how they are being used. Autodesk stands ready to support this Committee as it explores ways to help small businesses benefit from the use of these technologies in the construction sector.

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[4] https://factoryos.com/

[5] https://www.prnewswire.com/news-releases/plangrid-fuels-heavy-civil-global-infrastructure-growth-300668302.html?tc=eml_cleartime

[6] https://www.plangrid.com/press/tdot/