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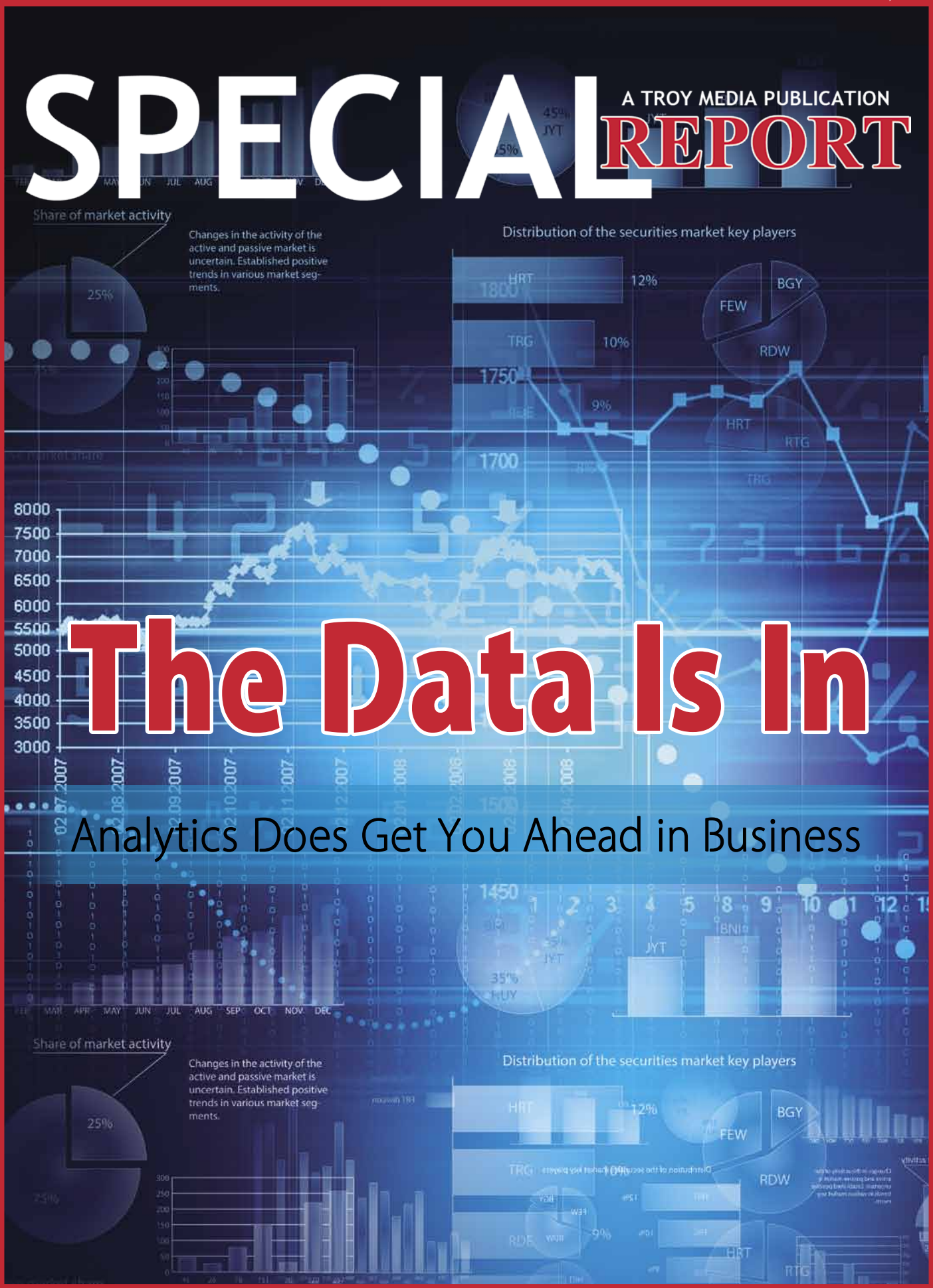


The Data Is In

Analytics Does Get You Ahead in Business

FIRST

CANADA

FOR INSPIRATION AND RECOGNITION OF SCIENCE AND TECHNOLOGY

FIRST® Robotics Competition

99%

Participating in FIRST® has broadened my skills.

Source:
FIRST® Robotics Canada Survey
April 2012

90%

Over 90% of the high schools and their corporate mentors participate year after year.

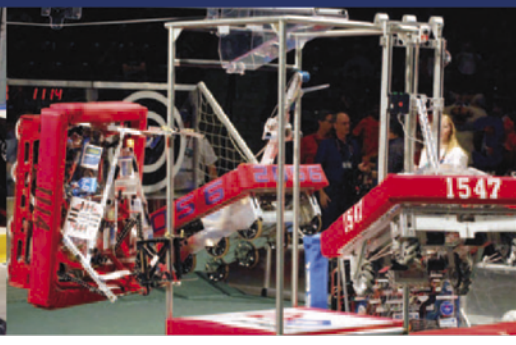
89%

Participating in FIRST® has given me a better idea of what I want to study or do after finishing school

Source:
FIRST® Robotics Canada Survey
April 2012

"FIRST programs help stimulate interest in STEM while also developing excellent leadership, teamwork and communication skills in our students."

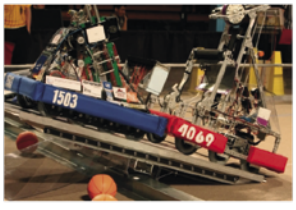
Mark Breadner
FIRST Executive Director



JOIN US TO CELEBRATE

Over 10 YEARS OF FIRST® ROBOTICS COMPETITION IN CANADA

WHAT IS THE FIRST ROBOTICS COMPETITION?



The ***FIRST***® Robotics Competition combines the excitement of a varsity sport with hands-on training in science and technology to help high school students discover how rewarding a career in engineering or technology can be. Remote-controlled robots, piloted by students and enthusiastically supported by thousands of screaming fans, go head-to-head in short games on the foor of a sports arena, battling it out to earn points during a two-minute round.

WHAT IS FIRST LEGO® LEAGUE?

The ***FIRST***® LEGO® League (FLL) is an international robotics program in which teams of young people aged 9-14 assemble robots (based on the LEGO Mindstorms kit) designed to accomplish tasks associated with a real-world "Challenge." This competition combines the excitement of a varsity sport with hands-on training in science and technology to help students discover how rewarding a career in engineering or technology can be.

WHAT IS JUNIOR FIRST LEGO® LEAGUE?

Junior ***FIRST***® LEGO® League (Jr.FLL™) captures young children's inherent curiosity and directs it toward discovering the wonders of science and technology. Jr.FLL developed from FIRST LEGO League (FLL), a program for 9 to 14 year olds (grades 4-8). Both Jr.FLL and FLL are created through a partnership between FIRST and The LEGO Group.

FIRST

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2012

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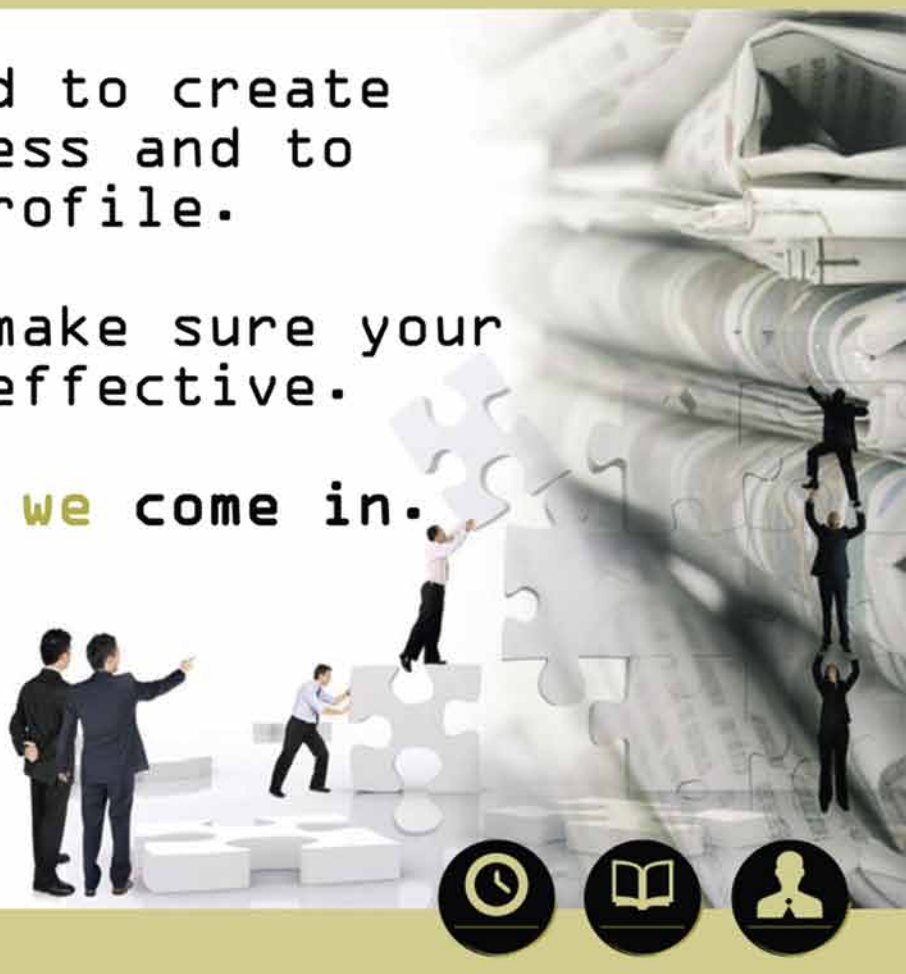

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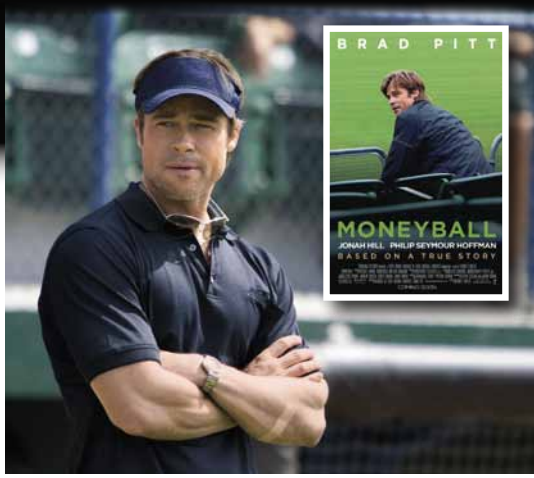
Analytics is changing sports

EDMONTON, AB/ Troy Media

Moneyball isn't just for pro baseball players and Brad Pitt anymore.



Executives in virtually every professional sports league, from the NHL to the NFL, are finding ways to incorporate analytics – the actual term used to describe the techniques popularized in the recent hit movie – into their particular game.

The film, based on the best-selling 2003 non-fiction book by Michael Lewis, has helped demonstrate just how important the role of statistical analysis can be in sports. The smart use of data analysis helped the Oakland A's, a subpar and struggling baseball team, win a record 20 consecutive games and their division championship while competing with teams that had as much as three times their payroll.

Skeptics became true believers

The A's success using analytics converted skeptics everywhere into new believers.

The Boston Red Sox went on to win two World Series after adopting the same data analysis methods. And baseball isn't the only sport where the edge gained by the use of analytics is spreading.

Marc Appleby with PowerScout, a hockey analytics company, is part of this management trend for the sport noting, "There are lots of performance statistics that are available in hockey, but determining what those statistics mean is the hard part."

Knowing how many goals a team averages is good, but as Appleby explains, "There are other aspects besides goals and assists that are important. PowerScout has researched key statistics from over 14,000 NHL games over a 13-year period where we've discovered winning trends that can be modeled today to help build a winning team. Ultimately, our mission is to help teams maximize their strengths and minimize their weaknesses, which is of growing interest to hockey teams at every level."

Companies like PowerScout are giving coaches and front-office executives a better look at the complete picture when they are assembling their teams during the off-season. Instead of just focusing on one specific player, analytics helps determine which types of players work best together.

Engineers with Formula 1 racing teams are even finding ways to apply analytics to gain an advantage over the competition during an event.

Formula 1 racing team Lotus F1 collects data as a race progresses. The information about the car, the weather, and the competitors is sent in real time to teammates on and off the track, reports Kevin Casey of InformationWeek. A mobile app is used for the driver and information that can give a competitive edge is streamed real-time.

Real time analytics provide a cutting edge advantage and could possibly be used in a number of other sports. For instance, a football coach using analytics software streaming to a handheld device during game play could use the information to determine what plays have the highest statistical edge.

Football teams are presently using analytics in the same way hockey teams are. Robert Bedetti, a blogger for the Harvard Sports Analysis Collective, recently employed analytics to help determine which draft picks are the riskiest.

Bedetti's analysis helped him understand "how different positions are valued and how they tend to live up to, or fall short of expectations" to discover that the quarterback position is one of the riskiest early-round picks. If you pick a quarterback in the first or second round you were more likely to end up disappointed; whereas, choosing a linebacker in the first or second round is shown to be a relatively safe pick.

The sports fan also uses analytics. Fantasy football players are relying on data gleaned from statisticians to gain the upper hand.

In Papa Chakravarthy's research paper, "Optimizing Draft Strategies in Fantasy Football," data was collected from ESPN and Pro Football Reference's websites to determine the best auction draft strategy that relies on accurate risk estimation in a fantasy football league.

Analytics determines risk level

The study considers several draft styles including points-based drafting, value-based drafting, risk-averse drafting, and risk-neutral drafting. It attempts to determine the risk level that provides risk-neutral drafting, as well as the ways risk neutrality can increase a team owner's utility where utility is directly related to the fantasy point output of a team.

Regardless of whether you are a team manager looking to draft the best possible team combination, a sports enthusiast building a fantasy football team, or a team looking to use real-time analytics, expect to see a lot more from the sports analytics field in the coming years.

Brad Pitt's character in "Moneyball" puts it best, "We'll change the game. That's what I want. I want it to mean something."■

Romancing the GENOME

Imagine being handed a book you know can help feed hungry people all over the world. Now imagine you're told it has three billion pages, and that it's only half the story.

In the rapidly-expanding world of DNA sequencing, throw everything you think you know about "big data" out the window. Scientists are hoping to increase the world's food supply by mining the ultimate data source: the genome.

A genome is the complete set of DNA for a particular organism – all the information about its heredity, and everything that makes it what it is. For the tiniest bacterium, that amounts to around 600,000 DNA base pairs. For more complex organisms, like cows or people, there are about three billion – times two.

"An individual genome has three billion letters, or data points, from each individual," said Dr. Graham Plastow, a professor at the University of Alberta's Department of Agricultural, Food and Nutritional Science. He's also CEO of Livestock Gentec, where genomics research is finding real-world application in Canada's livestock industry.

It's a big job.

"There is a copy from the mother and a copy from the father," said Dr. Plastow, "and each has three billion parts, and each copy of the genome is different. Typically there would be three million differences between the copy from the mother (the dam) and the father (the sire) of an animal."

When the Human Genome Project began in October of 1990, the intent was to determine the sequence of all three billion base pairs that make up a single person's DNA. It took 13 years, and cost nearly $4 billion. According to Dr. Plastow, many scientists were strongly opposed to the idea, calling it a waste of time and money. But it was an important first step.

"The first sequencing was like putting the first man on the moon," said Dr. Plastow. "But advances in genome sequencing are outpacing Moore's Law."

Moore's Law, for the uninitiated, is named for Intel co-founder Gordon E. Moore, who noted that the number of transistors on an integrated circuit doubled about every two years. Moore suggested the trend would continue, and technology experts have used Moore's Law to successfully predict growth rates of everything from computer processing speed to the number of pixels on digital cameras.

But not genome sequencing; at the rate this science is progressing, it will soon be faster and less expensive than anyone in 1990 could have imagined.

"In 2009, we sequenced a cow," said Dr. Plastow, "and that took four years and cost $50 million." A year later, he said, two bulls were sequenced in six months for about $100,000. Last year, the world's first Brahman bull genome was sequenced in three months for $20,000.

And this year, as part of a larger project, Genome Canada is funding the sequencing of 300 bulls, at a cost of around $10,000 each – and they expect new technology will allow a genome to be sequenced every day. Calling it "big data" doesn't begin to do justice to the process – and Dr. Plastow said the sequencing, amazingly, is becoming the easy part.

"Making sense of the data takes a lot of analytical and computer power," said Dr. Plastow. "Converting this data into information, and understanding what it really means, we will be able to make faster genetic improvements to improve food production, reduce the time to market – and get more from fewer animals."

And getting more from less is what it's all about. Today's global population of seven billion is predicted to climb to around nine billion by 2050; to keep up with that growth, more food will have to be produced and more efficient sources of protein will need to be developed.

Dr. Plastow is among those who are looking to improve beef production through applied analytics. In many ways, the idea is a natural fit for the cattle industry, where selective breeding has been the norm for hundreds of years.

"Knowledge of genetic variants can be used to improve breeding," said Dr. Plastow. Importantly, he's not talking about genetic modification; rather, by comparing their genotypes, the bulls with the best genetic makeup can be selected for breeding programs.

The implications for successfully mining this data are enormous; breeding only animals with a robust, fast-developing family tree means increasing a herd's efficiency with every new generation. Dr. Plastow estimates that if Livestock Gentec were able to bring a 5 per cent improvement in feed efficiency to just Alberta's livestock industry, it would amount to $30 million in savings every year.

Or, as Dr. Plastow puts it, improving quality by knowing ahead of time what the next generation of animals will bring means better beef in the long run. And, most importantly, a way to increase the world's food supply by mining the ultimate data source: the genome. And, it might answer that plaintive commercial question, "Where's the beef?" ■

Labour pains

What is the extent of the problem?

A C-Suite survey of Canadian corporate executives reported that despite the high level of unemployment in Canada, companies couldn't get all the people they need to fill the skilled positions that are available. Two-thirds of executives said they are having difficulty finding qualified employees, and one-third said the labour shortage is so severe that it is stunting their companies' growth.

Unfortunately, the problem is not one that is going to see an end any time soon. According to the Calgary Economic Development study, the demand for skilled labour in Alberta is expected to increase by more than 600,000 workers by 2021. If nothing is done to increase the number of skilled workers who are ready and willing to occupy these job openings, there will be about 114,000 unfilled vacancies.

If steps are not taken to prepare for this severe shortage of trained workers, Canada could face a number of long-term economic problems that will affect thousands across the nation.

So what can be done about this impending economic threat? The Canadian government has explored a number of options. Many initiatives have focused on obtaining more foreign workers from the United States, Ireland, and U.K. to fill these vacancies.

Canada's Temporary Foreign Worker Program was implemented to attempt to deal with the labour shortage head-on, allowing Canadian companies to hire foreign workers temporarily to fill these vacancies.

Though bringing in foreign workers on a temporary basis may remedy immediate labour needs, it does not address the labour shortage in the long term. Mike Rowe, an advocate for American investment in trades, believes the biggest problem stems from the lack of young people interested in skilled labour jobs, and the stigma associated with these trades.

"Millions of parents and kids see apprenticeships and on-the-job-training opportunities as 'vocational consolation prizes,' best suited for those not cut out for a four-year degree," Rowe said. "And still, we talk about millions of 'shovel-ready' jobs for a society that doesn't encourage people to pick up a shovel," he added.

By focusing efforts on training programs in skilled trades through vocational education and apprenticeships, Canada could find more youth going down a skilled trade career path. If skilled trades could be legitimized and popularized in the minds of Canada's young people, the influx of students pursuing skilled apprenticeships could help ease some of the stress on industries that rely heavily on these positions.

However, getting more students to pursue careers in skilled trade will not happen immediately. So what can companies do now to help address the labour shortages?

It's no surprise to anyone that Canada is suffering from a shortage in skilled labour. But it may surprise you to learn that analytic software and programs could be a key component to overcoming it.

James Freeman, Chief Marketing Officer for Calgary-based Zedi Inc., a premier provider of analytics and data services, applications and technology for the oil and gas industry, sums up how analytics could play an integral role in the future of labour shortages in Alberta and Canada as a whole in two words: increased efficiency.

"Since 2008, the production operations side of the upstream oil and gas industry has lost a lot of experienced people. Through analytics, we can help producers realize potential and become more efficient with the less-skilled labour they have, particularly where gas prices are very tight," Freeman said.

Essentially, analytics programs analyze data captured from the producing assets in the field, and trigger alarms or flag trends of interest that may deviate from normal operating conditions. Based on these flags, companies can then focus productive effort to minimize downtime and cost, and maximize labour efficiency.

Unfortunately, human resources (HR) and production management in Canadian companies are lagging behind when it comes to implementing core analytics programs into employee performance. In fact, in 2006, an Accenture High-Performance Workforce Study reported that nearly 40 per cent of companies surveyed have no formal measures for determining HR impact on workforce performance, while another 39 per cent have such measures, but only for some HR initiatives.

But, the study found that 78 per cent of companies that are leaders on human performance criteria are able to demonstrate, with quantitative measures, the impact of the performance of the top three workforces on the organization's overall financial performance. Similarly, 35 per cent of the leading businesses have formal, business-focused metrics – analytics – to gauge the impact of all of their HR activities on workforce performance.

According to these studies, successful companies are more likely to use analytics to link HR-related initiatives to business performance. The ability to develop business management plans from this data, to ensure that the workforce is working at its fullest potential, can help make up a portion of the labour shortages. Just as the development of manufacturing machinery reduced the labor force needed to make certain products, analytics application can reduce the required labor force by improving efficiency in almost any industry.

Bringing new workers to the skilled labour force is important, of course, but focusing on using the current workforce to its fullest potential may be a better way to dramatically ease the burden of the labour shortages that are plaguing Canadian industries. If all of the reasonable methods of dealing with this problem are coordinated together – greater efficiency through analytics, expansions of skilled labour programs, and occasional temporary international hiring – Canada may overcome this impending economic obstacle, and forge on into a more prosperous future. ■

Manufacturers reaping the BENEFITS

As the 21-century hits full stride, technology is changing the way many manufacturing based companies operate. From assembly lines to robotics, there has never been a slump in innovation.

While there are many new technological developments aimed at improving business hitting the market, analytics, the latest innovation, has some very troubling limitations.

The idea of analytics in the manufacturing industry is to simplify production, increase efficiency, and ultimately – increase revenue. While it is clear to most industry mavens that this is a worthy investment, it takes more than a computer to integrate such capabilities into a working business. It seems as if the future of manufacturing is in analytics, which will determine which companies survive.

In the "adapt or die" environment that is the global economy, companies will soon have no choice but to commit resources to analytics. This challenge applies to both small and large manufacturing companies in different ways.

Mark Hamblin, President of Dynamic Manufacturing Solutions notes that analytics, if applied properly, can have a very valuable upside for small and medium sized manufacturing companies. He indicates that analytics can "significantly improve operational efficiency and profitability" observing that these companies need to "convert their physical transactions to an electronic form" as an important first step in the process.

Since larger manufacturing companies are more mature in the application of analytics, they are starting to reap some of the higher benefits.

Vasu Netrakanti of Optessa Inc., which provides predictive analytics software solutions for major automobile manufacturing plants, says that the benefits of utilizing such analytics include saving money, improved productivity, increased efficiency and improved environmental impact and that the cost benefit from improved efficiency is significant.

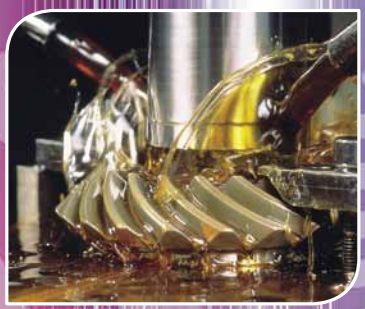
Netrakanti gave an example of how this works: "We could run an analysis and discover that by simply changing the way that cars line up to go into the paint shop would mean less times that you have to change out the colors and clean the machines. It would also mean less use of cleaning solvents. This results in improved efficiency and reduces the environmental impact."

Netrakanti says that although the benefits are significant, making the initial changes and beginning to utilize analytics is a challenge for many large manufacturing companies. "Getting people to change the way that they think and work is difficult. Cost is not really the barrier, it is the technical challenges and organizational challenges."

A recent study by Ventana Research, a leading benchmark research and advisory services firm, found that only 63 per cent of the 2,600 manufacturing employees polled used analytics in their work, while the findings also showed that a meager 12 per cent of all manufacturing companies work at what the research company ranks as a "high level of maturity in their use of analytics."

While the reason for the low numbers cannot be pinpointed, Robert Kugal, Senior Vice President of Ventana Research told the magazine that companies aren't devoting enough resources to the new technology, and therefore are unable to utilize it in original ways that could help their business. "The management of data tends to be an afterthought in most organizations," said Kugal.

Unfortunately, such rapid growth often begets its own problems. Analytics experts, also known as data scientists, are rare at this point. The learning curve is increasing as fast as the technology, which currently is much too fast for a busy workforce to keep up with. Where are they going to find all the smart people to make sense of all the charts and graphs being produced from the billions of bits of data being captured every day? ■



Analytics changing the finance industry

Big data and analytics are making huge waves across all industries; however, it is hard to compete with the speed of analytics in the financial market. With more and more data appearing every day, every minute, every second, companies rely not only on the organization and analysis of large quantities of data, but also on the speed at which it can be computed. The competitiveness in the industry is at the point where every instant matters and the transcendence of analytics is unheralded in the industry of finance.

Brett Vasconcellos, Director of Enterprise Architecture at BIDS Trading Technologies, knows how important financial analytics have become in the industry. BIDS Trading is a block trading company that helps institutional investors, including mutual funds and hedge funds, buy large numbers of shares at a time. Companies like BIDS Trading are able to securely process massive amounts of data at unbelievably fast speeds.

The sheer speed of it is difficult to fathom. Vasconcellos pointed out some interesting comparisons to help put this into perspective: "Options markets count over 20 billion messages per day. That exceeds daily Google searches, Facebook shares, and tweets through Twitter combined. NASDAQ boasts round-trip times of less than 100 microseconds. (A micro-second is one one-millionth of a second.) This means the round-trip times for NASDAQ are roughly 1000x faster than a Google search." This makes NASDAQ look like a racecar and Google like a little red wagon."

Why does such speed matter? Vasconcellos explains, "To some firms, each millisecond (1/1000 of a second) gained or lost is worth an estimated $100 million in revenue per year."

"We capture 200 million data points per day," said Vasconcellos. "We process up to 10 million transactions (orders to buy or sell shares) daily, and we archive everything about each transaction, both to meet regulatory requirements, as well as provide us data for analyzing our trading model."

With such large amounts of data and the need for speed, Sean McClure, Data Scientist and Partner at Excellerate Inc., a business analytics consulting firm, believes that the financial industry is leading the race in applying analytics: "In other industries these same capabilities are starting to develop, but the financial industry is really leading the way. This is because advancement comes down to trying to make the technology meet the user requirements and, in the financial industry, those requirements involve people needing to make fast decisions on very large and complex amounts of data."

"What's most interesting is the fact that we are starting to see industry handing over decision-making to computers," says McClure.

"This has real prominence in the financial space because of the sheer amount of data and the need to act on information rapidly. There are massive amounts of information coming in from everywhere that affect the market; everything from what's happening in politics to natural disasters, and the player in the game who can take advantage of the information quickest has the most to gain."

Excellerate Inc. focuses on business intelligence to support organizations in making data driven decisions. They recently launched a sister company called WhiteBox, led by Sean McClure as the Chief Data Scientist, that is dedicated to deploying advanced data mining algorithms and artificial intelligence into sophisticated software solutions for businesses in western Canada. With the main target in the financial sector being speed, Excellerate and WhiteBox aim to bring rapid analysis and high-end analytics to a variety of companies in this industry. McClure believes, "companies are starting to view data as their biggest asset to staying competitive," which makes speed that much more essential.

Improving systems to increase speed is not done easily, however. "Finding the bottle necks to make the system faster is difficult," says Vasconcellos. "It's rather straightforward to accelerate a system where a transaction takes a second, there are many places to optimize. But when you are trying to shave time off of one millisecond, like a Formula One mechanic you must squeeze a few percentage points of performance out of every component in the system."

Vasconcellos adds, "One of our more complex reports we run acts as a double-check to ensure people are not abusing the system. This was originally run once a quarter, but as our business grew, our need increased to monthly, then daily, and now in real time, finding a problem as it is occurring. This trend toward real time analysis is happening everywhere in the industry."

Being able to process big data in real time is the game changer. The financial industry is pushing the advancement of fast and real time big data analytics and the name of the game is speed. ■

Transforming the Construction Industry

According to the National Association of Home Builders (NAHB), an estimated 8,000 lbs. of waste is generated with the construction of a 2,000 square foot house.

The majority of that waste comes mostly from the on-site building process and consists of wood, cardboard and drywall. Klaas Rodenburg, CEO of Alberta Centre of Excellence for Building Information Modeling (aceBIM), a not-for-profit organization dedicated to introducing the benefits of BIM into industry, notes: "Framers, for example, will take the first 2 x 4 that they see and cut it to fit their specifications. They then discard the unused piece of 2 x 4 and grab a fresh piece and repeat the process. At the end of a job, the site is littered with a large stack of discarded and unusable pieces of framing materials and drywall." But that is about to change.

While home builders are using modern materials, new design methods, and state-of-the-art technology, the actual building of the house has not changed much over the last 100 years. They are still built one brick or piece of wood at a time. The technology being used is used mainly in design aspects of the construction industry and very little elsewhere, but that may be changing.

A technology that can be used by the housing industry is called lean manufacturing. Professor Lauri Koskela, a leader in lean manufacturing theory, says this process helps "design production systems to minimize waste of materials, time, and effort in order to generate the maximum possible amount of value".

Building Information Modeling (BIM), is a digital representation of the physical and functional characteristics of a facility which can transform the housing industry into a lean manufacturing force.

BIM allows companies to utilize the waste created during the building process. All waste material is added to the digital knowledge base – or BIM system – and can then be re-routed to another project for use. The wood and drywall can even be cut to specification in a factory in advance and assembled at the site in only a few days. This cuts waste significantly in both energy consumption and overall wasted materials.

To go a step further, many lumber yards and contracting facilities have lumber and other expensive housing components lying around for extended periods, waiting to be used. During this time, materials can be damaged or ruined. BIM acts as an inventory control system to ensure material is used in a timely manner.

Duplication is another issue that plagues the housing industry. According to Rodenberg, "There are people out there (who are) saying we can reduce the cost of buildings by 50 per cent by not duplicating things and doing things over and over again. Especially when you start looking at energy, how much does a bad decision cost you over 30 years?"

A company using a BIM system based on lean manufacturing theory will only have materials on hand for upcoming projects. They know when they will need certain components and when to order them. The process of materials distribution and management is much more contained in a BIM system.

Landmark Group of Builders in Alberta, Canada, is one building company using BIM principles and lean manufacturing to tackle these issues head on. It is using analytics to transition traditional building design methods to a virtual level: two-dimensional drawings are turned into a three dimensional world. With the current advances in analytics and software, companies now have the ability to add intelligence to the building process. BIM analytics know almost every aspect of the building inside and out, before it is built. BIM can even tell you where pipes are located and how much water will be flowing through them.

Scenarios can even be designed to test how a building will withstand earthquakes or being moved to another part of the world with a different climate. You can also monitor how minor changes in design – such as adding solar panels or sunshades to certain parts of the building – will effect energy consumption.

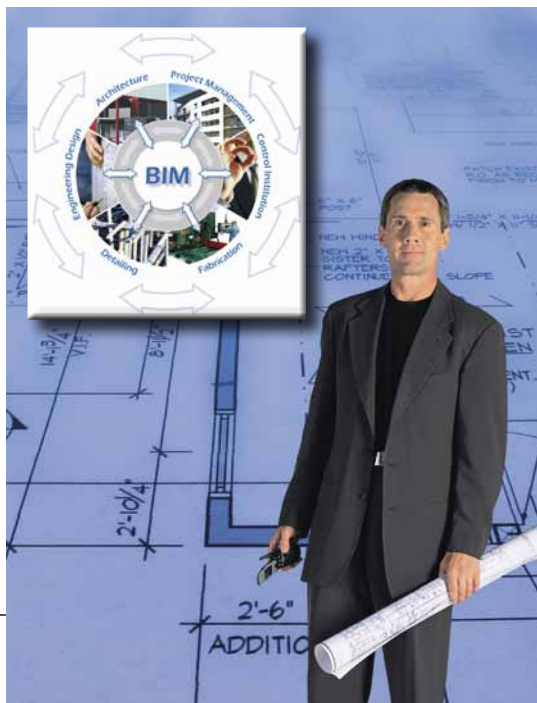
Analyzing all the variations of the data provides companies, like Landmark Group, the ability to create sustainable and efficient homes of exceptional quality. But, not only will the homes be efficient, they can be built in a fraction of the time that a conventional builder takes.

But it doesn't end there.

In 1993, the U.S. Federal Emergency Management Agency did a study called Building Performance after Hurricane Andrew. The study found that panel-built and modular homes and BIM-style homes that had portions built in factories weathered the hurricane far better and outperformed their conventional counterparts.

FEMA stated that the reason for the difference came down to quality of workmanship. Both Modular and BIM-style factory manufactured parts had an inherently more rigid system that performed significantly better than conventionally framed homes. FEMA was surprised to find that even rafters remained intact because of the rigid design structures.

The BIM model provides homes that are sustainable and of higher quality standards than traditionally built homes. BIM has created a truly industry changing process. However, the adoption of this process by the industry is slow to occur. ■



It's MAGIC

In now 40 years ago, British novelist Arthur C. Clarke posited, "Any sufficiently advanced technology is indistinguishable from magic."

Today, with the explosion of data and the means to evaluate it, he might have written that "any sufficiently advanced analytics system is indistinguishable from true artificial intelligence."

As these systems increase in complexity, we will likely see improvements in our lives never before imagined, even by Clarke. But there will be pitfalls to avoid along the journey, according to experts, and the time to think about addressing them is today.

"Part of the challenge is figuring out what is science fiction, and what is potential reality," said Kim Solez, a Professor of Pathology at the University of Alberta's Department of Laboratory Medicine and Pathology. "A lot comes down to timing; what will happen when we reach the technological singularity?"

You might be forgiven for not having heard of the "technological singularity," but according to Solez, it's only a matter of time – and when it occurs, it's not just going to change the way we think. It's going to redefine who we are as a species.

Solez spends more time thinking about the future than perhaps most, and with good reason. He teaches a course on Technology and the Future of Medicine, and part of his class is devoted to an exploration of how things might be when computers start to compete with the human brain.

"The technological singularity is basically the situation where machines become smarter than we are, and take over the agenda of the world," said Solez. "The machines are in charge, and only by cooperating with them can we even understand what's going on."

If the notion seems outlandish, it's helpful to understand that it stems from combining two widely-accepted ideas; that technological advances are exponential, not linear (as posited by Moore's Law), and that these technological advances will, ultimately, eliminate all manner of scarcity worldwide.

"In the post-scarcity world, everything is cheap and easy," said Solez, "and every experience you want to have you can have, because virtual reality is as good as reality."

Right along with the elimination of scarcity, Solez imagines the elimination of disease; medicine, in the future, might simply be the process of augmenting perennially healthy people.

"If medicine is just disease, then at any one time it is only of interest to people who are sick," said Solez. "Medicine will soon be focused on advancement of humans – to help human beings run faster, be taller, think better, and all the things we can imagine that will improve humanity."

But while it might sound like something of a utopia, Solez warns the post-sickness era of the future might not come without cost; we could eliminate all disease and still have a terrible world, he said.

"It's sort of going to be the best of times, and the worst of times," said Solez. "On the one hand, the possibilities of post-scarcity and abundance would be there; but also the possibility of human insignificance, a feeling of aimlessness and lost sense of purpose – maybe even a loss of identity."

That's because we can expect that the machines, continuing their exponential growth, will be able to self-improve very quickly – and pass through the moment of technological singularity in the blink of an eye. The instant we perceive they are as smart as we are, according to Solez, they will start to become much, much smarter.

How are we going to remain significant players in the world when machines are so much more intelligent? If the question sounds too hypothetical to warrant consideration, Solez points not to robots in the manufacturing industry, where we've perhaps grown accustomed to being outpaced – but to the world of complex games.

"It's already happened in chess," said Solez, noting computers have been outwitting Grand Masters for years. "And it's happened on the television show 'Jeopardy' – a computer beat not just any contestants, but the best the show had to offer. And it was made clear the machine could go on winning forever."

Solez and other forward-minded thinkers agree computers will have the technological ability to out-think us in all arenas, not in 500 or 100 years, but by 2045 – just 32 years from now. Solez said that means it's time to get to work.

"We need to mainstream the idea of the technological singularity, to get everyone thinking about it as fact, not fiction," said Solez. "We need to promote organized thinking about the future, in universities and beyond, to make a better world for all of us." ■

Paving the way to better health care

'Efficient data collection partnered with intelligent analytics is a recipe for higher quality health care overall and is the road to the future.'

Daniel Haight
Founding partner
Darkhorse Analytics

Analytics is changing the face of the health care industry, whether determining the risk of premature infants contracting life-threatening illnesses, decreasing the fall risk of patients, or ensuring that emergency responders are within a reasonable distance from your home.

Toronto's Hospital for Sick Children has tested an analytics system that can predict more accurately than ever before which premature babies are at greatest risk for disease and infection. And, the University of Ontario Institute of Technology (UOIT) is using IBM's InfoSphere Streams software to correlate thousands of real-time data sources and analyze the information being collected from over 400 premature infants who were monitored at the hospital. The system looks closely at data such as heart rate, temperature, blood saturation, and blood pressure levels; it is then streamed to the system 24/7 to provide a look at the babies' health in a way never seen before. So far, the InfoSphere streams have captured two decades worth of data for these 400 patients via constant monitoring.

UOIT analyzes the data in many ways, including discovering the onset of sepsis and various other conditions before these problems occur, reports Dr. Carolyn McGregor, the Canada Research Chair in Health Informatics at UOIT. They hope to be able to detect if the baby is about to develop any life-threatening infections 24 hours before visual onset. While medical personnel have traditionally used indicators such as body temperature to monitor for the onset of infection, analytics is providing "a much richer environment" to analyze a wider variety of conditions that babies can develop, MacGregor adds.

Premature infants are not the only patients reaping the benefits of analytics. In a case study performed by IBM, Evangelical Lutheran Good Samaritan Society (ELGSS), in Sioux Falls, South Dakota, used advanced case management to analyze data patterns that improved business processes and enhanced patient care.

Rustan Williams, the VP of information systems and technology systems and CIO for ELGSS, says one specific area it uses analytics is determining whether a patient may be a fall risk. If the patient is determined to be at risk, special measures can be taken to ensure the patient's safety.

The use of analytics in the medical community extends beyond the hospital. Ambulance services in many areas are now starting to use analytics to help increase efficiency. Companies such as Canada-based Darkhorse Analytics are using the process to offer assistance to these companies in a wide array of areas.

"Healthcare in Canada," Daniel Haight, a founding partner for Darkhorse Analytics says, "has started taking over ambulances, so all services have a computer-aided dispatch system, unless they are really small. It is through their own database that they collect every call that comes in. The data is broken down into very detailed intervals of performance. We collect all the data and mine it for insight. Darkhorse identifies where problems are occurring and then helps come up with a plan of action. Haight explains that each problem area has different issues. Some municipalities have plenty of emergency vehicles but not enough stations, while others have plenty of stations, but not enough vehicles. Through data analysis, Darkhorse is able to make suggestions on where stations should be located, how many vehicles should be housed at each, and the hours the stations should be more heavily staffed. ■


The University of Ontario Institute of Technology (UOIT)

Health Care 2.0

Call it Health Care 2.0, or call it the predictable result of a population more willing to embrace technology and take greater responsibility for their own wellness.

But there's little question among industry professionals: patients, at least in the information age, are no longer the passive observers of their health care process they once might have been. And those same professionals are discovering innovative ways to leverage their patients' growing desire for involvement into good medicine and healthy practices – more personalized care that's more efficient.

"What we have witnessed since the emergence of the Internet is that citizens are interested in health literacy and competency," said Dr. Don Juzwishin, Director of the Health Technology Assessment & Innovation Department at Alberta Health Services. "They want to have access to credible knowledge and information."

And where some medical professionals cringe at the notion of their patients self-diagnosing, Dr. Juzwishin believes it's exactly the right prescription for them –provided they're given sensible, trustworthy tools to guide their journey. His department is working to socialize the idea of personal health data tracking, so-called "socio-technical systems," where patients utilize a variety of methods to collect and analyze their own health data.This is the objective of Alberta's Personal Health Portal.

"There are also applications emerging that you can use to monitor your physical activity," said Dr. Juzwishin, "applications that you can use to take pictures of your food to provide a calorie count. We aretrying to encourage the ways citizens can take more responsibility for their health."

It's an effort not unfamiliar to Jason Pincock, CEO at Dynalife Diagnostics. The science of coaxing meaningful patterns from large amounts of data – known as "analytics" – forever changed the way his 52 year-old laboratory testing company did business.

"We used to just take blood and hand back a result," said Pincock. Now, according to Pincock, Dynalife has found itself gathering and aggregating data that can span a patient's lifetime – and, with wider focus and analytics, identify care trends in larger populations.

And that, Pincock said, is the sort of ground-level information that administrators can use to craft effective – and value-driven – policy.

"Using the data, we can find, for example, if we have populations of patients where the right things are not happening," said Pincock.

IImagine a group of patients with a common ailment where a certain clinical course of action is indicated, something as simple as performing a particular blood test periodically. If that group's caregivers aren't performing the number or type of tests expected, a red flag goes up.

"Someone who has diabetes should have test x," said Pincock, "and if those tests do not show up, we know something is wrong."

And going forward, Pincock agrees that health care data will continue to move out from behind the physician's curtain –and into patients' smartphones. "The future of health care is putting data in the hands of individuals," he said, "so patients can self-monitor, making the physician a coach and guide."

"In the future, you won't have to look at the data at all," said Dr. Locksley E. McGann, Laboratory Director at Canadian Blood Service's Edmonton Hematopoietic Stem Cell Laboratory. "The system will interpret the data, and advise you of the biggest problem areas and risks."

Right now, according to Dr. McGann, the system is practically set up backwards. When we don't feel well, we enter the health care system and we expect the system to take care of everything.

"Compare this to your car," he said. "You don't wait until it is broken down; you get an alert light and you go in before it gets worse."

The next step for health care, according to Dr. Juzwishin, is having patients be aware of and monitor their health status and having them take corrective action before they develop a chronic or debilitating disease. Citizens and the health system working effectively together to avoid chronic illness will also create a more sustainable health care system.

"Consider the vast power of the currently un-mined data that is resident within data repositories,"saidDr. Juzwishin. "Imagine how powerful that data would be in terms of identifyingwhat are effective interventionsand those that are not".

Dr. McGann uses the example of a roofing company going online to look at satellite photos of a potential client's roof, and providing the homeowner with a quote for new shingles – without knocking on a single door.

"If we were collecting and effectively interpreting more data," he said, "we could make better decisions as we see the results – and get things fixed before they became a bigger problem."

"It's all about keeping people out of the hospital if we can," said Pincock. "Analytics is still held on the provider side of health care. We need to give these tools to the public." ■

Analytics Improves SUSTAINABILITY for Forestry in Canada

Analytics is not a new practice for the forestry industry, although breakthroughs in analytics technologies over the last five years are making rapid transformations in forestry sustainability and how the industry operates.

According to Tom Grabowski, president and CEO of The Silvacom Group, a consulting and technology solutions service that has been serving the forestry industry for 30 years, advancements in analytics have rejuvenated the forest industry over those five years.

"Late breaking technological advances are changing the forestry industry," said Grabowski, "Analytics is helping forestry be more competitive and to better manage the forest inventory. Analytics has importance on all land based activity, forestry, oilfield, development etc."

"TThe forestry industry has always been trying to measure forests and project how we should be managing the forest so we can have a sustainable yield and perpetual supply." said Grabowski, "The forestry industry has been a data industry for many years . . . counting trees . . . starting from hundreds of years ago in Germany."

Such perpetual supply is a breakthrough that will revolutionize the industry; however, the full results of forestry analytics are still unfelt relative to its future potential. According to Grabowski, "We will see huge changes."

The size of Canada's forestry industry means that these changes wont go unnoticed. Canada's forest sector is the largest net exporter in the country and recorded $57.1 billion in total revenue in 2011, which accounted for 1.9 per cent of the country's gross domestic product (GDP), according to Natural Resources Canada Statistics.

According to Natural Resources Canada, Canada was the second largest global exporter of major forest products behind the United States in 2011, and the fourth largest when all forest products were considered.

Natural Resources Canada reported that the forest industry was responsible for the direct and indirect employment of nearly 600,000 people in 2011. Successes in the forestry industry are not only good for the economy; they are good for the job market. While forestry analytics is clearly changing operations and automating parts of the business, Grabowski says its advancement will not result in the loss of jobs.

"Jobs are becoming automated and semi-automated," said Grabowski, "Although, people are not being replaced by technology, rather jobs are being redeployed and computers are doing the work that people used to do. The work is changing from people doing the work, to the people telling the computer what to do."

This is a positive turn of events. "Forestry took a dive shortly before the recession hit; it is coming back now, swinging... and heading in the right direction." said Grabowski.

The use of analytics has benefited forestry in ways unimaginable just a decade ago. These new ways of plotting data, viewing trends, and predicting future patterns, have improved management of forest inventory and emerged as a vital instrument in all land-based activities. These new analytical solutions allow forestry companies to plan and execute activities for the future, something that the industry has been striving for since the beginning. ■

"It's never been a better time to be a data scientist"

Now more than ever, if you are a data scientist, analyst, or analytics professional, the job market is at your mercy. Companies of all types and sizes, from the biggest of the Fortune 500 to the smallest start-ups, are jumping on the bandwagon, investing in new technology and subscribing to cloud services and hiring more data scientists.

Wanted Analytics, a business intelligence agency, reports that tech salaries will increase 5 per cent in 2013 and leave room for negotiations due to increasing demand but the biggest increase will be for analytic developers. Their salary will jump 16.3 per cent per cent, and could see an even greater increase in the coming years.

The growth and success of business is the top priority for every company and in today's society that means better metrics. "Measure everything" is increasingly becoming the battle cry of many companies and by all accounts they are collecting data like never before.

The amount of data being measured every day is growing at a staggering rate and all the evidence points to continued exponential growth. As information grows, so do the job opportunities in the field of data analysis.

John Manoogian III, co-founder and chief technology officer at 140 Proof, told USA Today that, "It's never been a better time to be a data scientist." The numbers don't lie and the salaries don't hurt. For those looking to get into data science, or more broadly, the field of data analytics, the market is ripe and the opportunities abound. As demand from business increases, colleges and universities are being forced to expand their curriculum to prep future analysts for the ever-growing marketplace of technology. However, even with an increasing number of students honing their analytic skills, the rate of technology is still way ahead of human knowledge and this means that as long as technology continues to grow, the market should stay strong for data scientists looking to cash in on their talents.

According to Tech reporter Jim Schwartz of USA Today, the field of analytics has exploded over the last year and a half and demand for tech workers is projected to grow at a total rate of 19 per cent by 2020, further increasing the need for graduates with analytics degrees or at least some knowledge in the field.

With high demand and a limited supply, knowledge in analytics has another benefit in today's market, and that is opportunity. The job site glassdoor.com currently lists nearly 18,000 available jobs in "Big Data Analytics," while companies like the gaming company EA Sports hopes to hire up to 5,000 engineers in the field of data management and commerce in the United States alone by the start of 2020. Such demand means that companies need to offer competitive salaries in order to attract the best quality analysts, who will be able to pick a job like a kid in a candy store.

In this growing and morphing field of data analysis there are newly emerging, as well as established, positions and suitable training comes from a variety of education and training backgrounds.

According to ALIS (Alberta Learning Information Service) a comprehensive resource for researching occupations and educational opportunities in Alberta, the minimum academic requirement for many data analysis positions is a bachelor's degree in computing science, statistics or computer engineering, although master's or doctoral degrees are often required for the higher level positions.

ALIS also notes that some of the personal characteristics needed for success in this field include an aptitude for and interest in mathematics, statistics and databases, an interest in applying scientific principles to solve practical problems, the ability to analyze information and understand abstract relationships and the ability to think logically. Employment directions range widely with a variety of employers including medical and educational research agencies, natural resource companies, environmental research companies, market research companies, pharmaceutical companies, large retail companies and post-secondary institutions.

The increase in analytics jobs is not the only thing that is changing. Many jobs, themselves, are changing in nature and are starting to require data analysis skills.

Jason Pincock, CEO of Dynalife, an Alberta based medical laboratory that employs 1,200 Albertans reports that lab techs used to work with blood and chemistry but now it's all data and technology related – it is becoming a very IT-centric field.

The good news for future and current data analysts is that their skills can translate to most industries because the overall interpretation is similar across data platforms. While there are clearly technical differences, depending on sector, analysts are learning how to adapt on the fly to different modules. The bad news for data scientists is that with the constant growth of analytics, their knowledge may become obsolete as technology evolves which will require continuous learning an adaptation. But for now, things are looking good for the field and employment opportunities are vast. ■

Analytics reshaping environmental monitoring

It even changed the way 16,000 square kilometers of tropical "dry forest" was classified under Brazilian law

If you want to imagine the future of our world's environment, according to Dr. Arturo Sanchez-Azofeifa, you need to embrace the tenets of "e-science."

It's the so-called "fourth paradigm" of science, a term coined in 1999 by then-Director General of the UK Research Councils Sir John Taylor. As a concept, it's nothing more seemingly uncomplicated than big-data analytics being applied to scientific endeavours. Not unlike the first three paradigms – understanding that the Earth revolves around the sun, the notion of quantum physics, and the creating of computers in the 1970s – the implications and potential applications of the idea weren't immediately apparent.

But as the equipment to collect scientific data became more affordable; the technologies to track everything from birds to the air itself became more refined and widespread. Data sets previously too large to create out of field notebooks became reality, and the advanced computing age opened up the possibility of actually making sense of vast amounts of scientific information.

Applying analytics to large science endeavours is an increasingly successful approach for many fields of study, and it's bringing researchers to large-scale discoveries that might affect the fate of the planet.

"For a long time analytics has been used in the business world," said Dr. Sanchez-Azofeifa, who leads the Centre for Earth Observation Science at the University of Alberta's Department of Earth and Atmospheric Sciences. "But we are starting to use it for environmental monitoring, putting sensors everywhere. It's shifting the way we do science."

And not in a small way. An analytics project Dr. Sanchez-Azofeifa leads in the Brazilian state of Minas Gerais changed the way 16,000 square kilometers of tropical "dry forest" was classified under Brazilian law – allowing it to come under federal conservation protection in a court case that will likely transform how environmental protection is granted across South America.

Tropi-Dry, an effort of the University of Alberta funded by the Inter-American Institute (tself supported by the U.S. National Science Foundation) utilizes several years' worth of ecological and social science research. In this case, a logging consortium faced a court challenge when it wanted to harvest within one of Brazil's so-called tropical dry forests. While rainforests receive the lion's share of environmental interest and protection in South America, tropical dry forests play a special part in maintaining ecological balance.

Characterized by long seasons of drought and hundreds of uniquely-adapted tree species, tropical dry forests display higher mammal numbers than rainforests, and provide a home for a remarkably wide variety of wildlife. Tropi-Dry researchers established remote-sensing monitoring systems that spanned the region, collecting vast amounts of ecological data in real time. Additional data gathered by the project's resident experts in biology, ecology, forestry, mapping, sociology, anthropology, forestry and state policy contributed to a growing picture of the region.

Analysis of that enormous data set demonstrated the forest was arguably an extension of the already-protected Atlantic rainforest, providing a necessary buffer zone between human use and the biological diverse – and federally protected – ecosystem there. Brazil's superior court was convinced; logging, which under state law could have taken as much as 70 percent of the tropical dry forest, was halted.

The ruling set a precedent that could, with the implementation of similar analytics projects elsewhere, help other conservation efforts. And, according to Dr. Sanchez-Azofeifa, It was an analysis that couldn't have been imagined in scope or speed just a few years ago.

"In the past, we would put up a sensor and come back six months later and find out what changes happened," he said. "There was a lag between when we collected that data and when we would find out what was happening. Now we use real-time sensors, and we can see changes that are happening now."

The "happening now" approach, and the increasing integration of analytics into science, makes fields like biology more nimble; imagining new ways of interpreting data in turn inspires researchers to find new ways of collecting it. The system becomes exponentially more productive, and can begin to handle topics previously beyond our reach.

It's an approach that can improve our understanding of areas as complex as an ecosystem, or phenomena as seemingly unpredictable as a hurricane. Dr. Sanchez-Azofeifa said computer models now interpret real-time weather data to offer predictions about possible storm speeds and trajectories – efforts that save more lives than scientists even a decade ago might've dreamed. All of it relies on mountains of information – and those mountains show no signs of getting smaller.

"We have massive amounts of data, which brings a challenge," said Dr. Sanchez-Azofeifa. "Now we need to continue developing tools to understand and bring meaning to the data." ■

Analytics Business Directory 2013

The following Made-in-Alberta small businesses have been identified as supplying analytics services

	COMPANY	HEAD-QUARTERS	WEBSITE	PHONE
1	Absolute Tracking Solutions	Calgary	www.absolutetrac.com	403-252-8522
2	4abyte Inc.w	Calgary	www.4abyte.com	403-978-9516
3	4WEB.CA	Edmonton	www.4web.ca	1-877-470-4932
4	Acrodex	Edmonton	www.acrodex.com	780-426-4444
5	Alberta Centre of Excellence for BIM	Edmonton	www.albertabim.ca	780-419-6070
6	Alberta Council of Technologies	Alberta	www.ABCtech.ca	780-990-5874 or 1-866-241-7535
7	Alberta Geomatics Group	Alberta	www.albertageomaticsgroup.ca	403-541-1119
8	Alberta Innovates Centre for Machine Learning	Edmonton	www.aicml.ca	780-492-4828
9	Awarebase	Edmonton	www.awarebase.net	780-988-8862
10	Bids Trading Technologies	Calgary	www.bidstrading.com	403-476-1111
11	Blackbridge Networks	Lethbridge	www.blackbridgenetworks.com	403-332-6000
12	Blue Train	Edmonton	www.bluetrain.ca	780-628-7414
13	Calgary Scientific	Calgary	www.calgaryscientific.com	403-270-7159
14	Canadian Cloud Coucil	Calgary	canadiancloudcouncil.ca	1-855-285-9774
15	Catch My Data	Edmonton	www.catchmydata.com	780-902-6558
16	Cleankeys Inc.	Edmonton	www.cleankeys.com	780-702-1473 or 1-800-661-8406x223
17	Clinisys EMR inc.	Edmonton	www.clinisys.ca	780-440-1172
18	CMG Modelling Group	Calgary	www.cmgl.ccom	403-531-1300
19	Code Excellence	Calgary	www.codeexcellence.com	403-875-0809
20	Code Expert International	Calgary	www.codeexpert.com	403-804-4495
21	Complex System Inc.	Calgary	www.complexsysteminc.com	403-452-4312
22	Coole Immersive	Edmonton	www.coolimmersive.com	780-718-9004
23	Cybera	Calgary	www.cybera.ca	403-210-5333
24	Dakota Analytics	Calgary	www.dakotaanalytics.com	403-264-6999
25	Darkhorse Analytics	Edmonton	darkhorseanalytics.com	1-800-261-1832
26	Data Gardens	Edmonton	www.datagardens.com	780–784–5000
27	Datacan	Red Deer	www.datacan.ca	403-352-2245
28	Datahive	Calgary	www.datahive.ca	403-313-1106
29	Decisive Farming	Irricana	www.decisivefarming.com	403-935-4929 or 1-800-941-4811
30	DG Humphrey and Associates Ltd.	Edmonton	www.dghumphrey.com	780-399-7255
31	Drivewyze	Edmonton	www.drivewyze.com	1-888-988-1590
32	D-Tex Inc	Calgary	www.d-tex.ca	780-665-1599
33	Dycor Technologies	Edmonton	www.dycor.com	780-486-0091 or 1-800-663-9267
34	DynaLifeDX	Edmonton	dynalifedx.com	780-451-3702 or 1-800-661-9876
35	Dynamic Manufacturing Solutions	Edmonton	www.dynms.com	780-488-6116 or 1-877-488-6166
36	EvidencePIX	Calgary	www.evidencepix.com	587-434-0081
37	Excellerate4Success	Calgary	www.excellerate4success.com	403-668-7337
38	Expert Decisions	Calgary	expertdecisions.com	403-239-1180
39	Explorus	Calgary	explorus.org	403-616-4807
40	Faction Four Systems	Beaumont	www.factionfour.com	780-446-7311
41	GetWellNext	Edmonton	www.getwellnext.com	
42	Granify	Edmonton	www.granify.com	1-888-340-8429
43	Green Analytics	Edmonton	greenanalytics.ca	780-462-3235
44	Headcount	Edmonton	www.headcount.com	780-463-7004 or 1-877-463-7004
45	Ideaca	Alberta	www.ideaca.com	1-866-265-4332
46	Innovotech	Edmonton	www.innovatech.ca	1-888-670-5445
47	Intelligent Imaging Systems	Edmonton	www.intelligentimagingsystems.com	780-461-3355 or 1-877-393-3939
48	Invidi Technologies Corp	Edmonton	www.invidi.com	780-420-0469
49	Ithiam Holdings	Bragg Creek	www.ithiam.com	403-630-8785
50	Ivrnet	Calgary	www.ivrnet.com	403-538-0400 or 1-800-351-7227
51	Kiribatu Labs Ltd.	Edmonton	www.kiribatulabs.com	780-232-2634
52	Knight Enterprises	Calgary	www.kei.ca	403-237-9951
53	Latium Fleet Management	Nisku	www.latium.ca	780-955-1088
54	Localize Your Food	Edmonton	www.localizeyourfood.com	780-720-1430

55	Long View Systems	Edmonton	www.longviewsystems.com	780-969-3800 or 1-866-515-6900
56	Maxxam Analytics	Calgary	maxxam.ca	403-291-3077 or 1-800-386-7247
57	Metabolomic Technologies Inc.	Edmonton	www.metabolomictechnologies.ca	780-245-0865
58	Mechatroniq Systems	Calgary	www.mechatroniq.com	403-287-6567 or 1-877-277-6567
59	MPK Analytics	Edmonton	www.mpkanalytics.com	1-866-406-0187
60	MRF Geosystems	Calgary	www.mrf.com	403-216-5515 or 1-877 216-5515
61	NetworksMD	Calgary	networksmd.com	1-800-669-0463
62	Nirix	Edmonton	www.nirix.com	780-414-1556
63	OKAKI Health	Edmonton	okaki.com	info@okaki.com
64	OnX Enterprise Solutions	Edmonton	www.onx.com	1-866-906-4669
65	Optessa	Edmonton	www.optessa.com	780-431-8426
66	Orbital Software Solutions	Edmonton	www.orbitalsoftware.ca	780-800-4970
67	Osprey Infomatics	Calgary	www.ospreyinformatics.com	403-460-4779
68	Parvina Solutions	Calgary	www.pravina.com	403-879-7759
69	Pleasant Solutions	Edmonton	www.pleasantsolutions.ca	780-463-8875
70	Pivot Data Centres	Calgary	www.pivotdci.com	403-248-6700 or 1-800-4655-1697
71	Power On Ltd	Calgary	poweronltd.ca	403-875-2079
72	PPM2000	Edmonton	www.ppm2000.com	780-448-0616 or 1-888-776-9776
73	Primus	Edmonton	primus.ca	1-888-411-607
74	Proactive IT Management	Edmonton	www.proactiveit.ca	780-414-0339
75	Quercus Solutions	Edmonton	www.quercussolutions.com	780-409-8180
76	Radient Technologies	Edmonton	www.radientinc.com	780-465-1318
77	Random Knowledge	Edmonton	www.randomknowledge.net	780-428-9218
78	Rent Relay	Edmonton	www.rentrelay.com	1-855-498-7368
79	Rigstar Communications	Calgary	www.rigstar.org	403-243-0600 or 1-866-535-2418
80	Robots and Pencils	Calgary	www.robotsandpencils.com	403-453-0053
81	Rocketfuel Games	Edmonton	www.rocketfuelgames.ca	780-414-0975 or 1-877-837-5087
82	Safetracks GPS Solutions	Edmonton	www.safetracksgps.ca	1-877-761-4477
83	Scanimetrics	Edmonton	www.scanimetrics.com	780-433-9441
84	Serious Labs formerly 3Di	Edmonton	seriouslabs.com	780-440-1128
85	SigniaAnlaytics Inc.	Edmonton	www.signia.ca	780-668-5369
86	Silent-Aire Systems	Edmonton	www.silent-aire.com	780-456-1061 or 1-888-427-6178
87	Silvacom	Edmonton	www.silvacom.com	780-462-3238
88	Smart Technologies	Calgary	www.smarttech.com	403-245-0333
89	Softworks Group	Edmonton	www.softworksgroup.com	780-429-7462
90	Solution105 Consulting	Edmonton	www.solution105.com	780-429-4774 or 1-866-466-4774
91	Spatial Tree	Edmonton	www.spatialtree.com	hello@spatialtree.com
92	Spieker Point	Edmonton	www.spiekerpoint.com	780-439-0077 or 1-877-439-0077 x 111
93	Sporting Charts	Edmonton	www.sportingcharts.com	780-761-2626
94	Springbok Systems	Edmonton	www.springbok.ca	780-701-1940 or 1-955-432-6277
95	Storage Clarity	Calgary	www.storageclarity.com	403-764-1320
96	Storm Telematics	Edmonton	www.stormgps.com	1-877-309-8354
97	TCE Labs	Calgary	www.tcelab.com	403-604-5678
98	Technology North Corp	Edmonton	www.technologynorth.net	780-953-6863
99	Tecterra	Calgary	www.tecterra.com	403-532-4275
100	Tesera Systems	Cochrane	www.tesera.com	1-866-698-8789
101	Tiko Digital	Edmonton	www.tikodigital.com	780-705-8456
102	Top Draw	Edmonton	www.topdraw.com	780- 429-9993
103	Touch Metric	Edmonton	www.touchmetric.com	1-800-494-0827
104	Troy Infometrics	Edmonton	www.troyinfometrics.com	780-758-7171
105	TRTech formerly TR Labs	Alberta	www.trlabs.ca	780-441-3800
106	Vanko Analytics	Edmonton	www.vanko.net	1-800-307-8554
107	V Strategies Inc.	Calgary	www.vinc.ca	403-229-2511 or 1-888-966-6984
108	Vidya Knowledge Systems	Edmonton	vidya.com	403-397-8785
109	VISIO Media	Edmonton	www.visionmedia.ca	1-866-789-3776
110	Visionstate	Edmonton	www.visionstate.com	780-425-9460
111	VisuMap Technologies	Calgary	www.visumap.com	403-607-8240
112	ViTel Consulting	Edmonton	www.vitel.ca	780-452-5205
113	Vizworx	Calgary	www.vizworx.com	403-238-9335
114	Yardstick Technologies	Edmonton	www.yardsticktechnologies.com	780-701-1838
115	Yellow Pencil	Edmonton	www.yellowpencil.com	780-423-5917
116	ZEDI	Calgary	www.zedi.ca	403-444-1100 or 1-866-732-6967