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Examining Product Line Readiness: Experiences with the SEI Product Line Technical Probe℠

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Today's Presentation

Overview of the SEI Product Line Technical Probe (PLTP)

Experience Using the PLTP

- Early experiences
- Midcourse change
- Recent experiences

Organizations' Reactions to PLTP Findings

Conclusions

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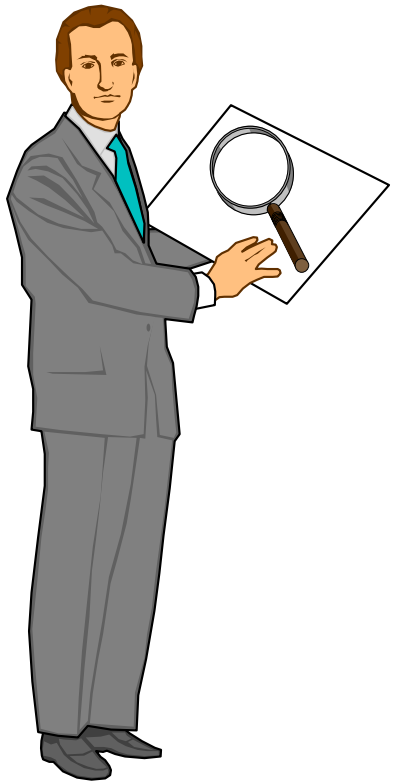
What Is the SEI Product Line Technical Probe (PLTP)?



A method for examining an organization's readiness to adopt or ability to succeed with a software product line approach

- diagnostic tool based on the SEI Framework for Software Product Line Practice
- The product line practice areas from the Framework are the basis of data collection and analysis.

SEI PLTP Outcomes

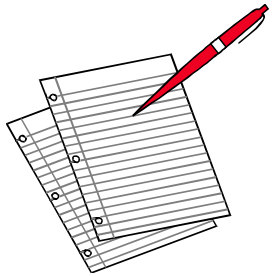
Set of findings that portray organizational

- strengths
- challenges

with regard to a product line approach

Findings are documented in a findings presentation and in a formal PLTP Findings Report.

Findings can be used to develop an adoption plan or action plan with the goal of making the organization more capable of achieving product line success.

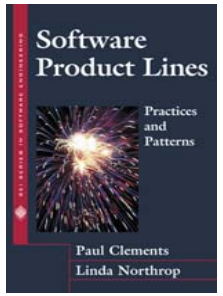


What is the SEI Framework for Software Product Line Practice℠ ?

The SEI Framework for Software Product Line Practice is a conceptual framework that describes the essential activities and twenty-nine practice areas necessary for successful software product lines.

The Framework, originally conceived in 1998, is evolving based on the experience and information provided by the community.

Version 4.0 – in *Software Product Lines: Practices and Patterns*



Version 4.2 – http://www.sei.cmu.edu/productlines/framework.html

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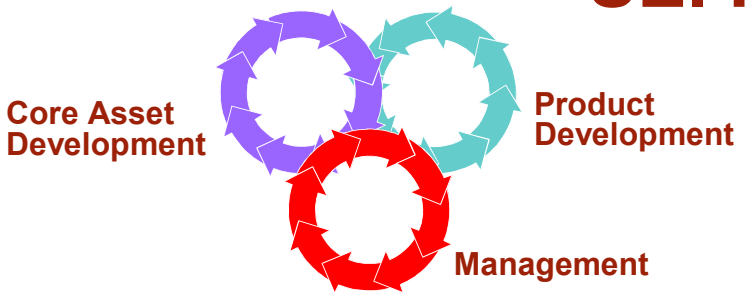
SEI Framework



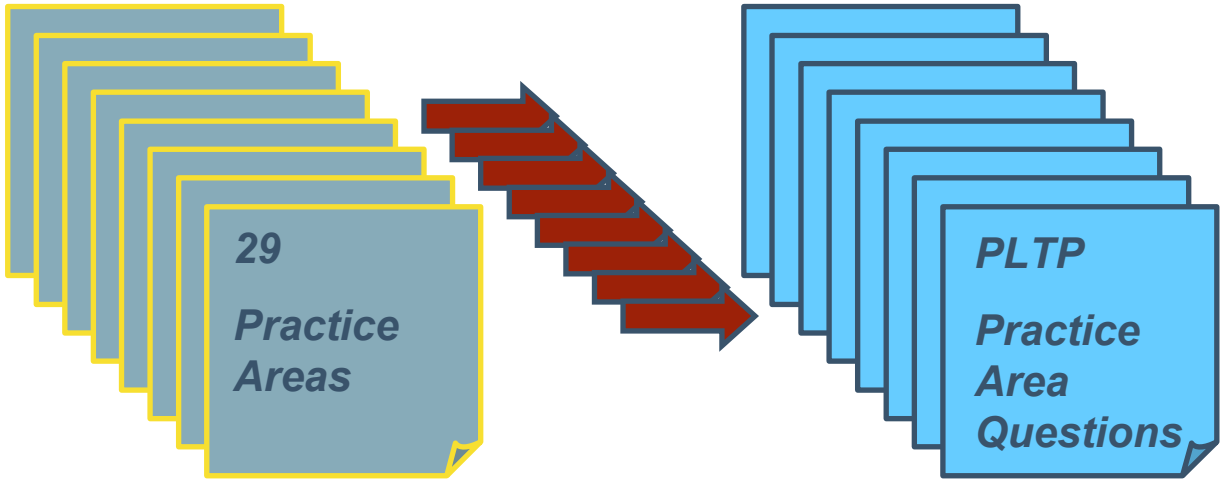
Essential Activities

Software Engineering	Technical Management	Organizational Management
Architecture Definition	Configuration Management	Building a Business Case
Architecture Evaluation	Data Collection, Metrics, and Tracking	Customer Interface Management
Component Development	Make/Buy/Mine/Commission Analysis	Developing an Acquisition Strategy
COTS Utilization	Process Definition	Funding
Mining Existing Assets	Scoping	Launching and Institutionalizing
Requirements Engineering	Technical Planning	Market Analysis
Software System Integration	Technical Risk Management	Operations
Testing	Tool Support	Organizational Planning
Understanding Relevant Domains		Organizational Risk Management
		Structuring the Organization
		Technology Forecasting
		Training

Practice Areas

Applying the Practice Areas in the PLTP

The PLTP process uses structured stakeholder interviews based on questions derived from the 29 practice areas.



Who Are the Stakeholders?

Executives

Technical support staff

Managers

Marketers

Architects

Customers/End users

Developers

Engineers

How is a PLTP Executed?

Preliminary Phase

- one-day meeting at customer site
- probe preparation

Technical Probe Phase

- data gathering
- data consolidation and analysis
- reporting
- four days at customer site

Follow-On

- report writing
- optional: facilitated development of action plan to address findings
- optional: tailored assistance

PLTP Applicability

When an organization

- is considering adopting a software product line approach
- has already initiated a software product line approach

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History of the SEI PLTP

The PLTP was created in 2000 in response to requests to evaluate the product line fitness of several organizations.

- original PLTP question bank was derived
- process was created
- other SEI diagnostics and earlier, less formal product line diagnostics were used as the basis
- question bank and process were continuously improved based on early applications
- team training materials and templates were developed

In 2002, we created the *SEI Adoption Factory Pattern* and subsequently modified the PLTP to use the Adoption Factory Pattern in both the PLTP data analysis and findings reports.

The PLTP has been used to examine a variety of government and commercial organizations.

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Sample Breadth of PLTP Experience

Domain	Size of Organization	Business Drivers for Software Product Line Approach
collaborative planning	small	Improve interoperability; reduce ownership costs; reduce development time
hardware diagnostics	small	Reduce ownership costs; reduce development cost and time
military training products	medium	Ensure commonality across systems; reduce ownership costs
automotive multimedia	large	Reduce development costs; formalize approach to reuse
engine controllers	large	Reduce complexity and costs; enter other market segments
automotive products	large	Reduce complexity; address staff shortages
military command and control (two)	large	Reduce time to field; reduce maintenance costs; reduce duplication
automated tellers	large	Improve productivity, performance and quality; reduce defects

Why Organizations Arrange For a PLTP

To take a baseline snapshot of the product line organization

To do a reality check

To avoid common pitfalls

To capitalize on strengths

To shore up weaknesses

To identify and mitigate risks early

To get stakeholder buy-in

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PLTP Findings

A PLTP team produces findings for each of the 29 practice areas

- based on the interviews and document examination
- expressed as strengths and challenges
- rated (High, Medium, Low) based on relative importance of the findings for the practice area at the time of the PLTP

In addition, the findings include recommendations and the caution that despite individual ratings, eventually all practice areas would have to be addressed thoroughly.

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Early PLTP Findings: Common Themes

All of the early organizations were at the beginning stages of product line adoption or exploration.

In all cases, the management challenges included

- Building a Business Case
- Scoping
- Process Definition
- Launching and Institutionalizing
- Structuring the Organization

The software engineering challenges typically included

- Architecture Definition
- Architecture Evaluation
- Requirements Engineering

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Early PLTP Findings: Tuning Needed

The findings were listed by practice area.

There was no higher level structuring.

The practice area ratings were derived largely from the expertise of the PLTP team.

As a result,

- The findings were difficult for organizations to digest.
- How to proceed was often not obvious.
- The process and results were not as repeatable as desired.

Although the PLTP was deemed useful, more was needed.

- Organizations wanted some sort of a product line roadmap.
- The PLTP Findings Report needed better organization.
- The themes that emerged from the early PTLP experiences provided powerful input.

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A Roadmap and an Aid for the PLTP

The SEI had defined ***software product line practice patterns*** to assist in planning and effecting product line adoption.

One of these patterns, ***the Factory Pattern***, already provided a high-level view of the a product line organization in terms of sub-patterns, which are ultimately expressed as practice areas.

We created a variant of the Factory Pattern with some useful views to provide both a generic product line roadmap and a new organizing structure for PLTP final analysis and report of findings.

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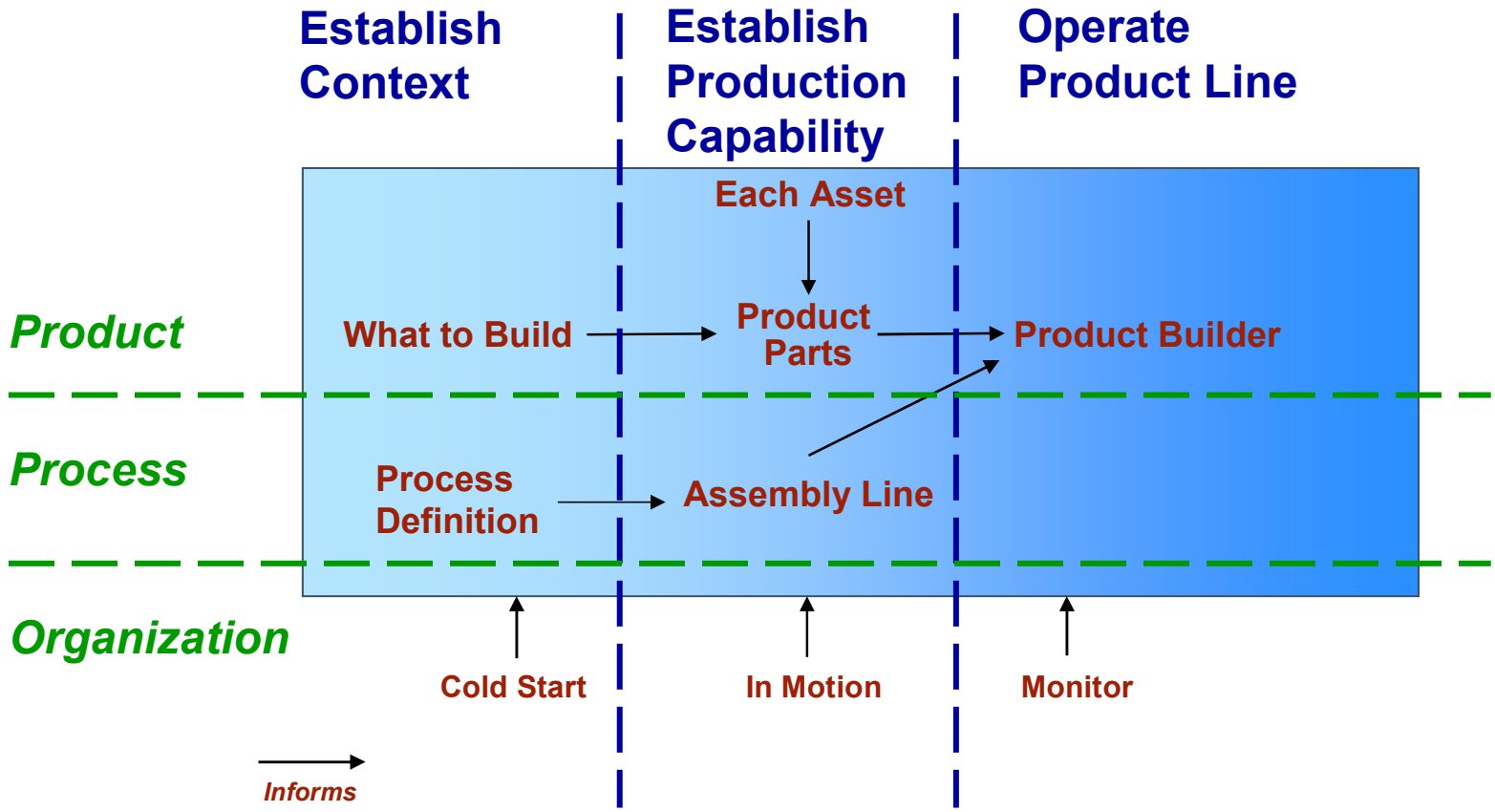
The Adoption Factory Pattern



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Associated Practice Areas

	Establish Context	Establish Production Capability	Operate Product Line
Product	Marketing Analysis Understanding Relevant Domains Technology Forecasting Building a Business Case Scoping	Requirements Engineering Architecture Definition Architecture Evaluation Mining Existing Assets Component Development COTS Utilization Software System Integration Testing	Requirements Engineering Architecture Definition Architecture Evaluation Mining Existing Assets Component Development COTS Utilization Software System Integration Testing
Process	Process Definition	Make/Buy/Mine/Commission Configuration Management Tool Support Data Collection, Metrics, Tracking Technical Planning Technical Risk Management	
Organization	Launching and Institutionalizing Funding Structuring the Organization Operations Organizational Planning Customer Interface Management Organizational Risk Management Developing an Acquisition Strategy Training	Launching and Institutionalizing Funding Structuring the Organization Operations Organizational Planning Customer Interface Management Organizational Risk Management Developing an Acquisition Strategy Training	Data Collection, Metrics and Tracking Technical Risk Management Organizational Risk Management Customer Interface Management Organizational Planning

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PLTP and the Adoption Factory Pattern

We still use practice areas as the primary reference for data collection and analysis.

We do a final analysis against the Adoption Factory pattern using all of its associated views (practice areas, phases, focus areas, roles, and outputs).

We report findings using the Adoption Factory pattern as an organizing structure.

We demonstrate cross-practice area challenges using the Adoption Factory pattern.

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Recent Findings: Common Themes - 1

The organizations that are requesting a PLTP are for the most part better informed about software product lines.

Engineering organizations tend to jump right into architecture and component development activities without doing a proper scoping and business case.

- Frustration and waste result.

There is still a pervading assumption that product lines involve a new technical approach only.

- There is too little awareness that a product line approach is both a new technical and business approach.

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Recent Findings: Common Themes - 2

Most organizations vastly underestimate the management commitment and involvement needed. They fail to have

- a responsible product line manager with authority to oversee the product line effort
- a product line adoption plan
- a product line concept of operations
- a training plan
- an appropriate funding model

Organizations with more product line sophistication struggle with

- configuration management
- appropriate variation mechanisms
- a production plan used to build all products
- appropriate data collection, metrics, and tracking activities

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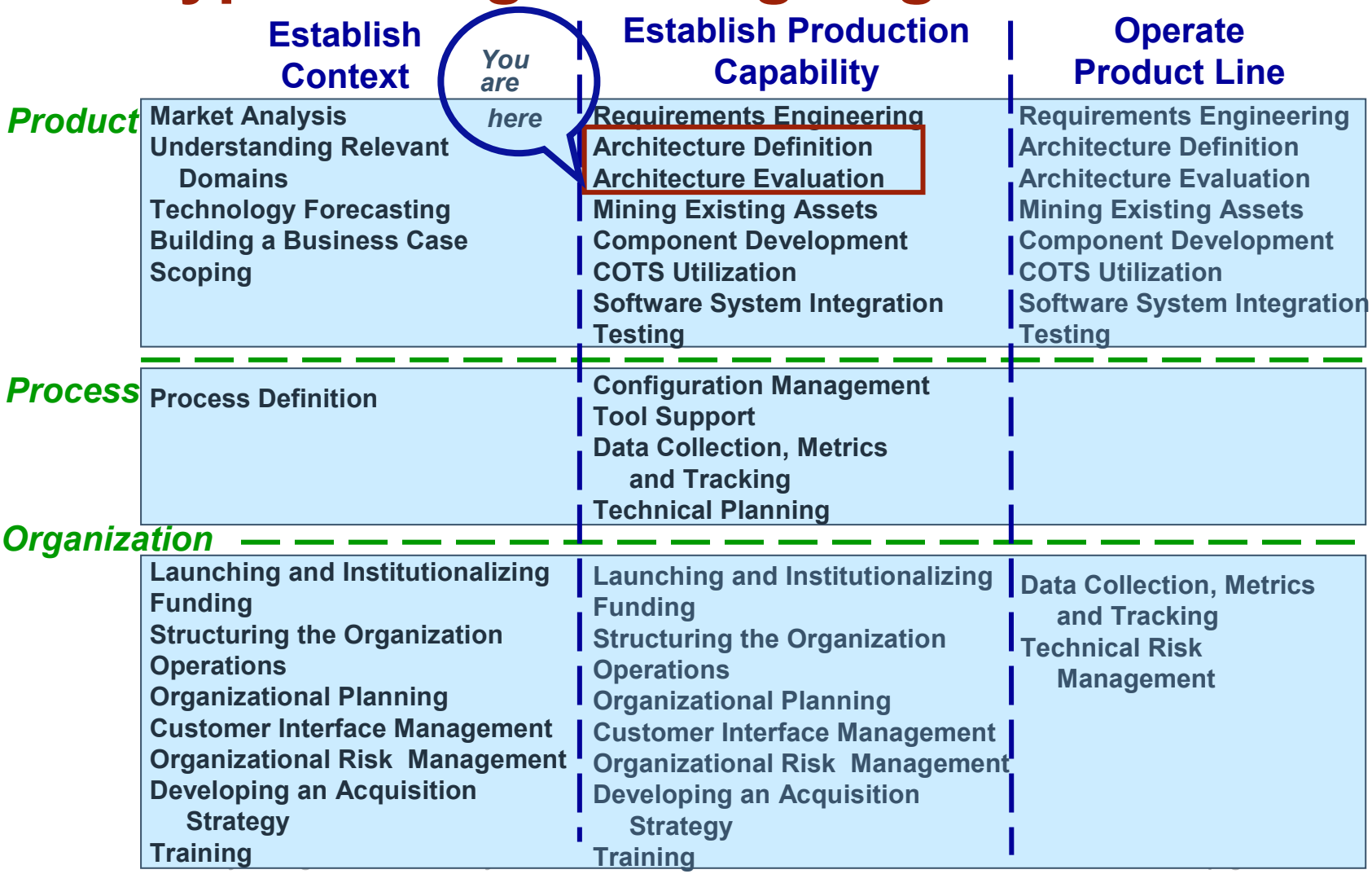
Typical Engineering Organization



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Typical Challenges (shown in red)

	Establish Context	Establish Production Capability	Operate Product Line
Product	Market Analysis Understanding Relevant Domains Technology Forecasting **Building a Business Case** **Scoping**	Requirements Engineering **Architecture Definition** Architecture Evaluation Mining Existing Assets **Component Development** COTS Utilization Software System Integration Testing	Requirements Engineering Architecture Definition Architecture Evaluation Mining Existing Assets Component Development COTS Utilization Software System Integration Testing
Process	Process Definition	**Configuration Management** Tool Support **Data Collection, Metrics and Tracking** Technical Planning	
Organization	**Launching and Institutionalizing** **Funding** **Structuring the Organization** **Operations** Organizational Planning Customer Interface Management Organizational Risk Management Developing an Acquisition Strategy **Training**	Launching and Institutionalizing Funding Structuring the Organization Operations Organizational Planning Customer Interface Management Organizational Risk Management Developing an Acquisition Strategy Training	Data Collection, Metrics and Tracking Technical Risk Management

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Reactions to PLTP Results: General

Interviewed stakeholders universally have more buy-in to their organization's product line effort.

Managers/sponsors of the PLTP have in every case been satisfied that they received a helpful and better understanding of their product line readiness and what is needed to get to full product line operations.

All organizations engaged the SEI to conduct follow-on planning sessions to determine how to proceed based on the PLTP findings.

Organizations have found the Adoption Factory pattern to be a very helpful organizing structure and guide for planning.

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Reactions to PLTP Results: Specific

Of the nine organizations depicted earlier

- One decided to abandon the product line approach; the challenges were too daunting.
- One deferred work on the product line effort in order to establish a firmer basis of process discipline.
  - The product line effort was reactivated after successful process improvement activities.
- Two are struggling in the initial stage of launching a product line.
- One has incorporated its product line effort into the context of a larger, subsuming enterprise effort.
- Four are making aggressive progress in their product line efforts.
- Two are planning on a second PLTP to measure their progress against their initial baseline.

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The SEI Product Line Technical Probe is an effective means for understanding an organization's readiness to proceed with a product line effort.

The PLTP provides a solid basis for developing a product line adoption plan.

The PLTP led the SEI to create the Adoption Factory pattern.

The Adoption Factory pattern is an effective roadmap for product line adoption and for reporting and prioritizing PLTP findings.

Most organizations who have applied the PLTP currently have product line efforts underway.

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Questions – Now or Later

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