

Chapter 8

Business Exploitation



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Abstract Business based on Product-Services is growing within the manufacturing sector, where companies are increasingly improving the service component of their offering to gain competitive advantage. Actually, the aggregation of product and service lifecycle engineering tools is able to generate a significant added value and the analysis carried out in the following paragraphs is going to deeply illustrate the business potential of such tools within the manufacturing sector, with particular attention to the use cases of the Manutelligence project. The whole process (the aggregation and the value creation) will be therefore investigated and the starting point will be the analysis of Product Lifecycle Management, the relative technologies and the market associated. From the scenario analysis of the global PLM sector emerged that the aggregation of product and service lifecycle engineering tools is able to generate significant added value highlighting in this way the relevant commercial perspectives of the Manutelligence platform. Finally a business model for the Platform is presented.

8.1 Product/Service Life Cycle Management Scenario, Market Trends and Challenges

Insights into the global PLM market are given by CIMdata Inc., strategic consulting and research firm, which publishes every year global and regional analysis reports covering the Product Lifecycle Management (PLM) market. According to CIMdata's analysis, in year 2016, the PLM market grew to \$40.6 billion overall, 5.0% growth in U.S. dollars over 2015. By analysing the specific PLM solution segments,

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Electronic Design Automation (EDA) counts for about 20.6% (\$8.3 billion) of the overall market, Systems Integrator/Reseller/VAR represents the 15.7% (\$6.3 billion), cPDM (collaborative Product Definition management) is the third most important segment within the PLM market with a share 13.9% (\$5.6 billion), S&A (Simulation & Analysis) counts for 13% (\$5.2 billion) whereas Architectural, Engineering, and Construction (AEC) represents about the 8.3% (\$3.3 billion). After the five most relevant segments, there are: Mechanical Computer-Aided Design (MCAD) Multi-Discipline counting for about 8.8% (\$3.5 billion) of the market, MCAD focused representing about 6.5% (\$2.6 billion), Focused Application Providers (including visualization and collaboration, content, document management, etc.) with a share of 5.1% (\$2.0 billion), NC (Numerical Control) Non-Bundled with 3.1% (\$1.2 billion) and Digital Manufacturing counting for 1.8% (\$717 million).¹

Most of the PLM market leaders presented a relevant growth in the last years and continued to make strategic acquisitions to expand their portfolios as well as in some cases, to enter new markets. In this framework, CIMdata forecasts the PLM market to grow at CAGR of 6.3% to \$52.3 billion in 2020.²

Currently, in the PLM market among the solution providers there are four big players (Autodesk, Dassault Systèmes, PTC and Siemens PLM), Enterprise resource planning (ERP) vendors (Infor, Oracle, SAP) and others providers including new players offering different kind of PLM solutions among other products. The product innovation, product development and engineering processes result to be the priorities in today's vendors objectives. As far as the larger players are concerned, the PLM market is evolving on 4 key aspects: (1) Reaching more people (more customers, including also SMEs with cloud-based solutions); (2) Covering a richer view of the product; (3) Enabling more processes; (4) Supporting further up and down the product lifecycle.³

The current PLM solutions mostly rely on managing CAD models, documents, BOM, Product configurations and Simulations, more and more enlarging the scope to the manufacturing planning and management, with a minor coverage of the product lifecycle tasks following the delivery to customer.

Hence, business potential is envisaged for advanced PLM solutions able to manage all the processes related to the product lifecycle, including also the service component: there is the need to have a PLM solution that integrates in one platform every aspect of the entire product-service lifecycle.

More in details^{4,5} the PLM market is going towards a significant transformation and the main trends are the following:

¹<https://www.cimdata.com/en/news/item/8281-cimdata-publishes-executive-plm-market-report> (CIMdata 2017 Executive PLM Market Report).

²<https://www.cimdata.com/en/news/item/6459-cimdata-publishes-plm-market-and-solution-provider-report> (The CIMdata 2016 PLM Market and Solution Provider Analysis Report).

³<http://tech-clarity.com/plm-vendors-2015/4269> (Strategies of the Major PLM Vendors 2015+).

⁴<http://tech-clarity.com/strategies-of-the-major-plm-vendors-2016/5048> (Strategies of the Major PLM Vendors 2016+).

⁵https://blogs.oracle.com/PLM/entry/3_trends_driving_big_changes.

1. Platformization: there is a transition from standalone PLM, CAD, CAM, and CAE tools to Integrated Innovation Platforms able to provide a holistic, integrated approach enabling cross functional collaboration. There is the need of advanced capabilities in order to manage all the different phases and data related to the entire product lifecycle (i.e. from innovation and product development, to commercialization and service management).
2. Service Management: there are great business potential for commercialization of PLM tools that handle the service management across the whole product lifecycle, considering services integrated with the product-related data and activities.
3. Market dynamics changed by the cloud: there is relevant number of manufacturers and vendors that are beginning the transition to the Cloud.
4. Internet of Things (IoT): IoT and Industry 4.0 are dramatically reshaping the PLM sector.
5. Innovation platform: PLM solutions are evolving towards the support to bottom up innovation, providing companies with a systematic approach to capture, select and invest in the promising innovative ideas, allowing at the same time financial and cost analysis. PLM solutions are becoming a business strategy, helping companies to be competitive and innovative in their sectors.
6. Industry specialization: vendors are continuing their industry specialization.

8.2 Business Potential of the Manutelligence Platform

Product-Service Life Cycle Management (P-SLM) in fact enables manufacturing enterprises to drastically improve their development, production processes and delivery of personalized product-service, adding customer-focused innovative services. P-SLM takes into account the entire life cycle of a Product-Service, it strongly reduces new processes and plant designs time and allows planning and integrating new processes and procedures.

However, advanced tools, ICT platforms and methodologies are not enough. A dedicated business strategy is needed to maximise the exploitation potential of the Manutelligence solution, which will facilitate the shift from PLM to P-SLM.

After having analysed the reference PLM market and the current trends, the focus of this paragraph is therefore on the definition of the business potential enabling the Manutelligence consortium partners to create a shared business vision and to define their position in the market. This will facilitate their collaboration and different roles, and put the basis for the business and exploitation planning after the end of the project.

In particular, the business potential will be analysed at three different levels, which will correspond to three distinct exploitation strategies: (1) Platform developers; (2) Consulting business; (3) Specific use cases.

8.2.1 Platform Developers

The business strategy for the platform developers foresees the exploitation of both the overall Manutelligence platform and of the standalone modules.

The partners involved in the development of the platform and in the integrations of the different modules are several: Dassault Systemes, Biba, Balance, Holonix and SUPSI. The final platform will be based on Dassault 3D EXPERIENCE platform. This platform is already providing solutions for different industry sectors leveraging the different modules (brands) that offer embedded processes and functionalities (e.g. CATIA and Solidworks for 3D modelling or ENOVIA for collaboration and BOM management) In addition, different modules could be customised for each use case.

In particular, the modules developed in the project—such as the LCA/LCC (the MAGA module from SUPSI and the BAL.LCPA module from Balance respectively) and IoT modules—could either become central applications or interface with the platform as standalone tools or pure standalone without interfaces. In the latter case, end-users of the individual modules will not be able to use and manage all the data belonging to the 3D EXPERIENCE environment. The stand-alone modules will be owned by the single partners that developed them (and they could be separately sold by each developer) and a joint exploitation strategy will be defined by the end of the project by the different developers for the overall platform including all the modules.

The main users of the platform will be designers involved in the definition process of the product-service, marketing people and product managers that will be able to collaborate with each other as well as with the manufacturers all along the product development process. Anyhow, also the other actors engaged in the manufacturing value chain will be possible users of the platform, interacting and collaborating through that with the other players. Last but not least, the platform will allow following the maintenance product phase and will provide means to sustain the service business by collecting via IoT all the product usage information. The assessment software tool included into the platform, based on well-known methodologies of LCA and LCC, will support the modelling of the product service system and the collection of the huge amount of data, shortening the time occurring between a change in the design and the sustainability assessment.

The platform will provide an integrated environment for the management of all phases of product lifecycle, addressing a wide range of industries. Great business potential is envisaged for the exploitation of this platform in the manufacturing sector where the increased servitization, complexity of processes and use of cloud and big data require advanced instruments for the product-services lifecycles management. As a consequence, the business potential for Manutelligence software developers stands on the opportunity to integrate their own software, already used in several industrial sectors, into the overall Manutelligence platform, offering a competitive tool able to store all the information concerning the product lifecycle in a homogeneous way.

Initially, the platform will be based on a generic concept of product-service lifecycle and this could represent a weakness of the product for those industrial sectors

demanding specific requirements. However, following adaptations and improvements of the platform may be implemented in order to create more customizable solutions and enhance their usability in specific sectors according to the trends underlined in the previous paragraph. Considering that currently, in the market, none of the existing tools provides functionalities tailored to PSS, with environmental and economic evaluation integrated in the same solution, the value added of Manutelligence platform entails great market perspectives.

8.2.2 Consulting Business

Manutelligence consulting business companies can exploit the Manutelligence platform as a mean to support industrial customers in process/product development as well as by offering them training on the management of product lifecycle and knowledge based on advanced S-PLM technologies.

The Manutelligence platform helps increasing the quality of interaction with customers and third parties, besides improving collaboration between different business areas inside the company itself. Quality of the services provided will be enhanced because the platform allows industrial clients to develop innovation within their businesses, providing them with full traceability of all data related to product lifecycle stages. The market trends of the manufacturing sector (i.e. servitization, evolution towards global market, etc.) work as opportunities for the exploitation of the platform by consulting companies. Several industrial companies in fact need support for complex product development activities, whereas product-related services have to be managed in relation to the product lifecycle. Even more important, manufacturing companies need to find innovative solutions to differentiate from competitors and defend/acquire market share. Overall, the targeted customers will be small-medium manufacturers (SMEs), aiming to reach the global market in the consumer goods, automotive, home & architecture, civil engineering, energy, automation and packaging sectors. All these sectors, for the most part, are not mature yet for a complete understanding and utilization of S-PLM technologies, thus they need to be trained before being interested direct buyers for Manutelligence platform. Ideally, the target customers have low development rate (products change every 2/3 years) or small portfolio of products, a not fully structured technical office and they are fostering an innovative approach to design. Among the Manutelligence partners usually providing consulting services, it is worth to mention Rina Consulting (formerly D'Appolonia), VTT, BIBA, Politecnico di Milano and Balance.

8.2.3 *Uses Cases*

The users of the Product-Service Lifecycle Management system (i.e. Ferrari, Meyer Turku Oy, Lindbäcks and Fundacio CIM) will have the opportunity to unlock a significant market potential and gain a clear competitive edge through the development of customized and knowledge intensive products and services.

Automotive

The Automotive use case is conducted at Ferrari facilities. Ferrari is leader of this pilot while other beneficiaries, namely Politecnico di Milano and Dassault, are involved with the aim of scientific, methodological and technical support.

Ferrari represents the luxury segment of the automotive sector and its business has a strong focus on the delivery of innovative product-services, in order to offer a customer experience based on the “thrill of driving”.

The whole automotive industry has been experiencing an evolution towards servitization. In the last decade, automotive companies faced the economic crisis exploiting revenues deriving from services linked to the purchase of a vehicle. Hence, manufacturers and dealers continue to expand the service offering, providing clients with customizable services across all phases of the product lifecycle. Therefore, the automotive sector deals with both important technical and “experience” aspects, but it is still centred on product development activities. Firms need new business models based on a product-service concept, besides advanced software tools able to manage big amount of data related to products’ lifecycles increasingly complex. Therefore, a huge business potential could be unlocked by the Manutelligence platform within the automotive sector. Manufacturers will benefit from a tool that can be integrated with existing software to perform, in addition to other more traditional tasks, also sustainability assessments through LCA and LCC methodologies and the management of all customers’ data. More specifically, automotive manufacturers will have the competitive advantage to guarantee the customers with the best technology and technical specifications available at the time of delivery and not at the time of the order, since status of the car under manufacturing will be traceable at each moment of its lifecycle (3D virtual representation) and advancements occurring between design and delivery stages could be implemented. Other consequent benefits rely on reduction of the time before delivery, better quality of product-services provided, thanks to clients’ feedback data, and increased cost savings which is a high priority for manufacturers. In fact, Manutelligence platform will allow data from testing and use of the car to be feedback into the design and engineering phases in a standardized manner in order to optimise the product ordered.

Shipbuilding

The Shipbuilding pilot is led by Meyer Turku Oy, one of the leading European shipbuilding companies. The company provides state-of-the-art technology solutions, advanced construction processes and innovations for cruise operators and other ship owners. The cruise sector is based on strong branding/marketing strategies aimed at always attracting new customers. Cruise operators are challenged to develop competitive cruise packages involving a high-quality stay onboard, an array of shore-based

activities offering access to a variety of cultures and sites and easy transfers to/from the vessel. The ship itself is designed as a tourist attraction.⁶ As a matter of fact, to fulfil the desires of its guest and attract new customers, the cruise industry has started diversifying the cruise product, to be able to respond to the preferences of a wide range of customer groups. To this purpose, the industry has innovated through the development of new destinations, new ship designs, new and diverse onboard amenities, facilities and services. Also for this reason, cruise liners are among the largest and most complex products made. Such complicated and interconnected systems hold a great market potential for the Manutelligence platform. Shipbuilding companies will be able to benefit from a tool that supports and enhances the interactions between engineering, ship manufacturing and construction, customers and users and which could also be integrated with existing and new software.

Smart House

The Smart house pilot is focused on the combination of modular housing components with sensing and communication technology, for the design and construction of future student homes. The pilot leader is Lindbäcks. The development and the construction of healthy homes indoor, which are then assembled quickly on site, have a high potential. The objective of this pilot is to demonstrate that room designers and manufacturers can provide personalised housing solutions—both product and services—to student residents. The data of usage gathered and the sensors measurement will in fact give valuable feedback to design and production departments. Moreover, additional apartment features will help the construction company gain a competitive advantage. Considering the trends in the overall construction industry, a great business potential will also be exploited with the introduction of additional per-use services, thanks to the installation of several sensors. These services include:

7. Service for living the apartment, for example adjust apartment setting like room temperature by voice, control of pets, older people, burglar alarm;
8. Service for maintenance, including sensors for humidity, control-system for water, heat and air consumption;
9. Service for construction, such as temperature, humidity, air pressure, etc.

In addition, other pay-per-use services could be investigated in the smart house use case to create an opportunity for additional business area. Pay per use services include: speaker in the kitchen, electrical heating floor, window with darken function, order kitchen equipment when needed, laundry by tube, carpool and bike pool in basement, pay rent after use of apartment. These services could be integrated in product offering, creating the opportunity to address customers' requirements across the entire lifecycle of the project. As a matter of fact, student residents will be able to adapt the rooms to their preferences and needs and be involved in the design phase.

Nevertheless, aspects related to data protection will have to be investigated to allow a full exploitation of the Manutelligence platform.

⁶J. Brida and S. Zapata, "Cruise Tourism: Economic, Socio-Cultural and Environmental Impacts," *International Journal of Leisure and Tourism Marketing*, vol. 1, no. 3, 2010.

Fab Lab

The FabLab use case is focused on FabLab-like facilities called Ateneus of Digital Fabrication (ADF), promoted by the Barcelona city council within the strategic Smart Cities framework. Fab Ateneus is a space dedicated to creation and learning connected to social innovation, new technologies and, especially, digital fabrication, where citizens are the active users and protagonists.

The objective of this use case is to give to Fab Ateneus users the possibility to learn and start using the potential of 3D printing and the “Internet of Things”. In particular, the aim is twofold; first of all to enable collaborative design for FabLabs, allowing “makers” to cooperate using best in class design collaboration tools. Secondly, to enable the manufacturing of IoT enabled objects, through the possibility of adding single boards PCs with sensors to a fully working IoT platform. This will support the growth of the future generation of designers and engineers, used to think from the beginning to product-services and Internet enabled things. As above mentioned, Fab Ateneus exists to promote activities and projects to improve society (i.e. the neighbourhood, the city and the world) using new models of organization (co-creation, open source collaboration, crowdsourcing, crowdfunding, etc.) and open, networked learning and social media to share acquired knowledge. The Manutelligence platform will help “makers” undertake projects that will have a positive impact on the neighbourhood, the city and the world providing a platform that:

10. Supports the generation of CAD design from user’s requirements, making easier the conversion and generation of CAD design from ideas just even sketched in a paper into readable format;
11. Enhances knowledge sharing within the FabLab/ADF network, with the creation of a network that allows the sharing of data about product design leading to a more efficient design process and to a better service for those customers who are not skilled;
12. Develops the production cycle, from the CAD file to the production resources needed for the realisation of the product, for the different digital fabrication technologies;
13. Gets cloud-based feedback and multidirectional information flow for smart objects;
14. Allows sustainability assessment. Environmental and economic sustainability factors will be included in the design phase to increase the level of awareness of FabLab/ADF customers and create more sustainable products, with less environmental impacts.

More generally, the Manutelligence platform will enable the transformation of the knowledge characteristic of the Information society into new economics forms centred on people, exploiting an important social vector.

8.3 Business Model

In this paragraph, a Business Model for the Manutelligence platform is presented. First of all, before developing the Business Model, a value proposition analysis has been conducted for each Manutelligence pilot (Automotive, Shipbuilding, Smart House, FabLab). Then, the outcomes of each value proposition analysis have been generalized in order to develop the business model of the Manutelligence platform. An overview of the Business Model Canvas resulted from the analysis is reported in Fig. 8.1.

8.3.1 Customers Segments

The analysis conducted for the definition of the Business Model Canvas started from the analysis of the potential customers and of the problems they are currently facing that are solved by the Manutelligence platform. Starting from the analysis of the pilots and their needs, the aim was to identify those ones that are cross to different sectors.

First of all, the users have been identified:

15. Designers: person that is responsible of the realization of a 2D/3D model.
16. Project managers: the main responsible of the definition and execution of project activities coordinating people involved and verifying progresses.



Fig. 8.1 Manutelligence business model canvas

17. Product engineers: responsible to define and control design activities and related resources as well as of the realization of the product.
18. Service engineers: responsible to define and control service activities and related resources as well as of to the realization of the service.

Furthermore, a list of characteristics of companies potentially interested in Manutelligence platform has been listed:

19. IoT oriented: manufacturing companies with the objective of the development of new smart products, provide new services to their customers, collect high amount of data from product or sensors, or gather real time information from machines.
20. High value of selling services: companies characterized by the creation of a large part of revenues from the selling of services.
21. High value of engineering: companies characterized by intense engineering activities where knowledge from previous project became essential to decrease the impact of the engineering within the overall cost of the developed solution. This requirement is typically requested by Aerospace, Aeronautical, Naval, Major Infrastructure, Oil & Gas industries.
22. Collaborative Design: companies interested on the improvement of the collaboration between different domain experts. This is typical from the already mentioned companies however this aspect could be crucial also for Mechanical, Software Houses, Creative, FabLab companies.

8.3.2 Value Proposition

The value proposition of the Manutelligence platform is the proposal of a collaborative platform that integrates different features, such as:

23. Physical and Virtual experience and information, integrated in the 3DEXPERIENCE of Dassault Systemes.
24. Integration of huge amount of data coming from different sources (thanks to IoT), integrated in the IoT Module of Holonix and Real Time data collection.
25. Economic and Environmental evaluation, integrated in the BAL.LCPA module (economic evaluation) and in the MAGA module (environmental evaluation), leveraging on interface with 3DEXPERIENCE of Dassault.
26. Social media text analysis of BIBA.
27. Collaborative design, integrated in the 3DEXPERIENCE of Dassault.

8.3.3 Customer Relationships and Channels

The different ways to reach customers creating awareness, selling and delivery of the Manutelligence platform have been identified. Concerning the creation of awareness,

the development of an “ad hoc” website, the advertising on different professional social network (such as LinkedIn) and the salesforce have been identified how effective streams for reaching the potential customers. In order to enable the customers to evaluate the potentialities and the benefits of the Manutelligence platform, the idea is to develop some demonstration and demos that show how the platform works. Salesforce is used to sell the platform to the interested customers, providing also consultancy and training activities (on site). The relation with customers after the sales is managed mainly through a helpdesk, based on a website platform, or through a direct assistance.

8.3.4 Revenue Models

In this area possible ways to gain revenues have been identified. A first way is the sell software licenses. Secondly, it is possible to create revenues through the consultancy and the customization of the platform, according to the customer’s needs. Furthermore, it is possible to consider the Manutelligence platform as a service, therefore using other ways of revenues, such as the pay per usage (the customer pays just when it uses the platform) or pay per software installed (the customer pays only for the software it needs).

8.3.5 Key Activities and Resources

The key activities to make the Manutelligence platform a commercial solution ready for the industrial environment can be summarized in:

28. Software development for ad hoc solution (customization of the platform), in order to satisfy the customers’ needs.
29. Evaluation and quantification of the potential benefits provided by the platform through precise and measurable KPIs.

The key resources to provide the platform on the market are:

30. The solution architect, in order to finalize the platform design for the daily business activities.
31. The software developers, in order to implement the platform according to the solution architect design.
32. The management consultants, in order to support customers in the choice of the proper platform.
33. The salesforce, in order to facilitate the communication of benefits and advantages reachable through the platform.
34. Agreements between platform developers in order to provide the platform on the market and realize some pilots/demonstrators.

8.3.6 Key Partners

Key relationships have to be established in order to facilitate the market introduction of the Manutelligence platform. First of all, an ad hoc agreement between platform developers is necessary to be signed in order to share revenues and investments. This is crucial for the joint exploitation of the project results. Clearly, the key partners will be the platform developers and an important role can be labelled by management consulting. External consortium partners, such as hardware suppliers, cloud providers and third party providers, are necessary to provide a complete solution, composed of the software (developed within the Manutelligence project) and of the hardware (provided by external partners).

8.3.7 Cost Structure

The cost structure distinguishes the periodic and the variable costs. Personnel costs cover a significant part within the whole costs. It is composed of the solution architects, the software developers, the management consultants and other costs. Another important part of the cost is composed of the salesforce, composed of agents' salaries, reimbursements and wages. Finally the management have a significant cost to coordinate the work giving a strategic vision. Other costs can be summarized in: (1) Marketing Costs; (2) Hardware; (3) Financial Expenses; Administrative Costs.

References

1. International Labour Organization "Construction sector" [Online]. Available <http://www.ilo.org/global/industries-and-sectors/construction/lang-en/index.htm>. Accessed November 2015
2. Osterwalder A, Pigneur Y (2010) Business model generation: a handbook for visionaries, game changers, and challengers. Wiley
3. Osterwalder A, Pigneur Y, Bernarda G, Smith A (2014) Value proposition design: how to create products and services customers want. Wiley
4. <https://www.scottish-enterprise.com/~media/se/resources/documents/stuv/sustainable-business-models.pdf>
5. Vosgien T (2015) Model-based system engineering enabling design-analysis data integration in digital design environments: application to collaborative aeronautics simulation-based design process and turbojet integration studies. Ecole Centrale Paris
6. Barkay J (2014) Service lifecycle management. Siemens PLM Software
7. McKinsey & Company (2013) The road to 2020 and beyond: what's driving the global automotive industry?
8. Lay G (2014) Servitization in industry. Springer International Publishing
9. Rodrigue J, Notteboom T (2013) The geography of cruise shipping: itineraries. Capacity deployment and ports of call, 3rd edn. Routledge, New York
10. Business Wire (2014) The global prefabricated buildings market—key trends and opportunities to 2017
11. Menichinelli M (2014) Come costruire un FabLab. Design

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