INNOVMETRIC

WHITE PAPER

The Roadmap to Digital Transformation of 3D Measurement

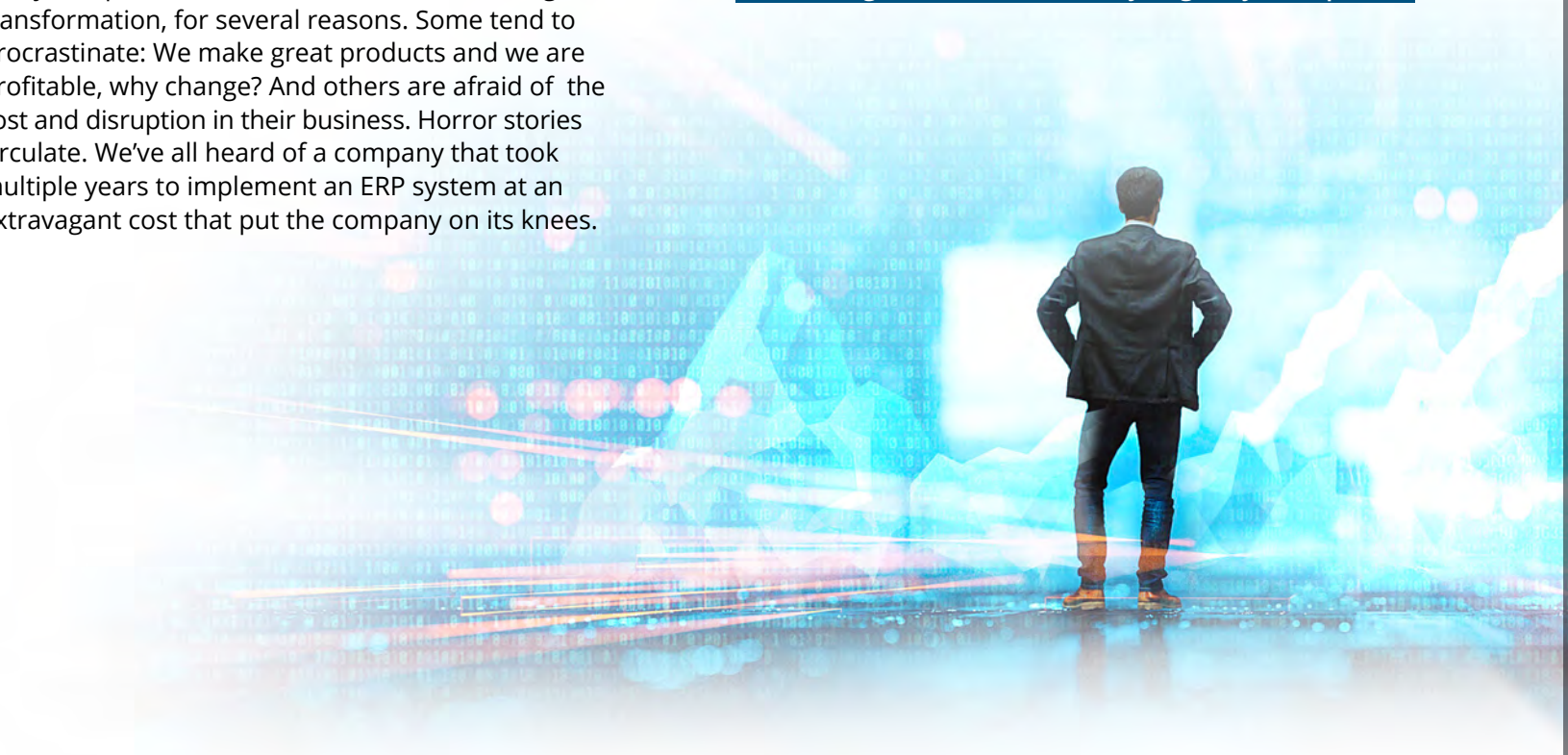
Digital Transformation (DX) is Needed More than Ever

Enterprises with strong digital skills have generally performed well during the pandemic, facilitating work from home, a trend that is here to stay. Digital platforms are a strategic component of today's manufacturing organizations that must compete in a global economy and are constantly looking for cost savings.

According to Forrester Consulting, "more than 90 percent of manufacturing leaders believe that DX is important for their success." Although the concept is appealing, many companies are hesitant of the move to digital transformation, for several reasons. Some tend to procrastinate: We make great products and we are profitable, why change? And others are afraid of the cost and disruption in their business. Horror stories circulate. We've all heard of a company that took multiple years to implement an ERP system at an extravagant cost that put the company on its knees.

You know what? These companies are RIGHT to be afraid of the digital transformation pitch they've heard. The vendors they meet try to sell them large systems that change all their processes and require an extensive amount of configuration. No wonder these projects exceed the anticipated costs and deadlines. They are just too BIG and too disruptive.

According to Gartner, "The transformation journey is taking large enterprises especially at least twice as long and costing twice as much as they originally anticipated."



Lessons Learned from Successful Digital Transformations

Fortunately, many companies have succeeded with digital transformation, without suffering. Here are the common elements of these successes: They resisted the temptation to implement a single global digital platform that would do everything. Despite its appeal, a single platform solution is generally not advisable because it can't beat the best-in-class specialized solutions. CRM systems are the best at managing customer accounts for sales and support. Microsoft's SharePoint offers a great data management solution for business documents. And PLM systems excel at managing product definition information. It would be impossible to find a single platform that would be more powerful than these three platforms combined.

Therefore, **companies should not look for a single solution that does it all, but carefully choose the right digital platform for each process and connect these platforms through hyperlinks to jump from one to the next when required.** Not only are multiple interconnected digital platforms capable of handling enterprisewide processes as efficiently as a single platform, but they are also easier to install and maintain, as their scope is narrower. This is a divide and conquer approach. **By breaking a BIG project into smaller ones, it becomes possible to implement each project at the right pace for the business** and with the best tools. The multiple platform approach is ideal to implement digital transformation gradually.

In companies that have succeeded with their digital transformation, project leaders got approval and support from all team members at every implementation step. There are just too many activities going on for an isolated task force to successfully control the implementation of a digital solution enterprisewide. All employees must participate. This means that employees must have enough time to master a new digital platform, to provide feedback to the implementation team, and make adjustments along the way. It also implies that the project implementation should not go too deep too quickly, without user comments influencing the implementation.

Finally, the businesses remained fully functional and profitable throughout the journey. **By implementing best-in-class solutions and planning a gradual implementation, there should be a significant return on investment after every phase.** This approach is the best way to ensure buy-in from all employees, upper management, and shareholders!

The Need to Digitally Transform 3D Measurement Processes

Of all manufacturing processes, measuring parts in 3D and sharing dimensional inspection results provides a compelling case for digital transformation. **Unlike the product definition process that has seen the rise of Product Data Management (PDM) systems to digitally manage CAD models and assemblies, 3D measurement processes have not significantly evolved in decades, relying on manual file exchange.**

Before the 2000s, parts were measured mostly with CMMs, and reports consisted of spreadsheets that experts used to analyze the deviations between the nominal and measured values. With the release of point cloud scanning technologies and 3D inspection software, inspection reports became more user friendly as they started to include color maps showing the deviations between a measured part and its CAD model as well as images representing the inspected dimensions rendered in 3D. Starting in 2005, inspection software vendors launched free 3D viewers to allow colleagues outside the measurement room to open 3D inspection projects and interpret results. Today, however, one thing has not changed. **Most of the files involved in 3D measurement, such as reports and 3D inspection projects, are still shared by manually copying them on network drives or on USB sticks.** Even when a data management system is used to ease the sharing process, large monolithic files that contain all of a part's measurement data are uploaded, making data transfers slow and inefficient.

The process of preparing inspection projects is also problematic. 3D measurement teams obtain the CAD models of inspected parts by manually exporting CAD data from the PDM or Product Lifecycle Management (PLM) system or asking colleagues from other departments to send them the data. Moreover, **the requirements needed to define the inspected geometry and controlled dimensions and tolerances are obtained by interpreting printed 2D drawings or importing CSV files exported from CAD software.** To complicate the process further, the person preparing an inspection project can never be sure that they received the latest version, often resulting in time-consuming back-and-forth exchanges with the product definition teams.

The chaotic integration of 3D measurements into enterprise processes is historical. 3D measurements used to be performed when the product was close to production. A waterfall approach, where product definition teams provide stable CAD models and dimensional requirements to the 3D measurement teams, made sense at that time. **But today, 3D measurement data produced by 3D scanning technologies is used in all phases of product development and manufacturing, including in the early prototyping stages, to accelerate time to market and reduce fabrication costs.** This huge expansion in the use of point cloud data has pushed the waterfall and file-based paradigms to their limits. If 3D measurement data could be managed through digital tools, in the same way PDM systems manage CAD data today, it would represent a huge step forward for manufacturers.

The Gradual Transformation Enabled by the PolyWorks® Digital Ecosystem

Since 1994, InnovMetric has been at the forefront of the point cloud revolution in manufacturing and has observed the growing complexity of its customers' processes. Its PolyWorks universal platform has revolutionized 3D metrology by eliminating the silos between portable and CMM metrology and raising the competence of operators. Even more importantly, the universal platform brings all 3D measurement data together to provide a single source of truth.

InnovMetric built its digital transformation technologies with this foundation. The company began with two major goals in mind:

- **Provide a modern data management solution for inspection files**
- **Integrate 3D measurement into digital product definition processes**

Most importantly, the key element of InnovMetric's digital transformation solution is its flexibility. Instead of offering a large monolithic platform that must be deployed all at once, InnovMetric has designed a modular digital ecosystem that can be implemented gradually, to let customers digitalize processes at their own pace. This helps employees embrace the change and minimizes the disruption of daily operations.

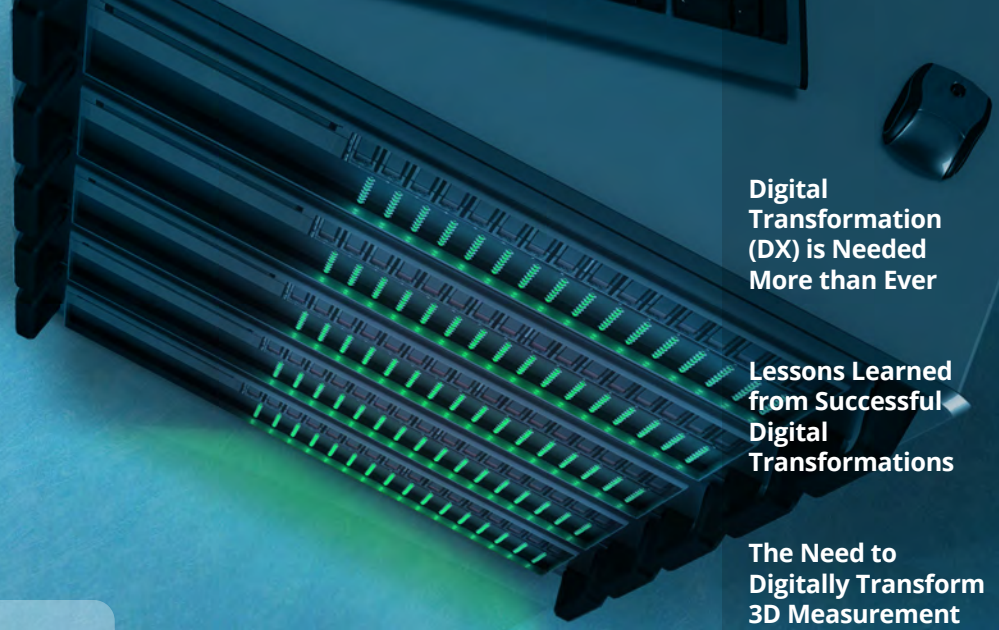
The InnovMetric Phases of Success

Consider the following roadmap that InnovMetric recommends to a typical manufacturer:

- **PHASE 1** Data management system deployment
- **PHASE 2** Web/mobile interface deployment
- **PHASE 3** Search engine performance optimization
- **PHASE 4** Web-based dashboard implementation
- **PHASE 5** Integration of 3rd party measurement data into PolyWorks|DataLoop™
- **PHASE 6** PolyWorks and PLM system digital connectivity
- **PHASE 7** Integration of 3D measurement requirements into product definition

PHASE 1

Data management system deployment



IMPLEMENTATION

- One week
- ☑ Requires Microsoft SQL Server 2017 or later

SCOPE

- → Configure Microsoft SQL Server for PolyWorks|DataLoop™ Core.
- → Use Active Directory to let PolyWorks users connect to PolyWorks|DataLoop using their network credentials.
- → Create two categories of users: one that can read/write data (3D measurement team) and one that can only read data (rest of the team).
- → Configure local PolyWorks|Inspector™ computers to connect to PolyWorks|DataLoop.
- → Provide training to PolyWorks users.

IMMEDIATE BENEFITS

- + All PolyWorks data managed by data management system.
- + Data easy to back up.
- + No more file browsing, operators can retrieve data using a search engine.
- + Optimal network traffic, quicker access to data for all PolyWorks users.

PHASE 2

Web/mobile interface deployment

IMPLEMENTATION

- One day
- ☑ Requires PHASE 1

SCOPE

- → Install PolyWorks|DataLoop Web/mobile server.
- → Provide server URLs to the teams.

IMMEDIATE BENEFITS

- + All users with read access can open inspection projects in 3D or inspection reports on a standard Web browser or phone.
- + Stable parametric URLs are available to share data through email.
- + Hyperlinks are available to connect PolyWorks|DataLoop to other solutions.
- + Discussion threads embedded within inspection projects allow teams to collaborate.

PHASE 3

Search engine performance optimization

IMPLEMENTATION

- Several weeks
- ☑ Requires PHASE 1

SCOPE

- → Identify key pieces of process information—i.e., metadata—for inspection projects and measured pieces such as part number, serial number, and operator name.
- → Program a limited number of possible values for selected metadata.
- → Inject this information as properties within inspection projects and measured pieces and index those properties in the database.

IMMEDIATE BENEFITS

- + Finding specific inspection projects is accelerated by filtering search results.
- + Root-cause analysis facilitated by the standardization of properties.

PHASE 4

Web-based dashboard implementation

IMPLEMENTATION

One day

☑ Requires PHASE 1
☑ Requires PHASE 2

SCOPE

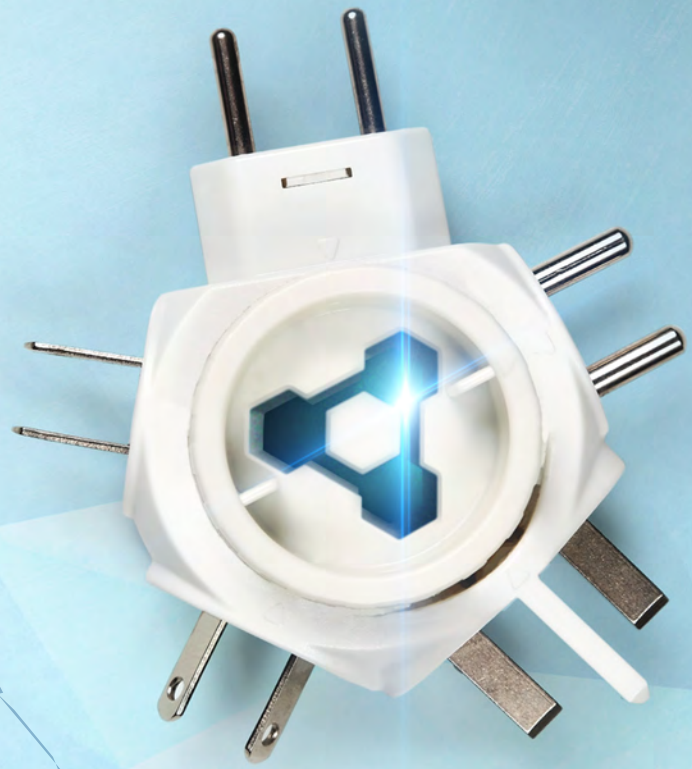
➔ Create first customized dashboard to monitor trends for a specific part in production.

IMMEDIATE BENEFITS

+ Real-time display of production data in a Web interface.
+ The capability of creating and sharing additional dashboards is mastered.

PHASE 5

Integration of 3rd party measurement data into PolyWorks|DataLoop



IMPLEMENTATION

- One week per type of 3rd party data
- ☑ Requires PHASE 1

SCOPE

- → Set up an import folder where 3rd party software and PolyWorks can exchange data.
- → Configure 3rd party measurement software to export data to that folder.
- → Configure PolyWorks to automatically import data from that folder and save an inspection project in PolyWorks|DataLoop

IMMEDIATE BENEFITS

- + All 3D measurement data from all software managed by PolyWorks|DataLoop.
- + All team members can review 3D measurement data and results from all types of measurement hardware using the web/mobile platforms.

PHASE 6

PolyWorks and PLM system digital connectivity

IMPLEMENTATION

One week

☑ Requires PHASE 1
☑ Requires PHASE 2

SCOPE

→ Link PolyWorks|DataLoop Core to the PLM.

→ Install a synchronization service on a server.

IMMEDIATE BENEFITS

+ PolyWorks users import the latest revision of the CAD models they need for inspection project preparation directly from the PLM system.

+ PLM users access 3D measurement data associated with CAD models with a single click.

PHASE 7

Integration of 3D measurement requirements into product definition

SCOPE

- → Install PolyWorks|PMI+Loop™ add-in within CAD system.
- → Train the design and manufacturing teams to use the Model-Based Definition (MBD) solution for 3D measurement planning.
- → Adjust product definition processes to optimize benefits resulting from new MBD technology.

IMPLEMENTATION

- Two months, for process adjustments
- ☑ Requires PHASE 1
- ☑ PHASE 2 recommended
- ☑ PHASE 6 preferable

IMMEDIATE BENEFITS

- + 3D control plans fully defined within CAD system.
- + Automated creation of measurement objects, dimensional requirements, and inspection reports in PolyWorks.
- + Uniform presentation of 3D control plans enterprisewide.
- + Single-click access to 3D measurement results from CAD software.
- + Faster design change cycles.

There are several remarkable aspects to the digital transformation roadmap proposed by InnovMetric for 3D measurement processes:

- After each phase, customer processes are fully functional, resulting in minimal disturbances in operations.
- Along the way, there are measurable outcomes and significant returns on investment.
- Five phases out of seven are performed within a week or less.
- Several phases are interchangeable. For example, phases 3 to 6 can be implemented in any order, as long as their prerequisites are met. This tells you a lot about the modular approach.
- Customers can pause between each phase to allow their teams to master the new tools and understand the impact. The implementation calendar is flexible and completely controlled by customers.
- It is even possible to insert new phases after PHASE 2 to prioritize other digital transformation projects. For example, a customer could wish to interconnect one of its existing digital solutions (ERP, MES, SPC) to the PolyWorks database.

After two years of launching its digital ecosystem, InnovMetric has observed that all its customers who embark on their digital transformation journey developed different roadmaps. Some customers are happy to use a data management system and only implemented Phase 1. Other customers have exploited the full potential of our solution and are close to implementing all seven phases. There is a common thread, however, between all these stories: all the digital transformation projects succeeded with substantial benefits.

The Key to Success: Gradual Transformation Controlled by Customers

InnovMetric's approach to digital transformation sets it apart :

The modular architecture allows customers to plan a gradual digital transformation with measurable benefits after each phase.

Teams have time between phases to acquire new digital skills and identify potential gains.

At any point along the roadmap, customers can either pause or insert a new phase to prioritize digitalization projects that bring additional benefits.

Another benefit of a gradual roadmap is that it can be reversed. If something goes wrong during a specific phase, the phase can be halted or even canceled, and the organization can return to the state it was in when the phase started. This means that the manufacturing organization is always in control. This kind of flexibility is nearly impossible with large transformation projects. Sometimes, the investments and efforts have been so large that managers cannot resolve themselves to take a huge step back, which may lead to transformation failures. Ultimately, planning for a gradual transformation is choosing to minimize the business risks.

PolyWorks is a specialized digital transformation solution that specifically addresses 3D measurement processes. But through this example, a universal conclusion emerged that manufacturers should keep in mind for all digital transformation initiatives: avoid the risks that come with large projects and prioritize digital transformation solutions that can be implemented gradually.

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For more information

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