

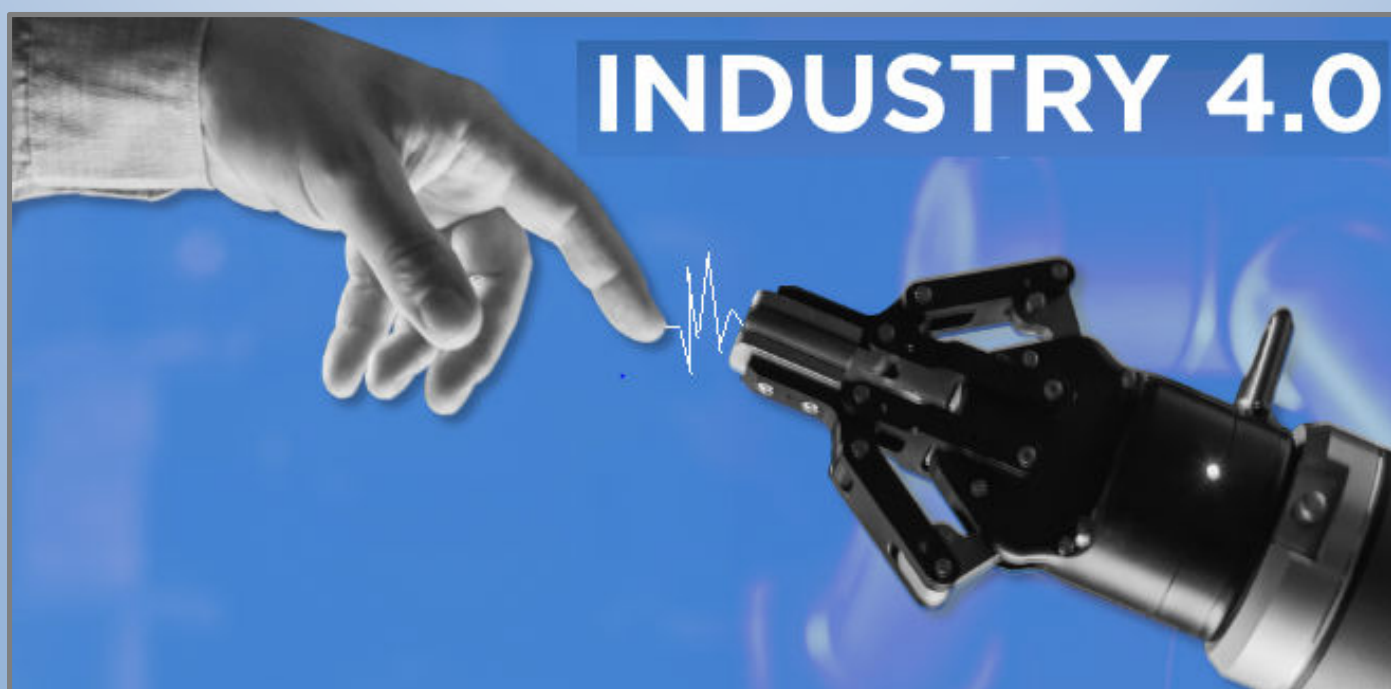
ACFA7004 International Innovation Management

Assignment - Research Methods and Professional Development

Research Proposal

STRATEGIC ALIGNMENT AND
COMMONISATION WITH RESPECT
TO DATA GATHERING, SHARING,
REPORTING AND PROCEDURES
WITHIN A MULTINATIONAL
MANUFACTURING ORGANISATION
ACROSS SITES IN THE UK, POLAND
AND MOROCCO

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1:1 Introduction –

With many Small and Medium Enterprises (SMEs) being part of a connective supply chain to other SMEs and OEMs, the implementation of the key building blocks of Industry 4.0 can be better achieved through improvements in the way data is captured, manipulated, shared, reported, stored, and understood.

This in turn will assist in the improvement in seamless production and movement of products, as well as the transfer of related data and information.

As some OEMs are now insisting on a connective supply and logistics capability to achieve visibility from their direct suppliers to protect their own manufacturing processes from disruption and avoid any costly delays, the quality and accuracy of the data gathered must be of both good quality and accuracy.

As technology becomes more accessible, this connectivity will likely become more commonplace. The connection through Information Technology and the manufacturing processes will ensure that information is shared in real time and corrective actions made.

In a business that has production sites in several countries on several continents this can be utilised to share business related data and information to support reporting of all required criteria that require feedback.

With all SMEs being increasingly squeezed to improve performance and productivity in the face of increased costs across many levels there is a great drive to increase efficiencies including data management.

The way data is shared between different departments or sites, as data sharing could promote the interconnection of information, strengthen relationships between departments and sites, promote knowledge transfer, optimise the allocation of resources, and contribute to the nurturing of innovation.

The business value of commonisation and re-use is driven in some ways by the systemic approaches made possible by integration across design, engineering and database capabilities in modern PLM (Product Lifecycle Management) solutions.

With origins in CAD (computer aided design) and CAM (computer aided manufacturing), these integrated technologies can also permit the ability to re-utilise parts, manufacturing processes and also sharing and re-using the rules, guidelines and procedures that define engineering knowledge.

This would be more easily be achieved through the Strategic alignment and commonisation with respect to data gathering, sharing, reporting and procedures.

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Factors that would benefit from this strategic alignment with accurate data gathering and understanding include:

Time Saving - through the shared interaction of all sites sharing the same methods for data recording, reporting and sharing.

Reduction in time to market for both 'Made To Print' and 'Design and Development' projects - which leads to quicker approvals and payments

Universal understanding of terminologies - through a recognised structure of product recognition strategy

A reduction in data handling - through the utilisation of shared templates and structures for referencing data within the recording and reporting streams.

The above would assist with:

Increased visibility of all criteria recorded

Early visibility to foresee planning on demand - through the Interaction with a manufacturing chain ensures full visibility across the entire supply stream.

Capacity monitoring affecting availability

Component logistics (on time/budget)

Component delivery timing and complexity - with *Engineer to order (ETO)* and *Just in time (JIT)*

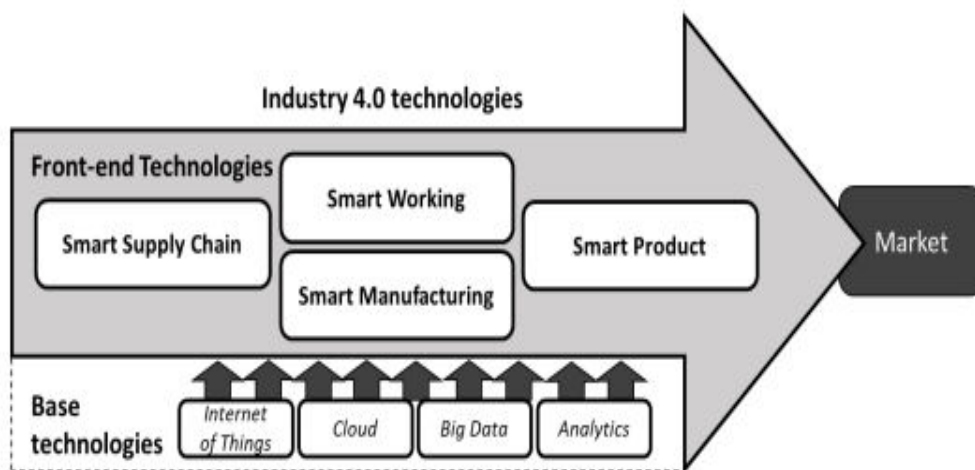
Planning to avoid chokepoints/capacity issues - Foreseeing the Bulk buying of components and raw materials to avoid supply issues and price fluctuations.

Visibility on how change could affect multiple projects

Manufacturing Efficiency – through *Batching, sequencing, integrated scheduling, maintenance, managing resources etc.*

Dynamic planning - *Expecting the unexpected.*

Dynamic reporting – minimal handling, interpretation and manipulation of data already gathered



In addition to the good acquisition of data, its' quality and ease in understanding would assist in the reporting of many related activities - a clear process to ensure data clean up and correct input going forward would be desired

Teams within the parent (and possibly sister sites) require data sets collected from across the group to facilitate various exercises, ranging from establishing new products and processes, costing analysis, price increase analysis, monthly sales reports, tool condition reports and numerous other ad hoc exercises.

Through research and investigation into how cross group data is referred to and reported it would indicate if the group is hampered in this work by the issue of data quality across systems such as ERP systems.

Data quality is definitely not what you would call a 'sexy subject', but it is one which if found to be lacking in quality would need to be addressed if a business wants to ensure a more robust, data driven decision making process as desired in Industry 4.0.

So,

What would gain from strategic alignment & what commonality and data methods could assist

Traceability (with examples of more accurate data descriptions)

- Common Identification and traceability of raw materials across all sites
Compound Type, Hardness, colour, particle content, supplied form
- Common Identification and traceability of bought in and child parts across all sites
Material, Type of part, dimensions, where used
- Common Identification and traceability of final products across all sites
Type, part number, use.
- Common Identification and traceability of tooling inventories and ancillaries across all sites
Recognised group tool numbers
- Common Identification and traceability of plant inventories across all sites
Machine numbers and ancillary plant references

Reporting

- Common templates for the reporting of manufacturing sales information across all sites
- Common templates for the reporting of manufacturing performance information across all sites
- Common templates for the reporting and sharing of process information and settings across all sites

New Product Introduction and Management

- Good part data for both the quotation of new work arising and utilising what parts are already produced or procured for re-use.
- Well defined and robust design rules across the majority of product types creating a family of similar designs which require minimal change to be offered elsewhere.
- Well defined and robust tool design rules with layouts pre-determined from experience with similar parts and layouts
- Common Process Flow reporting templates across all sites
- Common Failure Mode and Effect Analyses reporting templates across all sites
- Common Control Plan reporting templates across all sites
- Common Capacity reporting templates across all sites
- Common Work Instruction templates across all sites
- Common Capability Study and R&R reporting templates across all sites
- Common Test Report templates across all sites
- Common Part Submission Warrant templates across all sites

Downstream advantages from NPI improvements in commonisation would be

- achieve more from every operator/engineer through time saving on many levels
- less investment required in production equipment and tooling.
- obtain every possible price advantage on purchased materials and components

Commonisation can also be carried further over through the revised design principles to target a more niche collection of materials to be considered and used which could encourage cheaper materials to be utilised and also recyclability across the parts range and group as a whole.

The commonisation can promote other savings such as saving on refining a process to improve productivity, less production time and plant use and the associated energy usage, the storage space of multiple material compounds, scrap movements and related disposal costs and a reduction in material expenditure.

1:2 Challenges

‘When a vision is clear, consistently articulated and widely shared, decisions throughout the organisation can be made in a more consistent and directed way’ (Dr. Edmond Harty from an interview conducted with Dr. Claire McBride 2016)

Some of the issues affected by poor data and management are shown below:

- Terminologies – descriptions of defects, parts, downtime faults, machinery, sites etc.
- Formatting
- Storage location
- Accessibility
- Articulation as a company-wide commitment
- A lack of ownership by senior leaders
- National or cultural specifics
- The company leadership expects a pay-off sooner than is realistic.

If addressed, these all would greatly improve efficiency in many areas.

Those implementing data improvements must potentially overcome resistance in the embracing of the message that there could be a ‘better way to do what they already do’. Any perceived barriers need to be broken down.

The vision would have to be shared throughout the business and embraced by the entire team.

Time should be put aside for research/analyse the data gathered/to keep abreast of the latest technologies and if further resources/staff were needed, they should be acquired.

A unilateral dictated approach to the commonisation might not be favourable to achieve the required buy-in across departments and sites but a logical assessment of the already-used methods used by each site might indicate a mix of these to provide a better solution.

Communication of the principles advised along with the edict of the "mutual ownership of problems" (*genchi genbutsu*), solving problems at the source instead of remotely from behind a desk, and the "*kaizen mind*", (an unending drive to improve)

An individual or group could propose the potential company wide transformation of organisational practices to encourage or facilitate the way data is handled and assist with the implementation of Industry 4.0.

The Company Directors would have the ultimate decision on whether to approve the commonisation and release funds, approving resource availability with the advice that ‘not everything has to be

done at once', with a long-term strategy being applied, thus allowing for other provision to be catered for until a time when finances would allow a more swift change.

The Management then have the job of promoting the ethos and passing this on to the workforce who, in turn, need to embrace it and show their commitment.

The multi layered implementation leadership team should have the knowledge to gather the far-reaching data required, perform any background checks and studies, formulate the plan for the introducing, implementing and the maintaining of the process overall.

Research into and analysis of the current capabilities of the company would maintain focus. From the results of the research, a gap analysis would highlight the areas that require the improvement.

Finally, a process flow mapping out the process and the development plan to introduce the changes necessary would be devised and a robust implementation schedule shared.

The timing plan to investigate the presently used processes, feedback and then implement the new process with allocated responsibilities should be devised to structure the activities.

The cost of developing and implementing the new/revised digital reporting infrastructure, could be an initial problem, but the benefits through quicker processes and reporting would rapidly become apparent.

Resource – The right people who must be flexible in committing to the new practices, learning new skills and understand the benefits without dismissing them. All staff should be empowered to use computers and other devices to access and report production data, quality data, breakdowns, repairs, maintenance data and access real-time SPC programs.

Enterprise Resource Planning (ERP) and Enterprise Asset Management (EAM) systems may contain part and tooling databases that would support a basic commonisation and re-use initiative but the data input to these systems must be relevant, complete and correct.

The aim of structured databases, such as an 'archetype', is to capture, in a re-usable format, abstract, higher level information data such as stakeholder know-how about the information, engineering process steps and related actions required to design, develop and introduce a product reliably with the minimum effort.

This can involve the attributes and know-how relating to given internal and customer requirements, layout, detail of geometry, product design levels, performance, the manufacturing processes, embedded software, regulatory compliance etc.

In many ways, the 'archetype' could be utilised as the recipe to creating future good products and retain the knowledge and guidance showing the process of costing and creating the end-to-end product and process specification. But again, this information needs to be relevant, complete and correct.

Manufacturing digitisation may be associated with potential unemployment amongst those of lower skills in the workforce. However, manufacturing firms with an ambition of digitalisation should be prepared to be steer staff along a path that would protect the sustainability of economic, social and environmental concerns alike.

A structured study into National and Cultural differences would be researched and prepared so that any changes and terminology would be sympathetic to the language used by the sites outside of the UK.

Many resources (Banks, DTI, United Nations etc.) are available plus the option of interviews and questionnaires being distributed within the company mail circulation for views, guidance and feedback from a broad spectrum of people the changes could affect..

Limited interaction and communication between groups due to a busy working environment can promote an increase in the volume of designs, concepts, parts and processes.

Pressures of time and resource can dictate that a proportion of decisions are made on the basis of immediate, local issues and the dreaded 'end of desk meeting'.

Often individuals from any level from shop floor to the boardroom can identifying ways to improve quality, costs and timescales and on many occasions it is quite commonplace for individuals at all levels to develop better ways of doing things.

What is much more difficult is the capturing of this knowledge of a better approach and make it accessible to other people.

The widely accepted objective to share know-how create and use re-usable assets, modules, components and processes, is too difficult and gets side-lined.

Skills

Knowledge and expertise are key to success in any given discipline.

'The more we know about something, the more we can take calculated decisions about whether or not to proceed. And in a competitive environment this places a premium on getting hold of knowledge as early as possible.' (Tidd & Beasant)

– The skills within the current workforce should be assessed and addressed in several ways:

If suitable candidates are identified within the company and share the cognitive skills and commitment to progress, they should be trained as necessary.

Training in the acquisition, recording and reporting of good data, along with the necessary digital skills.

The way in which the data gathered is communicated should also be considered.

It doesn't have to be large sets of data items, easily understood graphs and charts could be utilised.

Templates for these graphical representations and charts should also be considered across a group to commonise the representations shared with training given to manipulate the data to populate the data strings given to all who should be sharing such information.

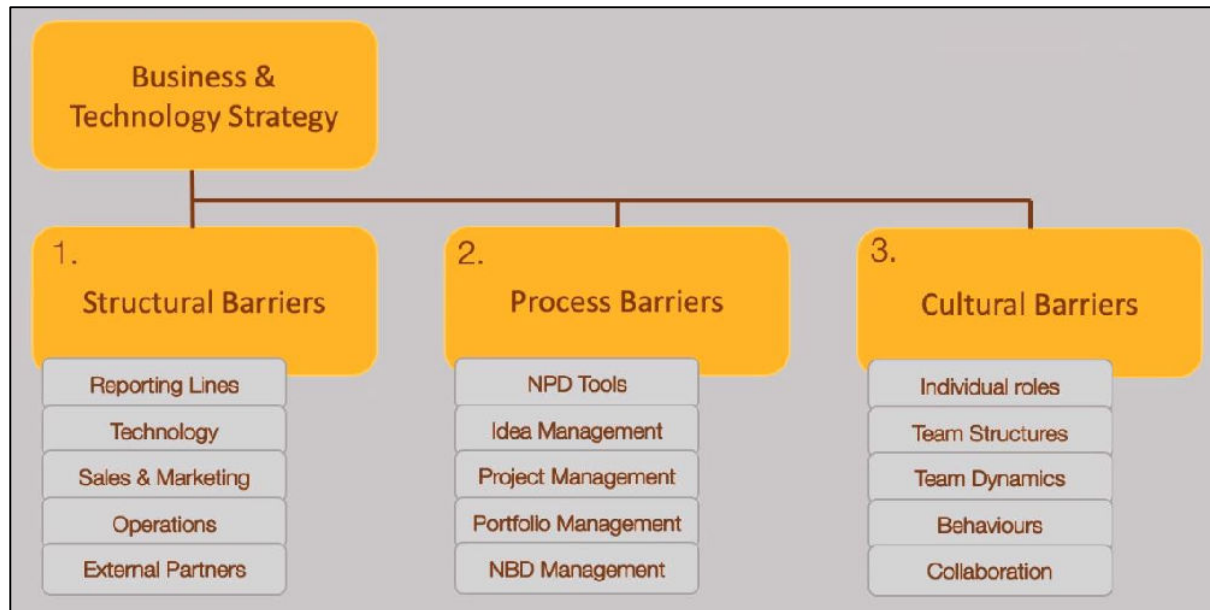
Training many people might assist to share the vision for colleagues to see the bigger picture of how good information can assist many departments and not be blinkered by site or departmental divisions.

Following assessment, the manufacturing structure may require to be enhanced through the recruitment of some key individuals who would possess experience in the areas where the necessary skills might be lacking.

The development of a data-based and digital performance culture and the corresponding skills set is key to the successful implementation of Industry 4.0.

The SME should become a *"Technology-led company"* (Roper, 2016)

Technology solely is not enough to bring about change – data and communication of it through utilisation of technology would improve the whole process, empowering staff to improve, with greater customer satisfaction and a reduction in costs.



Connectivity (External) – A reliable High-speed internet connection (and a backup connection strategy) would be essential.

Supplier Integration Software / Hardware and or purchase of OEM-led control and monitoring software solutions such as SAP could be a stumbling block because of restrictive purchase / set up costs or subscriptions for their use but good practice in the gathering and use of data would be good preparation for further expansion.

Data Storage and access - Cloud storage could also be utilised if available to quickly share data.

Access to databases, cloud share points would be required to be shared across the entire group to eliminate the need for requesting data, reports and information held on a server at another particular site.

There could be other priorities for Capital Expenditure – There will always be something else that may require capital expenditure before something else, the Directors must embrace the commitment to deliver the future, evaluating what would reap the larger dividends and rewards and future proofing the company.

KPI targets, together with the data from the monitoring of the process and sub-processes would provide the required evidential proof that the implementation of Industry 4.0 was required in the first instance and in time successful in order to justify the initial and further investment through the gains achieved.

1.3 Conclusions

Brexit, COVID 19 and now the cost of living crisis on the back of the issues related to the Russian invasion of Ukraine, have radically affected many industries and manufacturing in particular the further tightening of already stretched budgets that would otherwise be available for improvements.

Reporting, planning and contingencies have come to the fore. Whether it be monitoring exchange rates for international trade, fuel and raw material prices spiralling or more red tape applied in the movement of resources across borders, resources have been stretched, in many cases like never before.

The focus should be on the culture change, respect for people and consideration made to their input/suggestions and the skills change management.

A measure of the company's success could be measured not only in the growth in sales, but also the number of innovations that the company grows through its culture. (Goffin & Mitchell)

At the beginning, the technology led content side of the transformation into Industry 4.0 is not the main driver, the development of a data based, and digital performance culture along with the corresponding skills set within the organisation is.

Not having a level of standardisation across a group of sites within a company can make group analyses laborious and time consuming and can take a lot of time away from value adding activities. Reporting analyses can take many more hours than they should and a big part of the reason for this would likely be related to data quality which has meant that cross checking of information has been very manual.

Time spent doing this non value additional work also means less time spent on tasks which truly add value in a function such as work related interaction and discussion with both colleagues and customers and the manipulation and analysing of data to help make more informed decisions.

Outcomes and Benefits of good data quality and reporting include:

- Standardised data across the group
- Fewer errors
- Less time devising reporting methods and forms at any particular site when something may already used within the group
- Less time wasted searching for information

- Less time wasted cleaning up data in order to create meaningful analyses
- More robust analyses → multiple data sets can be quickly and easily manipulated if there is a common denominator across all reports
- Better data = better decision making
- Cleaner data ready for a potential switch to SAP in the future

Many would agree that having a data quality improvement drive would be of benefit.

This should be in cooperation with the Directors and key functional heads across all sites to define the key data required as a first step then, in conjunction with Lean manufacturing principles and Six Sigma targets, standardisation and commonisation can be introduced.

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