



PLM and the Digital Future Industry Survey

Survey Overview

Version 1.0

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1. THE PLM-DIGITAL PREMISE

The PLM-Digital Premise

The underlying principle of this Survey is that any sound roadmap for integrating PLM with the new Digital Future should be based on the following premise:-

For over 2 decades, PLM has been integrating and digitising the world of product development, building up a wealth of technical capability and business expertise. The recent advent of technologies within the 'Digital Wave' offers new opportunities to advance the reach and effectiveness of PLM; and also offers brand new areas of opportunity that should be exploited in their own right.

The relationship between PLM and Digital should be symbiotic and harmonised. Considering this holistic landscape, PLM knowledge and techniques provide a sound and proven structure for "connect everything" integration that the Digital discipline has yet to learn; and Digital capabilities offer a path to extend PLM beyond its current boundaries.

For any product-oriented company, the most effective strategy for the future will be based on a genuinely integrated approach to PLM and Digital development.

This Premise was first published in a [White Paper](#) on 13 May 2020 and was circulated for industry-wide discussion. To date there has been no disagreement with it, but feedback is welcome, as it is about any part of this Overview Document.

2. BACKGROUND

The rush of enthusiasm for new ideas such as Industrie 4.0 and IoT draws attention away from the some of the core aims and principles of PLM, despite the fact that PLM and Digital seem to overlap, and may possibly be different manifestations of the same approach.

This Survey is intended to add some clarity to the picture. Prepared by the Professional PLM Initiative in partnership with Xlifecycle, it ran throughout June 2020 and was open to PLM practitioners in any role, in any geography. Respondents from 12 countries entered their views on 5 separate questions, and the results have been collated into this Overview Document.

The Survey has been based around [The PLM-Digital Premise](#) (overleaf), and the presentation of the results is in the same vein. Resolving these issues is important for future investment in PLM, and in Digital, by user companies. It is hoped that the findings can be used to guide future progress in both disciplines.

3. PURPOSE OF THE SURVEY

The purpose of this Survey is to create a neutral reference point for understanding the PLM position and potential; and act as a basis for harmonising PLM and Digital programmes in the future.

4. SURVEY METHODOLOGY

Participation in the Survey was open to PLM users, vendors, service providers, consultants, academics and researchers – in fact, every PLM practitioner who is affected by, would like to be involved with, or is participating in a Digital programme.

The Survey could be downloaded as a Word document or completed on-line via the Xlifecycle web site. Results were captured in spreadsheet format and processed for percentages, and for good ideas from the participants' own words.

5. PRESENTATION OF RESULTS

Responses to each of the primary questions were grouped, and are shown as percentage results in the respective tables. The more freestyle answers have been summarised into text.

Pertinent and useful ideas have been expressed in the words of the Survey participants themselves. Care has been taken to anonymise the results to maintain confidentiality.

The results do not represent the views of the authors, but are a compilation of the views of the respondents.

6. RESULTS

Q1. Relationship

PLM has existed as a strategy and practice for over 20 years and pioneered many aspects that are now seen as part of the 'Digital Wave'.

Question: Do you see PLM and Digital as separate disciplines, or will everything merge in the future?

PLM and Digital are separate disciplines	13%
PLM is a discipline, but Digital is not	13%
PLM and Digital are part of the same holistic environment	25%
PLM and Digital will overlap	13%
PLM and Digital will merge	20%
PLM and Digital will remain separate	0%
PLM is a sub-set of Digital	16%

Question: What will it take to enable or accelerate such convergence?

- Active integration between the two disciplines, measuring performance in each area and clarifying definitions.
- Widen the scope of PLM beyond CAD/PLM. Link organisational silos to improve data continuity.
- PLM needs to become more digital, more mature, and better integrated with other IT platforms.
- PLM and Digital will be impelled to converge via the implementation of the Digital Thread; by the drive for smarter, connected products; or as new Digital developments are applied to PLM.
- On the other hand, PLM itself will enable digital integration, and hence become part of the Digital Wave.
- PLM will enable cross-functional digitalisation across the wider enterprise, and bring clarity to senior management.

Discussion

There is no most significant view about the relationship between PLM and Digital. Almost every option has support, apart from the possibility that PLM and Digital will remain completely separate into the future.

We are faced with the certainty that PLM and Digital will merge to some degree, but have no consensus about how this should be.

[cont.]

Ideas for accelerating the convergence focus on increasing the digital emphasis and capability within PLM in order to provide a pathway for the two activities to integrate, with several suggestions of how to do this.

Q2. Vision

The effectiveness of any business improvement initiative is greatly increased if there is a clear Vision of where it will be the future.

Question: Do you have a forward view of where your PLM will be in 5 or 10 years' time? Has your organisation formed a view of its Digital environment over a similar timespan?

Neither Digital nor PLM have clear vision	33%
PLM has a clear vision, whereas Digital does not	8%
PLM has no vision, whereas Digital has a clear vision	4%
PLM and Digital visions both exist separately	21%
PLM vision is part of Digital vision	13%
Digital strategy is part of PLM vision	13%
There is an integrated PLM/Digital vision	4%
Impossible to see 10 years ahead	4%

Question: Are the two views balanced?

Yes [10%]; No [10%]; Will remain separate but overlap [5%];
Impossible to foresee [10%].

The remaining 65% felt that the two views would come together because of:-

- Digital integration, and advances such as AI and Machine Learning;
- Seamless data integration;
- Development of IIoT across the Supply Chain;
- Companies realising that PLM is necessary for Digital;
- Extension of PLM functionality and integration;
- Organic merging;
- Adoption by business people, and through business delivery;
- Software changes in vendor applications; or,
- Vendors moving to the cloud, having to bring their customers with them.

Discussion

The most prominent response (33%) is that there is no clear Vision for PLM or for Digital, which is possibly to be expected.

A fifth of respondents (21%) saw PLM and Digital Visions existing separately. Those who thought they would merge had no significant preference for how this will be.

In terms of balance, most respondents (65%) felt that the Visions would come together (if they are not already) by more digitalisation; by extending PLM capability; or by the vendor drive for software development or to the cloud.

A small percentage thought that the PLM and Digital Visions would be driven to merge because of business activity, which is perhaps an encouraging prospect.

Q3. Digital Twin

The concept of the Digital Twin has appeared as part of the new Digital landscape, but PLM has been working on this for a long time, starting with Model Based Definition and extending across the lifecycle.

Question: Do you see the concept of “digital twins” as part of PLM or Digital? Are these the same thing, or separate ideas?

Digital Twins are part of both	22%
Digital Twins are part of PLM	33%
Digital Twins are part of Digital only	0%
Digital offers scope to enhance Digital Twins cf. PLM	4%
Digital Twins and PLM are the same	25%
Digital Twin is just another marketing concept	8%
Neither are properly defined	8%

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Question: Does the Digital approach offer any new opportunities?

64% of the respondents viewed Digital Twins as bringing new opportunities, whereas 16% did not see any (either due to the lack of clarity, possibly due to marketing jargon, or due to the fact that PLM is already mature in context of Digital); 20% of the respondents did not answer the question explicitly or declined to comment.

Per the respondents' views, opportunities to leverage Digital Twins include:

- Digital Twins can help make PLM more attractive and link to new practical business requirements.
- Digital Twin and digitalisation language can help executive management understand PLM and break organisational silos.
- Digital Twins are related to PLM; they also reach out to wider enterprise platforms and disciplines, such as ALM, MES, etc.
- Digital Twins contribute to expand the traditional scope of PLM beyond manufacturing and IOT, also leveraging model-based definition, systems engineering, AI / ML and new performance / operational parameters.
- Like PLM, Digital Twins help plan and design better products, hence bring more intelligence to the product lifecycle.
- Digital Twins help connect virtual and physical worlds, further than traditional PLM contributed to, expanding the product lifecycle usage and value.

Discussion

Most respondents (84%) viewed Digital Twins as a synonym or overlapping with PLM scope, with focus on the model-based definition of the product across its lifecycle. Several suggested that Digital Twins can help bring clarity and interest into PLM, especially with non-technical experts and executives.

Overlapping with the above, slightly more than one third of the respondents (36%) thought that Digital Twins reached beyond PLM and covered a wider scope, both from data and functional perspectives; clearly Digital Twins are models that can help expand the scope of PLM and improve product data quality and traceability (leveraging new data models and closed-loops).

Most views suggested that the Digital Twins are “applied” in context of PLM, whereas a minority of responses suggested that the reverse might also occur.

A small number of respondents (16%) did not see any value in discussing Digital Twins, either because PLM was already covering these (albeit using different language) or they considered Digital Twins as marketing jargon attempting to “digitalise” everything.

Q4. Digital Thread

And similarly, the concept of the Digital Thread has appeared as part of the new Digital landscape, but PLM has been working on this for a long time, based on configuration and change management across the lifecycle.

Question: Do you see the concept of the “Digital Thread” as part of PLM or Digital? Are these the same thing, or separate ideas?

Digital Thread is part of both	35%
Digital Thread is part of PLM	14%
Digital Thread is part of Digital only	0%
Digital Thread is one and the same in PLM and Digital	14%
Digital offers scope to enhance Digital Thread cf. PLM	23%
PLM has nothing to do with Digital Thread	0%
Digital Thread is just another marketing concept	5%
Neither are properly defined	9%

Question: Does the Digital approach offer any new opportunities?

80% of the respondents saw new opportunity potential from the Digital Thread, whereas 13% did not see any; 7% of the respondents did not answer the question explicitly or declined to elaborate.

Opportunities from the Digital Thread can be summarised across four axes:

- Digital Thread contributes to data connectivity, traceability and continuity across the enterprise.
- Digital Thread reaches above and beyond PLM as a discipline and offers the opportunity to integrate PLM building blocks with other enterprise functions and platforms.
- Digital Thread offers new applicative data bridges, from downstream production data optimisation to visualising (e.g. using IOT, AR / VR tools).
- Applying data configuration and change management across the product lifecycle and the entire Digital Thread, due to complexity of data structures and interfaces.

A number of ongoing challenges or threats were also highlighted:

- Digital Thread is not fully representative of the product data, without applying integrated data lifecycle management business rules, cf. PLM.
- Often Digital Thread can relate to a solution looking for a problem to solve (a mean to an end, a concept that can have multiple different applications).
- Digital Thread solutions need to take a holistic approach considering master data strategies and data integrity.

Discussion

Response trends about the Digital Thread were broadly similar to the ones regarding Digital Twins.

Most responses (87%) suggested that the Digital Thread has something to do with PLM and is contributing to integrate data across the enterprise. Many respondents gave their own definition on what Digital Thread might mean. The ability to link with PLM was obvious, but not exclusive, in how the responses were framed.

Similarly to Digital Twins, the general perception is that Digital Thread can help introduce concepts of data integration to non-technical experts or senior management which might not be familiar with PLM.

Looking at opportunities and threats that Digital Thread might bring, further clarification is needed to explicitly state how they contribute to better business integration and data continuity—especially in the context of PLM, managing data lifecycle, configuration and change.

There was no consensus amongst all respondents about what aspects of the Digital Thread specifically relate to digitalising the product lifecycle vs the rest of the enterprise operations. Overall, the terms was used in a fairly broad and vague sense, pretty much as a synonym of 'data continuity'.

A small number of respondents (13%) did not see any value in discussing the Digital Thread.

Q5. Future Convergence

In an industry context, the rise of smart products is often coupled with the emergence of smart factories. Traditional PLM is based on a fixed data structure and may not be adaptable in its current form.

Question: **With the current hype on Industry 4.0, how does PLM need to develop in order to support smart products and factories? Does PLM need to evolve to interlink with the new, wider connected enterprise?**

Respondents to the Survey expressed the following views, in their own words:-

Traditional PLM limits the speed of innovation, and must evolve to support IoT. Obstacles to PLM are now even more damaging because they impede Digital progress. PLM needs to break down silos before it can support Industry 4.0.

Good data is still critical for both PLM and Digital, and comprehensive data management and a digital backbone can provide the integration mechanism.

[cont.]

PLM must expand its horizons to encompass the possibilities of visualisation and connected things – incorporating AI, machine learning and analytics. PLM needs to expand to be able to manage smart data; and handle data from smart manufacturing, which it cannot do at the moment.

PLM does not need to evolve - it is about smart products, too, and is already covering the wider connected enterprise. Real-time track and trace at the highest level of PLM maturity will help PLM and Digital to converge. PLM is already applicable to smart products and Industry 4.0, in simulation and the Digital Twin. PLM and Industry 4.0 are tightly linked and will evolve together.

The factory of the future is an extension of what has been done for years, and PLM has always covered this. Making factories smarter has little to do with PLM. PLM is about controlling product data across the lifecycle, whereas Digital is about Big Data.

Industry 4.0 needs to evolve, linking with the wider connected enterprise. PLM does not enable Industry 4.0 but benefits from it. The potential of Industry 4.0 should be made available to SMEs.

Discussion

These results, which are the first in the Survey to be presented in the respondents' own words, reveal a mix of good ideas and outright disagreement.

On the one hand, PLM should and must evolve from its current limitations in order to support and be part of the new Digital developments: but on the other, a significant number believe that PLM is already there, and covers everything that Digital needs.

The ideas seem to offer a natural path to progression. Removing silos and other barriers from PLM is in line with the Digital 'connect everything' philosophy; and the suggestion of leveraging data, and data management, as a convergence mechanism seems to make use of one of the strong points shared by both disciplines.

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Q6. Other Comments

The questions in this Survey are based on an initial overview derived from The PLM-Digital Premise.

Question: **In your own words, do you have any other comments, input or thoughts? Have any issues been missed? Are any of the assumptions incorrect?**

PLM is not well understood, and is difficult to explain. At the moment Digital wave is still in hype mode and because of its wide scope it makes it very difficult for the enterprises to really understand the whole digital business beyond the marketing jargon. Industry 4.0 is far away from its maturity as Digital is not matured yet. Gaps continue to delay Digital due to legacy and ECAD/MCAD/BOM/Compliance functionality.

Defining the connections between PLM and the elements of Digital is important for reaching management, but of no practical use in generating solutions.

Manufacturers will capitalise on the data opportunities of Digital to offer better products and services to customers. Those that take a transformative approach will do well. Manufacturing companies have always taken advantage of new technologies as they become available. Perhaps PLM Managers should stop thinking that they can only improve PLM by buying more software

PLM is a precursor to effective Digital management. Most Digital Initiatives are done with the intent of measuring and trending product performance. The better the definition, the more valuable the results of the performance measurement.

It is difficult to implement good PLM without the concepts of data architecture and governance. Companies that neglect this to quickly release Digital initiatives will find that there is a high cost.

It is important to develop 3D representation of products in every aspect, including maintenance, repair and machine learning. The links between MBSE, PLM and ERP must be simplified before advanced digitalization.

In all of this, Change Management must not be forgotten.- and that too must evolve as products and the organisation change.

PLM must evolve on the concept of open source management, like Android apps, without compromising its fundamentals. The first step will be to take PLM fully to the cloud, and adapt to what that means.

Discussion

This was a 'freestyle' question, and no conclusions are drawn from it. The response presents a snapshot of ideas that people have about PLM and Digital, and some may be thought-provoking for the reader.

7. CONCLUSIONS

This Survey gathered views from PLM practitioners about the place of PLM in the wider, and newer, 'Digital' landscape. Respondents provided varied, insightful, and sometimes contradictory perspectives on how the two inter-relate; how they might be aligned; and the opportunities that may arise.

The overwhelming picture is that we are starting from a point of confusion. People are keen to explore the subject, but talk about it in different ways. There is no clear or consistent view of what the relationship between PLM and Digital should be, and no clear Vision for either.

No-one felt that the disciplines would remain discrete and separate, but there were almost random predictions about the degree of future overlap or merging. Many good ideas are proposed for how this could be expedited and optimised, but they are varied and will need a co-ordinated approach to apply them effectively.

The findings are similar for the two main "common factors", the Digital Twin and the Digital Thread. Most respondents suggested that these can help bring clarity and interest into PLM, especially with non-technical experts and executives: but there was then an almost random range of views about how this should come about.

The authors note also that this picture is viewed entirely from the PLM perspective – it seems unlikely that many purely 'Digital' practitioners will know what PLM is, let alone how to blend with it or leverage it.

It seems, therefore, that any advance in this area has to come from the PLM side, and this Survey has shown that there is a lot of good material to work with. As yet, no-one has devised any agreed definitions or standards in this area, and much of the publicity and marketing material around Digital is either ill-defined or inaccurate.

The next step should therefore be to build on the results of the Survey, and formulate the findings into a clear, neutral, written PLM-Digital position that everyone can refer to. Wider dissemination may also serve to highlight the important role of PLM amongst the Digital hype.

This Survey Overview is freely available for feedback via the Professional PLM and Xlifecycle web sites. It is hoped that PLM practitioners in general will be able to learn from and make use of the ideas, and that the feedback may lead to an industry-wide Position Paper that can be used as a general point of reference.