

Engineering Report

INNOVATION IN RELATION TO BEST PRACTICES

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Date *27 May 2022*

1. Introduction

This report will analyze the innovation process of a manufacturing company in South Wales through a case study.

The improvement of products or services, and the different processes used for their creation and distribution, is what is called the innovation process, .

The implementation of the new PLM (Product Lifecycle Management) system will be analyzed, where the company wants to replace the previous one due to the great limitations it has when using it for digital transformation. This new process will allow product information and 3D models to be used as the center of the development process, and will also allow the connection of product information and standards used from this branch in Wales with the rest of the group in other countries.

2. Case Study

This is the case study for a large-size manufacturing and engineering company based in South Wales, where this is one of the different branches from a big group of companies. The company has around 600 employees, and produces high-value components for the aerospace industry.

To achieve the final product, this company works with different manufacturing processes like, machined and vacform parts, sheet metal, composites, and additive manufacturing. On the other hand, the engineering side has multiple departments like, design, electrical, stress, flammability, certification, manufacturing, Bom and Document control, project management, etc.

As can be seen, this company has lots of departments and consequently many different processes and documents that need to be shared and accessible for everyone at any time. Furthermore, they did not want only to be connected between their different departments into the company, they wanted to be synchronised and unify processes with several companies within the Group. Using the Industry 4.0 technologies, this company is leaving a huge digital transformation, but this scenario will focus on the process innovation used in the Product Lifecycle Management 4.0 (PLM 4.0).

Convergence project is the name of this new PLM process innovation, whose main objective is to put the product at the center of the Model Based Engineering System:

- Manage Bill of Materials (BoM)
- Manage product variants
- Manage product configurations

Until the introduction of this new process, the PLM software was used only to manage 3D models, 2D drawings and the bill of materials, and everything else into the product lifecycle was managed by documents.

This new process was introduced 30 months ago, directly into two live programs, because the company is looking for a drastic change from a product driven by documents to a product driven by part numbers.

3. What was the principal driver(s) for this innovation?

Improve the performance of, confidence, and customer satisfaction with:

- operational culture around common and lasting standards
- Part of the harmonisation of processes
- Harmonising and simplifying the Product cycle process

Technology advances were another driver, because there was a necessity of keeping all branches connected and commonly using the technical resources dedicated to the materials and processes involved throughout the product cycle (Research & Technology, Development, production engineering, and in-service support).

The information is key for the good performance of any company (Trott pag 378), and the difficulties or slow process to get access to all this information by different departments, it was an issue for this company.

It is important to understand that the company was using its PLM software only to manage the 3D models, drawings and bill of materials, and the other processes like, paints, finishes, and

manufacturing BOM, etc, where managed through documents in folders. This would be a huge stopper to keep pushing the business to use the product data as the center of the model based engineering (*strategic intent*).

4. Barriers and risks faced by the company in developing this innovation

There were identified different barriers during this innovation development like:

Lack of a shared vision, purpose or strategy; the innovation idea is the base to start an uncertain long road trip in terms of strategy implementation, but this does not mean that is all what is required to reach the end of the journey safely. Equally important are those elements selected to do this trip, which are sharing the vision and purpose, and a bright perception of direction, (Bessant pag 27). This company had the idea and knew where to go, but did not share the vision or focus other teams in a proper way. Due to this lack of communication, there has been a huge rejection from different departments and employees to this innovation, and this is mainly because they can not see where the company wants to arrive by doing this implementation. This discomfort has been one of the reasons why more than five senior engineers and other designers have left the company in the last year.

Lack of time and staff; this particular branch in South Wales was experiencing a crucial period, because it did not have enough employees in the design office to deal with two new projects at the same time when these changes started. For this reason another company into the same group based in India was used to support the team. These two circumstances made a good combination

to delay the projects and put on the table the lack of time too. (Ref 91) shows that around 82 per cent of people believe that the lack of time is the bigger blocker to stop innovation into the companies. In this scenario the innovation did not stop, but the employees started to work under high pressure, because they were not achieving the timelines and consequently, the reactions against the new process began to emerge.

Lack of ownership by senior leaders; in the same way the seniors and team leaders were affected by this lack of time since they were responsables to give results, and they put themselves on the same level as the other employees criticizing and blaming the new process. Although this was true, the negative reaction of those seniors was because they were not involved in details, or they were not presented with the general idea of what the company wanted to achieve, and where they wanted to go with this implementation. This is why it is so important to know how to sell the idea in the right way at the different levels in the company's structure.

Equally important were the two main risks found here. First, the implementation of this innovation during the highest risk and complex first class customer program, and second, this implementation was during the lockdown Covid-19 situation.

This epidemiological catastrophe stopped the world economy, and changed the way of living and working for the majority of the population. Consequently, all engineering departments had to work from home for a notable period. It is apparent that this new situation affected this new innovation process, since this working from home and the pandemic introduced more negative factors like, social isolation, mental health, psychological distress and depression from the health and safety side, (Ref 92).

5. The key determinants in the process of committing to develop the innovation

- New servers were required to connect the convergence system.
- Specific training for the new PLM system to all users was required.
- Increase the network and intranet (Core server platform).
- IT security requirements, as part of the Cybersecurity project, they had to implement security updates to the core server platform and the individual users. An example of these individual restrictions was the use of only one internet browser to allow IT having better control, and reduce security risks. Furthermore, a new authenticator system for employees working outside from offices or using phones and laptops, was implemented to control the access to the network.

6. The processes and technologies which the company used to carry this development forward

- Big data & analytics (Data 4.0)
- Data management is responsible to provide the right data to the right person with the appropriate access. Into the PLM system this controls how the data is collected, stored, computed, and published or visualised.
- internet of things & the cloud.
- There was a full collaboration between different teams into the group, but IT and PLM departments were the most involved to carry out this innovation.

7. How management overview of the development was maintained

This innovation process has been an element of the company strategy to its digital transformation of the development process. This new PLM system is the base to get a digital development process like:

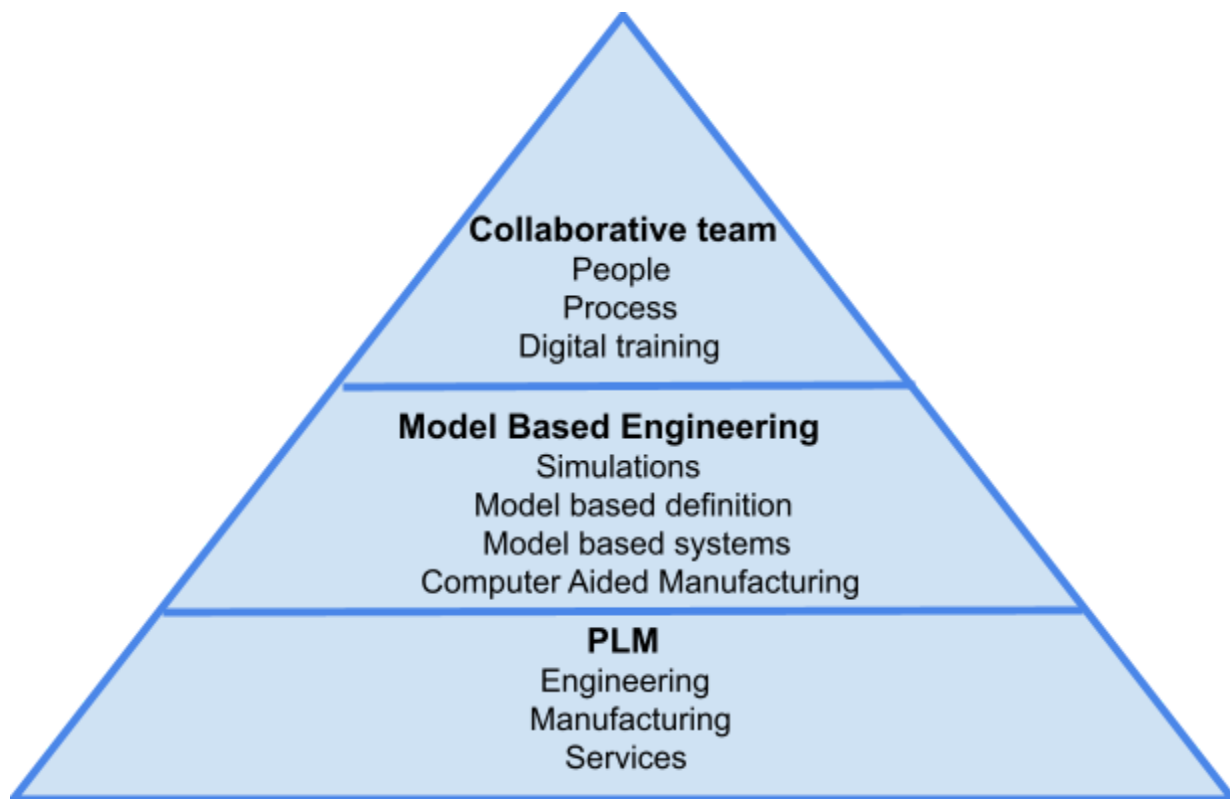


Figure 1. Development Process

Although this new PLM system will not be the final solution because since a year ago, the company has been working on a new platform with improved processes. It can be seen that it has been a great leap for the company within the strategy of achieving the digital transformation.

8. The extent to which you feel this innovation process represents best practice

The main branch of this company is based in France and has a long background from an innovation point of view. They have been in the 'Top 100 Global Innovators', (Ref 93), and although it has many innovative products, it is best known for being a solution finder.

In the same way, it can be said that although they have a lot of experience, many aspects of improvement can still be seen, such as:

- The lack of communication from the directors with the team leaders
- The lack of ownership of the team leaders as a consequence of not having the same vision
- The management of the strategy only based on the stipulated times, making this a linear process where there is no room for maneuver, (Bessant pag 36)
- The separation of production from the integration of the innovation process, (Trott pag 118-120).

9. Own critique of the whole innovation process, and evaluation of the success of your chosen innovation

In this report has been analysed the process innovation implemented in the engineering department of this manufacturing company based in South Wales. Unfortunately, we do not have all the data or information necessary to make a more detailed assessment, but certain aspects shown with the presentation of the case can be evaluated.

It has been shown that the company had done a good job in finding what they wanted to improve and where they wanted to go with the implementation of this process. It can be understood that

this clarity of objectives has led to a linear strategy, where they have not left any room for changes in direction, form or time. (Trott pag 128) states that innovation is not a linear process, rather it is a cycle of steps where coordination must be carried out with a special individual management, where changes in space and time can be managed.

To eliminate the rigidity of this process, it is very important to have the different levels of employees connected with the idea and the purpose that they want to achieve. The surveillance and control of an innovation strategy should not only be the responsibility of senior managers, because they would only be looking at it from one point of view, when they could have many others (under certain parameters) to introduce the flexibility sought, improve and learn along the way, and find other options to improve the dynamism of the process, (Trot pag 130).

Innovation processes depend a lot on the size of the company and the structural type of the organization. Due to the circumstances, in this report there is a lot of lack of evidence and information, but it can be understood that the lack of communication from the directors and the failure to prepare the seniors and team leaders, have been fundamental to create disagreement and a bad work environment that even caused the departure of many employees during the last year.

It cannot be said that it has been a successful process in all aspects, due to the many bad consequences exposed and because the company stopped the improvements or the further development of the implemented PLM system after its first year, and began to develop a new system with many improvements. Also, this is innovation and the company has reached lots of aims that have helped it to learn and continue to improve, and to use this system as a basis for developing many other processes.

10. Conclusion

It can be argued that although the implemented PLM is not a long-term solution, and there have been many losses of time and money, barriers and risks during the process, the company has achieved many proposed objectives, and has allowed the development of others.

Research and innovation processes must be present in all manufacturing companies if they want to survive and remain competitive in this industrial revolution 4.0.

It is very important to separate the production or services of the company, with the innovation processes that are being evaluated or implemented to reduce a large number of unnecessary risks.

The results of this report would be more conclusive if more data and information could have been obtained from the entire process.

8. References