Abstract: Globalization and higher requirements to stay in competition with other companies needs continuous development. There are many ways how to improve your business process. One of the opportunities is to implement PLM system to get certain benefits in cost reduction, quality improvement, time saving etc. Article gives a brief overview of PLM implementation stages from vision to real implementation. There are also described groups and staff, which should be involved in PLM implementation and brought their participation in different stages of PLM implementation. Efficient and practical groundwork what done in early stages lowers company’s implementation process and leads to better results.

Key words: PLM, PLM implementation, PLM vision, PLM strategy, PLM implementation strategy.

1. INTRODUCTION

Existing competitive manufacturing environment requires that companies should be more flexible, innovative and responsive to their customers' needs. Customers can choose from the wide range of products and different services. If small and medium sized enterprises (SMEs) want to get competitive advantages then they should replace their existing traditional business models to new ones [1]. The change requires also innovation in processes and methods to facilitate collaboration with suppliers and customers [2,3]. To act quickly for market changes we need to increase the speed of product development and production systems, which requires also implementation of different Enterprise Resource Planning (ERP) and Product Lifecycle Management systems (PLM).

This paper aim is to give an overview of PLM and its implementation from vision to real life implementation. There is brought out real example how PLM system with PDM capabilities were implemented. Currently there is no certain model for PLM implementation because all the cases and backgrounds are different. There are not a one to one defined implementation cases.

2. PLM

In 1980s engineering design entered a new era and software companies realized the potential market in form of efficient data management methodologies and began to develop the first generation commercial PDM (Product Data Management) systems. Developers were already involved in CAD (Computer Aided Design)/ CAM (Computer Aided Manufacturing) / CAE (Computer Aided Engineering) software market [4].

The Aim of Product Lifecycle Management (PLM) systems is to enable enterprises to satisfy they’re needed requirements. One of the major challenges for PLM systems is the lack of integrated decision support tools to help decision-making with available information in collaborative enterprise networks [5]. PLM not just a set of technologies it is a business strategy of different complex IT tools and applications which support digital design and manufacturing practices over the whole company in several ways. It’s a holistic business concept what is developed to manage a product and its lifecycle. PLM
manages items, documents and BOM’s supports analysis results, test specifications, quality standards, engineering requirements, changing orders, environmental component information, manufacturing procedures, product performance information, component suppliers. Modern PLM system capabilities are wide. Recently the manufacturing environment became modern and competitive for mastering new design and manufacturing methods, which enables to improve the sustainability of the products [6]. Thanks to possibility to integrate different CAD systems, CRM systems, Microsoft Office, ERP systems to whole it forms the information backbone of a product and its extended enterprise. [8,9,10].

Fig. 1. PLM System [8]

Solutions what can be added to PLM such as; [11,12,13]
- BOM (Bill Of Material) Management
- CAD File Management
- Change Management
- Compliance Management
- Content Management
- Classification Management
- Component &Supplier Management
- Concept Development
- Configuration Management
- Design Outsourcing
- Detailed Design
- Document Management
- Engineering Change Management
- Environmental Compliance
- Extended Capabilities
- Fast Fashion
- Formula and Recipe Management
- Global Product Development
- Label and Artwork Management
- Lean Product Development
- Maintenance & Calibration
- Maintenance, repair & operation Management
- Manufacturing Process Management
- Manufacturing Process Planning
- Mechatronics
- New Product Introduction
- Outsourced Manufacturing
- Packaging Management
- Part Traceability
- Portfolio Management
- Product Analytics
- Product Costing
- Product Data Management
- Product Engineering
- Product Governance & Compliance
- Product Life cycle Management
- Program Management
- Project Management
- Quality Management
- Quality Planning
- Quality Systems
- Quote Process Management
- Regulatory Compliance
- Reporting & Analytics
- Requirements Management
- Resource Management
- Risk Management
- Software Configuration Management
- Sourcing Management
- Source Code management
- Specification Management
- Supplier Corrective Action
- Supply Chain Management
- Systems Engineering
- Tooling Management
- Variants & Options
- Visualization & Markup
- Workflow Management

3. BENEFITS FROM PLM

Companies are Implementing PLM systems to get different benefits. Benefits are coming through making you Lifecycle more understandable by using it different modules of the system. Also by better file management and information movement inside the company and also between different phases of products life. In Closed-Loop Product Lifecycle information moves from Beginning of Life (BOL) to Middle of Life (MOL) and to End of Life (EOL). Information also moves backward from EOL to MOL and BOL by closing the necessary loops in products information. [14,15]

Benefits what companies usually might get can widely divided into four bigger categories such as:
- Cost reduction
- Quality improvement
- Time saving
- Other
Expectation to reduce product cost comes through reducing the product development cost, material cost, prototyping cost, production cost and so on by faster and controlled design and information movement. Reducing more different items and they are more standardized. Management of total production load is more simplified with the help of right product structure. By this one person can give more design for company and other engineers can deal with other projects. Inventory cost is lowering because there's better overview on products and don't need to keep so big stock reserve. Service cost is reduced through better knowledge what's needed for maintenance. [8,16,17]

Potential source of quality improvement in Production Company like errors, rework, wasted efforts customer complaints, product returns, recurring product problems and conformance with customer requirements can be achieved by better and clear data and information storage. Changing documents and revisions can be electronically accepted and released why change management is faster and less faulty. Easy to find documents, protocols and standards related to product. [8,16]

Reduced project times, project overrun times, engineering change times, cycle times might come to better definition of product structures because it's easier to use already existing information and amount of overlapping work decreases. Parts and drawings history can be available with minimum effort. All this leads to reduced time to market and profit. [8,16,17]

PLM also enables to make better business decisions and results by clearer products lifecycle. Improves visibility over the supply chain, provides feedback from different phases of lifecycle and enables better management of outsourced tasks. [8,16,17]

These are only some of benefits what are expected from PLM system. The real benefits for the company depend on implemented modules and systems functionality. The comprehensive is work before PLM implementation the more effect company gets from implementation.

4. PLM IMPLEMENTATION

PLM implementation is big step to most of companies. The reasons might be very different and the expected benefits might differ depending on the company. Common in these cases is that they all need some way to achieve their goals. Figure 2 shows one possibility how to implement PLM system [8,16]. The need for Implementing PLM system should come from company’s overall vision. PLM should help to achieve this mission or help the company closer to its goals. Corporate business vision is set by company’s management and company’s activities should conform to it. From company’s vision should come company’s business objectives. Company’s business objectives is the end result of proposed actions and says where company wants to be after a specific period of time.

From company’s business objectives should grow out input for PLM vision. A PLM vision is not an independent stand-alone unit. It has to fit with the company’s overall vision of its future, Its missions and objectives. [16]

If corporative business vision and business objectives were set by management then from PLM vision project manager is responsible for further development. Cooperating with management and steering group project manager has to describe companies PLM vision. It is high-level conceptual description of a company’s product lifecycle activities at some future time. It’s hard to look further into the future than five years from now. So the PLM vision is usually put in place for five years. It doesn't mean it's execution. [16]

PLM Vision is the best possible expectation for future situations and activities. PLM vision highlights the main features of future activities. [16]
A PLM Vision will be company-specific. It has to be clear so that everyone in company has clear agreed destination what they can follow. Clear understanding of the objectives, scope and components of PLM. Once the PLM vision has been agreed, a suitable PLM strategy and PLM Implementation strategy has to be developed to achieve the best results.\[^{16}\] PLM vision should be documented in a report. Executive overview should only be a few pages in length and there should be brought out things like:\[^{18}\]

- The company: objectives, strategy, success factors, key issues
- The PLM Initiative
- Description of PLM Vision
- Next steps: PLM strategy, PLM implementation Strategy, PLM Roadmap, PLM Plan, schedules, resources, value, cost, ROI.

PLM strategy will be company specific. It's also possible to work at the same time with multiple different strategies and make SWOT analysis (strength, weaknesses, opportunities and threats).

PLM strategy describes how PLM resources are used at the present moment based on As is analysis. A PLM strategy for the future shows how resources will be used in future based on To-be analysis.\[^{16}\]

PLM strategy is developed by Project manager and Project group, Steering group supports them with needed resources and controls that project would be in progress. In this phase project group has to work hard to achieve best result, which depends a lot in future implementation. The PLM strategy has to be documented and transmitted to everybody who’s involved. A strategy describes how to achieve objectives; how resources will be organized and managed. Provides the best chance to achieve set goals and assures that everyone work on same target.\[^{16}\]

The PLM strategy shows how PLM resources will be organized in future. The Implementation Strategy shows how resources will be organized to achieve goals what are set is Do-be analysis. The implementation strategy is sometimes...
referred to as change strategy or a
deployment strategy. The Implementation strategy is the starting
point for developing the Implementation Plan. Developing Implementation plan for
the first year and Implementation strategy at the same time helps to make sure their
compatibility. Putting together implementation plan in
addition to project group, what’s directly is
involved, and steering group comes extra
PLM supplier or implementation company. They have the knowledge to tell what
program will fulfill the company’s needs. From that stage on PLM supplier or
Implementation Company has to be chosen
for further project development.
PLM plan deals with all of PLM such as;
product data, equipment, human resources,
applications and processes. Objectives,
action steps, timing and financial
requirements are defined. In this phase all
issues and problems have to be solved and
company is ready for real implementation.
The main purpose of the chain from
business mission and objectives through
PLM Vision, PLM Strategy, PLM
implementation strategy PLM plan and
implementation is that the company meets
it objectives. [16]

5. CASE STUDY

Bestnet AS is as Estonian Small and
medium enterprise what is manufacturing
and selling their own design based trailers
for different purposes.
Bestnet AS business vision is "Car owners - we are your best choice for personal
transportation solution. The trailers will
rely on the experience of preparing a long-
term, quality and environmental sustainability" [19]. Based on vision
Bestnet AS made his first feasibility study
in 2005 and despite the facts, that product
information management grows over head,
reached to conclusion that at the moment
they don’t have needed recourses for
implementing PLM or PDM system.
Situation changed in year 2010 when in
cooperation with IMECC OÜ Bestnet AS
take in their plans to implement
Teamcenter Rapid Start what is with PDM
capabilities.
A central issues in Implementation are
coming from vision. From Bestnet AS
business strategy and business objectives
came small dimensional PLM vision what
company wants to achieve;
1) Current design is complicated because
most of parts are used at the same time in
different products and making changes to
them is complicated.
2) Data entry from CAD to ERP system is
manual. Company wanted to get automatic
data transmitting from CAD to ERP with
XML file that engineering Bill of Material
(eBOM) and manufacturing (mBOM) are
the same.
3) Direct communication with dealers for
better to ensure better service.
Based on these objectives company’s
Project team and PLM supplier started to
put together PLM strategy and PLM
implementation strategy. What was mainly
done with different managers and
engineers by mapping their expectations
for the system. Interviews were carried out
with engineers from different department.
At the current time PLM implementation
still continues. Set objectives are solved
with Teamcenter Rapid Start with
functionalities such as;
Secure vault, standard user roles and access
security, check-in/check-out, search were-
used tools, revision/version control, view
& markup, Solid Edge integration, BOM
management, ERP integration,
manufacturing data and process
management.
In the near future company should
successfully complete PLM
Implementation and reach its set goals.

6. CONCLUSION

PLM plays an important role in the modern
production landscape. In first part of article
is brought out information about PLM, its
components and benefits. How PLM is company’s specific and one possibility how implementation could be carried out. Also is brought out AS Bestnet PLM implementation progress activities.

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8. REFERENCES

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