



SYNERGISTIC CONCURRENT PRODUCT DEVELOPMENT

How to Achieve and Exploit Synergy between Strategy, People, Process, Tools, & Technology

CONFERENCE AGENDA - Thursday, June 8, 2006

7:30	Registration / Continental Breakfast		
8:15	Welcome / Announcements		
8:30	Keynote: <i>Concurrency as the Umbrella for Best Product Development Practices</i> Peter Fritz, Manager of Technical Training and Education; 3M Corporation		
9:00	<i>Concurrent Strategy Formulation</i> Frank Hull, Professor, Arizona State University		
9:30	Break / Networking		
9:45	<i>Organizing People: How to Build an Effective Concurrent Team</i> Joan Cullinane, VP, Velcro USA		
10:15	<i>Strategic Cross-Discipline Collaboration: A Foundation for Concurrent Product Development</i> Greg Beninati, Chairman, IDS Product Communities Practice, Raytheon		
10:45	Break / Networking		
11:00	Breakout I Sessions		
	<i>Integrating Strategy & People</i>	<i>Integrating Strategy & Process</i>	<i>Integrating Process & People</i>
11:45	Lunch		
12:30	Breakout I Reports		
1:15	<i>Tools & Technologies for Enabling Concurrent Practices</i> Gary Rosen, VP, Varian Semiconductor		
1:30	Breakout II Sessions		
	<i>Integrating Strategy with Tools & Technologies</i>	<i>Empowering People with Tools & Technologies</i>	<i>Enhancing Processes with Tools & Technologies</i>
2:30	Break / Networking		
2:45	Breakout II Reports		
3:00	Pillars of Concurrency, Paul Collins, Professor, University of Washington		
3:30	<i>Breakout III Sessions: Deploying the Pillars of Concurrency in your company</i>		

4:15	Breakout III Reports: What we will try to change in our companies
4:30	Wrap-up Discussion
5:00	Wine-down Reception

SYNERGISTIC CONCURRENT PRODUCT DEVELOPMENT

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8:30

Keynote: *Concurrency as the Umbrella for Best Product Development Practices*

Peter Fritz, Manager of Technical Training and Education; 3M Corporation

Overview

In many years of product development experience, Peter has been exposed to and lead a number of efforts that were truly memorable. What distinguished these experiences from all the others and why they remain part of the 3M Innovation legacy is that they have their roots in Concurrent Product Development (CPD). This does not imply that with CPD everything works according to plan; you can have a failed experiment that was executed flawlessly. It depends on what you do with the results. I hope that through sharing a number of personal experiences that something may resonate and be of value to you.

Looking at CPD, or Concurrency for short, there exist a number of valuable takeaways that can have a major impact on market success and overall project execution. Using Concurrency as “The Guiding Principle of Innovation” provides a directional philosophy that sets the tone for phenomenal results. When encompassing the 5 pillars of the Society: Strategy, People, Process, Tools & Technology; projects often deliver more than additive benefits. In some cases the pay-off is exponential.

So, when considering Concurrency, how does one know that you are on the right path? Is Concurrency really “mission critical” for your organization? What keeps you up at night? Peter’s talk will touch on a number of things to consider and perhaps provide a deeper context for some of your own efforts.

See Exercise A—How big is your company’s CPD umbrella?

This enables you to assess your company practices concurrency, page 9

1. Overview

Strategy is listed first among the SCPD pillars for a reason. Without a destination, your PD journey is likely to wander on paths that are unlikely to prove fruitful. Unsurprisingly, everybody sings the praises of setting strategic objectives. But the unsung fact is that up to 90 percent of strategic plans fail in critical ways. Concurrent strategy formulation is an answer to strategic failure.

The classical approach to strategy involves wise people sitting in conference devising rational plans. This is a necessary first step, but one that is increasingly insufficient. The need for a concurrent approach to strategy is largely driven by the acceleration of the rate of change in the levels of technological complexity and competitive pressures on costs. In fast paced environments, decisions must be made early-on even though they are provisional. A concurrent approach to strategy melds the advantages of rationally planned objectives with emergent opportunities. Plans are formulated upfront by stakeholders who also continuously reevaluate them during the journey. Thus, effective strategy in high-tech, dynamic markets require continuous adaptation based on the lessons learned during the product development journey.

Concurrent strategy formulation demands front-loaded planning that anticipates a great variety of contingencies so that adaptations are more quickly and readily made in order to continually optimize outcomes. Concurrent strategy may be summarized by the mnemonic, RRR: “Rapid, Reiterative Redesign.” According to Rick Martin, VP Unisys in 1994 (now at Lockheed-Martin):

We tell engineers up-front to look at the requirements and assess which are driving 80% of the cost or schedule. If possible, we then restructure the development to spiral-in improvements over a few years instead of driving for a design that attempts to be 100% compliant on day one. This also holds true for process improvement. It is always better to implement an approach that is 80% correct quickly and modify it over time than wait until the “perfect” process is approved by everyone. This approach helps people reuse knowledge and reassess cost/benefit tradeoffs continuously. Reiterative cycles enable engineers to process fuzzy, provisional information better so that optimal rather than perfect solutions are achieved. By approaching product development as a process of continuously reiterated cycles, we hope to never have to play catch-up again.

Concurrent strategy formulation is an iterative process melding what was planned with what emerges. To capture emergent opportunities, strategists must engage people from lower levels and diverse functions from inside and outside the corporation continuously throughout the journey.

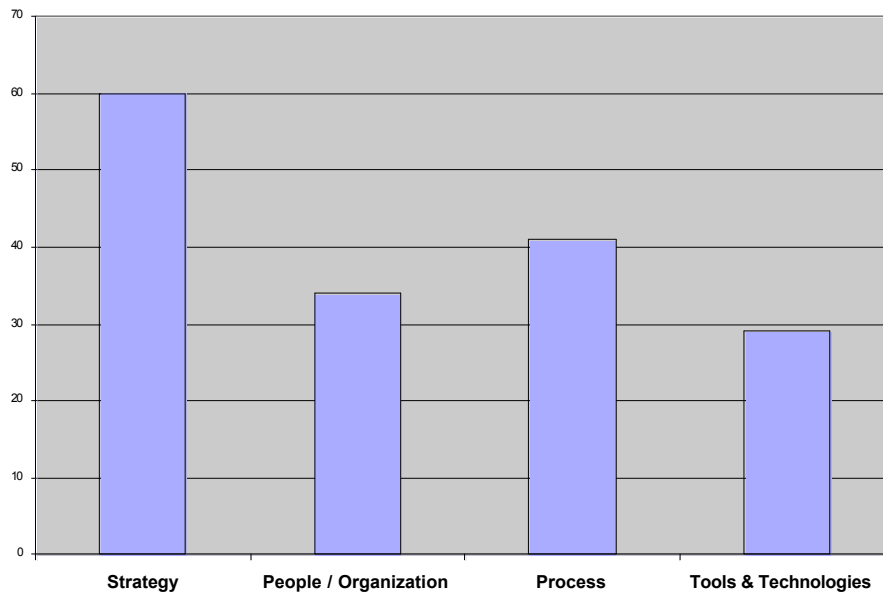
Concurrent strategy is necessary in a Moore’s Law environment. But it can also provide competitive advantages in less technically advanced markets? Stanley Works engaged in an outpacing strategy and drowned its competitors with innovations in seemingly staid products extant for centuries, e.g., hammers, tape measures, nails, etc. How did they do it? They encouraged “dabbling” up front and “discovery teams” with end-user customers. (Will Hill, VP, Stanley Works).

2. Strategy: The First Pillar of Concurrency

Concurrency is more than a general concept. CPD comprises a system of definable practices about which a rough consensus has emerged during the past decade. The five pillars espoused by the SCPD define this consensus: Strategy, People, Process, Tools and Technology (see <http://www.scpdnet.org/SCPDDBOK>). If a company implements best known practices within any of the pillars, product development will likely improve.

Shown in the chart below is the percentage of performance outcome (time compression, cost reduction, improved quality, and innovation) explained by each of the pillars in an analysis of 85 companies. Strategy explains the most, 60%. The People / Organization factor explains 34%. Process predicts 41%. While Tools & Technologies (combined in these data) predicts 29% of the variance in performance. Each pillar is a significant driver of performance improvement in its own right. Therefore, we first deal with each pillar, one by one, as a force to deploy in CPD.

%Variance Explained in Product Development Performance by CPD Pillars of Practice



3. Concurrent Strategy for Assuring Success¹

For a great many companies, the word strategy means setting the destination. Of course, objectives and plans are predictors of success. Less well known is that strategic planning is an insufficient cause of success. Some analysts argue that up to 90 percent of strategic plans fail in critical ways. One reason is because the turbulent conditions of Moore's law (twice the performance at half the cost every 18 months) roil even the best laid plans. Thus, effective strategy in high-tech, dynamic markets require adaptation based on the lessons learned during the product development journey. A concurrent approach to strategy melds the advantages of rationally planned objectives with emergent opportunities. Plans are formulated upfront by stakeholders who also continuously reevaluated them during the journey. In turbulent environments, options may shift rapidly with changes in technologies and markets. Concurrent strategy formulation demands front-loaded planning that anticipates a great variety of contingencies so that adaptations are more quickly and readily made in

¹ Excerpted and adapted from "Pillars of Concurrency," *Concurrency*, spring 2006.

order to continually optimize outcomes.

4. Axioms of Concurrency Front-Load Strategy Formulation²

Concurrency is the simultaneous involvement by all stakeholders in product development decisions from the outset and throughout the life cycle so that the entire value chain is reciprocally integrated - from idea to customer and back. The logic behind concurrency may be summarized in five axioms:

1. The bulk of costs are committed at early steps of a development cycle even though not expended until later
2. The cost of fixing faulty upstream decisions at late stages is exponentially greater than at earlier one
3. The opportunity costs of being late to market are very high, e.g., lower share, lower margins
4. Cross-functional teams typically provide a better quality solution to product development problems than solo individuals—especially at early stages.
5. The more novel and complex the product being developed, the more essential early cross-functional involvement is for faster and cheaper outcomes.

Early simultaneous involvement in product development by cross-functional teams using structured development processes saves time and cost over the life cycle, especially if the design is novel.

See Exercise B—How concurrent is your strategy?

This provides you with some key practices for concurrent strategy, page 10

² Excerpted and adapted from “Axioms of Concurrency,” Concurrency, spring 2005.

Overview

Organizing people? ...Who wants to do that?
Organizational behavior? ...Why deal with that?
Teamwork? ... Do we have to work together?
Concurrent? ... What's that all about?

I can do it myself!
I know the answer to that, why call anyone else!
I am faster alone!
I have solved this one before!
I don't have time to get all those people together!

They will slow me down!
They will not agree with me!
They don't listen to me!
They never consider my ideas!
They work slower than me!
Product development gets enough input already!
Manufacturing can make anything we tell them to!
We already know the Voice of the Customer (VOC), why ask for more?
We know the Critical to Quality (CTQ) requirements, why ask again?

Okay, enough of the excuses! Get on board. Your business is not improving without Concurrent Organization of People. Stop the whining and get the best of breed on board in a room and solve problems, design new products, and innovate as one. Yes, we do get more as one instead of individuals trying to do it alone! Don't just sit on the sideline, but be a player in the room with active engagement with members from design, marketing, sales, suppliers, customers, logistics, customer service, and anyone that is a key stakeholder to your project. If you are improving a process or designing something new, it cannot be done alone, unless your company metrics include adding more cost, more time, more mistakes, and many more upset customers!

Now you ask how do we do it? We have a lot of great talent in every company, but the excuses (above) sometimes get in the way. First, make the overt investment as a company to invest in organizing people and recognizing interdependencies at each and every new product kickoff or key initiative. You know you have reached concurrency when someone in the first team meeting asks where is manufacturing, where is our supplier, where is (XXX) interdependent department representative; and the meeting stops because we all forgot to invite them and discomfort overcomes the room. Don't proceed until we get the right people in the right place the first time! No one is left out! Concept to Product Launch is free of defect and ahead of schedule! You have arrived!

See Exercise C—How concurrent is your organization of people?

This provides you with some key practices for concurrent strategy, page 11

10:15

Strategic Cross-Discipline Collaboration: A Foundation for Concurrent Product Development

Greg Beninati, Chairman, IDS Product Communities Practice, Raytheon

Overview

A program-independent cross-discipline strategy enables concurrent product development and includes strategic suppliers, preferred parts, technology roadmaps and core “Make Capabilities.” Agreeing on and flowing out long-term strategies to the organization enables execution and limits debate once a project team has formed. This alignment is the basis for the efficiency, effectiveness, capacity, and capability (E2C2) that functional disciplines provide to programs.

Program and pursuit execution is accelerated by aligning and integrating each discipline’s capabilities through a collaborative sharing methodology. Leadership endorsement promotes information flow across an organization, providing integrated vision and direction. Strategic alignment drives team dynamics — forming, storming, norming, and performing — outside the program well before the team is even established or the pursuit known. Enablers like cross-discipline councils and communities of practice (CoPs) proactively eliminate risk and support the drive to a NoDoubt™ customer-focused culture.

Concurrent product development is a whole-life process operating from within and from outside programs, spanning years and providing a relentless approach to customer focused solutions and Mission Assurance.

Exercise D—How concurrent are your processes?

This provides you with some key practices for concurrent processes, page 12

Overview

Transforming a large, established product development organization from traditional serial methods to one of true concurrency requires a multi-pronged approach. Implementing a process that leverages functions outside of the engineering organization is only the first step. The inevitable cultural change requires education, processes and tools driven from both the executive and the grass roots level. At Varian, we have undertaken this challenge and developed an approach that incorporates all of these components.

The revised New Product Introduction (NPI) process at Varian incorporates best known methods (BKM's) from a variety of specialized functions (DFx's). DFx teams provide expertise to Integrated Development Teams (IDT's) producing new products. The DFx teams also drive true concurrency into the design since they represent most of the functions at Varian. In addition, a new NPI organization created around the NPI process takes learning from the IDT's and incorporates it into the next process revision.

Tools such as DFx scorecards and cost modeling templates facilitate the interaction of the DFx teams with the IDT's. These tools enable the DFx teams to impact designs early, before a prototype is built. They also provide a series of metrics to show progress in a particular area.

As our NPI process progresses, it is clear that automation will provide substantial benefits. We are integrating a program management tool that will drive a common process across all programs, increase visibility of programs throughout the enterprise, provide efficiency through reuse of documents and grow the concurrent product development culture. The program management tool unifies all of the processes, tools and metrics developed to support our concurrent product development initiative.

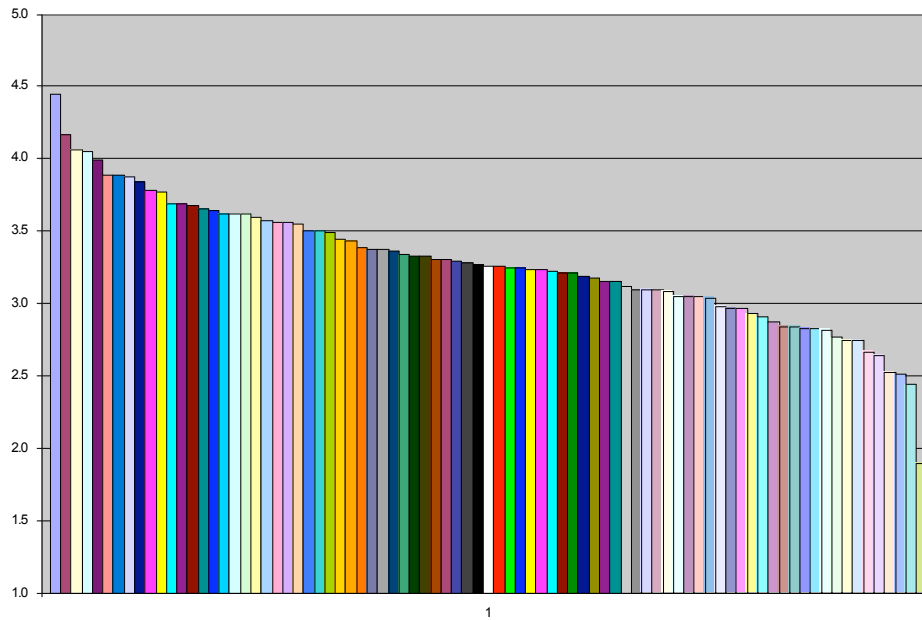
Exercise E—How concurrent are your tools/technologies?

This provides you with some key practices for concurrent practice in the area of tools and technologies, page 13

Exercise A—How big is your company’s CPD umbrella?

<i>The bigger your CPD umbrella, the higher your level of performance (time compression, cost reduction, improved quality, and innovation) is likely to be. These 10 items alone predict 35% of performance level in 85 companies.</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
▪ CPD VISION					
1. CPD is an explicit and fundamental part of our technology strategy.	1	2	3	4	5
2. CPD is understood as a strategic capability requiring system-wide integration, including organization, processes and tools.	1	2	3	4	5
3. CPD is an integral part of our product development processes.	1	2	3	4	5
4. We embrace the view that CPD practices are “determined by people, driven by processes, and enabled by technologies.”	1	2	3	4	5
5. Information on product development is shared incrementally and continuously by all involved.	1	2	3	4	5
▪ TOP MANAGEMENT CHAMPIONING OF CPD					
6. Responsibility for practicing CPD is distributed throughout the organization, including top management.	1	2	3	4	5
7. Upper management explicitly supports the adoption and implementation of CPD.	1	2	3	4	5
▪ STAFF SUPPORT OF CPD					
8. Rank & file engineers are champions of CPD.	1	2	3	4	5
9. Product development / project managers are champions of CPD.	1	2	3	4	5
10. Manufacturing personnel are champions of IPD/CE.	1	2	3	4	5

Average your answers to the 10 questions; plot below to rank the size of your CPD umbrella.



Exercise B—How concurrent is your strategy?

Concurrent Strategy Practice:

- Targets a balanced portfolio of competitive advantages, e.g. time and cost as well as novelty.
- Management communicates clearly defined strategic objectives for new product development projects and evaluates them according to how well they meet strategic objectives.
- Focuses innovation primarily on the rapid, reiterative redesign of existing products using platforms to integrate combinations of standard components.
- Senior management and multiple internal functions participate in product design reviews early on.
- Concurrent strategy front-loads decision-making by sharing provisional information early and often.
- Design reviews are more detailed at early and late stages than during mid-stages of the project.
- The concurrent execution of strategic plans blends what was planned and what emerges.
- Concurrent strategy formulation is an iterative process engaging lower levels and diverse functions from inside and outside the corporation continuously throughout the journey.

Measures of the strategy concepts described above predict over 60% of product development performance (time compression, cost reduction, improved quality, and innovation) in a study of 85 companies.

What percentage of the time does your company deploy concurrent strategy?

0-19% 20-39% 40-59% 60-79% 80-100%

Which concurrent strategy practices does your company do best?

Which concurrent strategy practices does your company most need to improve?

Exercise C—How concurrent is your organization of people?

Concurrent Organization of People³

People are the wellspring of product creation. Yet the lone genius or maverick cowboy is usually less important for the success of established corporations than team players, especially in hyper-competitive markets. Even though many scientists and engineers may say they are more creative working on their own, leading companies have increasingly organized them in cross-functional teams because data shows increased rates of invention, higher levels of quality and lower costs over the product life cycle. The reason is that cross-fertilization of ideas among team members results in greater cumulative innovation that is cost effective than if individuals worked solo and pooled their output.

How concurrent is your organization of people?

Concurrent organization practice:

- Engages people in cross-functional project teams at each phase of the development process, starting with the product concept.
- Involves downstream functions such as manufacturing in early product development decisions.
- Continues the involvement of upstream functions like product development after the customer has the product.
- Core members of a development team are responsible for a project throughout its life cycle.
- The “Voice of the Customer” drives the unification of disparate functions and levels within the organization, which means that status differences or home department affiliations do not stifle communications.
- People try to anticipate the needs of their internal customers and rapidly adjust their behavior to fulfill the requirements of others.
- People share early, provisional information regardless of function or level in the organization.

Measures of the people / organization concepts described above predict 34% of product development performance (time compression, cost reduction, improved quality, and innovation) in 85 companies.

What percentage of the time does your company deploy concurrent organization of people?

0-19% 20-39% 40-59% 60-79% 80-100%

Which concurrent practices for organizing people does your company do best?

Which concurrent practices for organizing people does your company most need to improve?

³ Excerpted and adapted from “Pillars of Concurrency,” *Concurrency*, spring 2006.

Exercise D—How concurrent are your processes?

Concurrent Process⁴

Processes provide the guidance necessary for people from diverse functional groups to collaborate effectively in product development. For example, product development processes typically specify tasks to be performed at each phase of a cycle. However, “process” done right is a dynamic exercise in human judgment enabling people to enact phases in a more overlapping than serial manner. Only if phases overlap with reciprocal feedback loops incorporating human judgment is process discipline likely to result in a product that both cost effective and innovative. Design rules and standard operating procedures are more useful if process engages stakeholders in the product development system in making flexible adaptations to optimize execution of specific projects. Processes reuse augments human knowledge by documenting, standardizing, sharing, and continually improving know-how. Processes facilitating knowledge reuse enable people from diverse functions to focus on unknown problems, thereby increasing the probability of innovative solutions that are efficiently discovered. Knowledge reuse therefore requires that companies have processes for seeking ideas from external as well as internal sources on a continuous, reiterative basis so as to avoid the not invented here syndrome. Moreover, process must be continuous by updating and adapting templates for guiding product development and transferring lessons gleaned from one product development team to the next generation.

How concurrent are your PD processes?

Concurrent process is used to manage the entire product development cycle from cradle to grave. A model plan includes process flow charts with exit and entry criteria at each step and ensures multifunctional involvement of key functions starting at early stages. Soft methods, such as focus groups and interviews, are used to identify customer needs as well as structured methodologies, e.g., quality function deployment (QFD). Multiple internal functions are involved in defining and translating customer needs. Customer requirements are systematically and repeatedly evaluated by multiple functions to reconcile the trade-off between these requirements and internal capabilities. Standardized parts and processes are used in the design process to foster knowledge reuse. Product documentation enables tracking the conformance of each aspect of development with the design requirements of the system architecture/configuration. Model product development processes are documented continuously improved by evaluating effectiveness of practice and capturing lessons learned.

Measures of process concepts described above predict 34% of product development performance (time compression, cost reduction, improved quality, and innovation) in 85 companies.

What percentage of the time does your company deploy concurrent processes?

0-19% 20-39% 40-59% 60-79% 80-100%

Which concurrent process practices does your company do best?

Which concurrent process practices does your company most need to improve?

⁴ Excerpted and adapted from “Pillars of Concurrency,” *Concurrency*, spring 2006.

Exercise E—How concurrent are your tools/technologies?

Concurrent Tools & Technologies⁵

Tools help people codify knowledge for reuse and improvement. Computerized tools such as CAD and information technologies such as PDM systems have had a revolutionary impact on product development capabilities by increasing flexibility and agility. However, the tools are only as smart as the knowledge they codify. Automation and software merely embed the know-how that technologies have created and transformed from tacit to codified knowledge. Concurrent deployment of tools not only add value per se, but also may enable other practices dealing with strategy, the organization of people, and process. For example, information databases and competitive analyses of trends enable enterprises to more quickly shift their strategy to capture emergent opportunities. Virtual modeling allows diverse people to be involved in critical early design decisions prior to physical mock-ups even when performing varied functions in different locations. Processes can be continuously updated and distributed electronically without the difficulty of physically altering hard copies of manuals.

How concurrent are your tools & technologies?

- CAE tools such as finite element analysis are used in the early stages of product development as well as DFX (Design for manufacturability, serviceability, etc.).
- Virtual prototyping is used in designing product without intermediate physical models, e.g., geometric model simulations.
- Information related to product development and management is stored in a computerized, relational database and distributed over a network to all stakeholders.
- Customer requirements are maintained on computerized databases with multiple functions having on-line access to updated information using common software.
- Common project management software provides a model plan with templates for customization.
- Critical product parameters are systematically analyzed and tracked for conformity to standards by tools, e.g., design of experiments, robust methods, etc.
- Decision-support systems, such as knowledge-based engineering (KBE), codify design rules and maintain collective wisdom for reuse.

Measures of process concepts described above predict 29% of product development performance (time compression, cost reduction, improved quality, and innovation) in 85 companies.

What percentage of the time does your company deploy concurrent tools & technologies?

0-19% 20-39% 40-59% 60-79% 80-100%

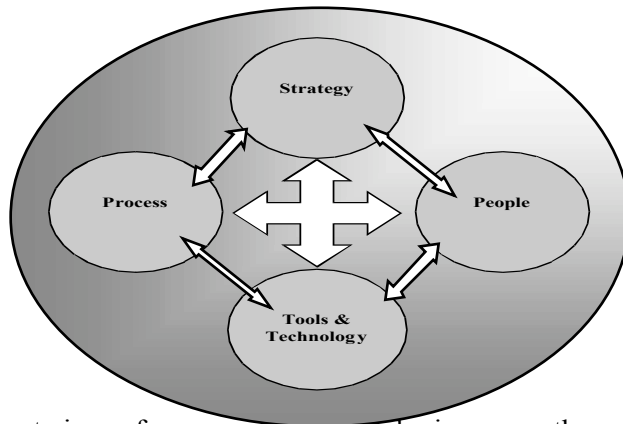
Which concurrent tools & technologies practices does your company do best?

Which concurrent tools & technologies practices does your company most need to improve?

⁵ Excerpted and adapted from “Pillars of Concurrency,” *Concurrency*, spring 2006.

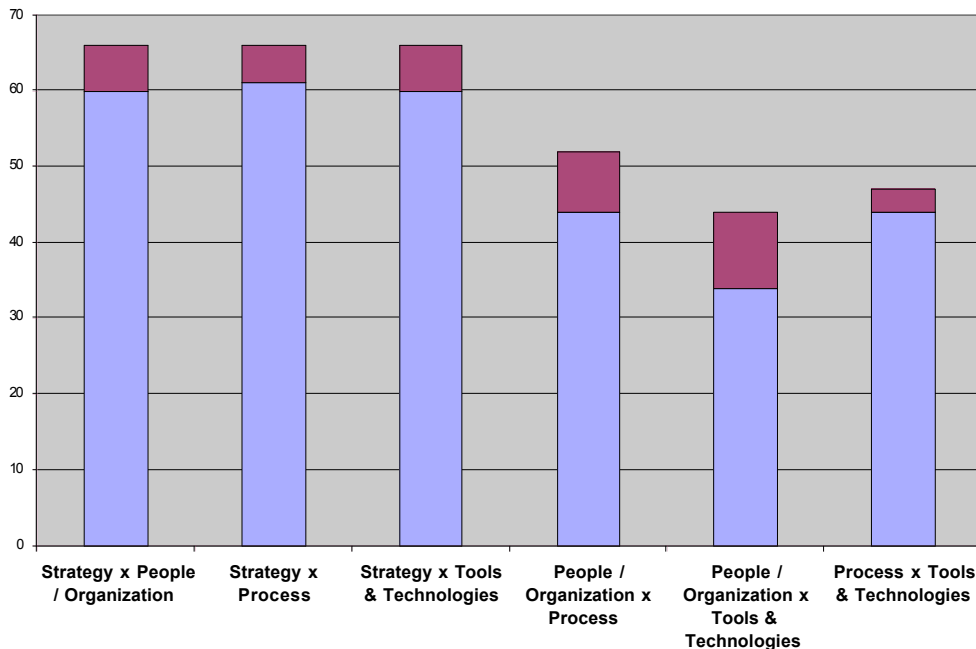
RATIONALE FOR BREAKOUT SESSIONS

CREATING SYNERGIES AMONG THE PILLARS FOR EXTRA PERFORMANCE GAINS



Large improvements in performance require deploying more than one pillar. So the challenge of implementing concurrency is to do it as a system of synergistically interrelated pillars. Research evidence from three separate studies of concurrent practices has shown that the average benefit of synergy among any two of the pillars as illustrated in the above diagram is quite significant statistically. For example, interaction effects among any two of the pillars boosts performance measured as faster, cheaper, higher quality and more innovative product development (Excerpted and adapted from “Pillars of Concurrency,” *Concurrency*, spring 2006).

Variance Explained in Product Development Performance by CPD Pillars of Practice



The bars shown above indicate the variance each pair of pillars predicts in performance (time compression, cost reduction, improved quality, and innovation). The extra variance at the tip is due to synergies, which provides an average of 11% extra explanatory power. This is a very conservative estimate of synergy because the concept of each pillar is measured by a roll-up of dozens of measures. Interactions among subcomponents sometimes add as much as 25% additional variance explained

because of synergies.

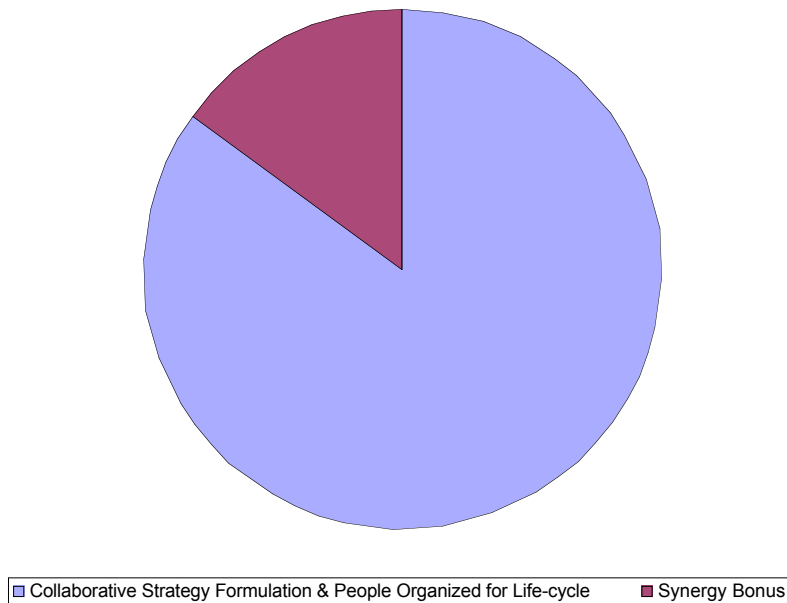
Breakout IA

Integrating Strategy & Organizing People—Helene Fine, Bridgewater State College

Concurrent strategy is a pillar that includes many subcomponents of practice, e.g., clear objectives, core business and technical competencies, rapid adaptation, etc. The example of the strategy pillar used herein is “collaborative strategy formulation whereby all stakeholders are engaged in an iterative process with lower levels and diverse functions participating on an ongoing basis.”

The pillar of organizing people has many subcomponents, e.g., life-cycle responsibility, open communication, job enlargement, engagement in bounded decision-making, shared assessments, etc. The example of the people / organization pillar used herein is “core members of development teams are responsible for a project throughout its life cycle and upstream functions like product development continue their involvement after the customer has the product in a system where information on product development is shared incrementally and continuously by all involved.”

Shown below is an illustration of the variance explained by the combination of these two measures of strategy and people/organization as well as the synergy bonus. The pair of pillars explains 40% of the variance in performance. Synergy explains a bonus 7%.



1. What are best practices for concurrent strategy?
2. What are best practices for organizing people for product development?
3. How can these practices be deployed synergistically?

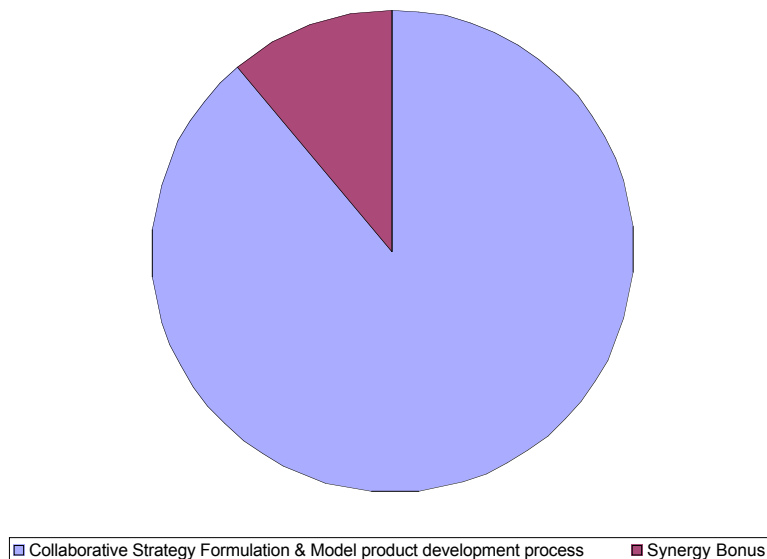
Breakout IB

Integrating Strategy & Process—John Yannone, ABIOMED

Concurrent strategy is a pillar that includes many subcomponents of practice, e.g., clear objectives, core business and technical competencies, rapid adaptation, etc. The example of the strategy pillar used herein is “collaborative strategy formulation whereby all stakeholders are engaged in an iterative process with lower levels and diverse functions participating on an ongoing basis.”

The pillar of process has many subcomponents, e.g., model product development plan, understanding the voice of the customer, competitive benchmarking, requirements management, standardization, documentation, product design reviews, continuous improvement, etc. The example of the process pillar used herein is “regular use of a model product development plan with process flow charts specifying exit and entry criteria at each step to ensure multifunctional involvement of key functions in early stages of the product development process.”

Shown below is an illustration of the variance explained by the combination of these two measures of strategy and process as well as the synergy bonus. The pair of pillars explains 48% of the variance in performance. Synergy explains a bonus 6%.



1. What are best practices for concurrent strategy?
2. What are best processes for product development?
3. How can these practices be deployed synergistically?

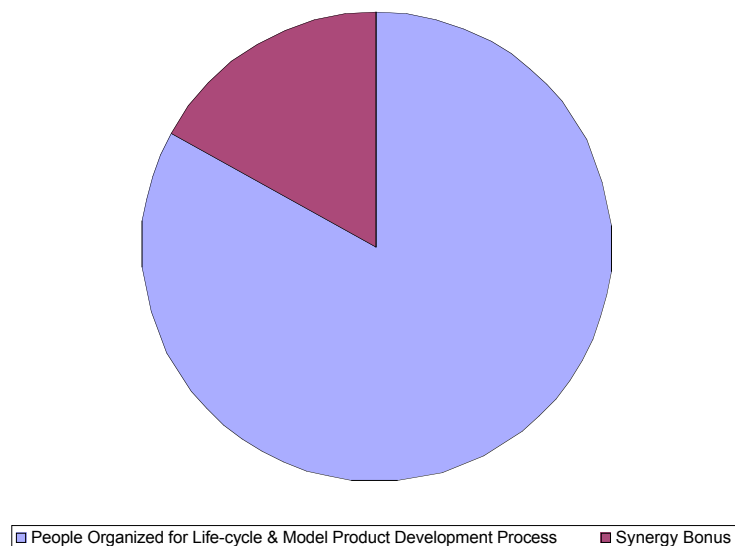
Breakout IC

Integrating Process & People / Organization—Jim Lechner, DaimlerChrysler

The pillar of organizing people also has many subcomponents, e.g., life-cycle responsibility, open communication, job enlargement, engagement in bounded decision-making, shared assessments, etc. The example of the people / organization pillar used herein is “core members of development teams are responsible for a project throughout its life cycle and upstream functions like product development continue their involvement after the customer has the product in a system where information on product development is shared incrementally and continuously by all involved.”

The pillar of process has many subcomponents, e.g., model product development plan, understanding the voice of the customer, competitive benchmarking, requirements management, standardization, documentation, product design reviews, continuous improvement, etc. The example of the process pillar used herein is “regular use of a model product development plan with process flow charts specifying exit and entry criteria at each step to ensure multifunctional involvement of key functions in early stages of the product development process.”

Shown below is an illustration of the variance explained by the combination of these two measures of people/organization and process as well as the synergy bonus. The pair of pillars explains 39% of the variance in performance. Synergy explains a bonus 8%.⁶



1. What are best practices for organizing people for product development?
2. What are best processes for product development?
3. How can these practices be deployed synergistically?

⁶Synergy between process and people/organization is the more important single opportunity. Flexible discipline for guiding people in organized product development activities is essential. However, deployment of stage-gates as a solo practice has only a small correlation with performance. But if the people in the team are able to use judgment in adapting the model process, synergies are enormous, e.g., 20% or more.

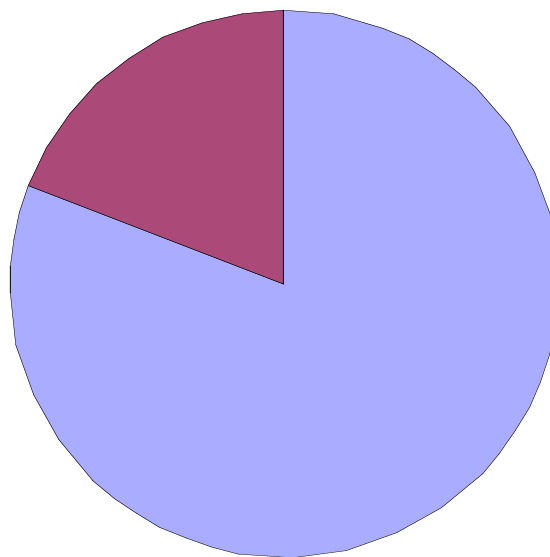
Breakout IIA

Integrating Strategy with Tools & Technologies— Mike Burstein, Tufts University

Concurrent strategy is a pillar that includes many subcomponents of practice, e.g., clear objectives, core business and technical competencies, rapid adaptation, etc. The example of the strategy pillar used herein is “collaborative strategy formulation whereby all stakeholders are engaged in an iterative process with lower levels and diverse functions participating on an ongoing basis.”

The pillar of Tools & Technologies has many subcomponents, e.g., product data management, project management, decision support systems, modeling and visualization tools, etc. The example of this pillar used herein is “Information related to product development & management, including customer requirements, is stored in a regularly evaluated and updated relational database that is and distributed over a network to all involved parties with multiple functions having on-line access.

Shown below is an illustration of the variance explained by the combination of these two measures of strategy and tools & technologies as well as the synergy bonus. The pair of pillars explains 48% of the variance in performance. Synergy explains a bonus 6%.



■ Collaborative Strategy Formulation & Product Data Management Tools ■ Synergy Bonus

1. What are best practices for concurrent strategy?
2. What are best tools & technologies for product development?
3. How can these practices be deployed synergistically?

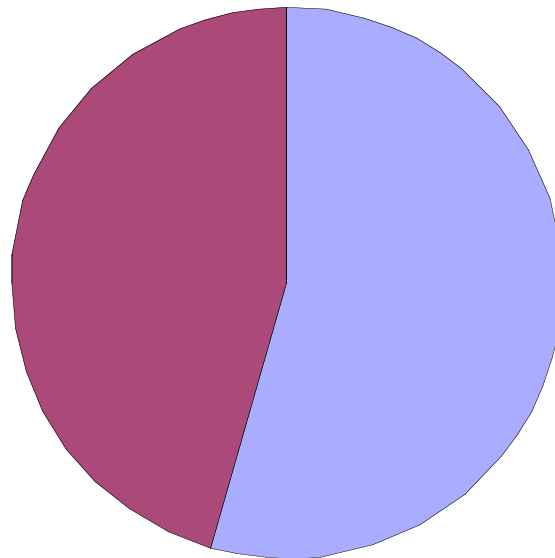
Breakout IIB

Empowering People with Tools & Technologies— Merle Kummer, Kummer Consulting

The pillar of organizing people has many subcomponents, e.g., life-cycle responsibility, open communication, job enlargement, engagement in bounded decision-making, shared assessments, etc. The example of the people / organization pillar used herein is “core members of development teams are responsible for a project throughout its life cycle and upstream functions like product development continue their involvement after the customer has the product in a system where information on product development is shared incrementally and continuously by all involved.”

The pillar of Tools & Technologies has many subcomponents, e.g., product data management, project management, decision support systems, modeling and visualization tools, etc. The example of this pillar used herein is “Information related to product development & management, including customer requirements, is stored in a regularly evaluated and updated relational database that is and distributed over a network to all involved parties with multiple functions having on-line access.

Shown below is an illustration of the variance explained by the combination of these two measures of people / organization and tools & technologies as well as the synergy bonus. The pair of pillars explains 24% of the variance in performance. Synergy explains a bonus 20%.



■ Organization of People for Life-cycle & Product Data Management Tools ■ Synergy Bonus

1. What are best practices for organizing people for product development?
2. What are best tools & technologies for product development?

3. How can these practices be deployed synergistically?

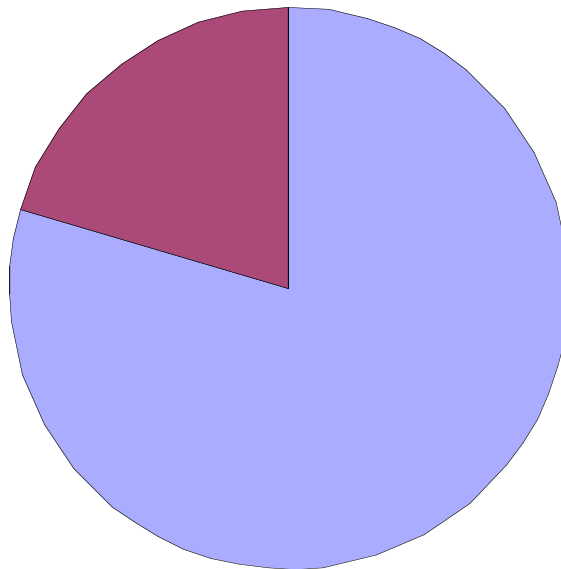
Breakout IIC

Enhancing Processes with Tools & Technologies—Chris Burkhart, Applied Materials

The pillar of process has many subcomponents, e.g., model product development plan, understanding the voice of the customer, competitive benchmarking, requirements management, standardization, documentation, product design reviews, continuous improvement, etc. The example of the process pillar used herein is “regular use of a model product development plan with process flow charts specifying exit and entry criteria at each step to ensure multifunctional involvement of key functions in early stages of the product development process.”

The pillar of Tools & Technologies has many subcomponents, e.g., product data management, project management, decision support systems, modeling and visualization tools, etc. The example of this pillar used herein is “Information related to product development & management, including customer requirements, is stored in a regularly evaluated and updated relational database that is and distributed over a network to all involved parties with multiple functions having on-line access.

Shown below is an illustration of the variance explained by the combination of these two measures of strategy and process as well as the synergy bonus. The pair of pillars explains 35% of the variance in performance. Synergy explains a bonus 9%.



■ Model Product Development Process & Product Data Management Tools ■ Synergy Bonus

1. What are best processes for product development?
2. What are best tools & technologies for product development?

3. How can these practices be deployed synergistically?

What are best practices you learned more about on Day One?

A. **Keynote: Concurrency as the Umbrella for Best Product Development Practices,** Peter Fritz, 3M

- Job enlargement
- Involvement with the customer even after they have the product
- Periodic table of technologies, e.g., melding adhesives with abrasives
- Continuous education
- Chart depicting the transition to concurrency: from > to
- Concurrency as the integrative umbrella

B. **Concurrent Strategy Execution,**

Frank Hull, Arizona State University

- Strategic plan is living document – keep it current with emerging opportunities
- Continuous cycle – a narrowing spiral to reduce risk
- Strategy is strongest predictor of performance
- Overemphasis on cost can inhibit innovation
- Strategy needs to be current with emerging knowledge as well as opportunities
- Rapid, reiterative redesign (RRR)
- Keep up with Moore's Law
- Multiplier effect when strategy is combined with other practices

C. **Organizing People: How to Build an Effective Concurrent Team,**

Joan Cullinane, Velcro USA

- Intellectual capital as the proper role of a leader
- Get the right talent
- Reward spectacular failure; punish mediocre performance
- Listen to the pain; remove the constraint
- Analyze reasons why people leave
- Talent will not stay without learning
- Co-locate early phases of virtual team
- 24/7 responsiveness
- Spread enthusiasm
- Look for volunteers.
- Cross-functional knowledge at concept stage
- No one is left out of the concept phase
- Decisions can't go through hierarchy
- Reward the team; reward for inclusion

- No boundaries – expect no boundaries
- Success comes with passion

D. Strategic Cross-Discipline Collaboration: A Foundation for Concurrent Product Development, Greg Beninati, Raytheon

- Set up infrastructure in advance
- Even large defense contractors will spend time on concurrency
- Communities of practice
- Avoiding secrets
- Use councils to disseminate knowledge (included senior director level)

E. Tools & Technologies for Enabling Concurrent Practices,

Gary Rosen, Varian Semiconductor

- BKM (Best Known Methods) document.
- Top down and bottom-up process
- Nail down process before automating
- Strive to understand metrics of concurrency
- Implemented Score card
- Avoiding hockey stick
- Metrics that give downstream processes credibility
- Create dashboards for 5 year visibility

Making it happen!

- What will you start doing differently in your job the end of next week?
- What do you want your company to starting doing differently for the rest of 2006?

John Yannone—ABIOMED

- Include manufacturing and purchasing in design process
- Insist that all team members are present at all strategy meetings
- Share knowledge with co-workers and vendors
- Stop using stage gate like a hockey stick
- Suggest standardization on tools
- Develop metrics and improve the process

Chris Burkhart—Applied Materials

- Need to develop the culture and behaviors to utilize tools
- “A fool with a tool is still a fool”

Roger Lundberg and Jim Lechner—Chrysler

- Incorporate the team essentials to CPD coaching
- Identify key problem and DFX implementations, including BKM’s
- Look at shadowing process
- Adoption of DFX methodology
- Redoing training and developing talent of chief engineers
- Identifying enablers of hockey-stick phenomenon

John Terzakis– Intel

- Risk taking needs to be revisited. We aren’t doing enough of it, and it isn’t “informed risk taking.”
- Look for teams that don’t have the full complement of XF representation
- Be an advocate of concurrency
- Communities of Practice (CoP) – more sharing of knowledge of successes and failures
- Less complicated dashboards and indicators

Steve Wedger and Gary Wandersee— Lockheed-Martin

- Taking current guidelines and apply lessons Varian taught us on how to make things more user friendly and approachable to new people
- Look at overall process consolidation within our branch of Lockheed-Martin
- Start leveraging CPD concepts into overall consolidation activity

Dhairya Shrivastava, Mike Khosla, Jim Doxey, and Russ Cormier —Novellus Systems

- Get the people buy-in – IPD meeting at high level, then test pilot ideas on project, then share this throughout
- Use XFT scorecard, templates, dash board
- Look at and select DFX measures
- Getting vendor involved in the design phase to incorporate DFX ideas upfront
- Do same with customers

Brian Nowicki et al.—Nuvera Fuel

- Revise PD process to concurrent instead of serial
- Incorporate RRR strategy
- Avoid hockey stick
- Develop BKM library
- Implement DFX methodology
- Scorecard approach
- Agile PLC in place, want to implement PDC into this system

Greg Beninati— Raytheon

- Trouble getting knowledge to right people – Varian’s scorecard encourages us to update and use our scorecard

Art Zoss and Andy Webb— Rolls-Royce

- Get strong management buy-in – working with over all improvement process, concurrency will deliver a lot
- DFX – make a driver
- Working on CPD mentoring process

Glen Perry et al. —Textron Systems

- Identify and disseminate key points to pertinent and interested folks (DFX involved early on)
- Select 2-3 metrics that want to pursue
- Share the experience at today’s meeting
- Start tracking the metrics we identify
- Suggest to senior management that they identify a senior management individual to champion CPD
- Generate BKM to be shared
- Promote retention and transfer of talent – realistic and doable mentoring program

Chris Duncan—US Army ARDEC

- Make sure engineers understand BKM of CPD
- Bring CPD into human capital development process, from senior management to lowest level
- Breakdown informal silos
- Advance the right kind of leadership skills in our organization – need to be more team oriented without having to have a single “leader ”

Gary Rosen et al.—Varian Semiconductor

- listen and look for volunteers
- more mentoring and coaching
- More meeting management training
- Investigate CMMI
- Get RRR into processes
- be more inclusive in teams
- implement CPD across whole company

Joan Cullinane et al.—Velco USA

- Next week?
 - Shift the paradigm from “Not me, but we...” migrating away from the “solo” engineering mentality
 - Have dialogue with departmental managers including R&D about lack of involvement of myself and staff in P.D. Cycle
 - Bringing “enthusiasm” to the Tuesday meeting and “selling the product”
- 2006
 - Enforce cross functional P.D. teams with accountability of team and individual members
 - Eliminate the “silo” structure and participate with a seamless organization
 - Establish metrics for measuring the P.D. process

Chinmoy Banerjee—Whirlpool

- Spread enthusiasm
- Provide learning opportunities to keep talent engaged
- Communities of Practice (CoP)
- Hockey stick – quick informal survey to see how much it happens, then corrective action
- More in grassroots way from bottom-up to top-down
- Better understand the process by engaging the users before using the tool
- Increase engagement of functions before two week rush
- Have strategies that are simple to understand

Steve Clark and others

- Simple scorecards, whole value chain
- Hockey stick phenomenon
- RRR needs to be reinforced – traditional practice is perfectionist in nature and thwarts learning
- Driving simple metrics
- Cross-pollination of ideas and practices across teams
- Promote CPD to members
- Midterm course corrections
- Reusing existing knowledge