Strategies for Successful Implementation of Industry 4.0 Solutions

If you've been tasked with enhancing asset performance using the latest digital technologies, then Orise can help you manage potential pitfalls and design/build a cost effective, practical, fit-for-purpose solution and guarantee solution' success.

Digitalization projects offer tremendous opportunities for supercharging enterprise productivity, and have the potential for significantly transforming a business, but projected benefits may not accrue if not done right. Following are some of the typical challenges that might be faced and examples of cases where Orise experienced and overcame such challenges. Orise can cut through buzzwords and technology confusion to plan and deliver practical fit-for-purpose solutions that provide the most bang for the buck. Orise provides this benefit by being flexible and technology neutral while providing a full range of services from pure consulting to full implementation of Industry 4.0 solutions.

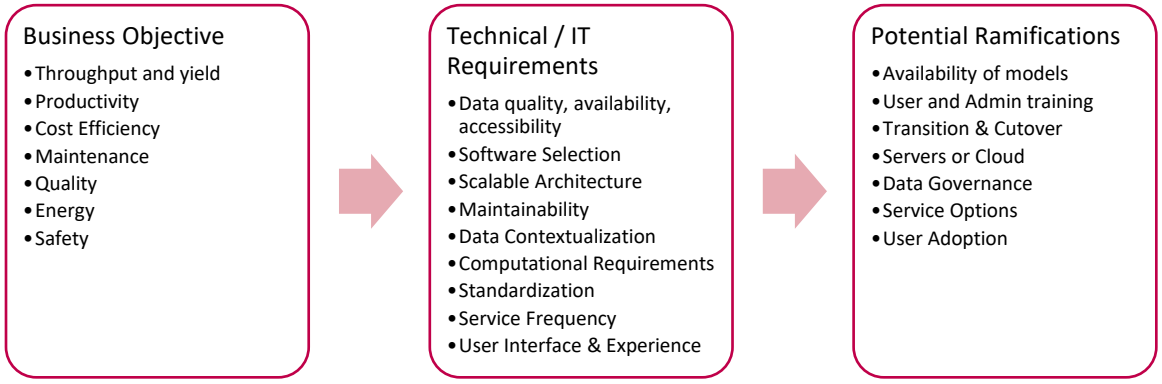
Orise has been providing industrial digitalization solutions and services to clients worldwide for over 20 years. Our project list currently exceeds 500 projects in 50 locations in 30 countries.

1. Translating Business Needs to IT requirements

Digitalization projects are about solving an urgent or chronic business problem. The problem could be as simple as fixing something not working (or not well enough), or upgrading legacy systems to the latest in hardware/software, or something more complex such as increasing transparency of business processes to enable quicker and more accurate decision making.

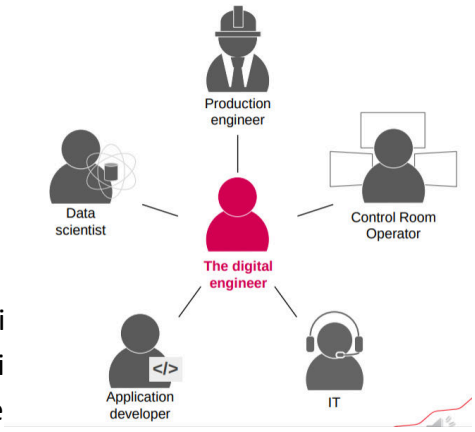
The first two problems have some challenges in terms of proper technology selection, but in general there will be several commercial solutions to choose from, and typically will not involve significant business transformation. The last problem however could involve a multilayered solution from smart sensors in the field (edge technology) to advanced data analytics to latest visualization tools in the corporate boardroom, as shown in the illustration above, which not only may be a challenge in terms of technology selection, but also technology integration and more importantly business transformation. Irrespective of the class of problem, a successful digitalization project requires the translation of the business problem into clear technical/IT requirements.

The figure below illustrates the range of issues and potential ramifications that have to be contented with in translating a business objective to clear technical/IT requirements, and thoroughly thought through:



It is Orise's experience that this step is sometimes not given enough priority. In some extreme cases, Orise has also observed a total breakdown of trust/communication between the business and IT departments.

The key methodology used by Orise to bridge this language gap is the utilization of a 'digitalization engineer' as illustrated in the attached diagram who has sufficient domain knowledge to understand the business needs and the technical expertise to translate them to clear technical/IT requirements. The result is that all stakeholders achieve a common understanding of what is needed. In Orise's experience, this allowed all parties to move forward and do their jobs to the best of their ability, includi Orise, and deliver a sustainable result that provided genui added value, leading to better adoption and very high e customer/corporate satisfaction.



2. Designing a solution where no standard solution exists

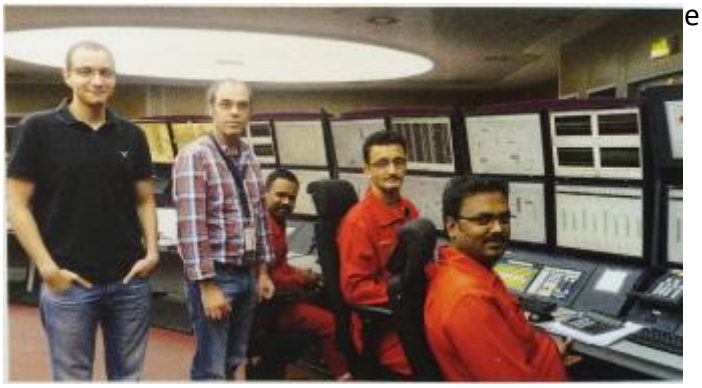
Another challenge often encountered is the absence of software or solution that is fit-for-purpose for the problem at hand. These are situations that Orise has often experienced, where its technology neutral position has greatly benefited its clients.

With Europe finding it difficult to cost-effectively compete with the rest of the world for the supply of standard chemicals, one of our clients – a large chemical company – had initiated a pivot towards producing higher value speciality chemicals. This meant moving from producing large volumes of one chemical to the production of multiple smaller batches. This move

presented the following immediate challenges: a) the management of quality for the many product lines, and minimizing variability between batches, b) step increase in the collection and analysis of data from a multitude of sensors and specialized equipment, c) need for a solution that could be rapidly implemented across multiple sites

With virtually no standard existing software able to cover the full range of the expected applications, Orise developed an architectural solution that divided the job into a series of smaller problems which could be handled by out-of-the-box solutions. The equipment problem was solved using a data modelling approach using equipment templates that was easy to implement and scale up (e.g. by using OSI PI Asset Framework). To scale up the data collection, Orise effectively applied local self powered smart sensors with 4G/5G communication, as one solution to bring in new data without the need for new wiring or cables.

The issue of quality and batch variability required a consultative approach to develop the solution. Orise first cross checked with the plant operators and got their input and



e on the jobs. Apart from being happy to be asked, this final piece of the jigsaw, combined with data, provided a fuller explanation for any performance variations. This enabled the development of data science models combining the insights from data with the operator's experience. These models could subsequently be brought online, leading to much better control over the operations, decrease of rejects and consistency of quality and batch times. The ultimate solution was applied across 50 plants across several physical locations.

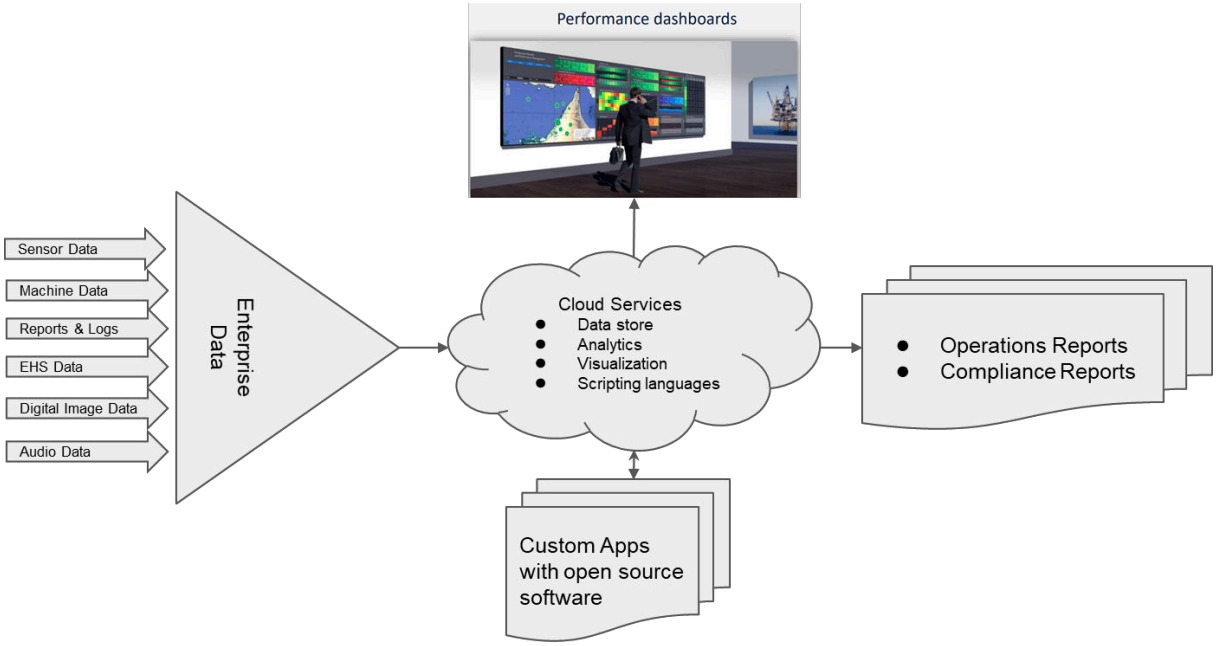
With its experience of the chemical industry and deep knowledge of digital technologies, Orise was not only able to imagine the strategic direction and deliver the technical solution; it was also able to deliver better performance from the plants … leading to happy factories and a happy corporate customer as well.

3. Harnessing the Cloud, the New Frontier in Industrial Digitalization

Digitalization initiatives are often just automation projects involving the implementation of data historians (such as OSI PI) or Process Information Management Systems (PIMS) or performance dashboards. These systems allow for more in-depth and efficient operations monitoring and provide increased agility for decision making. However, with the advent of the cloud and availability of robust and advanced open source analytical tools, digitalization

can provide another dimension, i.e. **a platform of deep learning and continuous innovation**, without a heavy price tag for additional hardware or software. Cloud based digital transformation takes you beyond IT to true digital empowerment of the workforce. A conceptual idea for a **Process Innovation System** (PIS) on the Cloud is provided in the illustration below. It is especially applicable to small to medium scale companies who may not have big IT departments or budgets but have even more need to be nimble to stay

competitive.



FIGUUR 1 ARCHITECTURE FOR A PROCESS INNOVATION SYSTEM (PIS) ON THE CLOUD

The specific benefits of a PIS are:

1. Multiple data sources can be easily combined - numeric, textual, digital image, etc by providing a gateway to cloud environment such as Azure
2. Quick prototyping of new ideas by the use of scripting languages such as Python and/or other open source apps readily available on the cloud as plug 'n play services - provides freedom and adaptability to quickly create business specific analytics on demand
3. Quickly leverage managed services allowing for much faster delivery - no need to buy individual niche pieces of software, no need to involve IT organizations, etc

Orise has provided several such systems to specialty chemicals manufacturers in Europe and has therefore unique experience in this area. Following are some key benefits observed or acknowledged by the customers:

- Quicker application development without reliance on expensive software suites
- Faster project delivery (in weeks) compared to standard MES implementations

- Significant reduction in quality variations and decreased production losses leading to significant increases in OEE
- Higher revenues combined with better business agility to respond to market demands for alternate chemicals

4. Building and Scaling Challenges for AI based models

AI, Neural Networks, Deep Learning are mostly synonymous techniques that provide the bedrock of analytical reasoning in the Cloud. However success in such modeling initiatives are often hampered by two issues:

a. Data complexity - this can lead to onerously long training durations to obtain the required level of accuracy. Thus is it necessary to reduce data complexity.

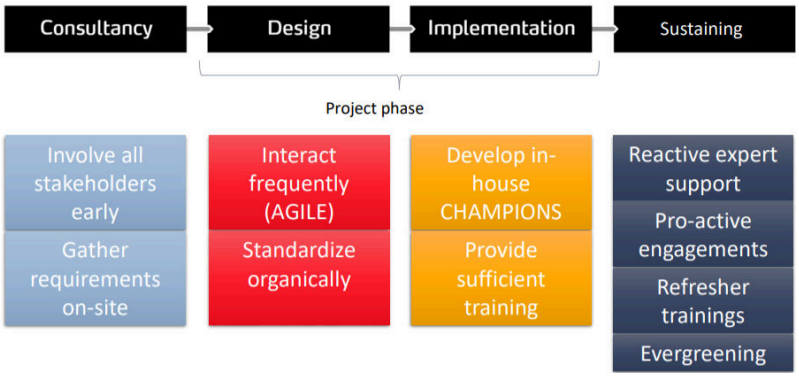
b. Model complexity - sometimes the urge is to try to cast too wide a net as 'machine learning' can do everything!! However, as found in the early days of AI, best success is attained only when problem domains are chosen narrowly.

Some of Orise's data driven solutions included providing heat-exchanger fouling monitoring and optimization, melt flow index real-time evaluation for extrusion process, soft sensors for optimal start-up of major exchanger, etc. Domain knowledge is the key strength employed by Orise to ensure data and model complexities are easily overcome and that the developed models are robust and problem specific, and that they can be easily leveraged across industries.

5. Summary

Orise is an industrial digitalization company, with a wealth of experience in the process industry, providing a full range of services in the digital transformation space, from project definition to technical design to physical implementation to life cycle support. The figure below captures the Orise mantras for successful industrial digitalization projects:

The end-to-end delivery – do's and don't



Due to our laser focus on process industry, and our technology agnostic position, we can design a solution best fit for your needs, be it a local point solution or a fully integrated implementation in the Cloud.

Orise is ready to be your partner for Industry 4.0 projects.