

Automating A True Engineer-to-Order Environment /s Possible. NeXtreme Automation proved it to me!



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An Interview with Ron McKitrick, Executive Director of Tryllium Industries Inc.
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Introduction

Arbrid Management's mission is to build a bridge between knowledge and decision. Our mandate is to stay current with emerging trends and technologies in enterprise software and be the best provider of insightful information that will help our customers make quality informed decisions.

In the constant search for new productivity tools for its clients, Arbrid occasionally discovers a new approach to solving persistent industrial problems. After performing a critical requirements review with a local engineer-to-order (ETO) organization, it was obvious that several well known ERP software solutions were claiming support for ETO but really did not understand the nuance of a true engineer-to-order business environment. Initially it seemed that the closest solutions were based on either a Project based manufacturing solution or a Job-cost based manufacturing solution. It was refreshing to find a pure ETO provider in our midst with a clear vision on how to harness the engineering department within the ERP business flow. Needless to say they are making inroads throughout North America allowing knowledge-based companies to capitalize on their engineering capabilities where it counts most -- winning profitable new business with **NeXtreme Automation** developed by Tryllium Industries Inc. of Cambridge, Ontario.

This interview was conducted by **Daniel Pillipow**, President of Arbrid Management Inc. Pillipow talked at length with Ron McKitrick, Tryllium's Executive Director following an impressive detailed product presentation conducted by Tryllium's staff. Pillipow asks McKitrick about the philosophy, origins, and application of the NeXtreme Automation solution. The following are detailed excerpts from our recorded conversation.

Pillipow: Tryllium refers to its technology as enterprise resource automation, or ERA. How does ERA differ from enterprise resource planning, or ERP?

McKitrick: Manufacturers have been using ERP software for decades. It's important technology because it keeps track of the financial results of every business transaction. But ERP doesn't know how a company *makes* money, only how it *spends* it. Enterprise Resource Automation goes an important step further by capturing a manufacturer's knowledge assets and placing them at the disposal of non-technical people. ERA is particularly useful for engineer-to-order manufacturers because ever-evolving designs and fabrication processes can be defined and managed with a minimum of engineering involvement.

ERA stresses an integration of the front-office knowledge processes. Tryllium has found that most engineer-to-order companies use many independent software applications in Sales, Application Engineering, Estimating, and even Finance. These programs are often home-grown tools that are key to preparing quotations, production plans, or project cost reporting. But they've been developed over many years and operate in isolation from each other. They usually require duplicate entry of a lot of small pieces of data, and are generally used only by people in narrowly focused job functions. In other words, these programs aren't enterprise applications and therefore don't look at supporting the complex workflow typical of an engineer-to-order manufacturer. An ERA system implementation normally addresses the integration of these separate routines into one environment.

In a nutshell, ERA is a technology for integrating and automating knowledge processes. ERP is strictly for storing raw data and analyzing it after the fact.

Pillipow: How and why did this technology get started?

McKitrick: Tryllium has been a CAD/CAM/CAE reseller since 1986, specializing in custom applications written to extend the functionality of commercially-available software products. Over the years our staff has presented the advantages of engineering process automation to our customers, and the industry has recognized the benefits without reservation. However, individual manufacturers have been unable to implement practical solutions internally and at the same were time unwilling to purchase them because early generations of design automation technology were unaffordable. Previous solutions to the problem were one-off custom environments that tried to integrate complex software and hardware systems in projects that took years and cost \$millions to complete.

In 1998, Tryllium realized that a *generic* platform for design automation would have tremendous market appeal, and began to work earnestly on developing a solution. It started with an Internet-based system for universal distribution of programmable parametric solid geometry components representing electromechanical items such as fasteners, bearings, motors, structural sections, and other products used by engineers in 3D CAD assembly modeling. At that time we called it **PartsLibrary**, and we soon realized the enormity of maintaining this ever-evolving databank.

By 2000, Tryllium realized that industry would embrace a solution enabling non-technical personnel to apply their own pre-defined design rules, engineer, document, and cost their complex products without constant technical assistance. Furthermore, the technology had to be Internet-based to help manufacturers sell their engineered products world-wide with detailed design and pricing available quickly at any hour and on any continent. This led us to develop and introduce the **NeXtreme Automation** technology platform. Tryllium has invested \$millions in R&D and market research to make inroads within this engineer-to-order "holy grail".

Pillipow: Would you please clarify the difference between ERA and NeXtreme Automation?

McKitrick: ERA is a generic term applied to the integration and automation of knowledge processes critical to manufacturing. It's a more all-encompassing version of an existing concept known as Knowledge-Based Engineering (KBE). **NeXtreme Automation** is a working technology platform pre-programmed with a manufacturer's product knowledge for integrating and automating all front-end functions in a transparent web-based environment.

Pillipow: What is the main focus of this technology?

McKitrick: For engineer-to-order manufacturers, NeXtreme Automation integrates the front-end functions of:

Sales & Marketing Manage customer contact, promote interest in a unique product, and collect the detailed specifications required to accurately engineer and price a solution for the customer's requirement.

Application Engineering Respond to Sales input to engineer a product solution within the boundaries of the competency of the manufacturer.

Design Engineering Prepare a detailed geometric design of the engineered product solution with associated Bill of Materials data identifying all of the raw materials and purchased components needed for production, completely automating the basic principles for each individual proposal.

Purchasing Reference the Bill of Materials with the company's cost standards maintained within the ERP system to get the cost of acquiring all components required to build the designed product.

Manufacturing Engineering Prepare a detailed Process Plan identifying all of the tooling, setup, fabrication, machining, welding, assembly, CNC programs, and testing operations required to produce the product.

Cost Estimating Reference the Process Plan with the company's capacity standards maintained within the ERP system to get the cost of machine time and labor required to build the designed product.

Technical Documentation Generate professional sales visuals, quotation drawings, production drawings, and process instructions to win a purchase order and guide production activities.

Design Control Track changes from the quoted configuration to ensure accurate invoicing and project history.

Pillipow: Where can this technology be used by industry?

McKitrick: NeXtreme Automation enables Sales Representatives, or even authorized customers, to invoke their set of manufacturer's technical functions automatically from any location served by an Internet connection. For the majority of engineer-to-order variations in a product family, the technology can derive viable product configurations, select materials, engineer sizes, generate professional sales visuals, communicate with the company's ERP system, calculate product price, and launch a Production Order with a detailed geometric design, drawings, and a ready-made production plan. This is done while maintaining proprietary vendor technology.

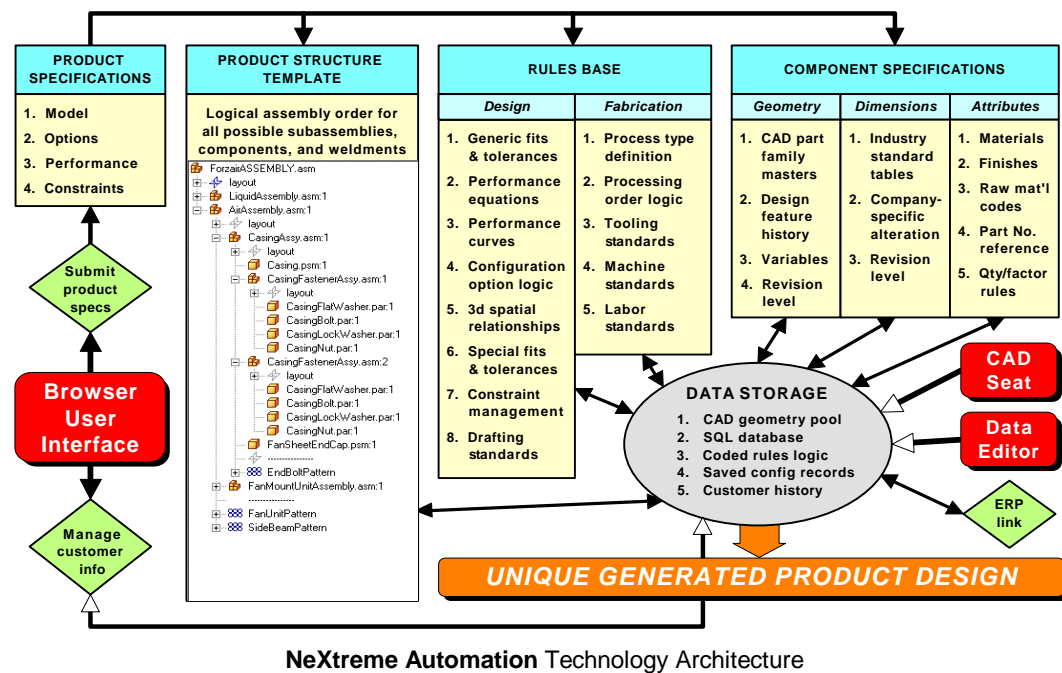
Pillipow: Hardware needed and training required?

McKitrick: NeXtreme Automation is a proprietary technology platform that integrates multiple commercial software applications to automatically deliver a digital 3D CAD assembly prototype and technical documentation presented in a variety of standard formats. It operates on an Intel-based computer with a Microsoft operating system. Its functions are accessed through a web browser. Optimum performance is obtained with a 3 GHz or faster processor, 2 Gb RAM, and hard disk capacity in excess of 200 Gb. The platform is installed on a webserver networked to a customer's existing local area network using 100 MHz Ethernet TCP/IP protocol. NeXtreme is accessible in both an Intranet and an Extranet.

Training for successful application of NeXtreme Automation is provided in 2 categories. Users need less than 1 day of exposure to the system's capabilities and functions to be highly productive. However, individuals assigned to *program* the technology platform with product knowledge require at least 10 days of training in the philosophy of operation and specific details of configuring 3D CAD geometry, non-geometric Bill of Materials, and fabrication process attributes.

At this time, there are no institutions of higher learning offering courses in product assembly architecture or rigorous parametric component modeling, so Tryllium is obliged to work closely with its customers to ensure successful implementation of a NeXtreme Automation environment.

[Tryllium provided the following schematic to illustrate the system architecture.]



Pillipow: How much does it cost per seat and what could one expect as the ROI in time and money savings?

McKittrick: NeXtreme Automation is a business-enabling technology (BET) with a purchase price comparable to a conventional enterprise resource planning (ERP) system. However, Tryllium is sensitive to the need for manufacturers to offset the investment quickly through direct cost savings. During today's difficult economic times, NeXtreme Automation can be *rented* by its customers at a monthly rate equivalent to a fraction of the engineering effort it replaces. For example, if an installation relieves 4 engineers of their daily redundant work, it's priced at 25% of their salary and overhead cost to the company, or about \$6,000 per month.

Currently there's no limit to the number of customer staff who may operate the system since it's accessed universally through web browsers. However, as a packaged investment, outright purchase pricing is a software base price of \$50,000 for 10 users. Annual software maintenance is 20% of the purchase price. If Tryllium is contracted to program the system with the manufacturer's product knowledge for ERA operation, the implementation cost will typically run in the range of \$30,000 to \$80,000 per complex product family (e.g. a heat exchanger engineered for a prescribed range of thermal performance and geometric variation).

Our experience shows that virtually all engineer-to-order manufacturing operations budget a minimum of 5% of annual revenue to paying engineers and estimators to design and quote product for sale. Return on investment (ROI) is calculated easily based on the technical salaries normally associated with the work NeXtreme Automation performs. Remember that a rental contract is charged at roughly 25% of the salaries offset, so a simple calculation (ignoring implementation) demonstrates a 400% ROI upon commissioning of the system. Taking implementation contracts into account, there is an up-front charge that

reduces ROI in the first year to about 150%. Payback for a NeXtreme Automation installation will average 9 to 12 months, and build upon a higher ROI from that point thereafter.

Other soft contributors to ROI include **a)** increased customer responsiveness and professionalism, **b)** better market penetration with shorter lead times, **c)** lower manufacturing costs due to reduction in design error, **d)** enhanced business growth opportunities with engineering resources reallocated to new product development, and **e)** prevention of losses due to unrecorded design changes during the contract.

Pillipow: How large must a company be to afford this technology?

McKitrick: The annual revenues of a particular manufacturer may not necessarily reflect the company's product complexity. Highly complex assembled electromechanical products will incur an inordinately high implementation cost due to the depth of detail required to program NeXtreme Automation. However, manufacturers in mature industries generally offer products where the one-off variations are predictable within a limited range of options. In cases such as pressure vessels for example, a company with annual revenues of \$20 million or more will easily see a payback for its investment within 12 months. Larger manufacturers will see payback within progressively shorter times.

Pillipow: Approximate savings in quote-related man hours?

McKitrick: Most manufacturers in mature industries are fortunate to have a 20% quote hit rate. That is, only 1 in 5 quotations result in a purchase order. Therefore, 80% of an engineer's time devoted to quoting product is effectively wasted. NeXtreme Automation will typically handle about 80% of product variations without the need for further attention to design details. Thus $0.8 \times 0.8 = 0.64$, or at least 60% of engineering time is saved in the mission-critical function of quoting product. In just crunching the numbers, a manufacturer will save an estimated 60% x 2,000 man-hours per year, or 1,200 man-hours per year per technical worker. The larger the technical staff, the greater the company's annual savings.

Pillipow: What is its main focus in manufacturing?

McKitrick: NeXtreme Automation's main focus is on saving time and money, as well as improving response to customer demand. North American manufacturing is under siege because developing countries offer quality products at lower prices. It's the indirect front-end costs in manufacturing that reduce North American competitiveness. NeXtreme Automation is positioned to level the playing field with foreign competition by dramatically reducing the overhead cost of redundant engineering work, thus allowing manufacturers the luxury of reallocating

technical resources to new product development innovation. This is the surest way for manufacturers to maintain a competitive edge.

Furthermore, if North American engineer-to-order manufacturers are to compete in foreign markets, they must reduce delivery lead time by enough to counter the delay inherent in trans-oceanic shipping. NeXtreme Automation automatically designs finished product even as it produces a calculated quotation, thereby slashing production lead time virtually in half when an order is placed by a remote customer. Consider the impact of *that* reduction in cycle time where conventional practice is typically 50% engineering and 50% build time.

Pillipow: Within a suppressed economy, how has it affected ETO business in general?

McKitrick: North American manufacturers are currently competing for level market demand but with more global competitors. Hence there is intense pressure to quote quickly and more accurately to maintain current revenue levels. NeXtreme Automation provides a major competitive advantage because every quotation is *calculated* precisely, generated in minutes, and delivers compelling professional sales visuals that often make the difference between winning and losing a sale. Profit margins are continuously squeezed so any means of reducing fixed costs enables a manufacturer to prosper at the expense of competitors who don't share the same vision of adopting Enterprise Resource Automation.

Pillipow: What can the small manufacturer do to lessen the effects of this downturn?

McKitrick: NeXtreme Automation offers an invaluable competitive advantage for those manufacturers that can afford to invest. Adopting the *philosophy* embodied in ERA technology is critical for survival, whether or not a technology purchase is possible. Even in a non-automated engineering environment, several important improvements can cut costs dramatically. First and foremost, a manufacturer's product knowledge should be formalized. In other words, all possible product configurations must be defined and documented, with written design procedures that eliminate the informal guesswork for each new project launched in the Engineering Department. In addition, manufacturers should seek to specialize in a narrow niche of competency where profitable production is virtually guaranteed on every purchase order obtained.

Pillipow: What's in R&D for this technology for the future?

McKitrick: The NeXtreme Automation platform is undergoing very rapid development, even though ERA is still an emerging technology. Today the system enables the Sales force to configure, engineer, present, and price a customized product, then submit the results to an ERP application and the drawings to the Shop Floor. Right now we are concentrating on generating machine instructions to

control CNC equipment and robotic handling equipment for direct production functions. NeXtreme already orchestrates purchasing functions, automatically placing orders for materials and components required to meet delivery of a customer's uniquely engineered product.

Within the decade we see NeXtreme Automation managing the entire spectrum of front-end technical tasks, enabling customers to visit an Internet site to design unique products and place production orders founded on knowledge input from Sales, Engineering, Purchasing, and Production but without human intervention. Tryllium Industries has grasped this vision and is working hard to deliver it to industry ahead of emerging competitors.

Pillipow: Speaking of competitors, how is NeXtreme Automation differentiated from other solutions out there?

McKitrick: I'm glad you asked! You'll understand if I don't name the other players in the Enterprise Resource Automation industry, but Tryllium *does* stand out for several reasons. What do engineer-to-order companies expect from their technology investments? Let's review the issues in terms of the advantages for manufacturers.

Operating Philosophy Tryllium brings a certain fanatical zeal to the design, marketing, and implementation of its NeXtreme Automation. Underlying everything our company does is the firm belief that every repetitive task performed in industry can and should be automated. How else can we conquer unnecessary costs? Executives expect to minimize labor on the shop floor by investing in machinery. Won't they also want to minimize labor in the front-office by investing in knowledge automation? We think so, and we're betting everything on this concept. But we aren't limited to the Engineering Department. We tackle the tough issues across the board. I see our competitors missing the boat by overlooking the impact Engineering has on the rest of the business.

Enterprise Integration Standalone software solutions have had their day. Manufacturers have dozens of islands of automation throughout their organizations. ERP was supposed to fix that, but ERP doesn't handle front-office knowledge processes. NeXtreme Automation does. Years ago Tryllium recognized the importance of integrating its technology across the enterprise so it wouldn't be just another standalone product. We support the complex workflow of engineer-to-order manufacturing from Sales through to Field Service. We incorporate or rewrite existing in-house applications, and we link to ERP in real time. Our competitors, on the other hand, appear to be offering little more than glorified new Engineering tools.

Lowest Purchase Cost As a totally web-engineered platform, the NeXtreme environment is comprised of a single powerful server with all its software components centrally resident. This means no upgrades are required for any user workstations, and it can be distributed as widely as necessary for virtually any number of concurrent users. Our competitors are touting single-user systems that synchronize to a central location when necessary, but their approach means every workstation needs its own expensive CAD engine. Furthermore, you'll have to upgrade most users' hardware to *operate* the CAD engine.

Lowest Operating Cost Again, NeXtreme's web-centric design minimizes software and hardware maintenance costs. Our competitors want you to overlook the fact that decentralized configurations are a nightmare for Information Technology staff to keep software and hardware components updated. Can you imagine having to distribute 100 copies of a database every time your purchase cost standards changed?

Implementation Success How many disastrous ERP installations have you heard about? Enterprise Resource Automation is a new technology, so a successful roll-out needs a new approach. First, Tryllium conducts a thorough Discovery to interview the future users of our ERA solution and develop a detailed implementation plan. The Spec lays out system inputs, transactions, and outputs, and even presents the interface screens for approval. Second, building a knowledge automation system requires expertise and resources that most companies don't have. Tryllium provides both with 20 years experience in design automation and our own huge library of industry-standard geometric objects and dimensional tables. We don't have to reinvent the wheel with every new customer. So, while our competitors want you to buy their software and install it yourself, we *guarantee* delivery of the working solution with minimum disruption of daily operations.

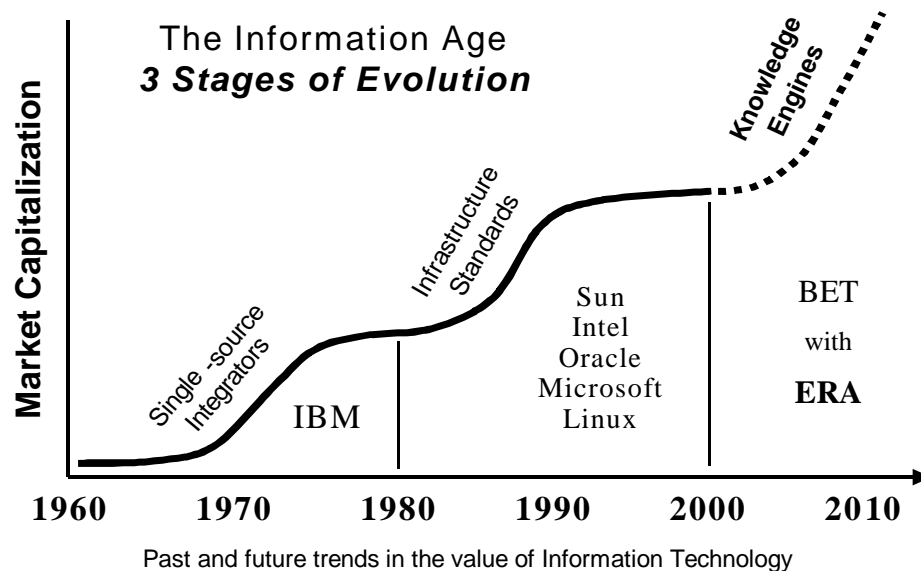
<p>Pillipow: What changes can you foresee for manufacturing in the future?</p>

McKitrick: Over the past decade, industry has concentrated on achieving Lean production by eliminating waste in the *physical* activity of manufacturing. This effort is entering the realm of diminishing returns. The bulk of waste in manufacturing is now concentrated in the front-end where industry has yet to streamline, integrate, and automate technical functions. A new class of technologies called business-enabling technology systems (BET) is emerging to meet this need.

Conventional computer-aided design (CAD), computer-aided machining (CAM), product lifecycle management (PLM), and enterprise resource planning (ERP) technologies provide minimal cost-saving benefit by merely *storing* vast amounts of detailed product and fabrication data. The data is still created and managed by repetitive human processes using isolated technology tools. The next generation of manufacturing technology will eliminate most indirect costs by *generating* the same data on demand from basic product specification inputs.

The age of knowledge *engines* is now evolving where complex product knowledge is encapsulated in Enterprise Resource *Automation* (ERA) technology platforms like **NeXtreme Automation**, ready for non-technical personnel to manipulate design and drive production in minutes rather than days or weeks. The days of redundant, informal engineering practice and production planning are numbered. Industry analysts suggest that Information Age evolution will produce a new generation of software companies attracting investment larger than ever before. Tryllium Industries is leading a revolution in manufacturing by marketing NeXtreme Automation technology first in North America, then globally. We see the next decade as one of major opportunity.

[Dr. Doherty of Wilfrid Laurier University provided the following graph to illustrate the trend.]



Pillipow: Thank you, Mr. McKitrick, for this very informative report.

About Ron McKitrick

Ron is Executive Director of Tryllium Industries Inc., an enterprise software vendor based in Cambridge, Ontario. He's a professional engineer with an MBA and speaks with experience of the opportunities for revolutionizing manufacturing. His lengthy career in industry spans executive positions at **General Electric, Black & Decker**, and the automotive parts and tooling industry where he was instrumental in developing new approaches to eliminating redundancy in front-office operations. Ron believes in the potential of North American manufacturers to reduce indirect costs dramatically while slashing delivery lead times through knowledge process optimization. His stewardship at Tryllium has helped the company focus decisively on the development of the NeXtreme Automation platform which delivers new levels of efficiency to engineer-to-order manufacturing. Contact Ron at (519) 650-2233 or rmckitrick@tryllium.ca.