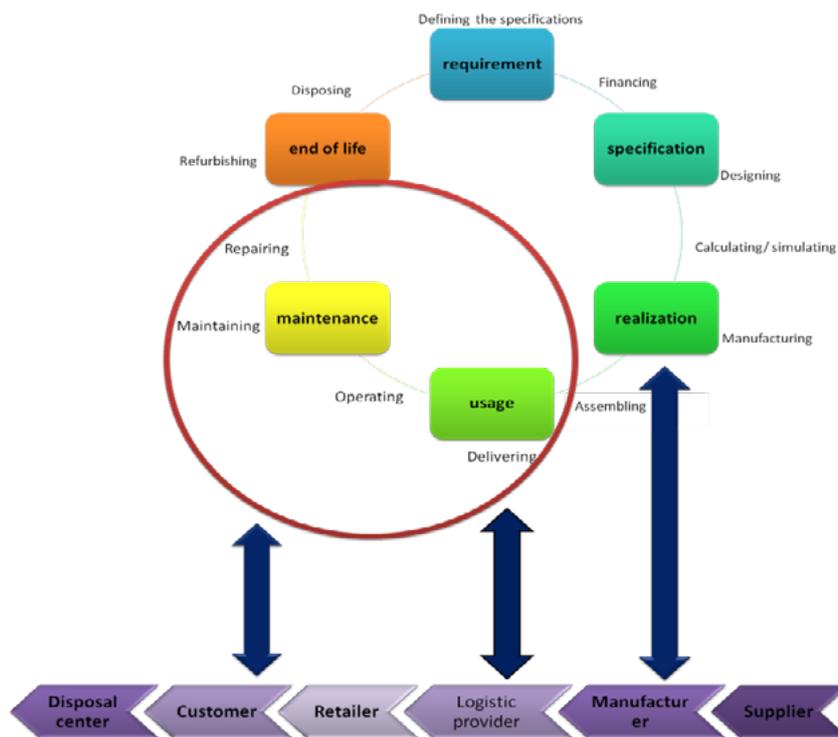


# Improving Product Lifecycle Activities by Learning from Information Flows



Product lifecycle management (PLM) integrates all activities and information related to a product and its extensions across its lifecycle. This cycle starts with the new idea development, continues with the design, realization, usage and maintenance and ends with the disposal of the product. Nowadays, product life cycle activities are not all done by one organization. They are performed by different organizations across the supply chain. Plenty of PLM systems such as CAD/CAM, PDM are developed so far. They support managing data and getting information feedback from the design, realization and manufacturing. However, after the product enters the usage phase, it is not easy or nearly impossible to have product related data because the data about the condition in which the product is operating or being used is usually not available. New technologies such

as XML, RFID and PEID have facilitated tracking and collecting the related information and data about the product when it is in its use or operation period. Yet there is a necessity to use these data in an effective way. Getting benefits from the data calls for information analytics. By this means, it is possible to extract knowledge and insight from the data. This knowledge has the potential to improve life-cycle activities. For example, the extracted knowledge can be integrated afterwards as a new information feedback from the use phase to another phase like maintenance. This can not only boost the information flow and reduce the costs but also provide the opportunity for organizations to get valuable outputs and bring a competitive advantage for them.



Link between product lifecycle and supply chain



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### **Improving Lifecycle Activities by Data Integration**

The focus of the research is how to integrate data based approaches which use available data through the life span to improve lifecycle activities; furthermore, how to integrate information feedbacks from one phase of lifecycle to another. Also, the challenges along this mapping are going to be discussed. Different possible research approaches to model an information flow will be studied.

Relevant research questions considered in this work will be:

- What are suitable information analytic methods for each phase especially in the middle of life of the product?
- Is it possible to apply current data analytic standards to PLM for getting information feedbacks?
- What is the impact of big data on this procedure?

### **Applying Information Management and Big Data**

The approach of modelling the data in this research is based on Product Lifecycle Information Management (PLIM). It refers to the process of gathering, organizing, exchanging and analyzing the key information through all phases of a product's life cycle. PLIM can be combined with big data analytical methods such as data mining and machine learning to utilize data from various data sources at different stages of PLIM, further analyze them for investigating knowledge. The discovered information can be used as a feedback from one phase of product lifecycle like usage phase to the other such as the maintenance, in order to improve the accuracy of forecasts and to reduce the costs.

### **Study on Wind Turbines**

An attractive application field is the maintenance of off-shore wind turbines. These turbines generate electricity and are located in the sea or other bodies of water. The estimated lifecycle of a wind turbine is 20 years. The maintenance activities cause most of the costs through turbine's whole time line. Therefore, it is highly demanded to reduce the maintenance and repair expenses and to improve the availability of this equipment. To achieve this goal, one can investigate how the available information from one stage of the turbine's life span, such as when it is in the state of use and operation, can be converted into effective knowledge.

Another issue is to investigate how this generated knowledge can be integrated in the turbines' through life processes in a way that makes improvement to other phases such as maintenance.



### **Expected Results**

The result of the research work would be a model (framework) which shows the relation and integration of data mining processes with PLM. The result of the case study on wind turbine maintenance activities would be a computer based algorithm developed or adopted to integrate the information collected from various data sources which has the potential to reduce maintenance costs.