PROFESSOR: Why don't we go ahead and get started. Thank you very much for making the trek and the logistics to get all the way across campus. And I'm pleased to see that most of us made it back here. And if people straggle in, we'll understand.

So this afternoon, we're going to shift from a technology focus to now research groups that are concentrating on specific business problems to solve. And our first speaker is Dr. Elgar Fleisch, who is the head of the eyed labs at the University of St. Gallen and ETH in Zurich, Switzerland. And he's here to share about the flagship project for the auto-ID labs in the anti-counterfeit space.

ELGAR FLEISCH: Thank you very much. So I hope you don't suffer the same jet lag as I do. And I have the best position in this day to talk about any counterfeiting.

So this is really the flagship project. We have not only one flagship project. Soon others will pop up. But this is a project which goes across all the labs-- our seven labs across the world.

What's the need, actually, for any counterfeiting? Why do we think this is important? Without going into details, you will find soon an extensive white paper on any counterfeiting using RFID and stuff like that on our web pages.

You see the red line. This is really kind of the global trade, how it grows. And the blue one, that is really counterfeit, how those grow. It's different scales though, so it has to.

We see that in recent years, counterfeiting is a good profession. And the topic is the punishments on counterfeit goods is really not very high. The punishments are low, but the returns-- the business cases for the fake producers, they're very good. It's like in drug business.

So this is why counterfeiting seems to be an increasing topic. We all know who work in this area that in some literature, you find numbers that say about 7% to 10% of all goods traded internationally are trading with counterfeit goods, or gray market goods, or stuff like that. This number is way exaggerated. That's what we found out in our research. You have to divide it by 10 or so.

However, still the problem is a big one. And we have not only impact on companies and on users, but also on the economy, so let's fight this one. And this, again, is an area where a lot of chaos in the system, and we've seen it in Sanjay's presentation. When you have somewhere chaos in a system, then RFID might be a good thing to use in order to get chaos straightened out a little bit.

What we see, that we have actually very good methods of authentications already in place if you use a banking card or stuff like that. We have heard this morning from an Austrian gentleman-- so I'm also from Austria. I have to talk to you later on. Then we know that in the banking business, we have already good authentication technologies available. However, we don't have low-cost authentication.

Beyond authentication, you have usually is made for things to humans. What we do usually, we authenticate humans. We don't authenticate things. But we are building the infrastructure for Internet of things. So let's talk about the machine-machine authentication now. And therefore, we need new technologies.

For doing so, we created kind of a special interest group. We have some companies working with us. The number is strongly growing. And the question is really-- and this is a research question we didn't solve so far. We need support from all of you. And how can we use RFID and related technologies in combination with classical measurements to fight counterfeit, parallel trade, illicit trade, all that stuff.

Well, what are the research questions? And I want you to think about what could be potential research question. Where could you propose some papers or help to us?

Basically, there is four different categories of research questions. One is, what is really the economy of illicit trade? That seems to be a simple question.

But you could ask anybody-- pharma industry, whatever, in the automotive industry. You receive different answers, unclear answers. So we would go into very detailed. This is the first work package, and I think we did some great work there already. To understand what's the economy of illicit trade. And Thorsten Staake over there, with the nice tie, is leading those research questions.

The second one is how to quantify illicit trade. Because you need to have business cases. You need to understand, what is the effective on brands, what is the effect on revenue, what is the effective whatsoever. So come up with models which are not consulting models where we say you could save 1% or 2%. No, we have to go into the black box and come up with clear figures, clear calculations.

And then, of course, if we know how the problem is structured, and if we know what the savings are-- so how expensive those technologies could be, solutions could be-- then we can derive the requirements, what are resolutions solutions in any counterfeiting auto-ID base. And basically, at the very end, then-- and this is the results for EPC globalizer. What's the impact on the infrastructure plus? So how would the infrastructure of things, internet of things would have to look like in order to serve all these requirements.

Some of the primary results-- I go through those rather quickly-- is, of course, there is the good supply chain. We call it here, the illicit intended supply chain. There is the bad supply chain.

And the bad supply chain, it's not only fakes. It's also if you run your machine beyond the hours you should run your machine. So you produce products for the grain market. It's parallel trade. It's theft. And if you have theft introduced to the illicit supply chain somewhere, you bring it back to the illicit supply chain.

All those problems, actually, you would find behind the topic any counterfeiting. So we choose any counterfeiting because of marketing reason. Everybody understands-- any counterfeiting.

But in fact, it's the most complicated track-and-trace thing you could solve, because you need to have a secure supply chain in order to solve those problems. One of the general findings is, you see many arrows crossing between the good and the bad supply chain. So what you have to think about first-- where are you able to leverage new technology in order to, let's say, do harm to the business case of fake producers?

And this is two points. Because only at two points in these two supply chains, there is a good gatekeeper who watches when bad goods cross from the bad supply chain into the good supply chain. And this is with customs, and this is with the end consumers.

So if we can build systems to enable customers and customs, then we can fight illicit trade considerably. We did some empirical studies here-- very funny results. We asked really who would buy fake goods? Because it's not clear who would really buy fake goods. And what are the reasons for it?

Here, one of the interesting results is that most of them buy faked goods because they think the original one is too expensive. So it's kind of a strange argument. And the other argument is really that the cost ratio-- cost performance ratio is very good if you buy fake goods. Which is probably not true if you talk about drugs.

I mean, we have to be anyway very carefully differentiating between different types of products you would fake. The ones the customer knows about, the others the customer won't know about it. What's really very interesting is that we learned that many of the people-- actually, most of the people, half of it-- we interviewed said they didn't buy faked goods because they had no opportunity so far.

So the market problem is rather big. This is only true for products you would know they are fake, like the Rolex for $5 or something like that. And most of your problems are with products you don't know as a user.

So what's the impact of an auto-ID-based solution as one first framework for an answer to the last research question? OK, if we have automated product authentication, then just use the simple managed methodology we developed in the labs. The cost of checking whether something is identical or not decreases. It's always what we do with this infrastructure, we reduce the cost of measuring reality.

So it's very simple and cheap to check whether something is identical if you have an RFID tag and some infrastructure available on the product and around the product. So you start checking more often in each warehouse, or with the mobile phone at home. If you check more often, you check not only on a statistical basis, but you may do a 100% check. So end of statistics is the key word there, which then will have impacts on the revenue model out of package too. Reputation would go up.

And it's not so simple, because if you're Microsoft and your software got faked in China, it's probably good for you now. Because you're developing a kind of a standard there. In five or 10 years, you start using the laws which are building up currently. And then force people to buy your Microsoft products, but then it's standard already. So it's not always true that fakes are bad. We have to be careful about that.

Anyway, so this would have an impact on the return. Now we could think about, OK, if we check a lot, we have a high-resolution data on those illicit actors. If we know how the actors work, we can do way more to fight those parties. And of course, we can also derive know-how and how to engineer the products so that the counterfeiting is getting more difficult.

Which again, helps in our business case, but then also we can come up with nice competitive strategies. Because we learned that the real danger is if somebody produces fakes, uses your IP, at the beginning you lose revenue. But on the long run, these guys build up know-how. And they become a real competitor, so this is one thing we want to fight.

And then of course, if we have a tool available for everybody where it's very simple. And I gave the signal-- I said the goal of this research is that we have a warehouse. And within one second, we can check the product, enter our product in a warehouse, whether they are OK or not. I mean, we cannot reach this within the next years. But this is a clear goal.

But if we have a tool like that, then we can start giving to third-parity suppliers, this tool. And they should check for any counterfeited-- for faked goods. So enter here, new business models would come up. You probably could enable a little army in fighting these issues. So again, it's not really just the automation part, but it's the transformational part, which seems to be very interesting in this counterfeit research.

Of course, there is 100 different ways in how to do any counterfeiting. That would be part of the solution-to-work package. Three, do it via pedigree and normal EPC tags, or do it via secure RFID tags. I think Friends of Austria are developing this direction.

So it depends on the business case, it depends on the problem. And the nice part is, the EPC network, the auto-ID infrastructure should be able to cope with all those different varieties of how to secure the supply chain. Not just with one, and this is the tricky part in doing so.

This is actually what we are planning to do. We have some considerable first results achieved. And we are planning that by the autumn, there will be a book out there showing the first results on any counterfeiting. And with this, I think I hand over to the cool chain where we have another different kind of how to secure a supply chain in a different direction. Thank you.

PROFESSOR: So I'd like to present John Pierre [INAUDIBLE]. He is another member of the conference committee that helped to organize this event. He is a Associate Professor of Agricultural and Biological Engineering and a Co-Director for the Center for Food Distribution at-- FSU or the University of Florida?

[INTERPOSING VOICES]

GUEST SPEAKER: It's bad for you, I can tell you that. OK, I'm going to do that. Well, let me start that. Well, I'm going to talk about cold chain with RFID time [INAUDIBLE] writing. And I'm going to change my definition of cold chain, because after I saw us crossing the street this afternoon, I think this is really cold chain-- one by one, crossing the street in the slush. That was great.

Well, you heard a lot of research group talking this morning. And I feel like a bit odd, because I'm more research group, but also end user. We developed some of the technology, but we are a big user of everything that you are providing-- this morning that you are talking about. And let's go with that.

Well, we are not the RFID lab. We are a research center that has a RFID lab inside. Or we call that the Center for Food Distribution Retailing, which is CFDR. And the mission of our center is to provide a food industry unique environment to assure food quality and safety throughout the whole distribution chain.

So we don't take only one part, but we take the old thing, from the beginning in the field or the manufacturing plant to until the customer leaves the retail store. That way that we organize that, we have 28 faculty at University of Florida and six with our university worldwide. And all of us has a specific discipline, and we always joint effort together.

The idea, in this case, is to look at different angles, what we can do with RFID. Our center is as an external advisory board, from the top down international decision maker in the food industry, retailer, food service. And to be advisory board member, you have to be president or senior vice president of a big company. So we have Walmart, Publix, Albertsons, Burger King, [INAUDIBLE] ShopRite, Preference Food Group, Outback. And are we going to add three more.

So these people, twice a year, come in Gainesville and tell us what their industry is looking for. And of course, RFID is a big thing about it. But today, I'm going to talk to you about why temperature tracking is so important for the food industry and the pharmaceutical industry from our eyes. From the external advisory board, but also what we have done during the whole year.

For the food industry, most personal products are really affected by temperature. It's a question of quality and safety. For some of you, last night I was flying with [INAUDIBLE], and you can watch TV.

And I was watching *Dateline* where they were promoting a big survey that they did about food safety and the retail store. And they were reporting that most of the infractions were about temperature management. We get food poisoning, not only at the retail store, but also at restaurant chains and things like that just because of poor management of temperature. And it makes a big difference, because each year, retail stores can lose about $400,000 due to bad temperature management per store.

For example, if I count all the stores that our advisory board has, it's about 8,000 stores. So if you add $400,000 for each of them, it's about $3 billion per year we lose, just because of poor temperature management, but also people that get sick too. So this is what we have been looking for. Trying to focus on what we can do with temperature tracking to help our industry.

So where temperature may be a problem-- well, it can come from the field. You have to know what kind of temperature when you harvest something. Is it cold, is it warm? If it's very warm, I have to cool it down. And at the warehouse, also, during transit is a major thing. During transit, distribution, and in the store-- if I can have all this information live, I can manage much better things in terms of cold chain management. Also, I can prevent any problem that can happen during by transit without it happening and get too bad.

Well, knowing real-time temperature can also predict residual shelf life and make decisions based on this knowledge. So what we have been spending many years in our center is that we are trying to have a good sense of what temperature has an effect on quality and safety of food. So we have been focusing a lot on produce, because we are in the state of Florida. So we have a lot of produce.

And what we have developed in the last few years is a mathematical product to predict quality. So just to give you an example here, is that based on experimental data that we have done, we can predict, if you give me the temperature chart, the history of the temperature of your product, I can predict exactly how the product is going to look like and what kind of shelf life I still have in my store or at least at the moment that I read my temperature.

So we have a huge database of experimental data. And all these models have been developed by our team. So if you provide me-- and also we can predict what kind of quality criteria you're looking for if you give me temperature. I can predict if it's the crispiness of lettuce you're looking forward, the color, if it's mold grown on raspberries, we can all predict these things if you provide me the temperature tracking of that.

So we have been trying a lot to do that. One of the requests was from the restaurant chain and the retailer. They said, when we get something in our distribution center and we have this temperature monitoring, we can look at it, but it's very difficult to do something with it. We have to interpret that. We look for peaks of temperature and things like that, but not exactly what to make a decision.

So if we can track that way before it gets to the DC, we can always manage our inventory and our distribution center and decide if my product that came yesterday, maybe it's in better shape that the ones coming in an hour from now. And maybe I ship that to my store right away, the one coming in, and keep the other one in my warehouse. Because it can still stay for a few days more without problem.

So we can predict in terms of the quality, in terms of the pallet level, the case level, and the item level. And this is what we have been working. We have been working with temperature tracking tags available on the market from different suppliers at different frequencies. But still, the same problem is where I'm going to put my tag to give me a good idea of what is my temperature to predict the shelf life of that.

One of the issues that we have done is that, well, the best way to measure my temperature of my product would be right in the core of my product at different locations, at least have a good reading of that. But as you know, a lot of these products, like if you take lettuce with 94% water, it's pretty difficult to get a signal through it. So I cannot read it, so I have to place my tag somewhere else.

So at this point, we try with the pallet level one, where we have to place this thing on the outside, right at the bottom of the pallet at this point here. So what we did is that, hey, let's measure temperature inside the pallet and measure what the RFID tag is providing us. Well, that's the problem here.

It's because, for example, I hope that you can see it. But the red line is the temperature of my tag, and all the other lines is the temperature inside my pallet load. So I'm pretty far for what I should measure.

Of course, some people are going to tell you, well, if you know the package, you can always predict. With formula heat and mass transfer, I know all this stuff. That's fine. But the problem is that I deal with the food industry when we have about 650 different cases or different configurations of materials, more than 1,000 products. Do the math-- all the combinations that can come together. It's pretty difficult to get that.

So at this point, we said, all right, let's go to the case level. Maybe we can get it better. So what we have done is that we have embedded the RFID temp tag on a reusable plastic container. So at least we are getting a little bit closer to that. That these are designed to be five on the pallet load, meaning that I always have one end of the container that they can see so I don't have a problem to read the tag.

The problem is exactly the same if you look at it. The RFID tag is the blue line, and the purple one is the surface of my container, and the blue is what is inside. Even a small container like that, I still cannot get my temperature inside.

Well, it's better because if I put that and embed that in a plastic container, I pretty much know what will be the heat transfer to predict what will be the temperature. So I am in a better prediction. Now I can predict what's going on inside my box, and we can get a better sense of prediction.

At the item level, well, we didn't see very much use of it. Because we always move these items to a certain-- I don't decide, I don't get my box in my distribution center and just look at one lettuce, and this one is not good, this one is good. No, I don't have time to do that. They have to move my product.

So case level would be the smallest item that I can use with temperature tracking, with temperature keeping in memory so I can download that at any time. So at the item level, it's more a punctual temperature. I just want some-- I don't want to store this data. Just tell me the temperature of my product right now. Is it at the right place?

So what I can do is, because I can see if it was unbroken or not on the display. So we can see that if my refrigerator display doesn't work well, I should have a signal about that. Because right now, you see the difference between nine hours of not good refrigerator display compared to the unbroken cold chain. I prefer this one than this one. Well, in your case, it's this one here. It's snowy. You know, it looks like it will get some snow soon.

Well, so punctual temperature at the item level, it's very important. Because it can prevent misplacement of the product in the store. It's bad to say that, but each time that you have a human decision in this old distribution chain. This is where you have losses. And this is what my wife told me each time that I shop. You made a decision to buy that, and that's the last.

But the thing is that you put this item, and if it's not the right temperature, you kill your product. You will not have the top quality, meaning that people won't buy it. And now it's opened the door to smart display. We are already working on the copying on that. Where if I can read my tag, even if the precision is not there that much, at least I know if there's a problem with the airflow. Or if I should redirect my air flow in order to [INAUDIBLE].

And now, we should provide a good thing for-- like the food service company. Where I can have a best before date dynamic. Because the best before date, when I produce something, it's always the worst-case scenario, that somebody kept that in their car for that number of hours. So my best [INAUDIBLE] is going to be that date.

But if I do a good job, I should have credit from that. If I have a good cold chain management, particularly for food service and restaurant chain, I should have my best before date maybe stretch a little bit longer, because my temperature management was great. So just to give you an idea, if I do that tomorrow morning, the food service company is going to save 30% of losses right away, because I allowed them to have a longer best before date, because they did a good job in coaching. That's a lot of money for them.

At home application, we discussed about that this morning. You said something about refrigerator, thinking smart, and what you have in the refrigerator. Well, I can even tell you, later in the future, if my refrigerator is well, or if maybe I should eat this thing that I don't want to eat because tomorrow it's going to be too bad. Or maybe I should wait tomorrow.

So prevention, also, of the DC is very important because we get all this load. We should make sure that they are at the right place at the right time. I can have smart transportation-- refrigerated trailer, C container. I can optimize my cooling at the form. And we're going see in the next presentation, that cooling is a critical thing on your shelf life. It prevents non-safe food to enter my distribution chain.

So if my truck is coming and I know a day before that this thing is going rotten because of the temperature, I don't want to open this door in my DC. With all the airflow, spores flying everywhere, it's going to be a pain for us. But also, it's going to be a cold chain diagnostic tool. Because each time that I can fix something, I can backtrack very well, very precisely where my unit is not working properly. Because sometimes it can take weeks before you find out about that.

Very quick, let's go with the pharma industry. The pharma industry has a very strict regulation about temperature range. And I'm talking about cold chain management here. Neither, very good accuracy-- if you provide me a temperature, it's better to be good, because my range is very, very small. Most of the vaccine is going to be between 2 and 8 degrees Celsius. So if you tell me that your RFID tag is plus-minus 2 degrees Celsius, well, I'm not interested at all.

And I have to be able to read it before I open the container. Because if I cannot, if I have to open it, well, this is where it gets to a conflict of what happened before I opened it. But also, I want to read that during my transit.

For some of you who are aware, we have been contracted by the American Red Cross to redesign their distribution system in terms of packaging, but also on the network. And we are trying this thing, also the RFID unit. And what is the major thing is, for them, it's not a question of losing the product, but more not providing the supply.

So if they can understand what is the temperature before it gets to this nation and decide if this product is going to be accepted or not, well, they can always ship another one to make sure that they get a supply. Because in 24 hours, you have to supply 4,000 different drop point hospitals in US with them. So you have to know this visibility about that.

One of the problems with the pharma industry with the cold packaging-- I have two minutes? And very quick is that it's unfriendly. Many of the packaging components are very unfriendly to RF temperature tag. For example, if I take some of the components-- we have foil, we have gel packs, we have metal cans, and all these things. I can get a signal through it. Even some of the vaccines are so bulky that I can not do that either.

For example, I just slice one packet in half. So it's the side of a styrofoam container with all the vaccine and all the gel packs. And I just cut it in half. And what happened is that many places, I cannot even read the tag. Maybe at the bottom, sometimes I have enough that I can read something. But most of the time, I cannot.

So we have to find a way to get around that. Because the good value about it is because I don't want to open my container before. Another one is the vacuum panel. Vacuum panel is a vacuum that is wrapped with mylar or foil. And because of the vacuum, it has very high insulation. So the top-notch product in the pharma industry-- vaccine, very expensive one-- they all ship like that because it's very good for them.

We have no signal through that. It's kind of completely shielded. So I cannot measure any temperature and read it from the outside. And we have been challenged with that, because a lot of companies are using that now.

So just as a conclusion, I can say that RFID temp tags opened a new era for cold chain management. Now all our researchers are thrilled about that. Because it can predict things, it can have data that they didn't have before. The food industry should benefit from new smart technology. And the pharmaceutical industry can have the real-time visibility, which is going to change quite a lot the way that they decide which items they should send to the other one. That's it. Thank you.

PROFESSOR: Thank you, very much. Our next speaker-- in place of Christian Helms who had a family emergency, he was kind enough to send Michael Nicometo who is Director at the Cold Chain Group AG in Bremen, Germany.

MICHAEL NICOMETO: OK, basically, I'm here to talk about what some of the problems that we have are when we think about embracing or adopting RFID technology within the cool chain. We have a board of directors. We have investors who expect an ROI. We have customers who don't want to pay for something unless they really see added value. Added cost is one thing, added value is a different thing.

So where we fit-- just so you know a little bit about us-- is we're a global cool chain logistics provider. Christian Helms is the CEO and Managing Director. I'm the Director and I'm also responsible for global IT and IS.

We were formed as a new company in February of 2005. We announced it through logistic in Berlin last year. But our experience goes far back beyond that. Christian has been-- he's built the perishable network for Kuehne and Nagel, which is a global logistics provider. And we work together with Hellmann. And at Hellmann, I was sitting second to the CIO where we had offices in 80 countries-- 130 offices and 3,500 users. So a lot of our experience comes from before this.

This is a new company that's dedicated to perishable temperature-sensitive types of handling. In July of 2005, we had a slight addition to our business plan, because we acquired a company that's like a mini-Cisco, if you will. It's food distribution in Germany. It's very high-end fresh, gourmet food that lost 7.5 million euros last year. So we had the task of turning that around very quickly, which we have in the six months that we've run it this year. That's called RUNGIS Express. It's in Meckenheim Germany.

Our focus really, again, is providing a global network of offices that are dedicated to the specialized handling of temperature-sensitive products with skilled and experienced people. Locations are very important, gateways, what we're doing. We worked with John Pierre for the last seven or eight years, I think it is now. Back to the days that he wrote the perishable handling manual for [INAUDIBLE] when he was up in Quebec. And we continue to work with him very closely through the University of Florida.

There's an awful lot of services that Cool Chain Group does. And RFID is one of the solutions sets that we're looking at to apply to all of the solutions that we have with handling these products. And John Pierre has really talked a lot about exactly the same things I'm going to talk about. I'm going to look at them from a more summarized business format rather than looking at it from a research, and a design, and optimization of all of the different protocols and everything that's involved.

With the cool chain, we really need to optimize transit time. If we can capture a broken transit point in the supply chain immediately-- let's say that a container doesn't get on a plane, and we don't know if it's confirmed on board or not. If it's sitting in Miami and it's on the tarmac at 110 degrees and it's blackberries and raspberries, we don't have very long to recover it to get it back inside of a cool chain. A lot of times, we don't even know that until the products become a product that you take to the dump. Or make wine out of it, if you're a winemaker, that might work.

So if we actually had the infrastructure in place to where we would know whether or not that actually got on the aircraft or not, we could actually have some dynamic reporting, exception reporting, and get to it, and bring it back to us. So optimizing transit time is extremely important. Finding where there's an exception to what we anticipate is going to happen is very important.

And the other thing is, if we have automated data collection at receiving and shipping, that saves us a lot of time. If you receive 2,000 or 3,000 containers of goods off of an LD7 or a couple of different containers off of an airline, and you have trucks backed up to your warehouse door honking their horns because they want to get it, and you have to receive and enter every single box, whether it's by barcode or manually, you're spending an awful lot of time. If you could take that same product through a portal, or with a handheld or anything else you want to think of, to read it for a reader configuration, you really cut down the receiving time, as well as finding out if there's any errors.

The temperature and monitor problems-- as JP talked about, that's very important. You saw what happens to product when it's out of the cool chain. For sensitive products like berries, one hour above temperature equals one day of lost shelf life.

It's an interesting statement, because as JP pointed out, when you looked at the charts measuring surface temperature on the outside of a pallet or a case, it doesn't necessarily tell you what the pulp temperature is of the product. And when somebody receives product, a lot of times if they get a truckload of product, they've got one or two traditional temperature records in there. If it's out of control, they'll reject the load. Or they'll set it off until they can do further QC.

And then they either reject the whole load, or they don't reject the whole load based on what they see on one or two measuring points. With RFID, we think we can put a tag on every single pallet in different locations on a pallet, map the whole container, and basically then be able to tell if some of the pallets were exposed to a bad temperature- either too warm, or too cool, or both in the same container. And through research that JP is doing at the university with his team, we can actually map what the effect is for different types of packaging versus different types of commodities, as to what the ambient temperature is, and how far you go out of temperature upper or lower control limit, and the length of time that you're out as to what the effect will be on the pulp temperature. So we can start to assign an awful lot of business intelligence to being able to really tell what that's doing to the product, not just look at the surface temperature and make a decision.

Real-time alerts during transit-- if there is a problem, then we can have an alert and go back through cellular or other types of communication. Or to the driver, we can actually take remedial action during the transit process rather than wait until we open up the doors and find out that we have something wrong. And the shelf-life predictability-- not just accepting or rejecting, but the shelf-life predictability becomes much more doable than it is with current technologies.

Trace and track is a very important thing for safety and recall. Also for tracking, like with food and other items-- what did we actually sell the thing for at the retail shelf versus what lot did it come from-- so we know how to do accounting and to send the revenues to the right people. But that's very pervasive.

That's very time intensive when you have human people trying to do all this, and you have ERP systems that are trying to take different receiving and shipping, and different logistics packages, and different airline tracking. And you try to put that all together, it becomes very difficult. If you're able to do it with RFID, then it becomes transparent, and it becomes non-pervasive or less pervasive to the actual process of the business flow so you can actually start to do that.

Humidity and atmospheric conditions are similar to temperature. Their second level, they're also very important. I didn't list any bullets here because it's really similar types of things just using different types of sensors.

Warehouse and handling efficiency, we touched on. Real-time receiving and shipping and pick detail-- not only do you save time, but you also gain on accuracy. With barcodes, sometimes people will read a box-- they can't read this box, and they go scan one they can. Until you get to the end of the lot, you don't really know what's going out the last door.

The last door is whatever is still in the system and they ship it. Warehouse workers that are responsible for picking and packing, in many cases, are very ingenious into how to get around a system. And so, good RFID will handle all of that. Also, we can do time studies on which people are doing their job better than others by observing different activities throughout different points. And we can have automated inventory with bin polling.

So what are our challenges? We need to be able to establish measurable baseline costs. Everybody wants an ROI, but they don't know what it really costs them right now. We don't know in the business world, a lot of times, how much we're really losing. If Christian was here, he'd give you all kinds of percentages and talk about everything from Marks and Spencers-- which is one of the best with shelf-life, not having a lot of shelf life loss-- to some of the worst ones.

But really, people don't have a good baseline. You have to establish a baseline so that when you look at an ROI, you can now actually start to measure the differences and know what you're really coming up with. And then you've got a sustainable ROI, so it's just not a flash in the pan. Where you put ROI in, you run it for three months, and then you quit doing it.

We need to understand that not all RFID technology is EPC RFID. And there are some closed applications, low-frequency temperature tags, for example, 125 kilohertz, probably, in some of these packages with a close read range could work, whereas, 900 megahertz wouldn't work. And so, we have to really figure out what fits where. But still, as we gain experience, then we need to move towards how do we get this all into a standardized infrastructure so that we don't have high infrastructure costs for different types of frequencies.

We have to have tags that are applied at the first stage of the process. Because it's much harder to cost justify applying tags midstream in any logistic process, or bar code, or any other type of labeling. So it has to really start at the beginning of whatever the process is so that we can utilize the benefit of that through the whole supply chain.

Right now, read accuracy is a big problem. If we've got 95% of the data, it's really not good enough. If we have to verify what's on there through traditional means of measurement or identification, then RFID is just an extra layer that's not really displacing that other cost. And it's getting better all the time. Some things are going to be close enough to 100%, I think, to where we can start using them pretty rapidly in real time.

The infrastructure has to be affordable, maintainable through the whole supply chain. Listening to some of the things you thought about with cost of readers early on, where they're not there yet, I agree with it. You know, electronics normally come down in cost.

I'm sure the readers haven't come down as much as we expected them to yet. But as compared to moving parts or scanners with lasers, definitely, the electronic reader for RFID is going to be far less to install and maintain than anything with any mechanical moving parts in it. But it has to be there, and it has to be affordable and maintainable through the whole supply chain.

We should approach the container level, pallet level, and item level, and sensor level independently. Sometimes people try to put together the total solution. And you never finish what you start. If we break it down into pieces, and that's what we're trying to do with some of our pilots and our tests, we can actually do something, gain some experience, and actually get an ROI on different pieces of that and then work towards building a complete infrastructure where everything works together.

And we have to find ways to lower costs, even with the current technology. And it's a lot easier to justify on a pallet basis or a container basis than it is on a case basis or a level basis. So we're focusing on that on the front end.

What are some of the concepts, some of the pilots that we're thinking about? Well, one of the things is to identify the right clients and commodities where we can actually put RFID tags onto cases when they produce them, when they label them, so we can run them all the way through the supply chain. And we can read them and not fight the commodities that have poor read rates, or the commodities that have very little profit in them or very low value. Because nobody is going to accept that.

So we want to get to where there's a low threshold for adoption for the concept in general, and for a reasonable expectation of an ROI, so that we can go ahead and do the pilots with those types of commodities and those types of customers. Then we'll determine the accuracy of the technology and the impact on the process flow. Do we really speed the actual process flow up, or do we slow it down?

We want to find carriers to test RFID tags on container level. And it's not traditionally RFID. It may just be RF with other types of communication devices. A lot of ocean containers have modems in them now, with the gensets. And there's a lot of things that they do where we can start to slowly purvey that with RFID as we think of it here, so that we can start tracking containers.

But we have to have the infrastructure throughout the supply chain. And it may be that we can find an ROI just from point G to point K, and not from A to Z. We don't necessarily have to try to do the complete chain. And again, look at what the accuracy of the technology is, the impact on the process flow, and then we establish our ROI.

And the final thing is talking about temperature mapping, where we're talking about whether it's on a case level or a pallet level, like I said earlier. If we can map that whole container or that whole truckload, we can actually start getting a lot more information. And then we can take business intelligence that we build into the final application, and we can say, all right, now we're going to accept or reject this load.

These pallets have a longer shelf life on the same load than these pallets do. So instead of doing FIFO, or first-in first-out inventory management, we're going to actually start doing shelf-life inventory management. Instead of sending the stuff that's been stressed by temperature across the state or whatever the longest distance from this DC is, we're going to send it to the store across the street. We're going to send the stuff with the most legs, or the most shelf life left on it, to the father points.

And so, by mapping the complete trailer, we can start to get much better experience. And even though our temperatures aren't going to be exact comparing surface to pulp, we're going to get a lot better than we are today.

When I sit down and talk to people who are very technical and very accurate in their analysis of this, they're saying, oh, we can't do all these things. And I laugh and I say, well, what are we doing today? We have two temperature, or one temperature recorder in the truck that's not accurate. And half the time, the truck driver throws it away if he has a problem. Anything we do is going to be a gross improvement over what we've got today. So let's go ahead and get the experience and take it forward.

So that's it. I think I just really wanted to give you a brief overview from our perspective. You know, we're not a big company that's going to be an industry leader, investing a lot of money. But we're also not a company that's going to wait and see what everybody else does. We're somewhere in the middle.

PROFESSOR: Thank you very much. Questions, if you could come down to the microphones, please. One question, we actually had a student working on this last year. And the question came up around sampling rates and how significant that was in the temperature of business.

I mean, if we take a read event and then we have some kind of telemetry stream-- so this would be characteristic of any sensor-- at what point do you marry that up, per an earlier question today, with your XML representation of the read event? And how often do you need to do that? Clearly a different time cycle than what we're doing in the ALE filtering of the actual EPC read event. I would be interested in your experiences in that regard.

MICHAEL NICOMETO: I think, from a temperature perspective, what we're really interested in are two things. The most obvious one is whether we're out of an upper or lower control limit. And if we are, we want to measure all of the events that happened once we go out of the control limit. So the relationship is going to be that we have a certain amount of temperature variation over a certain amount of time that's going to affect the pulp temperature of that product. A quick rise in surface temperature and a drop probably isn't going to affect the pulp temperature very much.

We can actually-- at this level of the analysis-- say, we're going to ignore all temperature readings that are in the temperature range. So we can actually say we want a temperature recorder that's going to make sure we're within our control limits. As long as we are, don't use the memory on the tag or the module to store any data. The only time we want to store the data is once you go out of limit. We may even say we only want to store certain incremental adjustments over a certain amount of time so we can then predict what the effect has been on it.

However, at another level, if we can get the proper memory storage and also the readability within a bandwidth-- like when we come through a portal-- it would be nice to know how much variations there has been within the limits, within the upper-lower control limit. Because you have to make some judgments when you set those control limits. And a variation of temperature even within the limits affects the quality of some products. And so, it depends on where we're at.

But again, when we compare it to what traditional equipment is, anything we do is better. And so, it's all a matter of, what's the right balance? And if we have 10,000 data points, and we're coming through a portal, and we're reading a pallet, then the first thing we have to do is be able to read whether or not there's an alert situation. So we're looking at, how do we set-- if there is some type of an alert-- how do we set the profile for this commodity on his pallet so that when we come through the portal, we only have to read enough data to know if there's a problem. If we try to read all of the data with the bandwidth that we have available through RFID today, with that many storage points, we don't have enough time as the [INAUDIBLE] comes through.

GUEST SPEAKER: Well, maybe I can just say a work note, as it were. Yes. One thing that I just want to say is that, of course, if you get the temperature of the tag, what is outside the package, it's kind of a problem, an issue right now. Because if I take the temperature of my product inside and I do regular data acquisition, I don't take that much data-- 10 minutes, 15 minutes, 20 minutes interval. That's way enough, because the lag that the time that it takes to change temperature of a product is pretty slow.

But if I take on the outside of my package, we have a big issue like that. Because if I take every 20 minutes, my picture can look much worse than it is in fact. So this is what, as Mike said. Sometimes we try to work on the range and fine tune that. But don't think that it's a ton of data, to be honest. Only a few per hour would be way enough in our case.

PROFESSOR: Well, thank you very much. Oh, we have a question.

AUDIENCE: Just out of curiosity, I always wonder, if you have a rule saying a product has to be within the range of 60 to 90 degrees in the distribution network, what happens if it's 59 or 81? do you really care?

GUEST SPEAKER: What kind of product?

AUDIENCE: I don't know, just any perishable product. You have this rule. If I encode it in my system--

GUEST SPEAKER: If it's in the pharma, by some regulation, if it goes out of the range, it's out. You can not use it at all. The reason why it's going like that is because-- we cannot prove it-- but if you have a time and temperature relationship, we may be more able to release some of the product that has been out of range because we can prove that it didn't affect the temperature of the product very much at that time.

In terms of food, you have some thresholds sometimes. Some products like fruit and vegetables, if you reach a certain threshold, it's gone. So I'm talking about freezing products. Some products are like minus 1, minus 1.5. If you go down over that, it's over. So sometimes, some of the ranges are pretty precise that you have to be there.

AUDIENCE: Yeah, just I'm the systems person. I'm wondering if it would be beneficial if I put in my system, say, it's perishable, but if confidence is 90%, does that help at all?

GUEST SPEAKER: Oh, yeah.

AUDIENCE: OK. Yeah, sometimes those magic numbers are hard to explain. It's 90, the absolute magic number?

GUEST SPEAKER: And the worst thing is that we are working with biological products. And all of them have an attitude. So they all behave differently. So of course, we learn enough after a while doing research that the precision is something that you have to take slightly sometimes, because the variation is pretty wide. But we know some guidelines, at least, that you have to be in this time.

MICHAEL NICOMETO: In addition to that, we've got some conditions that we don't know about the product at the point that we start to measure temperature. For example, what are the harvest conditions? Was it rainy for one week beforehand? Was it dry? All of that affects the beginning life of the product.

And so, what we're measuring when we measure the product is, we're measuring what's the optimal conditions. And this is where I was talking about some of the software that John Pierre's team is working on developing. It's giving you exactly the type of thing of that you're talking about, which says, well, if something's out of limit, we don't just reject it other than in case of controlled substances or pharmaceuticals.

But if something is out of limit for a short period of time, what was the out of limit? You know, so it's a time and temperature factor. How far out of temperature, and how long was it out of temperature, that really makes that a predictable situation. And again, if it's food products, we still have some other uncontrollable things that are there.

AUDIENCE: Thank you.

PROFESSOR: Well, thank you very much to the panel.