Company Perspectives on Innovation

Craig Maxwell

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MS. TODGHAM: I did introduce Craig Maxwell. While we are getting up, I can say a few more things about Craig. What I didn't comment on earlier was Parker Hannifin's core competency is in motion and control technologies, and now we get to learn more.

UNITED STATES SPEAKER

Craig Maxwell

Good morning, ladies and gentlemen. Thank you for inviting me to come speak to you.

So what I'm hopefully going to give you a glimpse of this morning is not so much the problem but potentially the solution to some of the challenges you have discussed over the last two days, specifically inside of a large organization, Parker Hannifin.

A little bit about myself: I graduated—I was not the great student that you might imagine I was. I graduated in the half of the class that made the top half possible, and I didn't hit my stride—I didn't really find my passion until I got out into the work force, and in 1981, I graduated. And I have held every position inside the engineering department, starting at the bottom, which I used to chase parts around the factory floor for the prototypes, and then rose to the position I am in now, which in most organizations is referred to as the chief technology officer, and that for me was a great education because I got to see it all. And I have great empathy for what happens in the organization, and quite frankly, no one can pull the wool over my eyes because I have had all the jobs. I know what it takes, and so it gives me a great position to speak to the masses inside of Parker-Hannifin.

So if you thought I was going to speak specifically to the technology that happens inside of Parker-Hannifin, it is impossible to do that because it is so large. My job is involved in four things: I work in the process of innovation, I work on the resource for innovation, the infrastructure, and last but not least, and probably the most fun that I have, is to do culture that fosters innovation. Douglas mentioned it a moment ago, the biggest challenge we have is in separating what innovation really means and what it is. I have heard someone

Craig Maxwell is Corporate Vice President of Technology and Innovation at Parker Hannifin. His responsibilities include leading Parker in new and emerging markets that compliment Parker’s core competency in motion and control technologies. In addition, Mr. Maxwell will be responsible for helping divisions implement the “Win Strategy,” specifically in the areas of innovative products and expanding systems solution expertise worldwide. Previously, he held a number of engineering positions with Stanadyne Corporation's Diesel Systems Group, including development, project, staff and chief engineer assignments.
once comment that if you have a lot of crazy ideas, you are creative. If you can turn those creative ideas into something of value, then you are innovative; big difference between the two, and there is that word value again. And value is defined in the eyes of the customer, not in the eyes of the researcher or the engineer who thinks they have a great idea. The only person that really matters is the customer, the consumer, and that's you and I, and we are really good at distinguishing between something that is valuable and something that is not. So the thing about innovation is that it lives squarely in what Stephen Covey would call quadrant two, the important but not urgent things that we face every day, and that's really dangerous because it is easy for a big corporation like Parker-Hannifin to ignore innovation and say, "We will put it off until tomorrow," and then the next day and the next day. And the problem is that there is always somebody else innovating into your space.

So innovation has an urgency all its own, but if you look at our history and the history of most large organizations – and it was Robert's term – I love this term of deficit of aspiration, that's what happens in large organizations, so my job is one of a cheer leader. It is my job to set those aspirations very, very high, to be quite frankly, a pain in everyone's you know what most days, to say we are not pushing hard enough, not going fast enough, not aspiring to greatness. And we talked about attracting young people to the fields of science and math, and I can tell you personally that in the 1960s it was the space program that inspired me and a lot of my fellow students, and it didn't matter whether you were good in science or math. Everyone captured the imagination of the nation, perhaps the world, and that's something that is missing today. On a small scale, I need to set that kind of agenda inside the corporation that says here is our space program, our moon shot, and what are you personally doing about it? And then making sure all of those things are in place. So Emerson's quote – and we have all seen it – as I started to research this speech, I found that some dispute that Emerson actually ever said this, but it is a great quote, and we will use it anyway, and so what Mr. Emerson was speaking to was –

35 See generally Kathy Sawyer, Build Nuclear Powered Rocket for Mars Mission Panel Urges, WASH. POST, June 12, 1991, at A2 (discussing how improving space program in the 1990s could be a boost for math and science education).
36 See generally Tom Maurstad, Burned into our Memory, DALLAS MORNING NEWS, Sept. 11, 2006, at 1G (describing how the moon landing captured the world's imagination).
DR. KING: Maybe Yogi Berra said it.

MR. MAXWELL: Maybe. But I like it, and at Parker-Hannifin each June — it’s coming up quickly — we have what’s called best mouse trap, and all the engineers, innovators from around the world come to Cleveland, Ohio, and present their best mouse traps to the office of the chief executive. So we have what we call the best mouse trap award, but what Emerson was talking about was that value prevails in the marketplace, and this comes to light in the bizarre history of the mouse trap. So I thought I would use this as my hook into the legal profession this morning, and here are some interesting facts. To date, there have been over 4,400 mouse trap patents issued in the United States. Of those 4,400, only 20 have ever made any money. And here is the really strange part; there are 400 applications for mouse straps every year. So that begs the question: Do people see mouse traps as the pathway to great wealth, or is there some morbid passion with killing mice?

So if you do the math, that's 1 out of 220 issued patents that made money, and therein lies the challenge in a large organization - driving to value -and how do you do that?

Some would have you believe that there is some kind of innovation DNA that only certain people possess. I heard some comments about degrees and degreed persons, and certainly, there are innovators amongst them, but I would argue it is more the artist. It is sometimes the right brain people that can make the connections that actually excels in this area. Malcolm Gladwell calls them mavens or connectors; they are people who tend to fly from flower to flower collecting pollen and information. They are general practitioners, and they are the ones that are able to connect the dots because it is very frequent that we find the most technical people are very good in their space, but innovation always occurs at the intersection of different knowledge domains. And so you need to move from place to place, and those people tend to be more of an artist. So it is not black magic. It is not innovation DNA that makes this work. Very recently Booz, Allen, Hamilton issued this report. If you haven’t seen it, it is worth your time and attention. And they studied the

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37 See Alan Hamilton, Mice Like Cheese? A Myth Full of Holes, THE TIMES (LONDON), Sept. 7, 2006, at 25 (citing Ralph Waldo Emerson who said that if you build a better mouse-trap the world will beat a path to your door).
39 Id.
40 Id.
43 The Booz Allen Hamilton Global Innovation 1000: Money Isn’t Everything, supra note 41.
R & D spent and innovation, and they found there is absolutely no correlation. They also found that while it had the potential to be the most valuable thing an organization could engage in, it was managed with the least discipline. So perhaps those researchers and scientists think it is black magic that has allowed this to happen, but it is not. And here is the scatter diagram that Booz Allen generated, where, again, you can see the sales growth percentage versus R & D spent, and it is all over the map. They really couldn't find any correlation. What they did find, however, is that the most innovative companies were the ones that had a process drove to value, and that's where I spend most of my time, is in creating that structure around innovation.

So before I go too much further, I need to introduce Parker-Hannifin, my employer. For those of you who don't know us, we don't make pens. We are not that Parker. Euphemistically, sometimes we say we are in motion to control, but we are into a lot more than that. And if it moved, we probably had something to do with it. We make everything from flight controls in Boeing or Airbus aircraft to cell phone shielding, shielding your head from the radiation that is emitted from the phone, so a very wide net is what we cast into the marketplace. And I won't bore you with all the details unless you want me to. We started here in Cleveland, Ohio, in 1918. Arthur Parker – and when he passed away – and some of my colleagues will know this better than I – how many patents did he have when he passed away? It was about 150, self-taught, just an innovator with a real passion. His son Patrick ran the corporation and just passed away recently after his father passed away in 1945. We are here in Cleveland, Ohio, on the east side, with 50,000 employees and 263 manufacturing sites worldwide. We are divided into eight groups. We had $8.2 billion dollars in sales last year and this year will be over $9 billion. There are 110 divisions, lots of customers, and lots of products. And then here is what the global organization looks like. Again, I don't need to get into the gory details.

How did I find my way out on to this stage today? Sometimes I wonder, but I just have a great time, and I tell people that I have never worked a day in my life. I have a great day every day. I am doing today what I did as a child, which is to tinker, play with things, learn every day, and in the process, I made a lot of money for the company that I worked for before Parker and then Parker-Hannifin. I joined this division of Parker-Hannifin in 1996. That's the red line. I got people organized that focused on the right things and took off. This division has grown every year since it was acquired in 1985 at a rate of about 18 percent per year through each of the recessions. So, you know, am I worried about innovation in North America? No, I am not. I
really think if we want to change things, we can change things. I am an optimist. I am a little bit Darwinian in the view of where talent lies. We will follow the talent. We have talent R & D centers in Asia and Europe, so if we see a need, we will set up operations in those locations. Information flows freely as really it needs to, and therein I think lays the solution to some of the challenges we face short-term. Certainly the core of our R & D expertise is here in North America today.

While I was doing that out in California, having all that fun, back here in Cleveland, Ohio, our CEO was scheming. He had just taken over the position, and he came out with what he called the win strategy. I live over here on the right side of the win strategy. Not surprisingly, that would be on the right side of the brain where all the innovation takes place. The left side is more on the operation side, and when I got the job, he asked me do what you have done in California for the entire corporation. That's my objective and goal, so I begin the presentation by asking you the audience, how many in this room can sing? Raise your hand. More than usual, very good. You are probably worried I am going to ask you to sing now, but I won't. Prove it. So if we ask that question to a second grade class, this is the kind of response we get. Every child in the room will raise their hand excitedly and ask for the opportunity to sing. Who can dance? How many people can dance in this room? You guys are good. Usually, I don't get anybody raising their hand.

MR. ROMOFF: Not that well.

MR. MAXWELL: And if we ask that same second grade class how many people in the class can dance, we get a very similar response. They all raise their hand. We fast forward 15 years, and we ask who can sing? It looks something like this. People start to stare at their feet. Nobody wants to be picked, and so the question you have to ask yourself is what happens? What happens to this talent that we have as a child, and I don't have a great story here. Our chief operating officer Nick Vanestti has a better one. His parents moved from the Midwest to California when he was in junior high school, and so he told this story, and it was the 1950s when Nick moved there. And he said that he was at his first school function. It was a dance, and all the kids were dancing. He said, in fact, in California at recess they had dance classes, which was new to him because in the Midwest they didn't do such things. But they had their function, and all the kids were dancing, and he saw a young lady that he thought was particularly attractive, and she saw him and came over and asked him if he could dance, and he said sure, I can dance. And he got up there and started to do what he thought was dancing, and she proceeded to tell him he couldn't dance a lick, and he says to this day, I will not dance because she destroyed my belief that I was a dancer, that I could dance. And I am afraid that happens in big organizations, too. We have a tendency to tell people that they can't do things.
So when we say who is innovative to a young graduate, we get a response that looks something like this, and then we bring them into the fold, and within a short five years, he looks something like this. And why does that happen? If we ask them – and I did when I got the job – they said, you know, you didn't give me money. You didn't give me resources. You didn't appreciate my brilliance. You didn't support me. Some of that may be true, some of it not, but the fact is the organization is structured to make money, not necessarily to innovate, and therein lies the challenge, to balance both.

As Booz Allen found, when I got into the bowels of innovation at Parker-Hannifin what I found was something that looked like that, an ad hoc, chaotic event that yielded very unpredictable or random results. And, of course, I did this way back in 1999, 2000 when we started doing it in California, and right away when you tell the engineers that you are about to structure what you do, they tell you if you do that you are going to kill all my creativity. And the response is, well, you know, this is what happened with Mozart, the written note was relatively new. Did it kill their ability to create and innovate? No. It just allowed them to communicate effectively across these different domains. There is a company in Palo Alto, California called IDEO, spelled I-D-E-O. They, I think, have taken this to the highest level that I have been able to find, where they have – this book right here, the "Art of Innovation" written by Tom Kelly, the brother of the founder Dave Kelly, where they believe and I believe that innovation is a process.\(^{47}\) And it is a process that can be learned and taught, and if you do that across a large organization, you unlock some tremendous potential.\(^{48}\) And it also was a need for a common language.\(^{49}\) The problem with innovation is it is defined differently by different people. Even just this morning in my brief exposure to your session here, I sense there were varying definitions of the term. And it is all about, again, this aspiration, this higher aspiration, this bar that we are setting for people. What does it mean to you? What are my expectations from the corporate standpoint? What are the customer's expectations for value? We had to give it a name, again back to being able to have a common language.

You know, General Electric calls their latest initiative Echo Imagine.\(^{50}\) We needed a name for our process, and the term we settled on was one called Winovation, the win strategy that I showed you earlier and innovation mar-


\(^{49}\) Id.

ried together. I was a little skeptical to be honest when we did this, but it has taken hold. People refer to it, and it is part of our vocabulary. By focusing on the process, what we are doing now is, we are changing all these other areas that are required for innovation to take place. As you start to focus on the process, for a good product, and how you get that product to commercialization, you start to change all the things like the resource, the infrastructure, and the culture. Define innovative, define new, define risk, define reward, value and use in terms of what the customer's expectations are, and define excellence, and that's what the process does.

Any of you in the room heard of the term "stage gate" before? It is a series of stages or gates that you run through as you move through product development, and at every gate or stage of the operation, we challenge value, and we even encourage the teams—in fact, we insist that they have a customer engaged in the actual development of the product. It is not allowed for them to move forward without that Alpha customer, and in doing so they are not allowed to get too far away from the value because it is very easy to develop the answer to nobody's question. I have done it myself several times. All of us who have been involved in R & D have done it. And so we had the courage to be different, it really wasn't courage but a license to be different. We really wanted to get people out of their shell and to have those eight groups, those knowledge domains, to jump between each other, and because now they have a common language, which is all web enabled, it is also where we can now see each other now for the first time. I can actually see every single project inside the corporation with 50,000 employees in it, and I can pick up the phone and call the person who is in charge of the product. Similarly, people in other groups or divisions can see their colleagues for the first time. So now what we start to see happening is this jumping of knowledge from one domain to another, that's when things really start to get interesting.

We had a big symposium in April in Florida a year ago now, and our CFO and CEO stood up saying they were empowering everyone in the engineering ranks to be different, to make that leap, and I have done this before, and it is like watching a snowball roll downhill. It starts to pick up speed and gets bigger and bigger, and as an executive, that's when you need to get out of the way because it is going to run you over. It is hard to control, but it is happening now. We are only one short year into it, but I can tell you we are seeing a huge change in the culture at Parker-Hannifin.

I like this quote by Jeffrey Immelt at GE; he had a similar vision several years ago when he took over and said that you were not going to stick around General Electric if you weren't ready to take some risks. So we encourage

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them to make the leap. Here is an interesting slide. Down at the bottom, you see commercialization, applied research, and pre-competitive research. Where we live in Parker-Hannifin is down there in commercialization because we have this thing behind us called investors, Wall Street. They have expectations for profit, and we can't get too far afield, or we will lose sight of what's important to our shareholder. But over there on the right are universities and that pre-competitive research. That's a green field for us. There is this chasm in the middle, this kind of no man's land of applied research where we see great potential and challenge, too, and that's where I've encouraged the divisions to focus. And so now we have the engineering community focused on getting out and going and tapping into this venture capital, basically research, which has been funded because, as Douglas indicated, it is not unusual to go in there and find out they have absolutely no idea how they are going to commercialize the product.\textsuperscript{53} They don't even know who their customer is, and we show up, and we say we are Parker-Hannifin, and we know how to make money. Can we help you? And we get a big hug. So it has been a really good relationship so far, that they were looking for us, and we are looking for them, and they are tapped in to the universities, so we get this flow of information tapping down into our divisions quite frequently. And it is somewhat of a cursor, a gift, that once you unlock this and challenge these people it doesn't matter where they are. It drives my wife crazy and my children because it is not unusual for me to be sitting on a beach and then see them raking the beach with a tractor and have to point out to everyone, or bore them with, some of the products I may have worked on that are on that tractor. So, you know, I can't turn it off. It doesn't matter where I am. I am always looking for something new, something I can tap into and share with my colleagues. And some of the best ideas are always in the shower. I don't know why that is, maybe the hot water coming down on the head.

It is happening all over the world now. You know, we have researchers in China. We have them in India. We have them in Korea, and so forth, here in North America and Europe and South America. Changing the world of engineering – and Douglas touched on this a little bit – this is really important, and I think it is overlooked, is that if you rely on the usual cast of characters – and I don't mean to pick on the marketing and sales department – but they sometimes wouldn't know a good idea if it jumped up and bit them in the back side. And because they are not connected enough to the technology, they don't understand what could happen, what is possible. So one of the

keys for us is to get the engineers out of the office and out in front of the customer, talking to them. It is not a comfortable place for a lot of them because they tend to be not very extroverted, somewhat introverted, but we have encouraged them to get outside and interview customers, and that’s where we find the real gems are coming from.

Part of it – this is a typical structure, you see the filtering going on – is that the customer is up at the top and gets filtered through all those different levels. By the time it gets down to the bottom, there in engineering is where the value is supposed to be created. You have played the game of telephone, where you start whispering messages in the ear of this person, and by the time it gets to that side of the room, it is completely different. That’s what happens in the engineering department. So now what we do is we go and parallel the customer as part of the team. The information flows freely, and we find not only do we compress time, things move faster, people are more energized and people feel more powered, connected to the solution. They feel like they have ownership; that it is their project. And we like them to feel a certain amount of pressure. That’s where the customer comes in, and so we focus up there on the green box at the top right, which is where we want the customer there. The customer also adds a sense of urgency to what’s going on because they want to commercialize the product so they don’t let us get too far afield. My job is to get to have a lot of fun. I get to set these boundary projects. I get to fund some of these little startup companies.

This one here is called Vetrix, getting ready to launch in the spring, summer, this year, a hybrid electric – it will be an electric fuel cell executor. Right now it is just electric but gets the equivalent today of about 281 miles a gallon and zero emissions also, and it goes 0 to 60 in 4.1 seconds. So it will compete with a sports car. So when you roll out a project like this in front of the engineers, they get pretty fired up, and they say, well, if you can do that, watch what I can do. And I challenge them to hybridize it. Back in 2003, they built the first fuel cell. It was so big I had to put it in a helmet case on the back of the scooter; it was huge and sounded more like a lawnmower than a fuel cell. One year later it was 60 percent lighter and 60 percent smaller and now fit underneath the seat of the vehicle. This year it is approaching commercialization, and it is 20 percent lighter than it was the year

55 Id.
57 Parker Hannifin Corp., supra note 51.
58 Id.
before.\textsuperscript{59} We think it is on par with the development pace. Fuel cells are not that far away, they are getting very, very close to commercialization; and there is the bike at the bottom, which is the commercial production vehicle.\textsuperscript{60}
And then something really curious starts to happen, which is the technology starts jumping, and all of a sudden these fuel cells they developed for something as crazy as a scooter start showing up in things like wheelchairs where we could take the range of a wheelchair and increase it by five times with no increase in weight.\textsuperscript{61} And if you don't think that has a lot of value to somebody who is handicapped, well, it does. So stay close to the value. This is your take away I hope. If you are so empowered to develop a common language of innovation, standardize the process, license the team members to innovate, engage the engineers in the business rather than working on the business, the process will draw a change in the organization. You have to walk the talk. You have to lead, not manage at the top and build better mouse traps really, and now when we ask who can sing, we get a different response a year into this than we did previously.

Thank you.

DISCUSSION FOLLOWING THE REMARKS OF H. DOUGLAS BARBER AND CRAIG MAXWELL

DR. KING: I had a question. Is this on?
MS. TODGHAM: Yes, it is.
DR. KING: Okay. I am concerned with rewarding innovators or developing a psychology of innovation. My recollection is that 3M has something of that order. I am thinking of financial rewards, cultural development. Can you train innovators? Can you train people to be innovators? I want to get right at the heart of the problem, and I wanted to get your thinking on it, both of you.
MR. MAXWELL: Can you train people to be innovators? There is no question that some people are just more innovative than others, but I am sure that everyone in this room has had a great idea at one point in your life; I will bet on it, but maybe you didn't feel empowered to bring it up.

The process that I talked about, everyone in the organization has access to it and can input an idea; it doesn't matter where it comes from in the organization. As far as rewards, you know, this is a slippery slope because people say we should pay for patents. I say we don't sell patents. We are not in the

\textsuperscript{59} Id.
\textsuperscript{60} Id.