The Stand of *Autodesk*: Good to Great

Interview with *Robert (Buzz) Kross*, Vice President of *Autodesk* Manufacturing Solutions Division

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Robert Kross is vice president of the *Manufacturing Solutions Division* at *Autodesk* and is responsible for developing innovative technology solutions that meet the specific needs of mechanical engineers, designers and drafters.

Prior to joining *Autodesk* in 1993, Kross was President and co-founder of *Woodbourne Inc.*, which provided parametric design tools for the *AutoCAD* platform. After *Autodesk* acquired *Woodbourne*, Kross joined the company as a director in the *Manufacturing Division* and since then has worked on the development and marketing of the group's core products, including *AutoCAD Mechanical*, *Autodesk Mechanical Desktop*, *Autodesk Streamline* and *Autodesk Inventor*, the company's premier *3D* mechanical design software.

Today, the manufacturing solutions division develops software used in various manufacturing segments including industrial machinery, electro mechanical, tool and die, industrial equipment, automotive components, and consumer products. Kross and his team are focused on helping customers extend the use of their digital design data across the enterprise with *Autodesk Inventor*, the latest in *3D* mechanical design technology, and *Autodesk Streamline*, the company's online collaboration service for the manufacturing industry.

Kross has more than 20 years experience in the manufacturing and *CAD/CAM* industries. He began his career as a mechanical engineer at *Triangle Package Machinery*, a company that designed custom, high-speed packaging machines. He then went on to spend nine years at *General Electric* and *GE Calma* with positions in software development, application engineering and technical management for the United States.

Kross holds a Bachelor of Science degree from *North Central College* in the Chicago, Illinois area.

– Today's *Autodesk* – a pioneer of international *CAD* market – is rapidly evolving company, leader of *CAD* market by the number of sold *2D* and *3D* licenses, by a total year revenue and net income. But since this interview you are giving in the frames of historical "*CAD/CAM/PLM Portraits Gallery*" project, I would like to use opportunity and ask you few questions from the past of your company to clarify for our readers some "white spots".

– At the beginning I would like to welcome all the readers and say that I visited Moscow last year, when *Autodesk* opened there its official representation and spent there a week. I met a lot of really smart customers; you have good education system in engineering mathematics. This territory is fastest growing in the world for us, particularly in manufacturing – a really good business for us. Of course there are still a lot of non-paying customers and this is something we would like to change for us.

– So, let's speak a little about *Autodesk* recent history. *Inventor* appeared on the market approximately in 1999, that is three years later than its competitors – *Solid Edge* and *SolidWorks*. However a long before it we got information in the press about a project under the name "*Rubicon*", which was forerunner of Inventor. How could you explain such a delay with *Inventor* shipment?

– Well, the first thing to know is that *Inventor* did start third by a couple of years, but it is a leader on the market. This is really important point, because it shows the fastest growth. The timing for it was such because we first built an *AutoCAD* version – *Mechanical Desktop*. And still probably 5% of our customers are using *Mechanical Desktop*. So, we started working on the *Inventor* project after we got *Mechanical Desktop* to market. This was the matter of resources that we shifted. I personally run the *Inventor* team, the *Rubicon* project, I built that team and I released it. We decided to do some things that hadn't been done before on the market, particularly with our database structure and graphics pipeline, those things took longer to built, than others. I guess why we have technical lead is because some of the architectural work we did way back then, and other systems are relatively simpler in their architecture. But we actually don't see *Solid Edge* on the market much. I think it is a good product, but there is something with its sales forces. The real competition is with *SolidWorks* – we compete with those guys every day. And I think with *Autodesk Vault* and *Streamline* solutions we compete more and more with *CATIA* on the *PLM* space, not as much as on the *CAD* space.

– Why earliest releases of *Inventor* opened *AutoCAD* files worse than its competitors? Was it a consequence of insufficient coordination between *Manufacturing* and *Platform Divisions*?

– Well, I don't think it was ever worse than its competitors. I think my competitors might say that or *SolidWorks* users, but I don't think it is true. At that time our initial target was *Pro/E* users and we didn't put as much effort into converting *AutoCAD* users as we do today. This was happening in the *Inventor* releases 1 to 4. Now already *Inventor 11* is coming, we just did a demonstration of that to our users and subscribers next door – we have made a really huge progress in that number of years.

– Quite for a long time *Autodesk* remained a technologically dependent company. *ACIS* kernel on which were based most of *Autodesk* products belonged, controlled and developed by *Spatial*. Why you didn't buy *Spatial* in the year 2000 when appeared a great possibility to do it for the small money – only 25 millions? With this you could resolve a problem of "kernel security" for *Autodesk*.

– The deal was not 25 but 31 million dollars. I think it was a bad purchase on *Dassault Systèmes*'s side. *Dassault* spent 31 million dollars on that business and you could ask them how much business they got out of that. I knew in the contract I had the ability to walk away with the source code for a no fee. In buying *Spatial* all I would do is buy what I already had. I would say that *SolidWorks* is dependent upon *UGS* because of *Parasolid*. Following my contract I new at some point, that if I didn't like what *Dassault* was doing I would just walk away with my license, built my own team and progress, which I did. So, now we are on *Shape Manager*, I have bigger engineering team working on *Shape Manager*, than *Spatial* did and it progressing really rapidly. So, that is why I felt I didn't need to buy it. It was 30 millions dollars, which I could spend somewhere else.

– Can you tell us please how the things are going now with the development of your own kernel – mysterious *Shape Manager*? Few years ago *Autodesk* hasn't got its own specialists who would be able to work on the kernel development. For these needs you were hiring "guys from Cambridge" and even went to court with *Dassault Systèmes* by this reason. Have you solved that kind of human resource problem?

– I have the dedicated team for *Shape Manager* in Cambridge in UK, they work full time and we expanded team greatly. Before we used to work with company *D-Cubed* (in June 2004 *D-Cubed* was acquired by *UGS*. – *Editorial note*), that has really experienced with *ACIS* "shape-data" guys. We worked with them for years and we really liked them. A couple years ago we hired all this team to work on us full time. So, today everybody in *Autodesk* uses *Shape Manager*, all our products are based on it. We now supply technology to groups like the *AutoCAD Group*, *3D Studio Max Group*. We will filter it into the *Alias* that joined our company. It is a real kernel capability for us, a very strong team. There are probably around 50 people in this group.

– At the very first issue of our magazine that was founded in the year 2000 we published your personal evaluation of the deal between *Spatial* and *Dassault Systèmes*. We took it from the "*CAD Report*" magazine, where you stated, that the deal only proves the right choice of your company (to use *ACIS* kernel). And you were sure that such a serious company as *Dassault* will make only positive influence on the *ACIS* development, that there will be added new technologies, developed for *CATIA*, and *Parasolid* kernel will experience problems, and the question was only if *SolidWorks* will have time to switch to *ACIS* without the loses. Tell us please did you really believe in what you were saying or it was a try to "keep the face" of the company?

– Yes, I still think it is true. I think the team from *Dassault Systèmes* did add some good discipline and some good capability to it. I felt I could do more, focusing on my own directions. My opinion is that *Dassault* strategy is to get their *SolidWorks* customers to switch to *CATIA* and it makes sense, because they compete with themselves by having both products - *SolidWorks* and *CATIA*. In longer term they want all these customers to shift. Speaking about *SolidWorks* switching to *ACIS* – I don't know if they ever switched to *ACIS* or not. I suspect they won't, because they would have so many file migration problems, customers data won't come over. That is why I think that these 31 million dollars was a really bad investment. Was it worth today? I mean what *Spatial* does today – they are the supplier for the API for *CATIA v5*.

Anyway the big thing about it is that it did position us to build our own geometry team, which is turned out to be a great asset for us. If you get a chance to see *Inventor 11* – you see some really great new shape description staff – we could never done that without our own kernel.

– Let's move to current *Autodesk* operations. At the last time we managed the process of differentiation of *AutoCAD* users. More and more *AutoCAD* users who are performing the complex tasks are moving to *Inventor* and other *3D* systems. From the other side, there are still many *2D* users, who do a simple work and whose needs does *AutoCAD LT* cover, which is much cheaper. Our question in this regard – what is the future of large *AutoCAD*? To be a platform for other vertical solutions?

– I don't think that complexity of what customer is designing is a decision point on *2D* to *3D*. I've met a lot of *2D* customers who are making really complex machines. I was at such a customer just few weeks ago. They are making complex timber-manufacturing machines – 300 foot long machines, thousands and thousands parts, and all in *2D*. These guys are not poorly educated, conservative, dummy; they are smart guys who believe that *2D* is the way to go. So, there is a segment on the market that wants to design that way. That is why I have *2D* products – *AutoCAD Mechanical* and customer has a choice how to design. I am personally a *3D* guy and I would design in *3D*, but I am not all customers. So, I think there is still plenty of room for *2D*, but it will continue to shrink in the linear jump. I have just announced half a million *Inventor* customers and we probably have 2,5 million *AutoCAD* customers who are still working in *2D*. So, there are still

a lot more *2D* than *3D*. We've been predicting that *3D* is going to take off and take over the world for the next 25 years or even longer than that. It is hard to see a young engineer graduating from college today and going out using *2D*, because they already learn *3D* concepts. I do think that as a new generation comes in *3D* will become a much more obvious choice and I believe that pace will continue to accelerating. Let's look into the growth rates: *Inventor* last year grew at 47% in terms of revenue and even faster in terms of the number of seats (39% – *Editorial note*). Our *AutoCAD* and *AutoCAD LT* business grew in high teens (29% – *Editorial note.*). So, there is much faster growth rate on *3D* side. However as I mentioned before we believe in *2D*, there are still customers using *2D* and asking from us for a lot of staff, here are still more users than anywhere else. But particularly in mechanical *3D* is accepted way and it will continue to grow faster.

– Everybody who participates in mainstream software development knows that sooner or later, when its user base will become wider, performing more and more various tasks, will come the time when amount of bugs reaches the critical point and systems users will start to criticize the software. Then the development team is forced to do the huge work of overwriting the programs, to make system work stable and safely. This huge time and money costing process got the name as "work under hood", and usually is hidden. We know such examples and wonder if *Inventor* has gone through such a difficult life stage or this is still in the future?

– That's a great question! Let me tell you what we are doing, because it is something really interesting. We've been very proactive. Four releases ago, we embedded in our product *Crush area report* function. So, every time our customer has got the problem, they can report it to us. Well, we've really adopted this is something we want to work on a news. We fix 25% of those crushes every release. In the latest *Inventor* release we have done 37% so far. I am in the unique position because I am the only software vendor who can talk about its bugs as a good thing. Because if customer has got the problem he can tell it to me and then we can fix it and get it back to him. I think software bugs is one of the big-big problems in the industry. So, rather than rewrite code, because fundamentally the process of writing code is the process of writing bugs, we go and fix in particularly bugs. And there have been so many things that we would never ever found. I mean deep little things, which you never see, you never do it, because customers are so creative doing staff we never thought about. This *Crush area report* has been fabulous for us. Moreover we have made it systematic. There have been two things we've made: we turned it to the business we can measure. I've put a lot of performance capability and measurement in to my software, so we could self-measure. For example, how fast it is versus the last release, does every new feature I put into software make it faster or slower. So, I can closely manage this. Every week I get a report, did *Inventor* get faster or slower than the last release. It is a huge benefit. My engineering team is paid based upon how many bugs they fix. Right now we are working on the other side, which means telling the customers about the fixed bugs and the work that is around the bug and when it will be fixed, such a close feedback level. We put the thing called *"Communication center"* into our product, so whenever we get the message we can send it to all our customers that are online telling about bugs and things like that. I think customers do feel it and you can see it here at the *AU* conference. I mean we get so many people here now, they do really well and I think it is actually the biggest value we can give to our customers – just make the product work better.

– Do you experience difficulty to maintain different systems inside one *Autodesk Inventor Series* – *AutoCAD*, *AutoCAD Mechanical* (*Mechanical Desktop*) and *Inventor*? Won't this lead to scattering of resources and decrease of *R&D* efficiency?

– No, it doesn't really. We have an engineering team built around it. So, we think about actually four lines of business: *Alias* line of business, Engineer to Order (ETO) software and services business, the *CAD* business, which has got multiple products in it and data management business. Engineering teams are well integrated, but it is a worldwide team. We have nine different sites. We have the entire infrastructure built to make that team worldwide. Different sites are dedicated to different things. For example, Singapore site is where we built *AutoCAD Mechanical*. There are another things that I heard a lot from my customers – a desire for system or *CAD* manager's staff work better, to have better licensing skills, more freedom for how they license data. Because customers want to buy a whole suite of products – everything from *Autodesk* – and then decide and pick up the license they want. Those are the things we think we need to help our customers with.

– Your competitors don't feel any threat from *Inventor* functionality and says that it is coming from *Autodesk* marketing budget. But what is your opinion, where do you see *Inventor* advantages over its rival's system functionality beyond your user base? Could you please name them one by one?

– You actually ask how do we win the new business? Most of my seats are new seats and it is true for all *Autodesk* in general. Around 75% (64.5%. – *Editorial note)* of my seats are new seats. The reasons I win are actually three. First one is our integrated data management, because everybody really loves *Autodesk Vault*. It is something that really separates our system from competitors – there is no other system like that in the world. The second thing

is ability to work with big assemblies. *Inventor* is simply the fastest system in the world. It can handle big assemblies better than anybody else can. The third thing is ease of use. It makes easier for *AutoCAD* users to go from *2D* concept to *Inventor.* The language is similar, the concept just similar. This is because we find the most our customers coming from some *2D* system to *Inventor*. But I think it is different depending on the case. If you are a *Pro/E* customer coming to *Inventor*, you win for different reasons when ten things are before ease of use there. It is even easier transition to learn *3D*.

– Do you have already any reaction or feedback from your user base on newest *Inventor 10*? Which from many improvements got the biggest positive feedback?

– Yes, of course we have a great feedback on *Inventor 10*, but we have got it on *Inventor 11* as well. We probably can't talk much about newest *Inventor 11* because of non-disclosure agreement (NDA) staff when going to the customers. One great thing I heard from *Inventor 10* users is that they like the performance, what they are unable to get in the other systems, the drawings standards like *GOST*, which we introduced for the first time and is very important for Russia, new drafting capabilities got very good feedback. We put this new tool called *Inventor Studio* into the software and introduced *Functional design* – these were great things that customers told me about. Probably at this point only young customers can use it because it is a really new way to model, but we think a younger age customers will like that capability.

– In the recent interviews to our magazine your competitors stated, that business from *Inventor* is limited by *Autodesk* user base size, that all important for *Inventor* deals are done inside of this user base. Is it true? To which extent this is true?

– I think it is actually a very funny statement (laughing). Because where would they say their customers come from? From the *Autodesk* user base. OK. Why it is that? Because we have all the customers! Just look at the legal customer base – 2,5 million customers using *AutoCAD*! This is just competitor marketing trick. I mean most of my customers are customers that I am switching from *2D* to *3D*. The fact that I won them once already is to my advantage, not to theirs (competitors). I think that in five years we still be converting *AutoCAD* customers to *3D*. Yes, it is true, that most of my customers comes from there. And I want to make my product the best for those customers. I can make the transition from *AutoCAD* to *Inventor* much more comfortable, much easier transition, than anybody else. Recently I've heard a great description: imagine you are 50 years old engineer, using *AutoCAD* for 20 years – you are just absolute expert. You bring a lot of the value to the company because you know the tools so well. Next day company is switching to *3D*. So, you go a way from being an expert to become a new guy. We can make that transition much more comfortable. You can still be an expert and still have a lot of value for company. So, it is a huge value for individual engineer going to *Inventor*. Because to transit from *AutoCAD* to *SolidWorks* is just like in the saying "going from senior to be a freshmen". But it is totally not like that making a transition to *Inventor*.

– What methodology do you implement to get the total number of sold *Inventor* licenses? What percent from that has Subscription?

– On maintenance are 90% of our customers; it always has been a very high index. I don't know the exact number of active users, because it is pretty hard to count it. We count seats all. If someone buys it today and dies tomorrow – I can't tell you the numbers. One thing about our business is that often I don't even meet the customer, the dealers sold the product. I actually sell my product to dealers. I think 90% on maintenance tells you a lot, because if customer is on subscription he will be the next release user. Subscription is not a non-expensive thing, so if customer pays the money it means he is going to use it. We always separate commercial and education licenses, like, for example, in Q3 we sold around 11300 of commercial licenses, which customers have bought.

– Which industry segments are the most advantageous for *Inventor* implementation?

– Most of our customers are making the industrial equipment and machinery, big heavy machines that has a lot of moving parts. And we do really well with mechanisms. Second biggest segment is automotive and transportation, I think 25% of our market is transportation. It is a really good segment for us. We now struggling to attack a couple of new markets: consumer products market, plastic designs, we have got a lot of advanced incredible shape descriptions staff going for curves, and etc. The second really interesting new market is *Building product manufacturers (BPM).* It is companies that make mechanical products going to buildings. *Inventor* can model those things and then composed them and put into the form that architect can use. Only *Autodesk* is able to do it.

– Recently *UGS* announced the launch of its *UGS Velocity Series* for the mid-market, which was evaluated by analysts as a very clever move, which is able to redefine the mid-systems market. Moreover *Autodesk* main competitors – *UGS* and *SolidWorks* (as a part of *Dassault Systèmes*) have clear advantage over *Autodesk* in this regard, because they are free to adopt for their needs technologies and solutions from they own high-end systems. What is *Autodesk* strategy in this domain? Do you have plans to make similar strong move in response? Because *Autodesk* already has *Inventor* and *Vault*, there is only left to buy *ANSYS* and any *CAM* system developer as *Mastercam*, for example, and to solve the question of integration of these products, which you certainly could do.

– Our strategy is different than theirs. I think *Dassault Systèmes* and *UGS* have a kind of division strategy: they have high-end product with high price, high functionality and high specialization and low-end product targeting with price. I don't understand how they do separate these things. The way they try to do it saying this is *Process- centric* and this is *Design-centric.* I don't believe it that. I mean I haven't met a customer yet who doesn't saying that my process is as important as my design. So, they try to separate you that way and then they built some limits in it. You can't make *SolidWorks* or *Solid Edge* a really productive system for big companies, for example, *ABB* and similar. We say *Inventor* is our tool; we can make it go as high as we can or as low as we can. We will bridge the gap. So, what we have in our vertical solutions: we bought *Alias* and now we have industrial design linked in the mechanical design, that is why we also bought electrical solutions, which we can link there as well, we also added *ANSYS* for finite element analysis (*FEA*) that goes to professionals, we just bought a motion analysis product to add in there. We have our central product and everything is built around it, which is much more rational strategy, as we think. In fact, often we compete with *SolidWorks* when customer needs a data management solution. They start with *PDMWorks* and usually fall on that,

because it doesn't really work. Then they try to bring *SMARTEAM* in, but it has different sales force, different objectives, they starting fighting like a crazy. That is why *Vault* is one of the biggest competitive advantages we have. Because it is more like *SMARTEAM* in functionality but much easier, and all integrated together. Our solutions have many-many advantages and it is different strategy.

We completely are not intended to buy *ANSYS*. But I like the product; I like the good people there. *ANSYS* is embedded in *Inventor Professional* and we are something like *OEM*. In comparison with *COSMOS* – *ANSYS* is really professional system. That is why I decided to go with *ANSYS*. I don't see the reason to buy it; it is a specialized field, our products work really well integrated already. I am happy with all our relationships with *ANSYS*. Speaking about *CAM* – it is a little more specialized. Where it is different is that more and more engineers would like to do design, *FEA*, motion simulation, but they don't do *CAM*. That is a different user. Anyway you wouldn't put it into *Inventor*, you'll put it alone next to it.

– Let's talk now about *Autodesk* perspectives and future plans. Does *Autodesk* has any plans to develop its own industrial applications on the *Inventor* base, for example, for design of dies and mould, cutters and yachts or ships?

– Yes, sure, we have vertical plans, shipbuilding, moulds are the things that a lot of our customers would like us to do, that is why we intended to do some of these things. And we already started to realize it, for example, *Inventor 11* has a lot of capability for mould-makers specifically. It doesn't necessarily mean that we'll make a separate product for them. A lot of shipbuilders use *Inventor* today already. We will continue to add capability. Of course, in some case we can make a specialized product, in different case we may not. Because the capability is necessary required, but not the separate product.

– What was the real sense to acquire company *Alias*? Was is a clever move to enter to the biggest industrial arena of your competitor *UGS* – *General Motors*? May be to get famous *UGS* clients, which before were inaccessible to *Autodesk* because of high level of complexity of its products and performed tasks?

– Our strategy has always been to vertically integrate. If you think inside the manufacturing company we intended to go further downstream and further upstream. This is an upstream move. Industrial design occurs before engineering, so our intention is to add that capability, to link it with *Inventor* and to continue to have *Inventor* data go downstream. So, that is the strategy, that droves us to do it. We think *Alias* is the leading name in the design portion of market. Because we are very interested in automotive, *Alias* gives it us. We will continue to develop that automotive portion of market as well as consumer products market and others. I think what we do is different what *UGS* does and we won't compete with *UGS*. I think actually we will write *UGS* data as we do today already. Very often people will design in *Alias* a car, for example, model the specific door inside *NX* and then manufacture it in *Inventor*, because a supplier is using *Inventor*. It is a really good link. I do see I can make my link to *Alias* better and we will maintain it, because that is what our customers want us to do.

– Will *Alias* work by its own? Or its technologies and products will be incorporated into the new *Inventor*? Could this *Autodesk* move be evaluated as a first attempt to give to *Inventor* the look of high-end system?

– *Alias* will continue to work by itself, to be a business by itself. But we really are going to crossover technologies: some things from *Alias* we will put into *Inventor*, there are *Inventor* features that we will put to *Alias*, for example, we will use *Vault* for *Alias*.

Regarding high-end look: if we talk about modeling I don't see a difference between mid-range and high-end, I think that always have been much a bias. The difference is how much it is specialized for automotive. I mean there are specialized automotive functions you put in there. I probably wouldn't put it in *Inventor*, because it is already in *Alias*. In terms of attempting to be a high-end system – we have been on comprehensive path for a long time already: in fact we do *FEA*, wire harness, electrical, mechanical; we do all of those things which are more like *CATIA* and less like *SolidWorks* do. So, for us what is going on is not the first step in a way to be a comprehensive system, but like second already. What is different this time with *Alias* acquisition is because it is so targeting automotive market – *Dassault Systèmes* and *UGS* noticed that. But such a development strategy has been for the long time.

– To the extent, which is allowed, could you please lift the veil of secrecy of *Autodesk* internal life? I mean what is the structure of new products development process: *R&D* divisions and its relationships? Is it centralized or decentralized to the following departments: *Manufacturing, Platform, Infrastructure, Discreet* and so on? How many people are engaged in *R&D* in your *Division*, and all together in the company? How do you create the products development plan? How and who make the decision to include any work to the development plan of the new release? How this work is coordinated? This is extremely difficult process!

– The new product development process is decentralized in divisions; we have customers focused on manufacturing, building, infrastructure and etc. Inside the divisions it tends to be more centralized. I have few engineering teams all of them are worldwide. I have nine development sites – 3 in Europe, 3 in Asia and 3 in USA. They are very well integrated. We have 4 different product lines. In my *R&D* division is probably around 900-1000 of specialists.

Each team has a *Product management organization*, which is responsible for the business. Their work is always based on three categories: customer satisfaction is the first. They do conferences like *AU* when at first day we had full day of description what our customer like, what they want us to do, what – not. We ask these things during surveys where participates 10 thousand customers. The second category is new capabilities – how we can develop our competitive edge, how to make it easier to use than *CATIA* and etc. The third category is targeting new markets, like plastic market we are attacking currently. The *Product management organization* is doing all the coordination needed. You are right saying it is an extremely difficult process.

– When you develop the plan of the new software release to what extent you act based on the user requests, based on your personal opinion? To what extent you explore the achievements of the competitors.

– We do it based on 30% of customer satisfaction, 40% on competition evaluation and the rest 30% – new capabilities for the new markets.

– What are the strategic aim(s) of *Manufacturing Solutions Division* for the next 5 years?

– I don't think our strategy of comprehensive solution will change – it is continuation of that, widening into more types of users. We have three goals: first – we want to ensure that our products work best for *AutoCAD* customers, we going to make it the best in the world system for our *2D* customer. I want *2D* do not exist for *AutoCAD* customers, for mechanical design. We have a goal to go beyond engineering. Right now I would say most of our customers are doing design work, but I want people to do other thing downstream. We have a big focus on downstream and upstream use. Some of the acquisitions we have been doing lately for that and the product itself talks about that. The next thing is to increase the segments we attack with new product capabilities.

– What the computer technologies will be adopted in the nearest 5 years by *CAD/CAM/PLM* developer companies and will be available for the users? (New platform, competitive OS, Multiprocessing, etc.)

– To my mind the big debate will be 64-bit, greater speed with multiprocessing – I just don't know the exact answer to that question. I think it is really gambling. We will invest in both, because for example, multiprocessing has been predicted for a long time but hasn't happened, because at first it has to become much cheaper, before it does work. I do think that *Tablet PC* is eventually going to arrive and to work, because engineering is going to leave the office to go to the point of work. *Tablet PC* doesn't work well enough yet, but I really want it to work, because I like it, I had one of the first ones. I think general processor and graphics increased speed will make a big difference. It will enable things like functional design, will see more design synthesis in the future.

– What will be the basic characteristic features of *CAD/CAM/CAE* in the nearest future? (May be we will experience a change of modeling paradigm, from geometrical to functional and behavioral?)

– Functional design is the best describing our nearest future. I think if you can describe your function and let the machine design it for you – that is pretty phenomenal!

– What ongoing processes in the world economy and industrial tendencies will make the biggest influence to *CAD/CAM/PLM* implementation and its overall shape?

– There are two things that big affect is happening already now, it is not the future, it is today – I mean *off-shoring* and *outsourcing*. Clearly it requires for greater tools for collaboration, because if you design in Ohio and manufacture it in Chine, you should have good tools, you just can't do it in *2D*. Numbers of errors made in *2D* are in tens times more than in *3D*. One of the reasons why we do really well in Japan is that Japan has its homegrown *CAD* market, around 50 little *CAD* products, built for local Japanese users. But like in US, they tried to manufacture *off-shore* from Japan. But they simply can't send these Japanese drawing to China or Korea. They had to standardize on *Autodesk* products and that was great for us. By the way China is also enormous market for us, we are already number one there! We see in China a really big growth, but it is not as big as in Russia. Russia shows the fastest growth we have! China is only more visible.

– What is your point of view on the nature of *Autodesk* phenomena? I mean – you are the oldest software company on the international market, which is not only going to give up its positions, but demonstrates big action, youth, ability for perfection and continuous to deliver products, what secure its absolute leadership on the market.

– I think it is because five years ago we in *Autodesk* started a culture change. It came from the book we all read called **"Good to Great"** written by *James Christopher*. At that time our President *Carol Bartz* put *Carl Bass* – a very bright man, technologist, who really knows the business – in a COO position in *Autodesk*. *Carl* revolutionalized the business. And this is the way he helped us all to understand it. What is great about this book is that it is not like usual pure philosophy business books, but it has observation of what business is went from being good company to being great company, why and what is the common thing. We studied that book and took it really seriously and said: "Let's do this!" People ask us as it has been an overnight success, but from the inside of the company it doesn't feel like overnight at all. It felt like five years of hard work, making our product right, market right. I think it is one of the fundamental works – making your customer happy, paying attention and listing to them, measuring our business. I would say the biggest difference that "Good to Great" caused, is that *Autodesk* became a data-driven company. We don't make decisions based upon opinions; we make them based upon real analytical data. So, we measure everything. *Autodesk* has become a very "data-hungry" business.

– At the end of our interview you have possibility to appeal to the huge Russian speaking market, to our readers from Russia, Ukraine, Belarus and the Baltic States. What words would you like to say?

– First I would like to mention is that Russia is a very important market segment for us, we want you really do well, we want to ensure we have happy and productive customers. We already invested a lot in things like *GOST* to make our customers there happy. Second, I think we are providing a great way to go from *2D* to *3D* and our customers must be there to be productive. Because it will be so much competition in the future that if you are not there (using *3D*) today you will be in trouble in the couple of years. The third thing is – we are trying to go there in a different way than our competitors do. We are going there with our comprehensive solution that let's you automate a great part of your engineering and product tasks. We not just trying to do a niche product as our competitors do, because I think *SolidWorks* is a niche product, it doesn't do electrical work and all the other functions. Our products will help you to stay without terrible migrations. We really want to work with this market, I've been there myself quite a few times, and my teams have been there. It is important segment for us to invest in.

– My duty is to mention about the great marketing activity of *Autodesk* on the territory of Russia and CIS, which has been really accelerated during the last time. One of the pleasant demonstrations of that is my visit to *AU*, possibility to meet with you personally and *Autodesk* participation at the "*CAD/CAM/PLM Portraits Gallery*" project.

– Thank you very much for interesting and frank conversation!

– Thank you as well, excellent, I really enjoyed.

Autodesk University 2005
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