ROI DIALOG

SQUARING THE CIRCLE?

How lean principles and ERP can be combined

ROI
MANAGEMENT CONSULTANTS

ROI DIALOG OVERVIEW – ISSUE 47

LEAN AND ERP: SQUARING THE CIRCLE?

Ulrich Krieg, Partner, ROI Management Consulting AG

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Do you know what a pushmi-pullyu is? No, it's not a new concept from the Toyota dictionary. It's actually a two-headed gazelle-unicorn cross with the two heads unfortunately situated at opposite ends of its body. In order not to lose step completely and succumb to a self-induced demise, the pushmi-pullyu must develop strategies to deal with the fundamental contradiction that is inherent in its very being. It solves the problem by relying on a division of labor – one head can always speak when the other head is busy eating, making the pushmi-pullyu a very effective animal. However, this is not as easy as it seems, since the pushmi-pullyu is a somewhat cantankerous creature if we can believe the man who invented it, the British children's author Hugh Lofting.

There is probably no better analogy for the complicated relationship between lean philosophy and ERP. In practice, the two worlds are almost at cross purposes with one another. Lean experts rarely apply their principles to ERP systems and almost never include them in their solutions, as the contradictions appear to be so large. Thus the central aim of ERP – maximizing capacity utilization and minimizing costs – is pitted against a production that is synchronized with customer takt and the elimination of waste shared by all lean approaches. The flow or pull principle that is so systematically applied in the lean world can scarcely be reconciled with order-based push systems.

And finally, there is a fundamental difference between the two approaches when dealing with complexity. While lean philosophy – a predominantly visual approach – focuses on simplification and the reduction of complexity and can often be implemented without the support of IT, managing complexity in the digital ERP world is significantly more important than reducing it.

However, the attempt to master unstable and excessively complex processes with even more complex IT systems generally failed in practice and will continue to fail in the era of Industry 4.0 as well. Awareness is growing that it is essential to seek to reduce the complexity of the production system, using measures like segmentation, flow-orientation, line balancing and pull control as a first step. IT can then be deployed based on these simplified, improved and more robust processes and its benefit fully exploited.
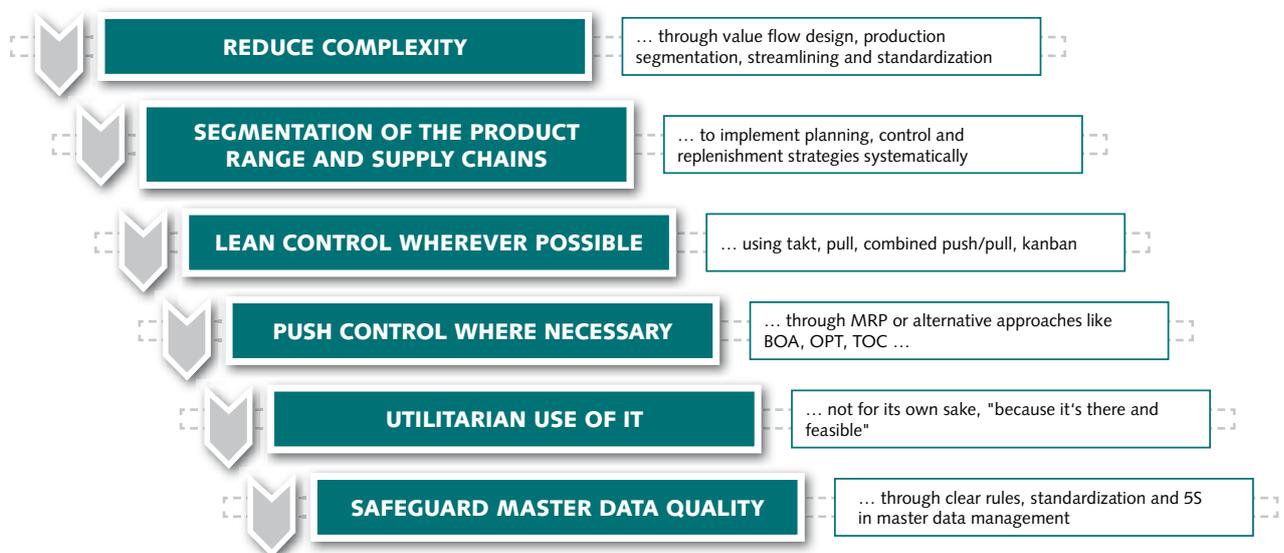
It is therefore hardly surprising that a common goal of both approaches – the creation of transparent, efficient and predictable production – has often been tackled in completely different ways in the last few years. In this context, those fighting in the IT corner rolled out heavy artillery – using comprehensive planning tools (advanced planning systems) with finite capacity scheduling and the desire to use mathematical optimization algorithms to plan every production step down to the last detail, wanting to achieve the ideal of the perfectly operating factory. Online quality and production progress data, immediate information about the availability of machines and causes of disruption and product costing analysis for every production job were intended to make manufacturing plant processes efficient and transparent.

> "The attempt to master unstable and excessively complex processes with even more complex IT systems will fail in the era of Industry 4.0, as well."

In the best case, this accords with a number of other applied lean ERP principles that achieve improvements in several areas in a structured manner (see figure). The user-oriented deployment of IT plays an important role in this, in addition to the rule of thumb "lean control wherever possible, push control where necessary", as many dimensions of cost and complexity can be prevented by "thwarted, over-hasty actions". It is preferable to make the effort to reassess new IT investment from the point of view of intended purpose and sustainability than to take the wrong decision under the pressure to change and because it is feasible. And the use of IT is only sustainable when lean management is practiced with IT systems. A good example of this is ensuring a high level of data quality through the application of 5S.

Optimum interaction between lean principles and ERP is usually achieved in practice when production control is effected as an "ERP-free zone" based on self-regulating control loops and IT support is concentrated at the boundaries of the production system, for example on the medium- to

LEAN ERP CASCADE PRINCIPLE
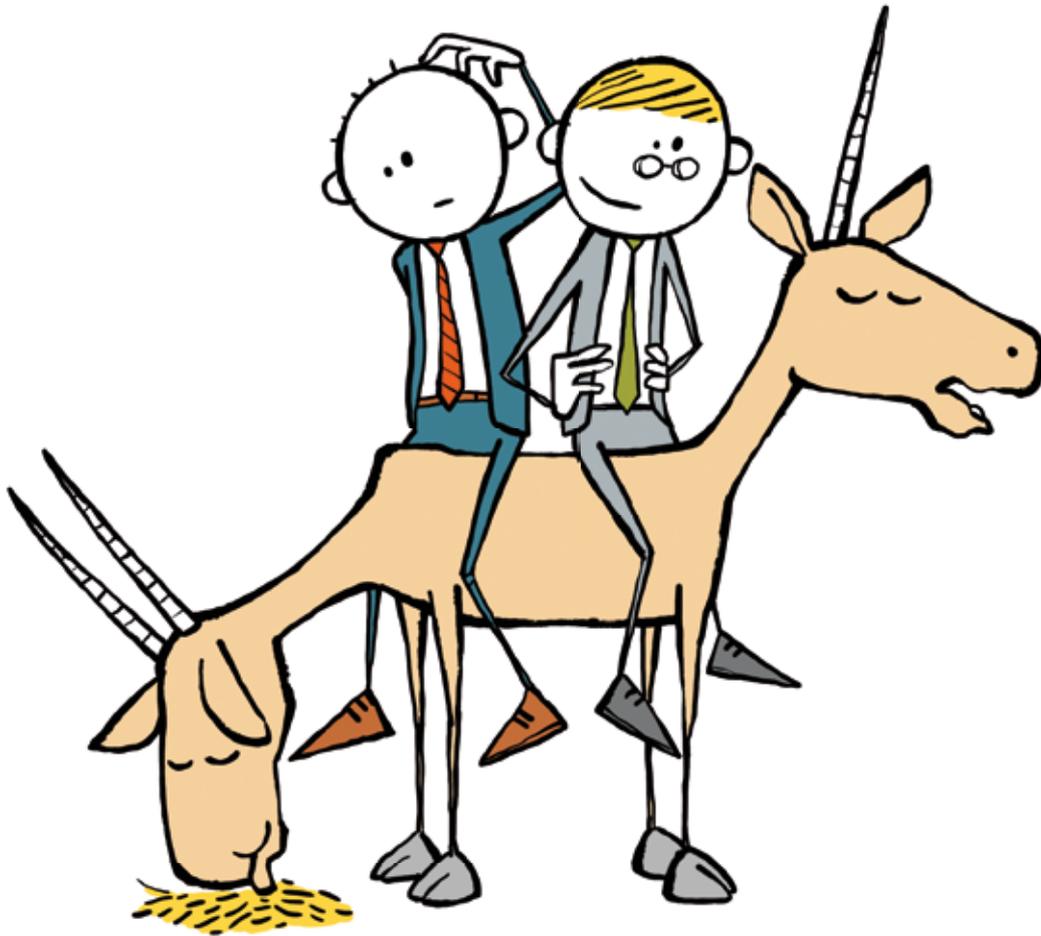
REDUCE COMPLEXITY	… through value flow design, production segmentation, streamlining and standardization
SEGMENTATION OF THE PRODUCT RANGE AND SUPPLY CHAINS	… to implement planning, control and replenishment strategies systematically
LEAN CONTROL WHEREVER POSSIBLE	… using takt, pull, combined push/pull, kanban
PUSH CONTROL WHERE NECESSARY	… through MRP or alternative approaches like BOA, OPT, TOC …
UTILITARIAN USE OF IT	… not for its own sake, "because it's there and feasible"
SAFEGUARD MASTER DATA QUALITY	… through clear rules, standardization and 5S in master data management

long-term planning of material and capacity requirements and on the end-to-end integration of customers, suppliers and partner production plants. And of course, in all those places that require the use of IT to provide transparency over volume and value flows as well as traceability.

Lean processes alone are not sufficient to master complex structures. Data acquired by ERP systems offer great potential for understanding and thus better controlling such complex structures. First, they can be used to make process-es more transparent in real time, to understand relationships and to intervene in operations in terms of specific process control. Second, data can also be used ex post to identify patterns in problems with productivity, quality and delivery and then, on this basis, to extrapo-late remedial actions for them.

"The successful interaction between lean principles and ERP requires, above all, an end to dogmatic confrontation."

The successful interaction between lean principles and ERP requires, above all, an end to dogmatic confrontation. It does not require one approach to be forcibly adapted to match the other. Instead there should be an alignment with the intelligent definition and organization of areas of applica-tion and technical and procedural interfaces. A pushmi-pullyu cannot be avoided if ERP is to be used alongside lean concepts in production. However, care can be taken to ensure that its special nature becomes a significant advantage and not a handicap.

"EFFICIENCY MEANS BEING PERSISTENT"

Interview with Andreas Schachtner, Senior Manager OSS Engineering, Global Backbone/Prototyping & Testing, TRW Automotive

Andreas Schachtner,
Senior Manager OSS Engineering,
Global Backbone/Prototyping
& Testing, TRW Automotive

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DIALOG: *Mr. Schachtner, TRW Automotive is one of the world's most successful companies in the field of automotive safety systems – and one of the most research-intensive. One central area is prototype construction. What are the biggest challenges that you have to tackle in this area?*

AS: A good market position does not in itself guarantee lasting success – which is why we are continually working not just on developing and enhancing our products but also on continuously improving our processes and structures. In this case, for example, it's a matter of achieving short, flexible lead times and making sample and prototype construction economical. Prototype construction at TRW is a complex, global process that needs to be managed across different sales regions, engineering fields, prototype construction locations and production plants. That is a major challenge, especially as mapping processes with standard ERP instruments has so far proven to be difficult.

DIALOG: *You are focusing on these topics with a project intended to make prototype construction at TRW more effective and efficient. Why does the struggle for efficiency never really end and what are the most important objectives?*

AS: I think it is also question of term definition. Efficiency doesn't just mean 'faster, higher, farther'. For us it means, above all, being persistent. Global projects, global supplier platforms, ever-greater demands placed on manufacturing speed, complexity management and prototype quality also result in constantly rising costs. Continuous efficiency-raising measures are indispensable in order to counteract this development and to achieve what are still-acceptable prototype costs.

> "We want to be able to construct any prototype in consistently high quality at any time."

It essentially involves two main lines of attack. We wish to establish globally standardized end-to-end prototype order processing with regard to the process and with regard to an integrated IT system that supports this process at every step of the way. On the one hand, this addresses the aforementioned topics – how can we reduce lead times? How can we increase efficiency and systematically align prototype construction with lean principles? On the other hand, a significant focus is placed on establishing a robust process to ensure that we can construct any prototype in consistently high quality at any time.

DIALOG: *You also rely on ERP software from SAP for optimizing this area. Can ERP and lean philosophies be combined in any meaningful way?*

AS: The linking of both approaches is already very beneficial. However, there must be a clear weighting of the topics – the focus is on a lean process. Here, ERP plays the important role of an enabler, especially in designing consistent order process-

ing across all global prototype construction locations, in reducing lead times and in ensuring really comprehensively optimized end-to-end processes.

DIALOG: *How did you actually go about this task? What were the project milestones?*

AS: Put simply, we defined three steps – from the inside out. The initial focus was on streamlining and reducing the complexity of the structures of the value-adding processes in prototype construction itself, i.e. reorganizing production scheduling by product groups or creating an optimized production layout by arranging the pre- and final assembly stages according to the flow principle, to name just two examples. The second step covered "IT-free" process improvements such as the introduction of a shopfloor management system, i.e. creating transparency through visualization, standardization and local troubleshooting as well as the clarification and improvement of interfaces to upstream areas.

And finally, we will implement a consistent, lean, end-to-end order fulfillment process with the support of SAP

solutions, create clean value flows and stock transparency and ensure that the SAP tool is used in a utilitarian manner, for example in processing the procurement of components, goods-in/goods-out management and scheduling. Incidentally, this approach also illustrates the question about the link between lean procedures and ERP – the art consists in combining the specific strengths of both methods and not in attempting to force one method over every process.

"When linking lean procedures and ERP, the art consists in combining the specific strengths of both methods."

TRW Automotive

With sales of USD 17.5 billion in 2014, TRW ranks among the leading suppliers to the automotive industry worldwide. The company is headquartered in Livonia, Michigan, USA, and has locations in 24 countries around the world, employing around 65,000 people. TRW Automotive's product portfolio includes vehicle control and driver assistance systems, braking systems, steering systems, suspension systems, passenger protection systems (steering wheels, seat belts and airbags), electronics, fastening systems, spare parts and customer services.
www.trw.com

DOODLE INSTEAD OF DATA SILO

Four approaches for smart mobile solutions in production

By Dr. Johannes Pohl, Project Manager, ROI Management Consulting AG

Dr. Johannes Pohl,
Project Manager,
ROI Management
Consulting AG

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Be honest – do you think the idea of "paperless production" is absurd? Obviously "tangible" analog processes provide the certainty of routine. Fewer misunderstandings occur when settings and changes are noted down on paper, taken to the machine and then entered. Printing out the shift plan in an Excel chart twice a day means that all employees have the information available at a glance, right? Not by a long chalk, because anyone who clings to this or similar processes and ignores those little "digital helpers" is neglecting considerable improvement potential.

Paper and ink as the standard form of information may be a classic problem in manufacturing, but it is by far not the most pressing. Dependency on outdated technologies creates a hidden drain of unnecessary costs, as it tends to hinder the efficient flow of information and deployment of staff rather than advance them. However, the situation is now changing dramatically with mobile applications for smartphones, tablets and laptops since, firstly, most employees now already use a smartphone privately with corresponding apps and are therefore familiar with the logic and with how to use them. And secondly, developing mobile software programs for existing devices is now much cheaper than producing new devices and equipment to achieve the same goals.

There are of course other good reasons for turning mobile applications into a natural tool in the work processes of a manufacturing company. Besides improved productivity and increased sales, they allow closer relationships to be established in customer, partner and supplier

> "Currently available apps are already lowering production costs and simplifying personnel planning significantly."

networks. Currently available apps are already lowering production costs and simplifying personnel planning significantly. Companies wishing to take advantage of these and other benefits should develop an "app strategy", including the following elements when shaping it:

1. PROMOTE TRANSPARENT SCHEDULING

Scheduling apps like Doodle can be installed on any popular smartphone in a matter of seconds and customized for planning processes such as shift plans or regular team meetings. Besides ease of use, the key benefit is the direct dissemination of information. For example, if staff call in sick using the application, the person responsible for planning can immediately send out a request for a stand-in to the employees who, according to the system, are available. The app can also be customized. For example, a chat function can be added that can then be used to arrange car sharing among the team. A process easily taking an hour by telephone can be reduced in this way to a few minutes.

2. GENERATE CLEAR INFORMATION

Mobile applications provide ready-to-use, understandable input masks for data that companies can adapt for their own requirements without any major additional programming effort. The Evernote app allows teams, for example, to develop key indicators, notes and drafts in a shared format. Unlike with common software programs, there is no need to send, store and forward different versions, and the application is not tied to a workplace. When a change is made to a process in several locations, access is available to common documents and the same level of information almost in real time.
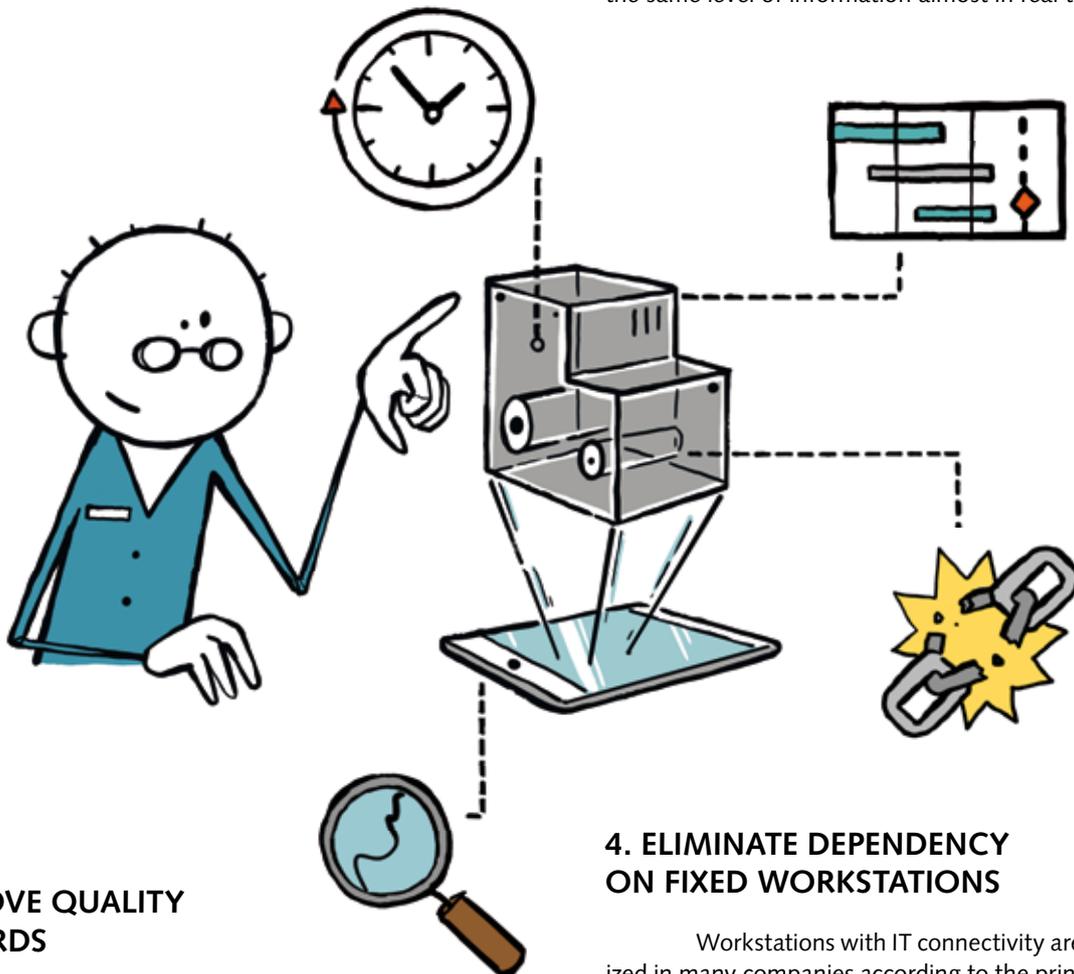
3. IMPROVE QUALITY STANDARDS

Quality controls are generally required to be very small, widely distributed checkpoints in the value chain. Using exact digital "stamps with GPS and time information, mobile devices and apps allows for far more flexible and precise checks on goods, equipment safety or even official regulations. The Android app "Oil & Gas Safety Management", for example, not only enables exact quality assurance and inspections, it also makes it possible to manage emergency precautions and planning.

4. ELIMINATE DEPENDENCY ON FIXED WORKSTATIONS

Workstations with IT connectivity are still organized in many companies according to the principle of "information silos". Specialist and operational departments primarily collect and share their own data within the boundaries of their own departments. Mobile applications will accelerate the breakup of these boundaries. Using apps like Fluke Connect, inspectors can forward pictures of machinery, goods or plant they have examined to teams and link them to a job order for the legal department or a maintenance agreement with just a few clicks.

MES SPOTLIGHT – WHAT WILL SYSTEMS HAVE TO ACCOMPLISH IN THE FUTURE?

Manufacturing Execution Systems (MES) play a major role in the implementation of Industry 4.0. They will remain indispensable in the medium-term in order to ensure the comprehensive integration of components and guarantee a high level of quality, transparency and efficiency in production. But what demands will be placed on MES in production and with regard to interaction with other IT systems in the future? Five experts give their views.

Industry 4.0 and MES:
What does the future hold?

L4:
ENTERPRISE
RESOURCE
PLANNING (ERP)

L3: MANUFACTURING
EXECUTION SYSTEM
(MES)

L2: LINE MANAGEMENT SYSTEM
(LMS)

L1: AUTOMATION
PROCESS / MACHINE CONTROL
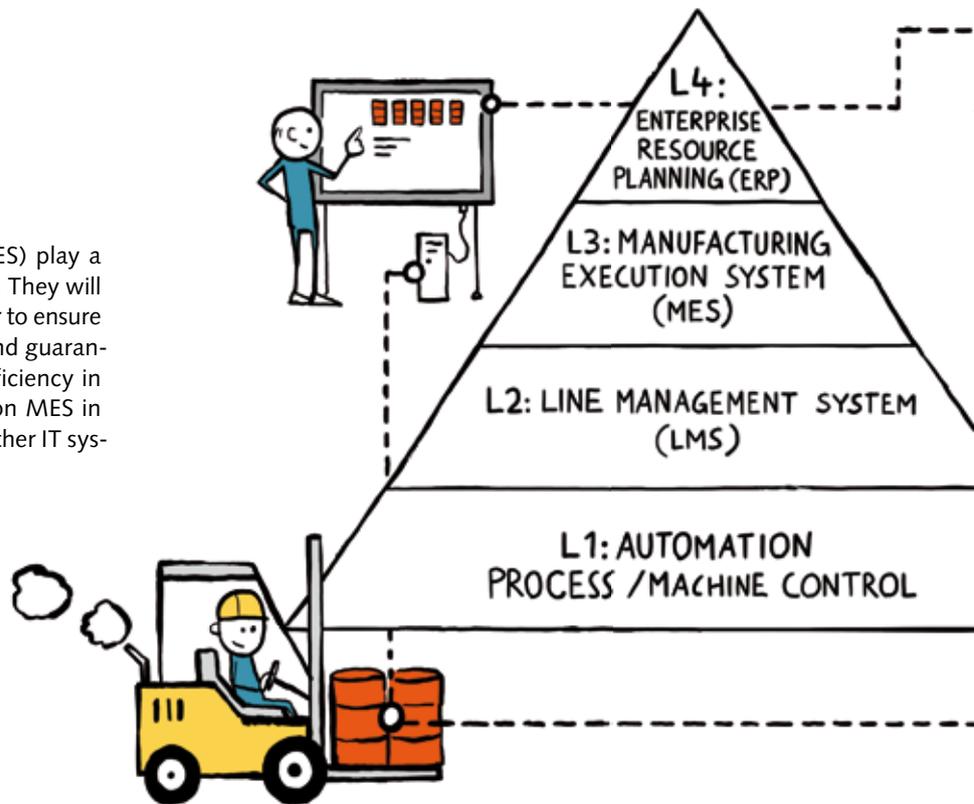
> *Really long-term benefits arise from the combination of IT-free lean solutions for the reduction of complexity and modern MES functions. A prerequisite for the success of this is, firstly, a cross-plant IT roadmap with a clear division of tasks between MES, ERP, CAQ, CAM and the process- and machine-control levels and, secondly, a clearly specified collaboration and a division of responsibility between the central IT organization and the individuals responsible for MES in production. The cost-effective use of MES is particularly important – not everything that is technically feasible makes sense.*

> *Besides efficient manufacturing processes and a focus on global value creation, the efficient analysis and assessment of all globally collected data in particular represent a major competitive advantage if a company wishes to remain a successful international supplier in the face of competition. An MES adapted to the needs and requirements of the company provides the basis for addressing this issue, which will become increasingly important in the future.*
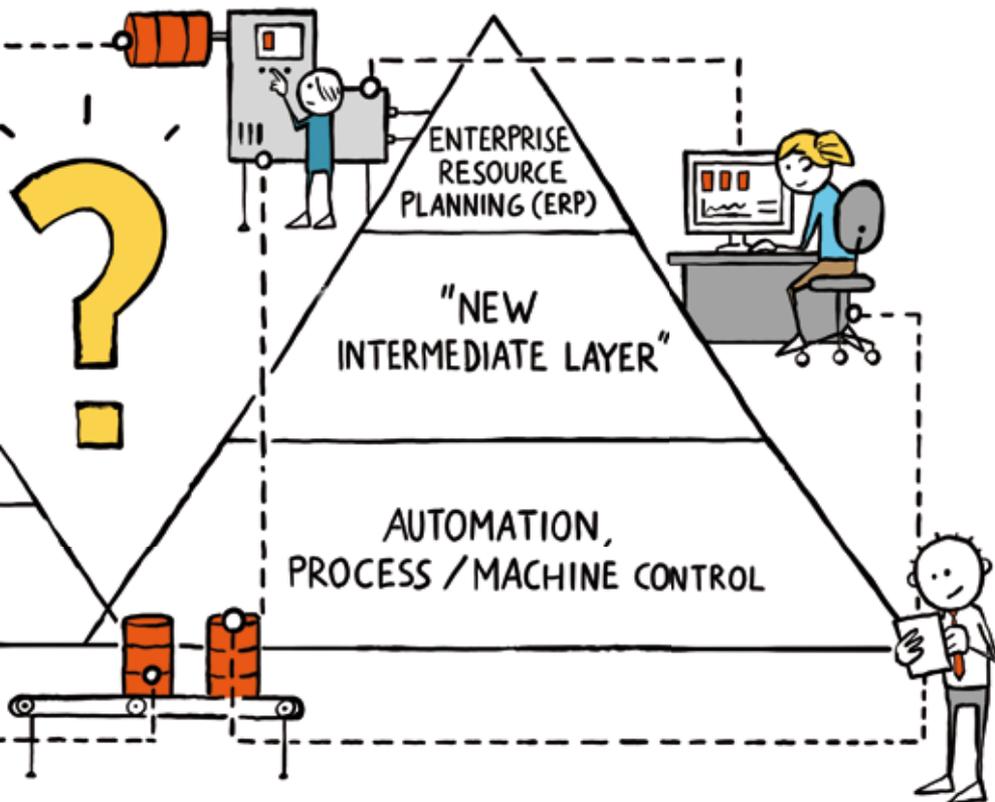
Ulrich Krieg,
Partner,
ROI Management Consulting AG

> *I see a whole new field in the area of traceability of products and production data. It would be ideal if affordable monitoring could show what products are located where in the value stream and which production steps have already been completed with what product data. I also think that the growing possibilities of IT systems will make it increasingly important to formulate a concrete 'automation strategy for administrative activities' in the sense of an 'IT strategy for production'.*

Dr. Clemens Honeder, COO, Miba Bearing Group

> *Manufacturing Execution Systems play a leading role in vertical process integration, since collecting information about production locally and making it available centrally will, in future, be a crucial task. Enabling the standardization of software systems and interfaces without neglecting the necessary flexibility and individuality of production will be a central challenge in this. Support for this will come from systematic, interdepartmental architecture management on the shop floor and the implementation of SOA-based software systems and processes.*

Christian Neumann, Executive Consultant SAP Manufacturing, Freudenberg IT

ENTERPRISE RESOURCE PLANNING (ERP)

"NEW INTERMEDIATE LAYER"

AUTOMATION, PROCESS / MACHINE CONTROL

> *Capturing, preparing and handling process and product data in real time constitutes a central element in Industry 4.0 and the Internet of Things. Among other things, an MES is ideally suited for this task and provides transparency for users in their production processes. Before introducing an MES, however, it is important to develop a comprehensive concept covering what is to happen with the data gathered. Enough data graveyards have emerged over the last two decades.*

Patrick Vith, COO, ThyssenKrupp Presta Steering

Markus Ber, COO, Miba Friction Group

LEAN ERP: SOLUTION MODULES FROM EVERYDAY PRACTICE

By Ulrich Krieg, Partner, ROI Management Consulting AG

LEAN ERP:
ROI SOLUTION MODULES FOR A VARIANT JOB MANUFACTURER
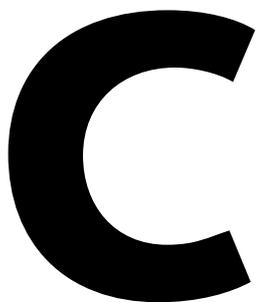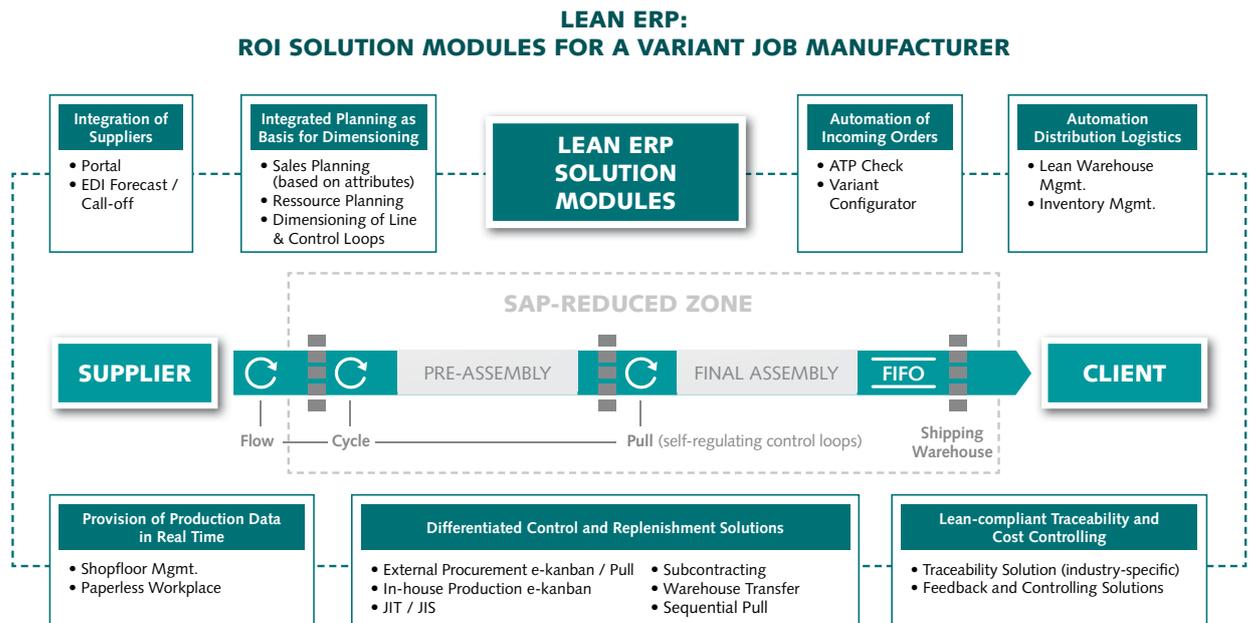
Can ERP systems actually be integrated with lean factory concepts in practice? The answer is yes – although on certain conditions. The most important of these is the philosophy for dealing with complexity. It is not mastering complexity in the supply chain and production that provides the basis for a successful project but its systematic reduction.

Approaches such as value stream design, streamlining, standardization, segmentation and demand management and smoothing can free ERP systems from the ballast of complex control functions. With lean production optimized in this way, ideally based on self-managing control loops, the role of IT has clearly-defined tasks.

These include, in particular, the integration of customers and suppliers, the automation of incoming orders, the mapping of the volume and value streams, ensuring traceability of the entire supply chain, sales and resource planning and the provision of a reliable data pool for the design of the production system. ROI has developed a comprehensive toolbox of lean ERP best-practice solutions for this approach that are available for various types of production.

Each module selected for an individual customer solution is based on the principle of optimum interaction between lean and ERP principles, as illustrated by the example of the "sequential pull" model. This module is suitable for controlling and demand-based commissioning of pre-assembly for variant and exotic component groups (component groups with low sales volumes, expensive or bulky parts).

The start of production of the required component group in the pre-assembly shop is triggered by a scan in final assembly. The request is displayed immediately on the SAP kanban planning board in the pre-assembly shop. The order sequence and the bill of materials can be seen in an additional job list on the screen. This is how the principles of lean philosophy can be successfully combined with the strengths and possibilities of an ERP system in order to achieve significant advances in efficiency and speed of production.

LEAN ERP TRAINING: AVOIDING WASTE EFFORTLESSLY
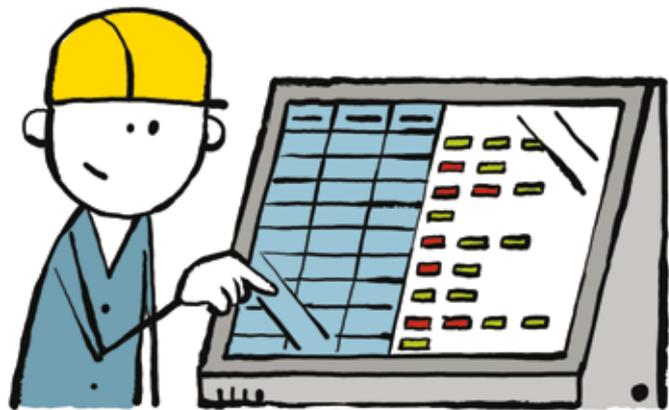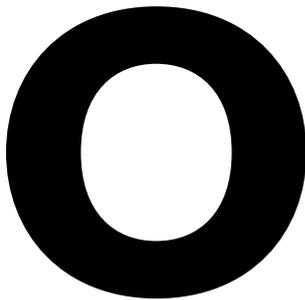
One characteristic shared by many lean projects is a focus placed on physical processes and objects. Here, ERP systems are generally only viewed with reference to managing decoupling points, defining supermarkets and implementing the pull principle – however, in doing so, there is also an attempt being made to limit the influence of the ERP system. Added to this is the increasing complexity of ERP solutions that many users cannot fully understand.

For this reason the 5S method central to lean philosophy – a system-oriented approach aimed at reducing waste and non-value-adding activities – frequently ignores IT infrastructures and only focuses on processes, disregarding considerable optimization potential in the digital work environment, since a system that generates planning using inaccurate data inevitably leads to waste ("muda").

It is this weak spot that ROI takes as the starting point for its newly developed lean ERP approach. The focus here is not just on scheduling and the push-pull principle but, starting with the basic idea of kaizen, also on continuous improvement of overall processes.
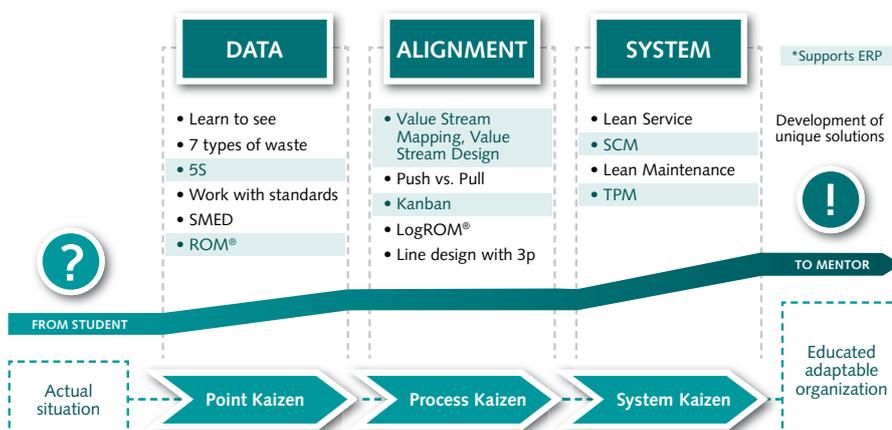
ROI is now offering training modules for this approach that are not only available at its Prague and Cologne Learning Factories but also via ROI's Learning Management System.

The structure of the course follows the classic kaizen levels (point, process, system), with the ERP system being viewed under the specific focus of each of the three levels.

Point kaizen looks at the relevant statistical and dynamic data from the point of view of timeliness and accuracy, process kaizen is concerned with alignment between the customer takt time, the finished batch sizes and packaging, while system kaizen concentrates on topics such as TPM or SCM.

The lean ERP course is designed to be interactive, relies on playful elements and is modeled as closely as possible on actual production conditions. During the training course, participants learn how the most important sources of waste connected with ERP can be identified and are given practical approaches and tools to help eliminate them, combining lean processes effortlessly with ERP.

LEAN ERP TRAINING APPROACH

DATA	ALIGNMENT	SYSTEM	*Supports ERP
• Learn to see • 7 types of waste • 5S • Work with standards • SMED • ROM®	• Value Stream Mapping, Value Stream Design • Push vs. Pull • Kanban • LogROM® • Line design with 3p	• Lean Service • SCM • Lean Maintenance • TPM	Development of unique solutions

FROM STUDENT → TO MENTOR

? → Point Kaizen → Process Kaizen → System Kaizen → !

Actual situation

Educated adaptable organization

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"WE ENABLE OUR CUSTOMERS TO EXTEND THEIR TECHNOLOGICAL LEAD"

Interview with Egon Hämmerle, EVP Global Operations,
VAT Vakuumventile AG

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DIALOG: *Mr. Hämmerle, VAT is an innovation leader in vacuum valve technology. How difficult is it to defend this position nowadays?*

EH: Over the last 50 years, innovation has been the driving force behind VAT's development, bringing us technology leadership in the field of vacuum valves and their application. However, defending a position of leadership is never easy.

Our customers operate in a highly competitive market environment that is characterized by short innovation cycles and the highest quality standards. Demands in the areas of cleanliness, precision and stability of vacuum components are growing at a rapid pace owing to ever shrinking structures. We enable our customers to extend their technological lead and for their part to assert their position in the market. We employ one-fifth of our workforce of 1.100 people in the area of research and product development in order to maintain this outstanding position of innovation leadership. But high levels of customer focus, flexibility and, of course, quality are essential for this, too.

> "The major challenge is to map the concepts developed and proven over many years in a global footprint"

DIALOG: *You operate in a very demanding market environment, especially with regard to the semiconductor industry. How dramatic have the changes in competition been in recent years?*

EH: The concentration of production capacities in the semiconductor industry has resulted in a tougher competitive environment and a greater procurement power on the part of the semiconductor manufacturers. This has increased the cost pressures for equipment manufacturers immensely, and the equipment manufacturers in turn pass on this market pressure to their suppliers. Market growth in the semiconductor sector as well as in the solar and flat-screen areas is mainly taking place in Asia. This is leading to a

globalization of the supply chain and necessitating global supply concepts on the customer side as well as on the client side – both for our customers as well as for their suppliers – like VAT.

New fields of application for vacuum technologies are opening up new opportunities for the use of vacuum valves, but they are also placing greater demands on our products. This trend is increasing the complexity and diversity of our product portfolio. VAT is addressing these market requirements with innovative product concepts that are based on standardized components and platform concepts and which therefore allow customer-specific solutions without extending the range of parts. This ensures that we can develop outstanding solutions together with our customers, and that we can offer them at fair market prices.

DIALOG: *To what degree is this development affecting VAT's production concept and production strategy on the one hand and the creation of the company's global footprint on the other?*
EH: VAT reacted promptly in this respect by establishing a second production plant in Malaysia, in addition to its main plant in Switzerland. Both principal plants are supplemented by production facilities in

Egon Hämmerle,
EVP Global Operations,
VAT Vakuumventile AG

Eastern Europe and Taiwan. Firstly, this ensures the necessary proximity and flexibility, as well as short lead times. Secondly, it means we can achieve a better balance of the currencies in which we generate income and incur expenses.

Process stability, sustainable quality standards and security of supply are fundamental prerequisites for long-term success in the industries that we supply. For this purpose, VAT has built up an excellent network of suppliers over the years and traditionally purchases a large share of added value from selected partners. This was the only way in which we were able to counteract the cyclical nature of the business and the associated dramatic fluctuations in capacity utilization in the past. Very rapid ramping up and ramping down of production capacities are part of the daily challenges in the semiconductor industry and also shape VAT's production concept.

The major challenge is now to map this concept which has been developed and proven over many years in a global footprint. This not only entails transferring complex and highly demanding processes. It also means developing new local suppliers in order to safeguard our customers' quality requirements.

This calls for clear strategies regarding the production equipment, the manufacturing technologies and the design of technology chains that we will implement at each of the production locations. We will also adapt our make-or-buy strategies to the new global footprint.

DIALOG: *Besides production, it is primarily purchasing and logistics that are responsible for achieving a high level of operational excellence. What is the strategy you are pursuing in these two areas?*
EH: Our footprint concept, which we developed with the support of ROI Management Consulting and which we validated with their experience from many projects in a wide range of industrial fields, does in fact focus on both production and the supply chain. I have already mentioned the central role of our supplier network. Our partners are involved in product de-

About VAT

Over the last 50 years, VAT has built up a global leadership position in vacuum technologies based on constant innovation and a single-minded focus on quality and reliability. VAT develops and manufactures vacuum valves, modules, bellows, and related services for the semiconductor and vacuum coating industries as well as for the research sector. The company has more than 1.100 employees and is headquartered in Haag, near St. Gallen in Switzerland.
www.vatvalve.com

velopment from a very early stage and contribute their expertise entirely. Our suppliers are aware of our customers' requirements and have harmonized their production processes to match them.

Increasing operational excellence through the lean production approach means that continuous process improvements and the elimination of waste must take place across departmental and company boundaries. We will closely integrate our preferred suppliers into this initiative in order to gain a holistic view of the production, logistics and administrative processes. Reducing lead time is at the top of the agenda of any optimization. This will enable us to become even more agile and to reduce the capital employed.

New concepts for the management and distribution of goods will play a significant role in helping to cut lead times. Categorizing orders into "make-to-stock", "make-to-order" and "make-to-project" in production planning and establishing regional distribution centers will ensure optimum harmonization between the supply chain and our customers' requirements.

www.roi-international.com

About ROI

With over 1,000 successful projects, ROI Management Consulting AG is one of the leading consulting companies for global footprint design, development and production. ROI helps industrial companies to optimize products, processes, technologies and global production networks in accordance with lean management and operational excellence principles and to adapt to changing market, customer and technology demands. As initiator and co-organiser of the Industry 4.0 Award, which was first presented in 2013, ROI actively promotes the development of technological innovation in Germany.

ROI has won several prestigious prizes and awards for its highly implementation-oriented projects. The company has about 100 employees at its locations in Munich, Beijing, Prague, Vienna and Zurich and is represented by partner offices in Italy, France, United Kingdom, Thailand, India and the USA.

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