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Industry 4.0: Customer service driven manufacturing

How automation, analytics and AI can drive rapid outcomes in a customer-focused production system

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Industry 4.0 is gathering momentum. With the explosion of data volume, computational power and connected systems, it is moving beyond the initial hype to a measurable reality. Parallel to this technological jump, customer expectations (and competition to meet those expectations) continue to grow. Throughput, cycle-times and cost-efficiencies remain important indicators, but even for manufacturing, the new name of the game driving decisions and determining performance is customer service. In this environment, the central conversation among industry leaders is no longer "whether" there's a need to transform the business; the conversation is "how".

1. Debunking Implementation Myths

Unfortunately, the concept of transformation gets often confounded with three implementation myths that prevent otherwise promising organizations from taking the necessary steps for business sustainability.

Implementation Myth #1:
Industry 4.0 is a binary state; either you have it or you don't.

Reality: First and foremost, Industry 4.0 isn't something to achieve; it's the opportunity to leverage the growing access to data, and emerging technologies, to propel you to your goals. The larger implication is that this transformation is not an on/off switch; the **4.0 transformation is an on-going journey**.

> "... 4.0 transformation is an on-going journey"

Implementation Myth #2:
Industry 4.0 requires massive IT transformation projects from the very beginning in order to pay-off.

Reality: A key advantage of the new technologies, and the service-centric approach, is that agility and scale have become core principles of any successful development and implementation. The result is an ability to **start small by being smart**. This means defining an initial scope which has a large and quick impact on business outcomes by repurposing existing data without the need for an IT overhaul.

> "... start small by being smart"

The formula to success in Industry 4.0 is to implement machine learning methods and other forms of artificial intelligence.

Reality: Technology is just a lever. A very powerful one, but still a lever. This necessary reminder means that despite the natural excitement created by these new and still evolving capabilities, your eyes must remain on the prize: the business outcomes. A technology's value, no matter how sophisticated or visually attractive, is only measurable against the net benefit it creates. Being always aware of this reality increases the probability of selecting the right technologies for the relevant applications along the journey.

"... eyes must remain on the prize: the business outcomes"

At the end of the day, success in the Industry 4.0 environment will be about how quickly and efficiently organizations are able to clearly state value to their customers, and then identify, adapt and adopt the available data and emerging technologies to those business needs. The next section explains the new lens under which data needs to be managed in order to enable the above.

2. Re-imagining Data in Industry 4.0: A Tale of Two Questions

The Initial Question

When transfering analytical models from the textbooks to the manufacturing floor, the availability and quality of data have historically been major challenges (not to mention a source of contention between academics and practitioners). But there's been good news! Especially in the last decade, big data and the proliferation of connected devices deserve recognition for attempting to narrow the data gap. Progress!... with a caveat. Along with the growing access to data came a new problem, an almost obvious question; and it was the same question across industries and borders and managerial levels:

"What do I do with all of this data?"

The bad news?... It was the wrong question.

A Test of Consistency

Before going further, let's briefly revisit the seed that was first planted in the title of this paper: "customer service driven manufacturing". The underlying thesis is that successful manufacturing organizations in the 4.0 era need to be driven by a customer focus (i.e., intent) as opposed to the traditional product-centric (i.e., object) approach. This entails asking questions like:

- What are my customers' needs and prioritities?
- How do I organize my production environment around my customers' priorities?
- Why are customers buying/not buying from me?
- How can I offer products that better serve my customers' needs?

The Right Question Regarding Data

So why would figuring out what to do with the new data be the wrong goal? Because that approach focuses on the object (i.e., the data), and not on the intent (i.e., the insights). It limits the possibilities and takes the eyes away from the prize (i.e., the business outcomes). Instead, consider the following question:

WHAT DO I NEED, THAT DATA CAN HELP ME WITH?

Data is still in the conversation, but it plays a supporting role. Data is a lever (as is the technology used to collect, store, transform and communicate it). The needs of the business are now the central part in this new question. Because the business goals should focus on the customer, the entire apparatus is more likely to be designed and implemented in alignment with that goal.

Implications for Measuring Data Availability

Finally, since we've established the need for a new lens to look at data, we also need to update our way of judging data availability. Achieving a single version of truth across the organization, and even with external stakeholders like suppliers and customers, is a great initial step; but it's not enough on its own. To stay consistent with the focus on the customer, in order to drive business outcomes, data availability must be measured relative to the extent that it facilitates such a goal (as opposed to the breadth or volume of data). Embracing this position will have direct implications on how the data model is built and operationalized. To help in this self-assessment, we suggest that data availability is appropriate when it meets all three of the below criteria:

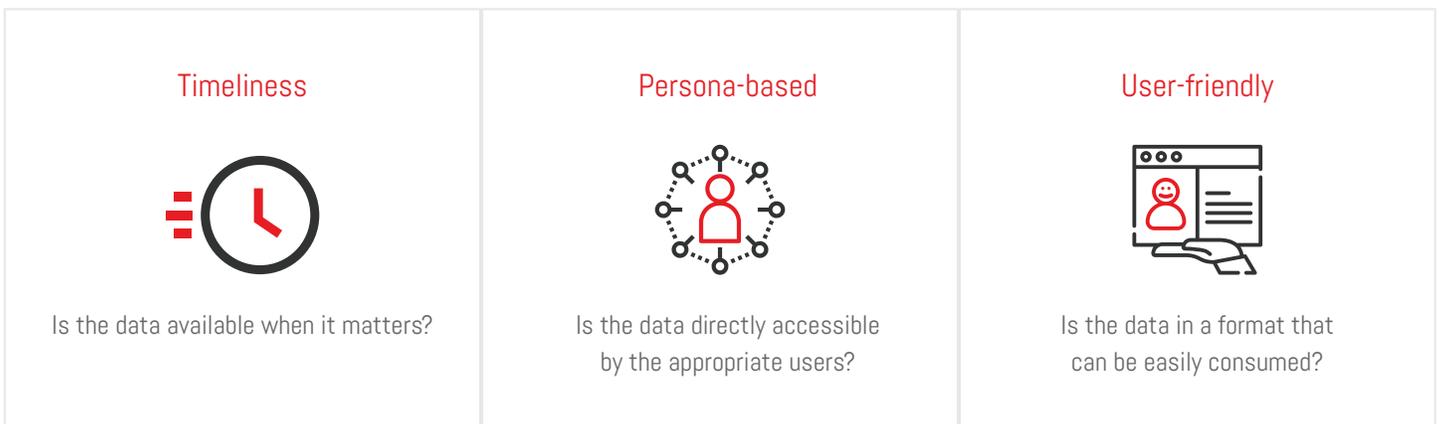| Timeliness	Persona-based	User-friendly
Is the data available when it matters?	Is the data directly accessible by the appropriate users?	Is the data in a format that can be easily consumed?

Fig. 1:   Criteria for Assessing the Level of Data Availability

The next section presents a framework to more efficiently and effectively navigate a customer-focused manufacturing world through the use of technology.

3. A Model to Answer "How"

The Three A's

First, a disclaimer: there are plenty of ways to organize technological tools; this is just one of them. Further, the shared value and interdependencies that these tools have means that the borders between categories are often fuzzy. With that said, we propose that there are three "A's" that must always be considered, and progressively incorporated, in order to have a successful journey: (1) Analytics; (2) Artificial Intelligence; and (3) Automation. Next we'll define them and present some examples.

A1 ANALYTICS are meant to help the organization **understand**. They rely on a mix between statistical knowledge and domain expertise being applied to data to answer three types of questions:

1.   WHERE AM I, RELATIVE TO MY GOALS? This is associated in textbooks with descriptive analytics, and the simplicity of its name often results in the importance of this step to be tragically understated. This is the building block for establishing a single version of the truth from which other analyses emerge. As a result, having a poor starting point (e.g., one that is statistically accurate, but tone deaf to the business priorities) will leave some critical issues unattended while triggering wild goose chases based on misleading metrics. Examples:

- What is my suppliers' on-time delivery performance against system lead time? Against promised date?

- Is supplier on-time delivery affecting my ability to meet customer expectations? If so, how many and which suppliers are they?

2.   WHY AM I HERE? This is formally labeled as diagnostic analytics, and in business jargon it's called root cause analysis. Ironically, almost every organization publishes a report of this type but it's with low frequency that the results are illuminating or actionable. This step is all about learning, and that requires that the analysis balances a pragmatic trade-off: on one hand, going deep enough to filter out the noise, while on the other hand, maintaining enough structure that patterns are revealed and corrective actions have a scalable impact. Examples:

- Were supplier orders received after they were needed because of poor internal planning or was it a supplier issue?

- Are my critical suppliers predictably late? Is the system lead time, which drives my ordering pattern, unilaterally inconsistent with reality?

3.   WHAT SHOULD I DO? This maps to prescriptive analytics, or more simply put, the understanding of what is needed. Most tools achieve this partially by creating a laundry list of all items that need someone's attention. Where most tools fail is in prioritizing these actions and presenting the decision-support data in connection to the impact on the customer-focused business objectives. Examples:

- How should I design, and control performance of my supplier network?

- Which open purchase orders are most critical to get expedited in order to mitigate the impact on critical customer orders?

A2   ARTIFICIAL INTELLIGENCE (AI) can be a very large umbrella, but here we'll highlight its relevance on predictive modeling. Earlier iterations of this capability include words like "forecasting", "simulation" and "predictive analytics". But it's important to recognize that while the underlying questions remain the same…

"WHERE AM I GOING? / WHAT IS MOST LIKELY TO HAPPEN?"

… the mechanics have evolved in speed, scale and closed-loop learning to such an extent, that their impact warrants a category of their own. Machine learning methods are a major enabler of this application, transcending the "analysis-only" approach to data by generating critical processes of its own. At its best, predictive modeling through AI democratizes tribal knowledge, while augmenting the organization's decision-making intelligence. AI helps manufacturing organizations tackle emerging issues when it's most economical to do so, along with facilitating the proactive planning and prepositioning of resources in order to execute when needed.

Examples:

- Do I have enough inventory in the pipeline to fulfill my projected sales orders, over the next 12 months, on-time?

- What supplier actions will I need to take if my demand for next quarter increases by 20%?

A3   AUTOMATION is a process-intensive technology aimed at facilitating faster and more reliable flows of information. An effective use of Analytics and AI helps to identify the ideal candidates for automation. Note here that the range of applications is very broad, and includes: report generation, communication of analytics, job assignments and escalations, decision-making and approvals, etc. Additionally, automation produces two by-products that have important long-term consequences. First, they reduce labor costs by essentially eliminating the non-value added component to tasks that can be done through a set of instructions and rules. Second, they increase job satisfaction by allowing workers to spend their time on value-creating activities that they feel uniquely qualified to perform.

Examples:

- Can I be automatically notified when a delay in a supplier's shipment will affect my production plans, and more specifically my customer fulfillment date?

- Can I automatically send an escalation to expedite open purchase orders associated with tight production schedules to meet demand?

The VIP Guardrails

When applied properly, the "three A's" will help manufacturing organizations transform their way of doing business to be truly customer-focused. Below are three "guardrails" or validation areas where improvements must be realized in order to claim progress on the 3A's. Their importance is such that their acronym coincidentally is "VIP":

V

VISIBILITY:

"Out of sight" often translates to "out of mind", but seeing different versions of truth can be even more dangerous. The journey must always start with a shared knowledge of reality that connects individual users, functional areas and supply chain stakeholders.

I

INSIGHTS:

It's not hard to use existing data to generate more data. Reports, Control Towers, Work Queues are not automatically valuable. In order for data to become insightful we've found that meeting all of the following 4 criteria is an honest and effective litmus test. The data is insightful if it is 1) New, 2) Timely, 3) Actionable, 4) Impactful.
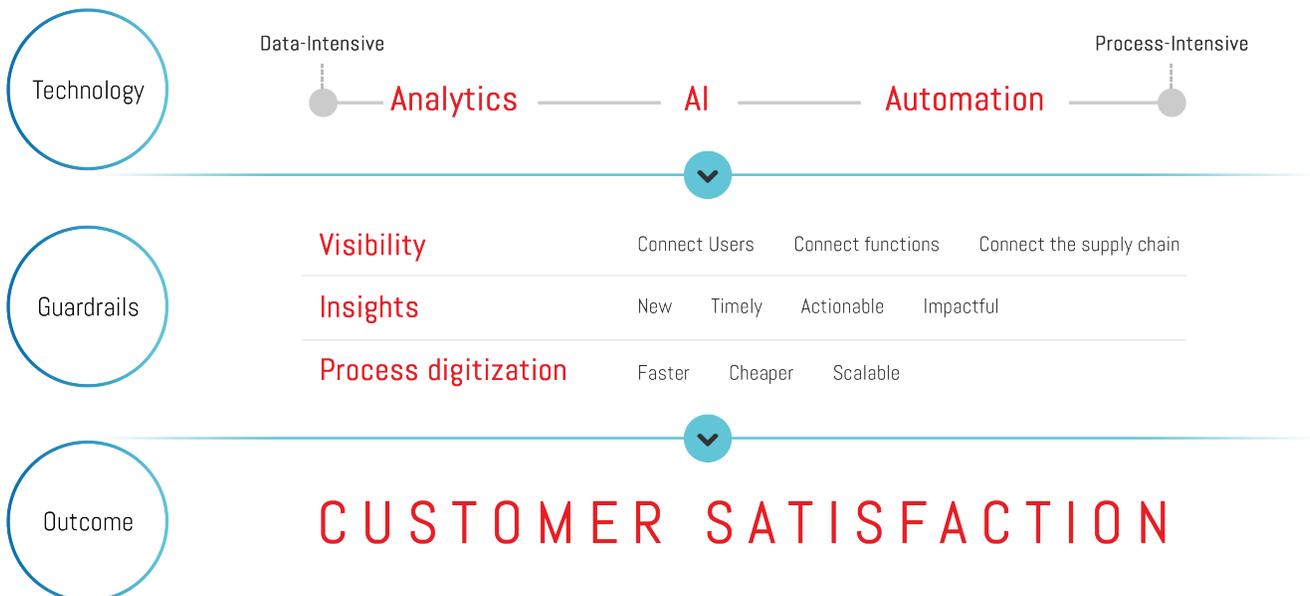
P

PROCESS DIGITIZATION:

There's a reason why the "4.0" concept is often associated with the "Digital Revolution". Digitizing processes favors data integrity and makes the storage, retrieval, transformation and dissemination of data through technology faster, cheaper and scalable. Not everything needs to be digitized on day one, but that's the journey's direction.

The Consolidated Model

Fig. 2: Model to guide the Transformation to Customer-focused Manufacturing

Technology	Data-Intensive			Process-Intensive
	Analytics	AI	Automation	

Guardrails				
Visibility	Connect Users	Connect functions	Connect the supply chain	
Insights	New	Timely	Actionable	Impactful
Process digitization	Faster	Cheaper	Scalable	

Outcome

CUSTOMER SATISFACTION

4. Beyond Manufacturing... a Cautionary Note

To conclude, it's important to remember that manufacturing is not independent of post-sales performance. To this effect, we'll highlight three areas that are tightly interconnected with manufacturing and that follow this paper's same thesis.

Warranty management as an enabler of customer satisfaction.

After manufactured goods are sold, the continued demand for these goods is largely influenced by the "field experience" of the customer installed base. This manifests itself both in repeat business and new customer potential mediated by reputation. The implications for manufacturing include both the production of spare components to meet service needs, and the prediction of future sales orders given current customer satisfaction.

Customer installed base as a driver for incremental revenue.

The best customer is the one you already have, as long as you keep them happy. This is especially true for luxury items where there's a status, or differentiated perception, associated to a brand. There's a large opportunity in proactively ensuring that existing customers drive on-going revenue through maintenance, accessories, upgrades and even new products. For manufacturing, incorporating these predictions into the production plans make a strong path for sustainability.

Service to Design data as an early feedback loop.

Given long supplier and production lead times, engineering and manufacturing need to get as much feedback, as early as possible, on the products' field performance. This helps to not only proactively manage customer issues, but also to quickly react to anticipated events ranging from defective batches of a specific supplier component to impractical manufacturing designs.

About Entercoms

We live today in a service-driven economy, where the customer's post-sales service experience is the key to customer retention and long-term customer value. But companies have historically underinvested in service supply chains. Entercoms helps its customers accelerate the transformation of their service supply chains through deep domain expertise and technology. Entercoms achieves this through a BPaaS engagement model that focuses on business outcomes at speed. Within 90 days of their engagement, Entercoms' clients see benefits in areas such as on-time delivery performance, asset uptime, spares inventory, forecast accuracy, field service technician utilization, remote diagnostics accuracy, and service revenue.

Key Services Offered

A true BPaaS company with offerings in the field of Service Supply Chain Planning, Supply Chain Execution, Diagnostics/Knowledge Management, Predictive Failure Analytics, Asset Recovery, Float Analytics, Fraud Identification, Customer/Install base analytics and Service Revenue Generation.

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