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# Empirical Study of Multi-Party Workshop Facilitation in Strategy Planning Phase for Product Lifecycle Management System

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**Abstract.** This paper proposes a framework of short term and intensive workshop facilitation for multi-party stakeholders in PLM strategy planning phase. We have been empirically pursuing what a valuable facilitation for the workshop is; how multi-party PLM stakeholders can build proactively a mutual consensus in as short a time as possible. PLM project promotion members always encounter a difficulty of consensus building. This is because various stockholders have different opinions and responsibilities through sales, engineering, manufacturing, and service departments. Firstly, we mention key challenges of multi-party consensus building in PLM strategy planning phase. Secondly, we propose a programmatic framework on intensive workshop-facilitation which is configured twelve steps. The key outcome of the workshop is to craft a PLM Success Value Roadmap (PSVR) which is contained various hypothesis defined by the workshop participants helping by facilitators (KPIs). For example, there are PLM vision, strategy, initiative, process, and key performance indicator. Thirdly, we mention an empirical case study conducted our proposed workshop-facilitation method for an industrial company. Seventeen stakeholders were joined as the workshop participants who were invited from three different business units. It was held as a two-day intensive PLM trial workshop. Finally, we found that the proposed workshop-facilitation as a consensus building method contributed to the satisfaction of more than 60% of the participants. 85% of the participants commented that they would encourage colleagues to participate in the workshop that we have developed. We conclude that the multi-party intensive workshop was a valuable experience that it allows stakeholders to produce a PLM strategy in a relatively short time.

**Keywords:** PLM Strategy Planning, Multi-party Consensus Building, Workshop Facilitation, Product Lifecycle Management System

## 1 Introduction

According to the Digital Transformation 2025 government report in Japan published by Ministry of Economy, Trade and Industry, many Japanese companies will become concerned that their current legacy information and communication technology (ICT) systems cannot cope with operational changes in the era of digital transformation [1].

This means that there will be an increasing need in Japan to either replace or rebuild aging product lifecycle management (PLM) systems as well as other corporate legacy business systems. Consequently, such companies must plan new PLM strategies. Regarding the current technological capabilities of commercial PLM software packages, an increasing number of out of the box (OOTB) PLM functionalities are available based on enterprise product information and process management. For example, we note that in Japan, PLM packages provide many of the standard functions required by PLM end users while requiring minimal customization [2]. Given all of the above, now would be a good time for PLM project promotion members to start planning new PLM strategies. The time is right to replace existing legacy PLM systems with up-to-date PLM solutions that have as many OOTB functionalities as possible. However, it will be difficult for members to devise new PLM strategies rapidly. In particular, PLM project promotion members must overcome the following outstanding issues regarding a negative mindset:

- difficulty of justifying why end users need PLM itself;
- no PLM alignment between corporate strategies and business operations;
- no specific key performance indicators that all stakeholders can understand;
- differing views among departments regarding new PLM initiatives;
- no idea of up-to-date PLM application package functionalities;
- no alignment between business unit and IT department members;
- trauma associated with the failure of a previous PLM project; and
- uncertainty about how to define PLM vision and strategy.

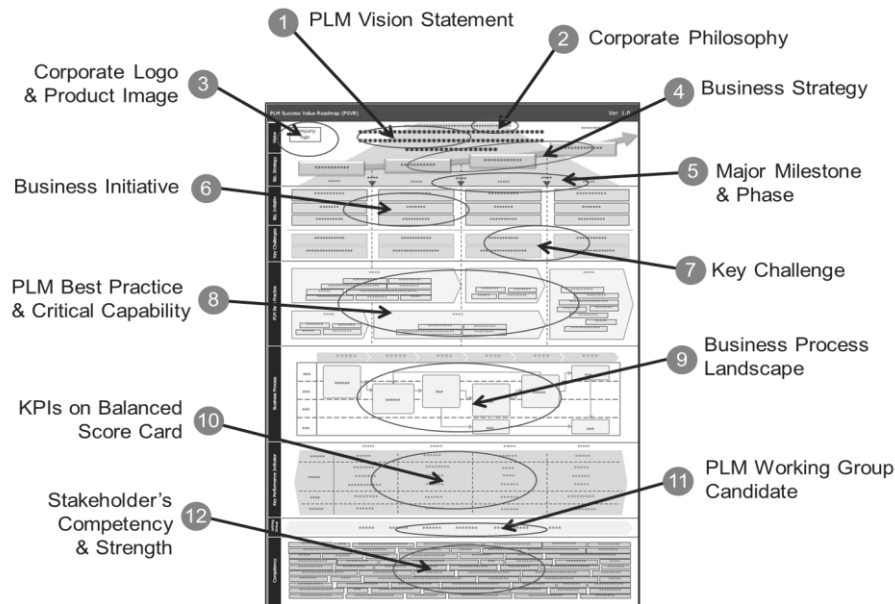
Ultimately, PLM project promotion members are uncertain about the manner in which to align with PLM strategy and corporate business goals getting common consensus among multi-party stakeholders. A key initiative for a PLM strategy is to “build with good people” [3]. This suggests to us that strategy planning must involve a variety of people with different skills across the product lifecycle [Fig. 1]. During the last five years, we sought empirical answers to the questions of (i) what constitutes valuable facilitation for a workshop and (ii) how multi-party stakeholders throughout whole product lifecycle can build mutual consensus proactively in the short-term [4]. Herein, reflecting our past outcomes of empirical research and studies, we propose a framework of short-term intensive workshop facilitation for multi-party consensus building at PLM strategy planning phase.



**Fig. 1.** Example of workshop atmosphere on multi-party consensus building

## 2 PLM Success Value Roadmap (PSVR)

To overcome the challenges facing PLM project promotion team members as described in Section 1, several PLM strategy case studies of larger Japanese firms have been reported [5]. It also suggests that small and medium sized enterprises should have to prepare and define a PLM vision and strategy as well as larger enterprises [6]. Following that, we have also conducted preliminary research involving requirement-gathering sessions with some of specific Japanese manufacturers who were planning to implement PLM systems. We asked them about the contexts of PLM strategy planning, including business strategy, key challenges, target business processes, and key critical capabilities. Finally, from the interview outcomes, we developed a simple A3-size one-page summary format [Fig. 2] that we refer to as the PLM Success Value Roadmap (PSVR). The PSVR is a deliverable of the PLM strategy-planning phase that we are proposing herein, and it must cover the understanding of every stakeholder working in any variety of organizations. As stated in Fig. 2, the PSVR as a one-page summary can be simply overviewed by the stakeholders. There are 12 different views regarding PLM strategy, including PLM vision, business strategy, difficulties experienced by existing end users, ICT best practices, focused processes, and key performance indicators. The PSVR allows PLM promotion members and related stakeholders to understand globally the comprehensive PLM strategy as planned. The contents of the PSVR are defined in the proposed workshop-facilitation steps explained in Section 3.



**Fig. 2.** Illustrative example of PLM Success Value Roadmap (PSVR) – as A3 size one-page summary

### **3 Design of Workshop Facilitation for PLM Strategy Planning**

We designed a strategic workshop-facilitation framework for PLM stakeholders who are selected from various departments including sales/marketing, product planning, product engineering, quality assurance, production/procurement, and service/maintenance. We assume that these stakeholders are selected by level-C executives and that the former become corporate PLM promotion members. However, the workshop members are not always available to work full-time on the assigned mission. Consequently, the workshop must be held over a relatively short time (e.g., several days) to allow the members to establish rapidly a single common PLM vision and strategy that contributes to the executives' strategic business goals. This paper aims to provide a pragmatic step-by-step approach that facilitates various elements of PLM strategy planning in such business situations.

#### **3.1 Proposed Workshop Facilitation Framework**

The following explains the three primary sessions in terms of the proposed workshop-facilitation framework for multi-party participants invited from the various departments of the enterprise.

##### ***Session A: Defining the vision and strategy***

The aim of Session A (the first session) is to establish a common and single PLM vision statement. The PLM vision should conform to the corporate strategy based on the consensus of all participants. Session A also identifies the key challenges that must be overcome across the departments.

##### ***Session B: Understanding the technology and processes***

Session B (the next session) concerns technology experience. The aim is to get the workshop participants to identify and experience state-of-the-art commercial PLM software packages based on proven business processes. This is an important experience to smoothly imagine the ideal business process innovation with critical PLM capabilities.

##### ***Session C: Configuring the metrics and roadmap***

The aim of Session C (the final session) is to achieve a single consensus among the participants. The KPIs are defined based on the balanced scorecard (BSC) methodology. Encompassing all the items discussed by the participants, a PSVR is created as a one-page summary.

#### **3.2 Workshop Facilitation Steps**

In Sessions A–C, the facilitator leads the workshop through the following 12 steps (Table 1). These steps encourage the participants to explore the various critical topics that are necessary to define a PSVR as mentioned in Section 2. The aim of these steps is to support the workshop participants in preparing the fundamental contents of their PLM strategy both smoothly and efficiently.

**Table 1.** Proposed Workshop Facilitation Framework.

| Session                      | Step | Key Facilitation  |
|------------------------------|------|---|
| A<br>Vision<br>& Strategy    | 1    | <b>Identify</b> the corporate strategy and operational issues                   |
|                              | 2    | <b>Realize</b> the participants' negative challenges and positive motivations   |
|                              | 3    | <b>Recognize</b> operational PLM initiatives and map them to business processes |
|                              | 4    | <b>Define</b> the PLM vision statement to build common consensus                |
| B<br>Technology<br>& Process | 5    | <b>Understand</b> commercial PLM systems regarding business scenarios           |
|                              | 6    | <b>Discuss</b> case studies of PLM best practices                               |
|                              | 7    | <b>Discover</b> new PLM initiatives regarding commercial PLM functionality      |
|                              | 8    | <b>Experience</b> the OOTB functions of a PLM system with own product data      |
|                              | 9    | <b>Select</b> favorite PLM functionalities from PLM hands-on experience         |
|                              | 10   | <b>Devise</b> intended business processes based on new PLM initiatives          |
| C<br>Metrics<br>& Roadmap    | 11   | <b>Configure</b> a strategy map to define the KPIs                              |
|                              | 12   | <b>Complete</b> an original PSVR for the stakeholders                           |

***Step 1: Identify the corporate strategy and operational issues***

By reviewing the results of the pre-questionnaire that the workshop participants completed beforehand, the participants agree on (i) the direction of the corporate management strategy, (ii) the key challenges, and (iii) the business process. These are compared with the participants' corporate direction and the PLM-related best practices of other companies.

***Step 2: Realize the participants' negative challenges and positive motivations***

To determine the participants' mindsets regarding PLM strategy, the workshop facilitator asks the participants to write down existing negative operational problems and positive motivations using sticky notes. These are then gathered together, and the KJ method [7] is used to categorize all the various phrases and sentences into clusters. This encourages the participants, in the opening session of the workshop (i.e., as early as possible), to obtain a mutual understanding of their key competences.

***Step 3: Recognize operational PLM initiatives and map them to business processes***

Having obtained a mutual understanding of the negative and positive topics in step 2, the facilitator then asks the participants to consider what the ideal PLM initiatives are. Several initiatives and action items are gathered together on sticky notes, whereupon these topics are mapped to some of the 26 business processes that we have defined as PLM best practices.

***Step 4: Define the PLM vision statement to build common consensus***

One single PLM vision statement is defined as a common contribution by all the workshop participants. This represents an important final direction for implementing future PLM solutions. Having defined the PLM vision statement, the PLM stakeholders can always refer to it during the PLM promotion project. This is a fundamental starting point when making a PLM strategic plan.

***Step 5: Understand commercial PLM systems regarding business scenarios***

Nowadays, major commercial PLM software packages have many usable OOTB functionalities, thereby allowing the participants to imagine how their own PLM strategy could be realized during the PLM system implementation phase. This step provides the participants with a standard demonstration session so that they understand which OOTB functionalities are suitable for their business situations. Once the participants understand the PLM OOTB functionalities, the workshop

facilitator encourages them to discuss which PLM capabilities are suitable for them and how those capabilities can be adapted to their new business process.

***Step 6: Discuss case studies of PLM best practices***

The facilitator presents global case studies of PLM best practices in other companies. This is an important opportunity for the participants to learn about previously unknown PLM initiatives beyond the realm of their own company. The facilitator introduces as wide a variety of case studies as possible, not merely cases from the same industries with which the participants are familiar.

***Step 7: Discover new PLM initiatives regarding commercial PLM functionality***

The participants are now starting to imagine using the commercial OOTB PLM functionalities while incorporating their own intended business processes. In step 7, they establish a high-level definition of their ideal business-process landscape. This is in the form of a swim-lane diagram [8], which is a mapping diagram containing business phases and related organizations. This diagram helps the participants to prioritize new PLM initiatives.

***Step 8: Experience the OOTB functions of a PLM system with own product data***

To allow the participants, as future end users of PLM system, to experience the reality of OOTB PLM functionalities, this step provides a hands-on session with a PLM application system. The participants use their own original real product data as created on a 3D CAD system. A benefit of this hands-on experience is that it minimizes the number of subsequent unnecessary customization requirements.

***Step 9: Select favorite PLM functionalities from PLM hands-on experience***

Having experienced the hands-on session in step 8, the participants know which functionalities should be used in their own business processes. In this step, the facilitator encourages the participants to select as many of these preferred functionalities as desired and then map them onto the previously defined swim-lane diagram.

***Step 10: Devise intended business processes based on new PLM initiatives***

Referring to the template provided by the swim-lane diagram, which represents all the business processes and the relationships with all the PLM organizations, the participants devise their ideal intended business processes with one single common consensus. They then map the new PLM initiatives that they defined in step 7 on the intended processes.

***Step 11: Configure a strategy map to define the KPIs***

The participants tentatively define metrics for the PLM initiatives. This activity again uses the Balanced Score Card (BSC) method [9]. For a PLM strategy, the BSC is configured with four different views, namely (i) corporate management, (ii) business process, (iii) adoption, and (iv) information technology. The facilitator asks the participants to define KPIs through the BSC activity by working in groups.

***Step 12: Complete an original PSVR for the stakeholders***

Finally, having worked through steps 1–11, the participants complete a PSVR as a comprehensive one-page summary of their PLM strategic planning.

## 4 Case Study

### 4.1 Background and Opportunity

Company X (as a pseudonym) is a medium-sized manufacturer of high-tech electronics and comprises three different business units. It deals in high-tech products and components for electronic equipment, electrical machinery, and automotive industries. The operating officer Mr. A (as a pseudonym) of the corporate business planning department of the company has decided to implement an enterprise PLM system to manage all product data and processes throughout the three different business units. A key challenge is that the PLM user candidates of the three business units have never experienced business collaboration each other at all, and there are no job-rotation opportunities for them among the business units. We had the opportunity to use our developed multi-party PLM strategy-planning workshop method to organize consensus building for the stakeholders of the business units. To support mutual communication, a dedicated professional facilitator was also assigned from a PLM solution company.

### 4.2 Characteristic of Participants

The executive officer nominated 17 employees as the workshop members (see Table 2). Reviewing the preliminary questionnaire answered in step 1, it was clear that the participants all had different expectations regarding the PLM system itself. By following the 12 workshop facilitation steps, they attempted to craft an original one-page PSVR facilitated by the professional PLM consultant. This was a two-day event held at the company's employee training center.

**Table 2.** Attendees List of the Workshop at Company-X

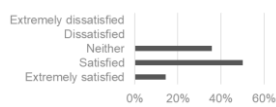
| Business Unit | Participant | Affiliation department | Expectation of PLM System                           |
|---------------|-------------|------------------------|---|
| BU-1          | 1           | Sales                  | Product information sharing among departments       |
|               | 2           | Procurement            | Supplier collaboration with open and close          |
|               | 3           | Manufacturing          | Reformation of working process and data             |
|               | 4           | Production Engineering | Project management with product data                |
|               | 5           | Design Engineering     | Improvement of product quality and reliability      |
| BU-2          | 6           | Sales                  | Standardization for product and related parts       |
|               | 7           | Sales                  | Delivery date management                            |
|               | 8           | Procurement            | Standardization and trade-off                       |
|               | 9           | Manufacturing          | Clear role and responsibility                       |
|               | 10          | Design Engineering     | Standardization and motivation management           |
|               | 11          | Business Development   | Launch process management                           |
| BU-3          | 12          | Sales                  | Eliminate duplicated activities                     |
|               | 13          | Sales                  | Clear responsibility and eliminate non-valued tasks |
|               | 14          | Procurement            | Process reengineering                               |
|               | 15          | Manufacturing          | Resource management and process management          |
|               | 16          | Manufacturing          | Replace existing systems reducing maintenance cost  |
|               | 17          | Design Engineering     | Information sharing with up-to-date contents        |



### 4.3 Discussion

After the workshop event at Company X, we asked the participants the following eight questions. The aim of this survey was to assess whether our developed workshop-facilitation steps helped to plan a PLM strategy in such a multi-party environment. We received 14 responses to this survey.

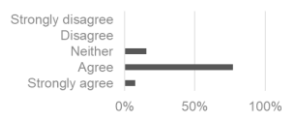
***Q1: How satisfied were you with the workshop?***



**Fig. 3.** Result of Q1

More than 60% of the participants were either satisfied or strongly satisfied with the workshop. This means that the workshop method that we have developed was evaluated positively and accepted comprehensively (Fig. 3).

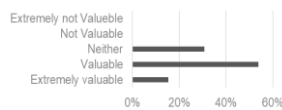
***Q2: Did you find the multi-party discussion during the workshop effective?***



**Fig. 4.** Result of Q2

Most of the respondents (more than 80%) found that multi-party discussion such as group work across different departments was effective. In fact, we received positive feedback on multi-party discussion in the free description in question 7 (Fig. 4).

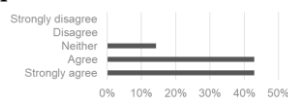
***Q3: How was the utilization and actual progress of the external facilitator?***



**Fig. 5.** Result of Q3

The replies to this question indicate that using an external facilitator made an important contribution to the trial workshop. However, more research is needed to determine whether this feedback was dependent on the skills of the professional facilitator (Fig. 5).

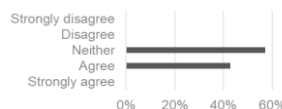
***Q4: Did the problem hypothesis presented during the workshop correlate with problems in the actual workplace?***



**Fig. 6.** Result of Q4

Most of the respondents agreed that they were able to extract a hypothesis that was appropriate to real issues in the workplace. This was one of our aims and a significant indicator for our study (Fig. 6).

***Q5: In the discussion during the workshop, did you identify the root cause of the business problems?***



**Fig. 7.** Result of Q5

40% of the respondents agreed that they were able to identify the root cause. However, the majority neither agreed nor disagreed (Fig. 7), pointing out in question 7 that it was necessary to have more discussion time.

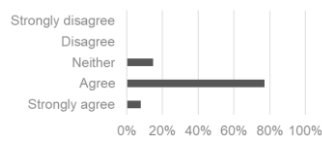
**Q6: What are your opinions about the PLM success value roadmap that you crafted through the workshop group discussion? (free comment)**

- I felt that “high-level discussion” was very important regarding the vision that I created.
- I realized what my department’s strong and weak points are; I found a direction to solve.
- I think that it describes exactly the issues regarding my division.
- I feel that its content is very effective, so I definitely want to realize it.
- I realized that we all had the same common understanding even if different departments.
- I am concerned that it might be lacking in detail.
- 

**Q7: Regarding the workshop that you experienced, please list what you felt were the pros and cons (free comment)**

- Pro: I was able to exchange opinions across departments.
- Pro: I had a common recognition in related divisions.
- Pro: I could share my PLM vision with my members.
- Pro: It was a very valuable opportunity for discussions with other department members.
- Pro: By sharing problems, the task has been clarified.
- Pro: I was able to proceed with the tempo well in a short time.
- Pro: I was glad that I could think of it with different thought circuits.
- Pro: Because I got away from daily work, I was able to concentrate quietly take a lecture.
- Pro: It was refreshing for me to extract problems in a short time.
- 
- Con: In discussions with members of the same division, it was difficult to come up with new ideas.
- Con: I think that participants were biased by department.
- Con: Time was limited, and some discussion was inadequate.
- Con: I thought that there was not enough time for group discussions.
- Con: I wanted to hear about the problems of other departments in advance.
- Con: I would like to have received a little more advice from the facilitator.
- Con: Our discussions took place in an intentionally made atmosphere, which I felt was far from practical.
- Con: Even if we concluded in this workshop, we would be not able to solve it at work by ourselves.
- Con: I wanted to talk a bit more about the current ICT system problems.

**Q8: Would you recommend this workshop method to your coworkers and colleagues?**



85% of the participants commented that they would encourage colleagues to participate in the workshop that we have developed. This means that the multi-party intensive workshop would be a valuable experience for many of the stakeholders for PLM strategy planning (Fig. 8).

**Fig. 8.** Result of Q8

## 5 Conclusions and Future Work

We proposed a workshop-facilitation framework for the PLM strategic planning phase, the aim being to encourage multi-party participants to discuss proactively in a positive discussion atmosphere. We defined 12 steps as the facilitation workstream, and we had an opportunity to work through these steps with an industrial company. Having conducted this empirical trial study with the company, we found that the proposed consensus-building method contributed to the satisfaction of more than 60% of the participants. 85% of the participants commented that they would encourage colleagues to participate in the workshop that we have developed. We conclude that the multi-party intensive workshop was a valuable experience that helped that stakeholders to produce a PLM strategy in a relatively short time. However, because in their feedback some of the participants requested more leadership from the facilitator, we must consider the role of the facilitator in the requirement-gathering phase (e.g., cons in Q7 discussed in the above section 4.3). We must also identify whether the outcome was due to our proposed method or the skills of the professional facilitator. For example, during the workshop time, the facilitator noticed that even silent participant had the similar opinions as other participants had. Facilitators should be aware of such equal dialogue without prejudice. Therefore, as a future work, we intend to apply probabilistic latent semantic analysis, such as *topic modeling* [10], to the raw data arising from participants' dialogs. This aims to incorporate a scientific objective metric into the workshop outcome. Additionally, because it was obtained from an experiment with just one company, our trial data set was relatively small. We require more data so that we can be confident in our developed facilitation method.

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