

Prescriptive Analytics: Taking Analytics to the Next Level

MacSWEENEY: Good morning, good afternoon or good evening, depending on where you are in the world, and welcome to today's Webcast, Prescriptive Analytics: Taking Analytics to the Next Level, brought to you by Wall Street & Technology and IBM, and broadcast by United Business Media.

I'm Greg MacSweeney, Editorial Director for Wall Street & Technology and for The InformationWeek Financial Services Group, and I'll be your moderator today. I want to make sure this is as interactive as possible, so I'd like to make a few announcements before we begin.

There are elements of this Webcast that will appear as pop-ups, and I want to make sure you can view them. At this time, please disable any pop-up blockers, if you haven't done so already.

This Webcast event contains audience polling. The polling questions will appear in the slide presentation window. Please complete the poll when it appears, and click on the Submit Answer button located on the polling side window. And thank you in advance for your participation.

I also encourage everyone to participate in our interactive Q&A session at the end of today's Webcast. Please feel free to submit questions to our guest presenters any time during the Webcast. Just type your question into the Ask a

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Question text area below the media player window, and then click the Submit button.

The slides will also advance automatically during the Webcast. If you like, you may download a copy of the slides by clicking on the download slide button located below the presentation window.

And lastly, if you're experiencing any technical problems, please click on the Help link below the media player, it will take you to our Webcast help guide. And it can also connect you to our live technical support help line, whose number is located within the guide.

Today we have a great panel of presenters, and discussing today's topic will be Jeremy Bloom, IBM ILOG Optimization product marketing manager. Dr. Bloom has more than 25 years of business experience applying operations research and optimization. He joined ILOG in 2007 before it was acquired by IBM, and he served as the Technical Account Manager; and later, as Product Marketing Manager for the Optimization product line.

After Jeremy, we'll hear from Jaime Villaseñor, Chief Risk Officer and Development Manager at Indeval, the Mexican Central Securities Depository. Jaime has been Chief Risk Officer and Development Officer at the Central Securities

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Depository since 2003.

He has over 20 years of experience in the financial services industry. He currently participates as a member in the risk committees of several financial institutions. He's a member of several industry associations; and, he's a partner of a company that specializes in trading algorithms in Mexican debt securities.

Now, on to the presentation, *Prescriptive Analytics: Taking Analytics to the Next Level*. So, financial firms are all experiencing massive data increases in virtually all types of data, from trade related data, to quotes, to non-formatted data such as news or other event data, financial data, and so forth.

All this information is needed to help make decisions for risk management, investment decisions, capital allotment -- almost anything. However, the volume and variety of data is making it hard to manage, store and eventually digest. Simply having access to the data does not mean that the traders, risk managers or executives have access to it when they need it so they can compile it, turn it into useful information; and finally, make informed decisions.

One particularly daunting challenge for users is making sure that the data they have is accurate. According to a

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survey we conducted earlier this year, a large majority of users say that they occasionally find errors or discrepancies in the data they have, and they need to scrub this data before they actually use it.

And 13 percent say that finding errors in data is very common. For significantly disclosed decision-making process and in markets where any increase in latency can put a firm at a competitive disadvantage, making sure the data is clean is definitely a priority.

Once the data is clean, firms are finding innovative ways to compile the data, evaluate the information and make informed decisions and take action. Today's not just about discovering what needs to be done, but actually acting on the information in a timely manner.

Some firms are actually taking analytics to the next stage of its evolution by developing systems and processes that cannot only churn the data -- churn, as I mentioned before, vast volumes of data -- but can actually determine what actions should be taken and in some cases actually perform the action automatically. These newer systems can prescribe a solution, recommend and take action based off a certain set of data outcomes.

This is what we're going to hear about today, how firms are

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taking data, analyzing it and automating some of the decision response. And we're going to hear about a lot of this over the next 45 minutes, and what Jaime is doing at Indeval.

So without anything further from me, let me set up our first polling question for the day. A very simple question: what line of business are you in? There are four choices there. These four choices are finance, banking, other or academic. If you could, please take a second to answer this question.

And then this will kind of...it will help some of our speakers tailor some of their comments, and when we get to the Q&A later in the day, it will help them tailor some of their responses if we know a little bit better about who the audience is.

So here we go. We have about 25 percent in finance, 25 percent in banking, and about 45 percent other. And a couple of academics there as well. So, that's our first question; and now, let me hand this over to Jeremy from IBM ILOG.

BLOOM: Thank you. Good morning, and good afternoon, and good evening, wherever you are. I'd like to just briefly introduce the main topic today by giving you an

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overview of where optimization fits into the finance, banking and insurance industries.

And optimization is one of the high-level advanced analytics that can be applied to data. It helps to make better decisions faster. Right now what we're hearing from our customers is there are three major hot button issues in this finance, banking and insurance sector. They're risk management, operational efficiency and product innovation.

Risk management, I think the importance of that issue has been heightened by the financial crisis that we suffered a couple of years ago. It involves determining what the best return you can get for a given level of risk or vice versa, maximizing your return...I'm sorry, limiting your risk to get the highest level of return possible.

Operational efficiency deals with trying to make sure that your operations and your transactions costs are minimized. And this is done through various ways of scheduling or planning deployment of your assets.

And finally, product innovation is becoming increasingly important as the industry has become more competitive. And many financial firms are attempting to provide value-added services to their customers through product innovation or to maintain or attain a level of market penetration.

Now, within the financial industries, there's a number of classical applications of optimization. The most important one or the most prominent one is portfolio optimization, which is to select a set of assets to guarantee a level of return for a minimum level of risk or to maximize your return given the level of risk. Portfolio optimization applications have become increasingly sophisticated in recent years to deal with trading issues, transactions costs and so forth.

The second major application is in trade matching and trade timing. This is an attempt to use optimization to schedule the trades in order to minimize the difference between the posted price and the actual price which the transaction takes place.

Asset management liability deals with matching the stream of assets with stream of liabilities in order to ensure that the liabilities can be serviced on time at minimum cost. Cash management is an issue of relating the amount of cash on hand and short-term assets to the needs of the organization for that cash.

Derivatives pricing -- most of the work in derivatives pricing is not to use optimization, but in many cases, optimization can provide flexible and robust algorithms for

handling pricing of various exotic derivatives. And finally, loan configuration and lending have to do with determining what the best offer to make to a set of customers is.

Now, each of these optimization applications address one, in most cases, more than one of these hot button issues. I'm not going to walk through the entire slide here, but I think you can see that, for example, in portfolio optimization, assist in risk management by minimizing risk for a given target return, but it also allows companies to provide product innovation by, for example, tailoring portfolios to individual clients and to market segments. So each of the optimization applications can address these hot button issues in a very effective way.

Just to give you very briefly an overview of the ILOG optimization suite. Most of you are familiar with ILOG, perhaps know our products, but for those of you who are not, we have two major products. The first one is called CPLEX Optimization Studio, which is illustrated on this slide on the left.

CPLEX Optimization Studio is a complete development environment for creating and deploying optimization-based analytic applications and solutions. It includes both our solver engines, CPLEX optimizer which uses mixed integer

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programming, and CPLEX Constraint Program, or CPLEX optimizer, which uses constraint programming.

It includes a variety of interfaces both at the level of individual objects -- which are available through our Concert technology -- and also through high level modeling language called OPL. And on many platforms, there's also an integrated development environment that allows you to manage the model development process.

Coupled with CPLEX Optimization Studio is our ODM enterprise product. ODM enterprise is a platform for building complete optimization-based analytic decision support solutions that can be deployed at a corporate level. It provides many of the common functionalities that business users need to see, the ability to create what-if scenarios and test solutions against a variety of situations.

It enables development of graphical displays of data, and it automates the process of deploying. These two products together provide a powerful set of tools that enable you to develop and create high-level analytic decision support solutions.

I'd like to introduce the next talk by giving you a little bit of background. We'll introduce Indeval in a moment,

but Indeval was a winner of the Informs Franz Edelman Award, which is an award by the Institute for Operations Research and the Management Society, the Professional Society for Operations Researchers.

It is a very prestigious award that involves a rigorous application selection process. And it's judged primarily on the implementation of an [INAUDIBLE] research solution to an important business problem. And some of the judging criteria you see here are the implementations itself, the impact and the value as measured as much quantitatively as possible but also with non-quantified impacts.

The technical innovation and the difficulty of the solution. And Informs awards this award once per year, and this year, Indeval was the winner, and we'd like to take this opportunity to congratulate Indeval and to allow them to present their solution to you. So without further ado, I'm going to turn it back to Greg, who will introduce our speaker.

MacSWEENEY: Thank you, Jeremy. Jaime, I will now turn it over to you, and you can present your presentation.

VILLASEÑOR: Thanks a lot. Well, good morning to everybody, or good afternoon, as was said before. I would like to thank IBM and other sponsors for the invitation to

participate in this Webinar. Specifically, I would like to explain the context in which CPLEX was a key part of our achievement.

It is important to state that the end product is a major development in the Mexican financial markets that has profoundly changed the way business is conducted. It is one of the biggest security settlement systems in the world, settling over \$250 billion every day. It's important to state that this system settles \$250 billion every day, and in time this solution [INAUDIBLE] presented and could have a worldwide impact.

The corporation I work for, Indeval, is a Central Securities Depository. All of you are excused for not knowing what a Central Securities Depository is. However, in order to understand the problem, how it was solved and the analytics involved, I will take a few minutes to explain the services our institution lends to the financial community.

Central Securities Depositories -- or, CSDs -- are widely considered to be the central hub of the securities market post trade infrastructure, playing a mission critical role. However, like with your local power company, their existence is largely taken for granted and usually goes unnoticed unless problems arise.

There are two principal functions that are generally within the purview of the CSD. One is a provision of services related to the custody and management of securities retained on behalf of the financial community and investing public. The other core function of the CSD is the efficient settlement of securities transactions.

The centralized and mobilized custody of securities allows the CSDs to use electronic book entry for the record keeping of holdings. This facility is essential for the efficient management of securities, making it possible for market participants to complete large volumes of transactions safely and efficiently.

In relation to securities settlements, it is important to establish that settlement occurs when securities and/or funds are transferred between the accounts of the counter parties to a transaction.

So if an individual wishes to buy or sell securities, she instructs her financial institution which, acting on her behalf, sends an instruction to the security settlement system, to receive or deliver securities against payment.

The security settlement system does this through an electronic book entry, modifying funds and securities

balances simultaneously. As an example, assume the Bank A has bought 100 securities from Bank B for \$500. This transaction is settled through a process referred to as delivery versus payment, which is an industry requirement for the settlement of securities transactions.

Industry best practice for the delivery versus payment defines that the payment portion of the transaction be settled through funds administered by the central bank through a direct link with the security settlement system and the central bank, such as the Federal Reserve, in the case of the United States.

The Bank for International Settlement has defined three models of delivery versus payment -- or, DVP. The first being model one, with real-time gross settlement for all transactions. In other words, each trade settles individually.

The advantage of this approach is that the funds or securities associated with each transaction are immediately available to the counter parties upon completion of the settlement. In our example, Bank A has received securities and Bank B has received funds immediately.

Now, assume that Bank A is not only buying securities from Bank B but is selling them to Bank C for \$500 the same day.

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In model one DVT if a Bank A does not have funds or securities, neither of the two transactions could be settled.

Bank A would then need to borrow money to pay the securities to Bank B, and once it has received the securities, deliver them to Bank C in exchange for money. This transaction is costly to Bank A and therefore not efficient.

Model one operates in real time and results in high liquidity provided that initial resources are at hand. But it's not efficient, and normally fails to settle some transactions. However, it's quite simple to implement.

Model two calls for real-time delivery of the securities and the net settlement of the related payment obligations at the end of the settlement cycle, but has no outstanding feature that needed to be considered.

Finally, model three involves net settlement of both securities and payments at the end of the settlement cycle. This net settlement is derived through a process of netting which involves an offsetting of obligation, reducing a large number of individual transactions to a smaller number to be settled.

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In our example, the two transactions get reduced to one transaction in which Bank B delivers 100 securities to Bank C, and Bank C delivers \$500 to Bank A. In this case, Bank A is [INAUDIBLE] netted and does not need to resort to borrow money or securities to fulfill its obligations, which is efficient.

While the most difficult to attain in its optimal form, a model three system makes the most efficient use of the available resources by netting all pending transactions and settling the resulting obligations, increasing the settlement rate.

Unfortunately, the implementation of model three is complex, and generally involves lengthy period of time in completing the entire settlement process and delays the release of funds and securities.

The difficulty that CSDs face when choosing one of these settlement models is balancing the trade-off in terms of efficiency in funds and securities usage on one hand and the ability to provide interday liquidity through real-time settlement on the other.

Thus, a very desirable outcome in our collective goal was to develop and implement a settlement system that included the best of the models -- namely, efficient management of

resources through the netting of funds and securities such as with model three.

Since having a security settlement system that can function with minimum resource usage is invaluable when liquidity is scarce, such as in the event of heightened market stress, and also to achieve real-time or very near real-time settlement as in model one in order to meet the almost constant demand for interday liquidity and improve risk management.

In search of these desirable features, we face a challenge directly related to model three settlement process -- that being, determining which transaction should be settled with the participant's available cash and securities balances.

Overcoming this challenge was our objective when we initiated our task in order to ascertain the feasibility of optimizing our processing. Model one enables banks to get cash quickly. Model one is much simpler, as it does not require complex risk controls to deal with defaults. Model one settles operations earlier, thus reducing uncertainty and risk.

However, as I pointed out in model one would fail to settle many more operations than model three. And experts strongly agree that is very important to

efficiently use available balances to avoid failed operations. This is especially true in times of market stress, when resource availability may be severely restricted.

A model three that settles in near real time has all the advantages of model one. I will now describe how we were being...how we were able to design a clearing process that enabled our security settlement system to be a near real-time model three and we certainly could not have achieved this without operations research.

Consider what the model three system has to do. Even in the much simpler case when there are no cash constraints, one has to find a set of transactions with the largest number of securities that does not overdraw accounts.

We can model this for each security negotiated as a binary program that has one constraint for each participant to ensure that securities balances are not overdrawn. This problem is equivalent to one frequently encountered in payment systems where we solve it for funds rather than securities.

We have not found an algorithm that consistently solves this problem quickly. And we have then have to make do with rather elaborate heuristics that solve the knapsack

problem many times and find a good feasible solution.

In the security settlement system, a heuristic algorithm must deal with many securities at the same time as well as cash constraints. This would take too long and yield poor results.

Fortunately, we were able to find a way out. In payment systems, important legal principles prohibit partial settlement of payment. Similar restrictions are not as prevalent in security settlement systems, where acceptance of partial deliveries to facilitate settlement has become commonplace in markets around the world.

After extensive discussion, the Mexican securities market participants were convinced to have some operations settled partially, most of them for only a few minutes in order to improve the overall settlement rates. With this, we eliminated all the binary variables and got a much more tractable problem. Now, we were able to find an optimal [integer] solution with standard OR tools, and this solution is far superior to the optimal solution of the binary problem.

The model presented so far does not include cash constraints, and we needed that to achieve delivery versus payment. With these restrictions, we got a linear program

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which can maximize, for instance, the value of the transactions to be settled.

The solution may include values that are not integers. Since we do not settle a fraction of a security, we have to round up the optimal solution of this problem, use these values as upper bounds for the variables and disregard cash restrictions.

We use a small fund to provide a buffer for these accounts. The model we use for our clearing process is more complex. It includes redemptions and repayments of credits granted by the fund.

All this optimization is done using CPLEX as a key component. Our main goal was to implement a world-class model three system that could work in a continuous way and that would establish the state of the art while attaining Indeval's organizational objectives.

A new rules-based security settlement systems was designed and tested by a team that consisted of a major Mexican university, ITAM, the central bank, and us, the Central Securities Depository.

The core of the new system is now responsible for processing all the settlement instructions that Indeval

receives from its participants. The settlement model admits transactions and then queues them to be processed by a Novell presettlement module.

This module determines whether the operation is settled immediately, goes through a clearing process, or remains in the queue with a pending status. It also determines how the clearing process is invoked or triggered. Operations that are only partially settled are returned to the queue for further processing.

The presettlement module maintains the queue of operations awaiting processing. Each transaction type has a specific set of business rules that take into account the monetary value of the transaction as well as the balances of the accounts affected.

The settlement module completes the settlement of the transactions through the simultaneous transfer of securities and funds into the respective participant accounts. The clearance process module selects a set of operations that can be settled using the available resources in order to optimize a specific objective function.

As was explained previously, the application of a linear programming model for clearing operations was critical to

the successful development of the new system.

Our goals using the simulation model were four-fold.

First, to find a balance between the liquidity in the system and the time taken to settle operations, where a trade-off between the two variables was expected.

Second, to enable an analysis of the advantages and limitations of using the presettlement rules as parameters. Our third objective was to measure the performance of the system under different configurations generated by changing the parameters and decision variables. And finally, to determine and settle the set of values for the parameters that would allow the system to work effectively.

The input data for each simulation experiment used actual settlement instructions and arrival times of the individual transactions, only changing the rules of parameter values between the experiments.

These experiments correspond to various scenarios that were derived from combinations of various parameter options based on the knowledge and experience of Indeval's experts and the historical data available while trying to achieve near real-time settlement.

The scenarios used in simulation were scenarios for the

presettlement rules, all delivery versus payment and redemptions are sent to the clearing process, like in a perfect model three, or if funds are available directly to the settlement process such as in model one, scenarios for the objective function to maximize the value or the number of securities to be settled.

Also scenarios for the triggering mechanisms that allow for variations in the maximum monetary value, the maximum number of operations awaiting to be cleared, or the maximum time between clearings.

Literally hundreds of simulations were carried out using a trust fund of only \$30,000. Remember that this is selling over \$250 billion every day, and this is the only buffer that we need.

The results demonstrate clearly that there is a trade-off between reducing the settlement times and using more funds in the system as expected. Furthermore, the best results were achieved in the model three environment with an objective function optimizing the quantity of securities.

It is very important to point out that the trust fund was never overdrawn in the simulations. Thus, the other simulation, a model three environment with near real-time settlement, was experimentally tested and passed with

flying colors.

I would like to mention that our system called Dali, after the Spanish painter -- not Mexican, by the way -- uses several of the features evaluated in the simulation including the integration of model one, the integration of model one and model three characteristics into a single settlement engine, an enhanced version of the new presettlement module that handles transactions with configurable rules, and the optimization criteria which was considered in the LP problems.

Having demonstrated the feasibility of the design of the system by simulating its functionality, we needed to build up the entire technological platform and operational environment that would enable its implementation.

With this objective in mind, a total business process redesign was carried out. Business process modeling notation, business rules and an audit of compliance with relevant international standards were all embraced during this phase of the project.

When this phase was completed, we started its development and subsequent implementation. There were, however, several challenges that needed to be overcome to achieve this end.

First of all, we needed the entire support of the Mexican financial community coupled with our comprehension of the benefits to be derived from Dali, the new system. This involved the coordination of all the direct market players, including financial authorities and more than 100 intermediaries, some who were reluctant at first to change their operating procedures.

Yes, it was very tough. This represented a great challenge, but also a great opportunity, since we needed all the Mexican securities market stakeholders to understand how our operations research-based settlement engine worked, which was also no easy task.

We also needed to methodically plan the strategy we would use to replace Indeval's legacy system in order to ensure the flawless functioning of Dali, mitigate the almost countless risk associated with the startup risk for this level of criticality, and smooth transition to a new operational scheme. There was no turning back.

Going back to the power company example, imagine a blackout. Now, imagine the similar service disruption involving the flow of billions of dollars. Any errors in the implementation process could potentially have been catastrophic for the Mexican financial market. These

challenges were tackled using specific courses of action.

In parallel with these activities, we created and executed a nationwide coordination strategy that included the establishment of a steering committee and the provision of extensive training and information sessions involving hundreds of staff and senior management from every stakeholder organization.

From that day, that first day of Dali's operation, we have run this OR-based clearing and settlement process at least 270 times each and every business day. That amounts to more than 67,000 times a year with every settlement cycle being mission critical for business and to the functioning of the Mexican financial markets.

Through Indeval's efforts, our participants have obtained immediate and tremendous benefits derived solely from the implementation of Dali and its optimization of funds and securities usage.

This project was undertaken because there would be benefits for Indeval, which obviously there were, but also because we firmly believe that the results it would yield would be extremely positive for the Mexican financial market as a whole.

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We have been rewarded for our commitment with a system that has delivered benefits to the market participants directly attributable to operations research. Because our clearing and settlement module reduces liquidity requirements by more than 52 percent, financial intermediaries have been able to save over \$240 million in intraday interest cost during Dali's first 18 months of operations even considering a very conservative borrowing rate.

Furthermore, since the implementation of Dali, the securities required in order to complete the settlement have been reduced by 26 percent, significantly enhancing overall settlement liquidity and settlement rates for our market.

Market participants throughout the world have a renewed focus in closing exposures to their counter parties as soon as possible. The importance of this was graphically illustrated by the exposures which resulted from the failure of Lehman Brothers in September of 2008.

The event highlighted the importance of settling open transactions as quickly as possible. In this context, Dali delivers continuous and near real-time settlement, which substantially reduces the average duration which trades remain unsettled, unsettlement rate and the related counter party risk.

By integrating operations research technology and the help of providers such as CPLEX, we have had a combination necessary to bring to the market a good solution. In a recent settlement cycle, Dali settled in just more than one minute more than \$75 billion in value generating more than 22,000 associated database records and more than 10,000 messages for our clients.

As a result, we believe Indeval holds the unique distinction of being the only CSD in the world that has achieved near real-time model three settlement and this will certainly be applied broadly by other CSDs and other clearing corporations in time. Thank you very much. I would like to hand it to Jeremy.

BLOOM: Greg, did you want to handle the poll now?

MacSWEENEY: Yes, let's try to do this poll again. I'm going to push this polling slide out to everybody again, see if everybody can see it. Okay, so here's the polling question we tried before; hopefully everybody can see this now.

Please rate your familiarity with optimization on a scale of 1 to 5, with 1 being not familiar at all and then moving up 2, 3, 4, 5, being very familiar with optimization. I'll

give everybody a few seconds to answer this, and then we'll be able to take a look at some of the poll results when Jeremy starts the conclusion of his presentation in a few minutes.

So again, please rate your familiarity with the optimization on a scale of 1 to 5 with 1 being not familiar at all and 5 being very familiar. And let's see what we have. Here are the poll results. I think everybody can see this on the screen.

So we have about 18 percent that are very familiar, and then 27 percent coming in right in the middle and then 24 percent trending towards not familiar at all. So Jeremy, maybe you can comment on some of that, some of these results, as you begin the next portion of your presentation.

BLOOM: Thank you, Greg. Those of you who are not familiar with optimization may be wondering how you might be able to take advantage of it in your business, and IBM provides three ways that you can apply optimization to help solve your business problems.

If you have the expertise, as Indeval does, you can build your own applications using optimization. We have the technology that enables you to do the development faster and more reliably, and our tools permit you to create

effective optimization solutions for your analytic decision support applications.

Another way to use IBM technologies is we have a variety of Business Partners who embed the ILOG optimization technology in their own applications. And in many cases, these are packaged applications, packaged solutions that are designed to solve a specific problem. I'd be glad to put you in touch with our partners and help them figure out whether their package solution will assist you.

The final way to use IBM ILOG optimization technology is to let us help you build it. If you have a business problem that you think might be solvable by optimization but you don't have the expertise within your organization, we have professional services consultants who can provide that expertise, and they can help build a custom application that meets your specific business requirements.

So three ways to use the IBM ILOG optimization technology: build the application yourself; use a packaged solution from one of our ISV partners; or, let us help you build it with our professional service consultants.

I'd just like to close the presentation by reinforcing the value of IBM ILOG optimization technology. We see four specific benefits to using IBM ILOG optimization. First of

all, you make smarter decisions -- that is, you can get better performance for lower cost, as the Indeval application graphically illustrates.

Through optimization, you can find non-obvious solutions that maximize your value or minimize your costs while observing the many complex business requirements and strategies that are required to compete effectively in modern financial markets.

And optimization produces quantifiable benefits on your bottom line. Recall that one of the reasons that Indeval received the Franz Settlement Award this year is because they could demonstrate the value of their solution in dollar terms.

And of course, not all of the value will be in dollar terms or in monetary terms, but we can quantify often many of the benefits that you're going to receive. In many cases, we can estimate that before you build the application so you have a pretty good idea what your return on investment is.

Just so you know, in many cases, these optimization applications pay for themselves very quickly. We've seen payback periods that are measured in months or weeks, or even in some cases in days.

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The second value of IBM ILOG optimization technology is you can make faster decisions. That allows you to automate the decision process which increases the speed with which you can respond in today's accelerating markets.

And I think again, the Indeval application illustrates this graphically by reducing the clearing time for some of these transactions to a couple of minutes, which increases the liquidity and reduces the risk of failed settlements.

So this is just one example where optimization can automate your decision process and make your decisions faster. And by the way, that doesn't mean that your employees become superfluous; what it enables them to do is it enables them to focus on high value situations where complexities overwhelm the automated decision. So, instead of focusing on routine, they can focus on critical complexities.

The third value of IBM ILOG optimization technology is we can help you build your applications faster and at lower cost and maintain them at lower cost with higher reliability.

That's because we have specialized high-level modeling tools available through the CPLEX Optimization Studio and ODM enterprise that enable your analysts to code and value your model with less time and effort than traditional

programming languages. And, increases the transparency of your model which makes maintaining it and upgrading it easier and more reliable.

The final value of IBM ILOG optimization technology is that it turns information into action, as Greg described earlier -- that is to say, high-level advanced analytics such as optimization, not only process information, but they actually turn it into decisions.

And they do that in a way that makes your decision smarter and faster, and builds on the value of the information that you're collecting today in your enterprise information technology systems. And with that, I'm going to conclude my part of the presentation and open it up for questions. Greg.

MacSWEENEY: Great, thanks, Jeremy. So we are now going to...oops, wrong slide. One second. We're on to questions and answers area. Thank you to both Jeremy and Jaime for their great presentations today.

Before we begin with today's presentation, fill out the feedback form that's going to appear on the screen in front of you. To complete the form, please press the submit answer button at the bottom of the page. Obviously, thank you in advance for filling out the feedback form. Your

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participation in these surveys helps us perform and improve our future Webcasts.

Now we're going to move on to the question and answer part of our event. As a reminder, to participate in the Q&A, just type your question into the text box located below the media player, and then click on the submit question button. And then we will try to get to as many questions as we can during the final 10 minutes or so of our presentation today.

So a couple of questions here. Jaime, now, how did Indeval, and I guess with you there, how did you determine that CPLEX was a product that you really needed to help build Dali on top of?

VILLASEÑOR: Well, we did a lot of research on our own, comparing some of the available tools and even considered to do something ourselves with the help of this Mexican university I mentioned in the presentation.

However, it was very clear from our research and also from asking our colleagues from other parts of the world that there was really no question that the ILOG CPLEX product should be used because it was more reliable, it was more flexible, it had more support.

And it was something that, as you see because of the

complexity of the project, we didn't want to spend our time also in trying to get a component that was not reliable with us, and would let us focus on more important things.

So basically that took about, all this took about two months or three months in exploring, and after that, which was four years ago, well, we've been happy ever since.

MacSWEENEY: Great. Thank you. This question's for Jeremy. Obviously the Dali project was large. It was mission critical, it was vital for the market. Have you seen CPLEX deployed on big projects like this in other areas, and can you give me a couple of examples?

BLOOM: Oh, absolutely. A couple of major implementations. We have a very large automobile manufacturer who uses CPLEX and the ILOG optimization technology to plan and schedule their production.

We have a major dairy company that uses it to do the real-time scheduling for their production lines. We have airlines that use CPLEX to set up their routing of their aircraft and their crew deployment.

And as you may know, the aircraft environment is very, very mission critical, because disruptions in an airline spread across the system, so they have to actually make sure that

their planes are on time and crews available. There are complex work rules that have to be enforced and the airlines use CPLEX and the IBM ILOG optimization technology very effectively.

Those are only a few of the hundreds of implementations that we have. And if you have a question about a specific industry, we can certainly point you to references that use CPLEX in your industry for the kind of problem that you want to solve.

MacSWEENEY: Great. Thank you. Jaime, over the past 18 months since Dali has been up and running, there have been obviously some very volatile trading days, to say the least. How has Dali performed during some of the more volatile trading days, and can you give any specific examples?

VILLASEÑOR: Well, in terms of what we've observed in the last 18 months -- some of which have been very volatile -- although the settlement engine has been very stable, we have had a lot of volume coming in at certain points in time. But really the engine for our financial markets is very, what we get is very high volumes.

But for the overall Dali CPLEX components, they can deal with hundreds of times, probably thousands of times,

greater scale of a problem. I think that our financial system and even one as big as the one in the United States, we're still small compared to what you can get these engines to process. So even in heightened market stress, we have performed excellently.

Now, this does not mean that liquidity in the market has been corrected or anything; it's just that the technical components the implementations that needs to be done has been done flawlessly. And well, we have to take care of other issues, but of course, having our software, our hardware, our components reliable, allows us to focus on more important issues.

And one of the specific examples, probably, was recently we've had a lot of bank closures in the United States and Europe. And we haven't had one in Mexico still, but we've seen that. That obligates us and forces us to run settlement processes with characteristics which are not normal. Everything has been going, as I said flawlessly, even in those events.

MacSWEENEY: Jeremy, I think I touched on it earlier on the Webcast; I think you did today as well. We've been hearing there's a greater focus on risk in the market because of all the events of the past two years. But are firms actually moving to spend more on risk technology, people on

processes, or are they doing other things to mitigate risk?

BLOOM: Well, I think that we've seen an increase in spending on risk management, generally, not just in optimization, but through business rules and business process management. I think there's a greater concern now because of the exposures that were revealed during the financial crisis. And we anticipate continued interest in that area.

MacSWEENEY: Gotcha. Time for a couple more questions here. Jaime, you know you mentioned some of the challenges of the project. Obviously there were technology challenges. If you could say, what was the most difficult portion of the project, if you could say what was the hardest part to get through, or to implement, or to do, what would you say that would be?

VILLASEÑOR: Well, definitely it was coordinating all the stakeholders and the market players. That was definitely the hardest. All the conceptual part was hard, but it was being dealt by a small team, and even though they had hard times they just went through it.

But coordinating the whole industry and convincing all the industry that they had to use it because we couldn't have any exceptions to the process that was being built was

definitely the hardest part of the whole project.

MacSWEENEY: Okay. Great. And one last question here.

This is, I think, for Jeremy. Jeremy, do you have application on pricing?

BLOOM: The answer is yes, although, pricing is a very broad field, and so we'd have to discuss the specific context of your question. But for example, many of our hospitality and airline companies use optimization for what is called revenue management or yield management...

...which is you determine how to price the fixed assets they have which are seats on the airline or rooms at a particular location in order to maximize the revenue and to match the pricing to the customer's willingness to pay.

And yield management applications, revenue management applications have been one of the frontiers in optimization technology for a number of years, and we see increasing use across a variety of industries starting with the airline but moving into a broader hospitality industry. So if you would like more details on that, please send me an e-mail and we can arrange to talk with you more about our experience with pricing.

MacSWEENEY: Great. Great. Well, thank you very much.

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Jeremy, do you have any final comments or thoughts before we wrap up today?

BLOOM: Yes, I definitely want to thank Jaime and Indeval for their willingness to share their experience with us today. We think that their recognition by the Franz Edelman Award was well deserved. It certainly is a novel application of optimization that has created real value in the real world. And we think the Edelman Prize appropriately recognizes that. Thank you, Jaime, and we look forward to continuing our relationship with you.

VILLASEÑOR: I would like to thank all of you, too, for the opportunity to show what we accomplished as a team. Thank you.

MacSWEENEY: And yes, Jaime and Jeremy, thank you both. Jaime, that was a great presentation today, and very indepth, and it shows a lot of the power of what you guys are doing. Thank you very much.

So, that concludes today's event. For those who have submitted questions that we didn't have time to address during the Webcast, one of our experts will send you a personal response via e-mail. Thank you for attending today's Webcast, *Prescriptive Analytics: Taking Analytics to the Next Level*, brought to you by Wall Street &

Technology and IBM.

For more information about today's Webcast, please visit any of the resource links open before you. Within the next 24 hours, you'll receive a personalized follow-up e-mail with details and a link to today's presentation available on demand. Additionally, you can view today's event on demand by visiting wallstreetandtech.com/online-events. On behalf of our guests, Jeremy from IBM, Jaime from Indeval, and myself, Greg MacSweeney, thank you for your time and have a great day.

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