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Transcript for Session 035

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Transcript:

Hi and welcome to http://chandoo.org podcast. This is session 35 and I am really excited to present to you yet another episode that has so many insights and so much of information and is really a travel back in time. In this episode, I am presenting Dan Fylstra, the person who created the Excel Solver software that we all use and love and rely on to optimize business problems and solve complex business models. I got to meet him face to face when I was in Santa Clara a few weeks back. I couldn't let the opportunity go by and so I immediately asked him if he would like to be part of http://chandoo.org podcast and he was really kind to accept the request. So, I did a podcast interview with him which goes back in time talking about the initial days of Excel VisiCalc development and how Solver came to be, some of his experiences of those initial days and where he sees the market heading today, the relevance of tools like Solver and predictive analytics and data science tools that are out there. It is really such a fascinating story. I am really happy to have him on the podcast. Without further ado, let me welcome Dan Fylstra. Before we say hello to him, I want to remind you that you can go to http://chandoo.org/session35/ to access all the show notes, links, resources and Dan's website mentioned in the podcast.

Welcome to http://chandoo.org podcast. This is session 35. I am really fortunate to have Dan Fylstra from http://solver.com, the person who brought us Excel's Solver, on this podcast. I feel extremely fortunate to him with us on the show. I had the opportunity to meet him and talk to him during the Pass Business Analytics conference in Santa Clara and as soon as I got to know that he was there, I wanted to ask him if he would do a podcast. And, he was really gracious and agreed. So, I am really glad to have him here.

Chandoo: Hey Dan, how are you doing?

Dan: Very well; very good to meet you as well.

Chandoo: Thank you. It is my pleasure and honor to have you on the show. I know many of the listeners of http://chandoo.org podcast are familiar with Solver but not many know the person behind it. Some people do go the Solver help screen and realise that there is a website called http://solver.com through which this is offered as a package in Excel but a very small minority would know that. I used to think that it was part of Excel until I was once playing with it too much and then I realised that it is actually a

package that is bundled with Excel. So, can you tell us a little bit about Solver and yourself so that our readers are familiar with your work?

Dan: Sure. Well, this goes back pretty far. Solver was introduced as part of Excel all the way back in 1990. That was the launch of Excel's 3.0. Solver has been around for that long. It has been improved several times. We've had a long standing relationship with Microsoft. Solver has been improved a couple of times; most recently in Excel 2010 when there was a very significant update. The origins of Solver go back to an era earlier than a lot of people might remember. This literally happened at a time when Microsoft was kind of a smaller player in spreadsheets and Lotus1-2-3 was at the helm. During that time Windows itself wasn't that well established. Windows had been launched but there was literally a layer running on top of MS-DOS and the big alternative to Windows was IBM's OS2 which at the time seemed like a very significant force. And, after that point, Lotus 1-2-3 which had been non-graphical spreadsheets used with the monitor in character mode - Excel was the first spreadsheet to come out that used full graphics on the screen. It came out on the Macintosh and then Microsoft introduced it on Windows. Lotus replied with something called 1-2-3 G which was their first graphical spreadsheet and also included in it was something called Solver. This was competitive and they made a lot of it. It had greatly enhanced capabilities because not only could it do what-if but it could back solve and optimize and so on. And, it turns out that prior to that time we had developed something called What-If Solver which was an add-in for Lotus 1-2-3 release 2 that did everything that Solver does now almost and Lotus had seen it. In various private meetings with Lotus, certain un-identified people were very interested. They did have their own Solver using certain methods within 1-2-3 G.

At that time, there were three major players - Microsoft with Excel, Lotus with 1-2-3 with most of the market and Borland with Quattro Pro. Lotus coming out with 1-2-3 G and Solver created a situation where Microsoft and Borland both were scrambling to find an alternative quickly - either to develop it themselves and sell it or find someone who had it. And, we had it. Not only did we have it but we had something better. And, so, we entered into an extended period negotiation and making a deal and it was Pete Higgins at Microsoft who made this deal many years ago. Pete Higgins is a very good guy who ultimately became the architect of Microsoft Office which didn't exist at that time. There was just Excel and Word as separate products. That, in many ways propelled Microsoft to where it is today.

So, we did a lot of behind the scenes development. This is before Windows 3.0 came out or Excel 3.0 came out. There was a lot of development and within months of each, Windows 3.0 and Excel 3.0 and Solver and various other enhancements came out. That launched a period of really rapid growth for Excel. It was really the take-off point for Excel. It was quite a fascinating experience and we've kind of worked pretty well with Microsoft ever since. Borland developed a linear programming Solver in Quattro Pro themselves but later came back to us and said that it doesn't do everything that Excel and Lotus do and so they ended up licensing a Solver from us as well which was with Quattro Pro for as long as it was out there. Then, ultimately, Lotus came back to us and said why we don't create a Solver for Lotus 1-2-3 and we did. We kind of came full cirlce.

And, so, it's been there for quite a few years and it was an undiscovered gem for a lot of people. For the people who have used it, they have got tremendous value from it. If you are using Solver (mathematical optimization which is what it does) and if you apply it in various business solutions, you can usually realise a very direct business path. I know of places in large companies where one person working for three months (a consultant to a major soft drink bottling company) produced a saving of $3 million and that was in the first round of application of the model. In the second round, I believe they saved $6-7 million more! That's a good case. We have a lot of stories of people doing things like that.

Chandoo: Yeah. I use Solver mainly to teach people how to model and optimize situations as well as for personal work and consulting and I just see it as the problem solving tool in Excel. You can use Excel for modeling and presentation but when it comes to solving a problem, you have no other place to go to than Solver. So, it's named exactly what it does. All of this background is really interesting and fascinating to hear. I had the fortune of meeting Dan Bricklin while I was in Houston, Dallas, last year. He was a keynote speaker at one of the conferences there and I was in his session all through and I had the opportunity to take a picture with him. I know you were working as a partner for his company, if I am not wrong. Can you tell us a little more about VisiCalc which was Excel's pre-cursor launch and how things were at that time?

Dan: That goes back even further in time. In fact Dan Bricklin and Bob Frankston who were involved with VisiCalc, along with various other people were invited to a conference by a bunch of historians who write articles about the software industry and they wanted to interview all of us. 25 years after the birth of the spreadsheet VisiCalc, they wanted the history while we were still around. I don't think any of us were ready for that. So, this goes back to 1978-1979 and at that time, Dan Bricklin and I were both students are Harvard Business School and I was one year ahead of him and all three of us were graduates of Electronic Engineering and Computer Science. So, we have all been through the same program.

And, the idea for the electronic spreadsheet came to Dan Bricklin while sitting in a classroom for Finance and the professor was doing what we think of in a spreadsheet with a chalk-board with an eraser in one hand and chalk in the other, changing all those numbers. And, Dan who had worked before at Digital Incorporation felt that we could do the same thing with numbers as we could do with word processors. This is what Dan told me that was really interesting. He went to talk with Charles Calso saying that he has this idea for a spreadsheet and asked what he thinks of the potential. Charles was a very smart guy; he was aware of everything that existed at that time. Big companies were all using time sharing and they had financial planning packages which were command oriented. And, Calso told Bricklin that he didn't think they were so much of a mine. The market was well served by these time sharing packages. But, Calso had had a meeting with a student in the previous year and he told Bricklin that he had this student last year who'd started a company to market software for personal computers and why he doesn't go and talk to him. So, Dan did. He called me up and we talked and I showed him an Apple2. I had exactly one Apple2 which I had bought from Steve Jobs personally and I wound up loaning that to Dan and Bob.

I never got it back! But, Bob who was really the programmer and the guy who wrote the code used that machine to develop the very first spreadsheet VisiCalc. It was quite a technical challenge to develop it and Bob had a mind about what it was like. There were issues like the processor was so slow that a human typing on the keyboard could get ahead of it. There were special things to buffer and to ensure that it was a smooth user experience.

We've obviously come a long way since those days.

Chandoo: It's fascinating and unreal for somebody to talk about these things in 2015. I was not even born in 1978; I was born in 1981 but I still relate to many of the things that you say like the DOS Windows layer and the green screens and things like that. But, it is a really fascinating background story.

Dan: If you start from today and think how much change has occurred since the character green screens to where we are now and from big, clunky machines and that Bricklin managed to buy maybe a $1,00,000 computer - that's what it took to develop something in those days. And, now, anybody with practically nothing can have far more computer power than they had to develop something new. If you try to project 30 years from now - you can possibly imagine what we'll have!

Chandoo: Growing up and learning programming, we used to have these 5.25 inch floppy disks and I think the capacity was 256 KB or something and so you couldn't really have anything on them and we used to carry them to the computer lab and we had to make trade-offs as in which program to copy, which one to delete and now you have GB's and TB's of memory. It just shows you that the technology world is such a rapidly changing place and you never know what comes next.

Dan: It's human imagination and creativity that leads to all those things actually being realised. Technology makes certain things possible and somebody needs to see what could be done and make it happen.

Chandoo: Yeah, you are right. I say technology but I mean the tech community as a whole pushing the boundaries constantly and seeing how much more improvement can be made in pretty much all aspects of human life. That's really amazing.

Dan: One other huge change is collaboration; groups of people who are geographically dispersed and who can be anywhere. That's so different today. It was fortunate that Bricklin, Frankston and I were all in the same physical geographical place in Massachusetts but, today, that wouldn't be needed. We

collaborate all the time with people in India, Phillipines, Eastern Europe, South America and so on. We take it for granted.

Chandoo: It is even more surprising - I haven't been to a conference where a lot of Excel people have congregated until now. This is my first ever such conference but, the moment I see and talk to somebody, I feel like I already know them and it instantly clicks. It's because we have been collaborating on email and through blogs and social media on one project or another. So, it doesn't even feel awkward or anything. There is no gap between speaking, shaking hands and getting into work mode. That's another thing that technology has made possible. It's all one world now; it's amazing.

Obviously all of these things are very exciting to hear and it shows a glimpse into what things were back then and how the world has changed because of those actions. So, what is it that you are doing these days and can you tell us what keeps you busy these days?

Dan: The idea of Solver has been taken much further and branched out in to related areas that you might call analytics - Business Analytics or just Advanced Analytics. So, the first issue is that Solver models that you can do with the basic Solver in Excel are kind of limited in size. And, we have built Solver upgrades that take that from hundreds of variables to hundreds of thousands and even millions of decision variables. We typically offer these Solver upgrades to large companies - a very broad range - 7,700 companies have used our Solver upgrades and they have solved very large problems. That's just in the scope of mathematical optimization. It truly all has to do with allocating scarce resources to different purposes in a better way. That's usually how you realise cost savings. And, we've built software for Monte Carlo simulation and risk analysis. That's used in a lot of industries like gas exploration and pharmaceutical clinical trials and all sorts of places where there is high risk although it can be applied even where there is medium risk and so it can be applied in almost any industry. Then, we combine those things to allocate scarce resources under conditions of uncertainty. So, we are combining optimization and simulation methods for optimization. This allows you to deal with uncertain demand or uncertain exchange rates and still allocate your resources that are under your control in a better way; i.e. things like money, people and equipment can be allocated to better purposes with a quantitative model. Then, we finally went into predictive analytics and now we have very powerful Excel-based capability for a product for data mining and text mining, forecasting, prediction and all the sort of stuff that you read about with SAS and SPSS and Amazon machine learning and so on. All those things you really can do with Excel if you would like. And, you can do them with surprisingly few limits. People think that they can only solve small problems of these kinds. But, that's not true. You can solve problems essentially as large as you could with high-end priced software as you can with Excel. The key to it is a good Excel modeller who can build an appropriate kind of model.

Chandoo: I totally agree with you. I think that even just out of the box Excel is such a powerful software and I usually feel that not many people utilize that power itself. But, when you add these kind of

functionalities like advanced Solver or Excel miner, I think it just takes you to a whole other level where you are now practically making money with every click. That's the kind of insights that you gain from such usage of this. I think that's really fascinating and amazing to hear that all these products are out there.

Purely out of curiosity - this is something that I wanted to ask you but we somehow skipped that - how did you come up with the idea of Solver when you originally did? I know the techniques for linear programming are probably a little older than the evolution of software, but what pushed you to the software of Solver.

Dan: It actually came about in a series of steps. Speaking about what people know about the Goal Seek feature in Excel - if you go back in time to when we were first doing this when there was just Lotus 1-2-3 and very early Excel - that feature was not built in. And, the very first thing that we did was a little product for Lotus 1-2-3 called What-If Analyst. It was really like a single variable goal seek. Goal seek is like back solving through one cell. That looked useful and people were happy with it and that led us to develop something that would develop multi-variable goal seeking - you can now maybe have 10 or 20 input cells and they are all adjusted so that the objective cell reaches the goal. At that point we were very close in terms of the mathematical model that you use in that case which involves solving systems of non-linear equations and they are very closely related to unconstrained optimization and then there is one more step of optimization with constraints and so that's the path we followed. So, Solver is really something that can do everything that goal seek does as well as everything that multi-variable goal seek can do. You just have a constant value for the objective cell and find something that satisfies a whole bunch of constraints. That's how we got there. It's interesting. Linear programming is the best known and most widely used kind of optimization but it is really a special case of the marginal problem. I think in Excel 3.0 the very first version of Solver just used non-linear methods. In Excel 4.0 we actually added the syntax for linear programming. So, it was a path.

Chandoo: The reason why I said linear programming is that I assumed from some reading that the techniques for linear optimization were developed during the world wars. But, obviously, optimization is a problem that humans have been facing and solving in one way or another for thousands of years by now. So, yes, that's right.

Dan: They are fundamental methods and they are all related.

Chandoo: Let me ask you one more question. Obviously, techniques like optimization and problem modeling are taught at an engineering college level - at least I learnt those things in college - but, I assume, these are really hard to grasp and apply to real life situations. I learnt how to do this at least two times in school but once I got into work and I started facing optimization problems, I had many

challenges on how to model the problem on paper and how to translate the problem into a worksheet and then how to set up Solver. These are the areas where I often struggle. I assume that a lot of Analysts and Managers who are the people who use these kinds of tools also face similar constraints unless they have some sort of proper, solid education background into the problem of modeling? So, what kind of suggestion would you give somebody who needs to optimize things like a small business owner but doesn't have formal education or background in Mathematics in a very solid way. How would you encourage them to get that optimization mind-set and modeling skill?

Dan: You are right that these concepts are taught in universities typically in graduate programs and to some extent in under-graduate programs. Now there is at least some coverage in most MBA programs of analytical methods and it is growing. There are also new Masters of Analytics programs just dedicated to that purpose. For people who don't have the time to spend to get that kind of degree, the textbooks that are used in those programs can be got on Amazon. They are expensive textbooks but that is one pretty good way to learn. There are also some online programs like http://statistics.com that has a whole bunch of information about statistics and also some on optimization. Currently there is a lot of online videos. So, if you just start at http://solver.com, there is a support menu and under that there are recommended books and we have pictures of some of our favorite textbooks and they link to the Amazon link where you can get them. There is fair amount of video training available. We have a You Tube channel http://youtube.com/user/frontlinesolvers and there is a lot of video there. That is essentially what I would do. I would see some of those books, watch some of the videos and try to get grounding. I think we have 40 or maybe 60 example files of Excel solver knowledge; you can solve them all with the Solver in Excel. Those are just free downloads from http://solver.com. That's a really good way to get started because you can see examples and maybe be lucky to find an example that is pretty close to a problem you are trying to solve and you can use that as the core and expand upon it. Hopefully, those are some resources that are available. It does take some application and effort because it is a little different way of how you would approach a modeling problem. However, there is really nothing better though than understanding your business situation (this applies whether it is a small business or a large business) and its essence and being able to express it in a model in Excel. If you can get that far and you can get used to the idea of decision variables and constraints and the things you can change and control the constraints and limit how you can use your resources then you can probably do it. We are very much advocates. There are people who just want you to go to school and become a Data Scientist and defer to the experts who have a degree. We actually have an internal model in the company that we democratize analytics. By that we mean that we make it available and possible for not just the high priests and experts and so on to build these kinds of models but anyone who is willing to try and put in the effort can do it and get a payoff from it. I will say this and this is just to be fair - larger businesses simply get a bigger pay-off than smaller businesses. For example, in an optimization model, you'll be able to achieve some cost savings and sometimes it is like 3% saving and sometimes it is 5-7% savings or something like that. If you are a big enough company then you get to multiply that percent savings by a really big number. So, it is a little harder for a smaller business to get the pay-off but it is still very much worthwhile.

Chandoo: I think the mind-set is also important. If you optimize too late then that might be more learning and more time for you whereas if you start a little early when you are small and a mistake wouldn't cost you too much then that is also important from a business perspective that you have an optimized process and you are not really wasting too much. But, I agree, that the multiplication factor would play a role when it comes to the cost for investment and the time that goes into optimization.

Dan: In my talk you might have seen that I put up the cover for this book - and this is an interesting read - it is now a book. I think it came out in 2007 titled Competing on Analytics by Thomas H. Davenport and Jeanne G. Harris. This is more of a general management book. It isn't going to teach you how to do it but it is going to show you why and how these analytic methods can have such a huge impact. I think there was a Harvard Business Review article by the same authors and that can give you a sense of why it really is important to have in your company an ability to apply quantitative methods and build analytic models just to compete. That books starts with a story of a Blockbuster Video and NetFlix. At that time, Blockbuster Video was the largest chain of video rental stores in America. NetFlix was an upstart but what they did (this is now very well-known because they sponsored day and night competitions) is build analytic models to figure out what movies their customers would want to see next. They saw what they watched before and what their motivations were and it gave them quite a niche. It allowed them to supply those videos. And, over a period of time, it had a magnitude of impact. It is now the largest user of internet bandwidth - they've gone beyond DVDs - NetFlix is now a major player - and Blockbuster Video is no more. They are gone. All those doors are shuttered. That is an analytics story.

Chandoo: That's right. That's like the poster boy for putting focus on analytics and making it a core competency for your business. It's really good that you mentioned that example; thank you. I just want to personally thank you so much for allowing me to do this podcast. It has been a pleasure and honor to meet you and have you in this podcast as well as talk to you personally when you were in the conference. Thank you so much Dan.

Dan: You bet. And, likewise, believe me; I really appreciate what you have been doing with your site and all the great things you do with Excel charts and more. So, to you - keep it up please.

Chandoo: Thank you so much. I feel so fortunate to hear those words from you. Thank you.

Dan: You bet. Take care:

Chandoo: Thank you Dan. I'll let you go back to your day and I really appreciate you sparing some time for our audience. I'll drop an email to you once this goes up.

Dan: Okay, great, take care.

Chandoo: Take care. Bye.

Chandoo: That was Dan Fylstra. I hope you enjoyed the insights and interview from him. For more information about his work and all the show notes and information, please visit http://chandoo.org/session35/. You can also go to http://solver.com which is Dan's website where Solver is offered by frontline systems and you can access all the information, products and services that they have to offer. Thank you so much for listening to http://chandoo.org podcast. I wish you an awesome day.