



Collaborative Reengineering-based Product Line Scoping



SEA

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Agenda

- ▶ Introduction and Motivation
- ▶ Research Context
- ▶ Collaborative approach for reengineering-based product line scoping
- ▶ Prototype case study
- ▶ Conclusion

Introduction and Motivation [1/2]

- ▶ Increasing number of organizations are shifting to software product line approaches
 - Reduce time-to-market and development costs
 - Increase reliability and ease of maintenance
- ▶ PLs are often not developed from scratch but introduced to already existing products
- ▶ Existing research is typically focused on architecture-level approaches (e.g. Bayer *et al.*)

Introduction and Motivation [2/2]

- ▶ Effectiveness of reengineering processes in PLE strongly depends on reconciling business objectives with technical constraints
 - → sales/marketing has to work with engineers/dev.
- ▶ Comparably limited methods and guidelines exist for reengineering-based scoping
- ▶ task conducted by diverse stakeholders
- ▶ team members need a common/shared vision

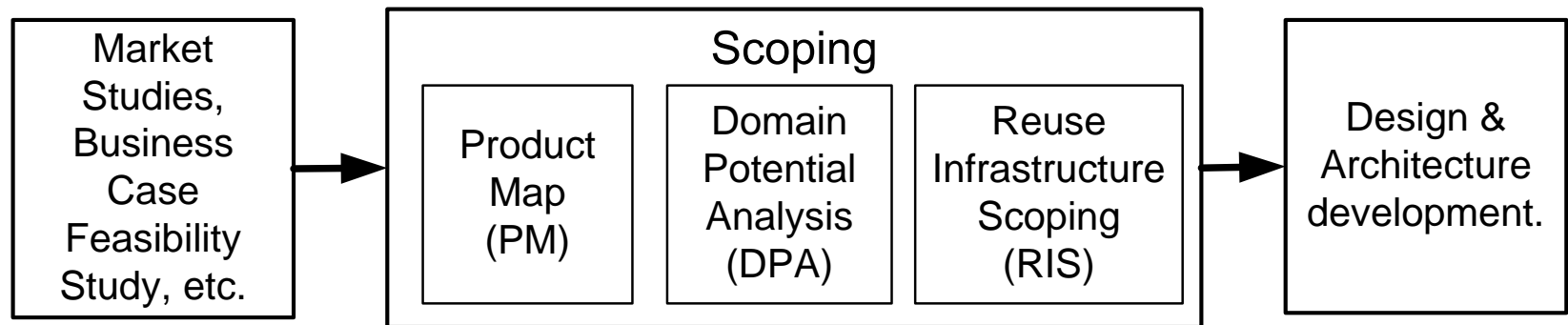
→ *agile, collaborative approach seems obvious*

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Research Context

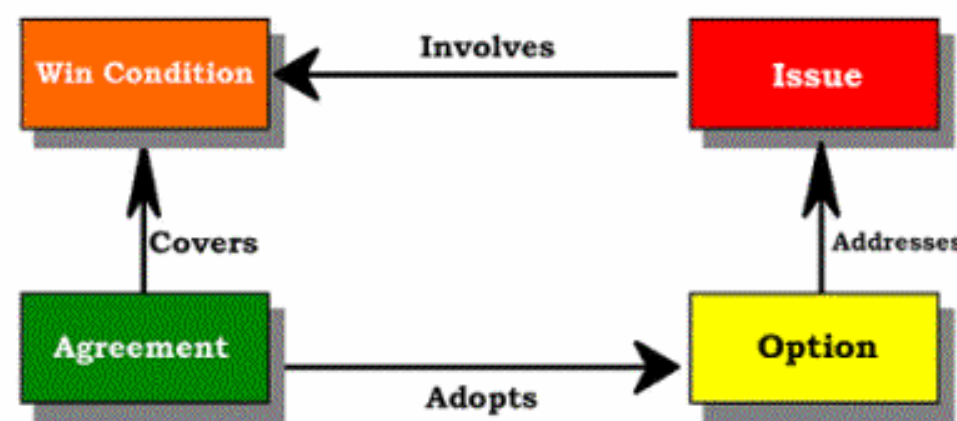
- ▶ Our Approach uses/is based on
 - PuLSE (Bayer *et al.*, Schmid) as framework
 - EasyWinWin (Boehm *et al.*) as negotiation method
 - the Group Support System (GSS, www.groupsystems.com) to demonstrate our ideas
 - Collaboration patterns from the field of Collaboration Engineering (Briggs *et al.*) to define the process

PuLSE



- ▶ PM: features, domains, products
- ▶ DPA: domain suitability assessment for reuse
- ▶ RIS: identification of common functionality

EasyWinWin



- ▶ Requirements definition methodology
- ▶ Builds on win-win negotiation approach
- ▶ Uses collaboration patterns
- ▶ Focuses on stakeholder interaction and involvement
 - Stakeholders collect, elaborate, and prioritize their requirements, and surface and resolve issues
 - to come up with mutually satisfactory agreements
- ▶ Supported by GSS tool
- ▶ Consistent with agile principles

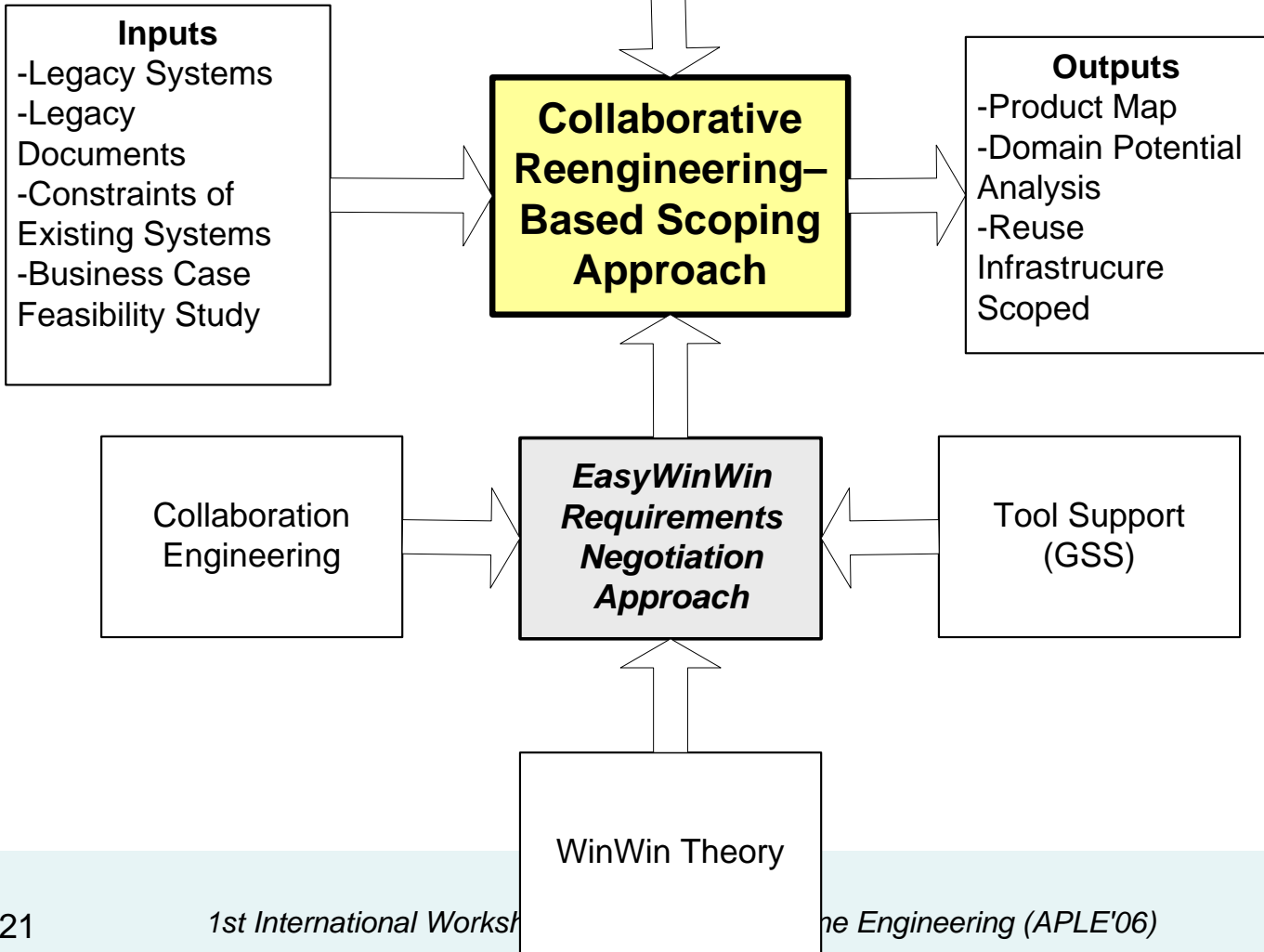
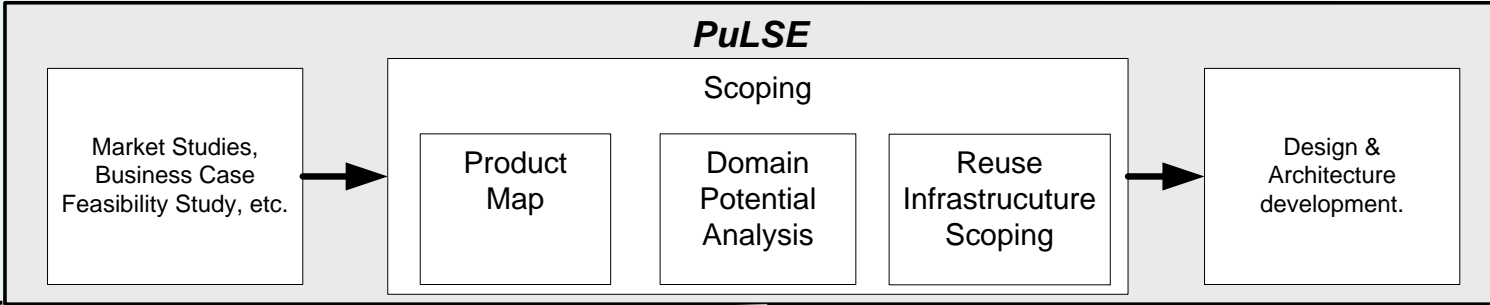
Collaboration Engineering (CE)

- ▶ Stakeholders need to collaborate
- ▶ CE facilitates effective collaboration
- ▶ Proposes five patterns:
 - Diverge (e.g., brainstorm)
 - Converge (e.g., moderated discussion on brainstorming results)
 - Organize (e.g., categorize brainstorming results)
 - Evaluate (e.g., vote)
 - Build consensus (e.g., discuss disagreements)

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Success-critical Stakeholders

- ▶ Customers
- ▶ Marketing and sales staff
- ▶ Senior management
- ▶ Developers
- ▶ Software architects
- ▶ Maintenance staff



Major Steps

- ▶ 1: Review and expand domains
- ▶ 2: Brainstorm features for new domains
- ▶ 3: Discuss/define products
- ▶ 4: Assign features/domains to products
- ▶ 5: Consolidate and prioritize Product Map

Detailed Step 1

Step 1	Review And Expand Domains
Purpose	Identify domains contained in the legacy products and expand them for proposed product line
Description	In the development of legacy system there might not be a need to define domain as is required in product line paradigm. In this activity list of domains proposed earlier is discussed and expanded. As we assume company has experience of the domain it is not a difficult task other wise domain expert must be hired for the task.
Input	Document containing initial list of domains and features of legacy systems.
Output	Mutually agreed list of domains of new product line
Do this	Open initial domain\feature list in the group outliner Open the slide which describe the purpose of the activity and how participant can contribute their ideas in group outliner
Say this	Domain or sub-domain is functionality cluster representing business concept for example project tracking, project forecasting are domain of project management. Advantage of using domains is products can be discussed at higher level of details but defining constituents are there and big picture is not lost in details of the product. For this activity we will use group outliner tool of GSS. Group outline support collaborative development of hierarchical list. All the participants have can do what ever they want to list. They can add new domain, they can add comments to any domain, they can identify sub-domain or feature of domain, and they can move up or down the hierarchy the domains of sub-domain.
Remember this	Well defined domains help in identifying architectural and physical components at later stages.
Participants Role	All participant opinions are valuable; however domains are business area terms. Requirement engineers, domain expert and architect are more likely to know the structure of the business domain.

Detailed Step 2

Step 2	Brainstorm features for new domains
Purpose	Collect features for each domain from stakeholders.
Description	Using electronic brainstorming collect features for each domain from participants.
Input	List of domains from previous activity
Output	List of possible feature for each domain
Do this	Put relevant slide for brainstorming for participants viewing. Open GSS brainstorming tool. Number or worksheets should be two more than the number of participants – this rule of thumb as worksheets are rotated among participants. Start activity by allowing participants to have access.
Say this	Brainstorming is a creative activity which helps collect idea from participants is quick time. Brainstorming tool is GSS supports anonymous idea contribution. No one knows who has contributed a particular idea. This enables the participants to more productive as they don't have any fear of looking not so smart and fear of superiors is also removed. Each participant is assigned a work sheet as soon as he submits and idea that sheet is randomly assigned to another participant. The ideas written on some particular sheet are visible all the time to participant who is working on that sheet. Participant can also add comments to any idea as well.
Remember this	Use one brainstorming session per identified domain.
Participants Role	Market and business oriented persons are in better position to propose feature which are desirable for customers. Brainstorming is creative activity and all can contribute their ideas which later on will be refined.

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Prototype Case Study

- ▶ We conducted two preliminary case studies in the project management domain
- ▶ We used the open source Gantt Project (<http://ganttproject.sourceforge.net/>) as starting system for reengineering the PL
- ▶ Using the GSS tool we followed our approach/went through the process defined before to create product maps
- ▶ We defined three products
 - stand-alone / network-enabled / online

- 0/0 Tasks
 - 0/0 - Create Task
 - 0/0 - Enter start and enddate from calender
 - 0/0 - Create subtasks
 - 0/0 - Enter start end dates from calendar to the subtask
 - 0/0 - Move the task up or down in the hierarchy
 - 0/0 - Define multi level tasks hierarchy
 - 0/0 - Schedule tasks
 - 0/0 - Define predecessor of the task
 - 0/0 - define constraints in terms of predecessors and successor
 - 0/0 - Enter priority of the task
 - 0/0 - Enter duration of the task
- 0/0 Resources
 - 0/0 - Define a resource
 - 0/0 - User defined attributes of resource e.g. skill, experience
 - 0/0 - Assign resource to the task
 - 0/0 - Report schedule conflict of the resource
 - 0/0 - Define suitable roles for the project resources
 - 0/0 - Enter contact information of the resources
- 0/0 Calendar
 - 0/0 - Configure weekends and holidays
 - 0/0 - Define availability of resource
 - 0/0 - Start\end date of task
 - 0/0 - Manual date entry
 - 0/0 - date entry through selection from graphical calendar
- 0/0 Visualization tools
 - 0/0 - Gantt Chart
 - 0/0 - Pert Chart
 - 0/0 - Pie chart
 - 0/0 - Bar Chart
- 0/0 Interface to other programs
 - 0/0 - Import project from MS Project
 - 0/0 - Export project to MS Project
 - 0/0 - Export project in PDF format
- 0/0 Project Tracking
 - 0/0 - Show percentage completion of the task on Gantt chart
 - 0/0 - Can drag the percent complete on the task gantt chart

Review and expand existing Features and Domains

Participants can add comments to any item of the list

New domains can be added by any participant to existing list

GroupSystems - Gantt Project - [Brainstorm for New Features in Proposed Tracking Domain (Electronic Brainstorming)]

File Folders Edit Brainstorming Group Options Window Help

Agenda People Whiteboard Handouts Opinion Reports Briefcase Log Find Folder List

Go What features do you want in this domain?

Brainstorm features for new domains

#1 4/0 #2 3/0 #3 2/0 #4 3/0 #5 6/0 In Use #6 3/0 #7 2/0 #8 1/0 #9 2/0

Discussion #5

Edit Comment

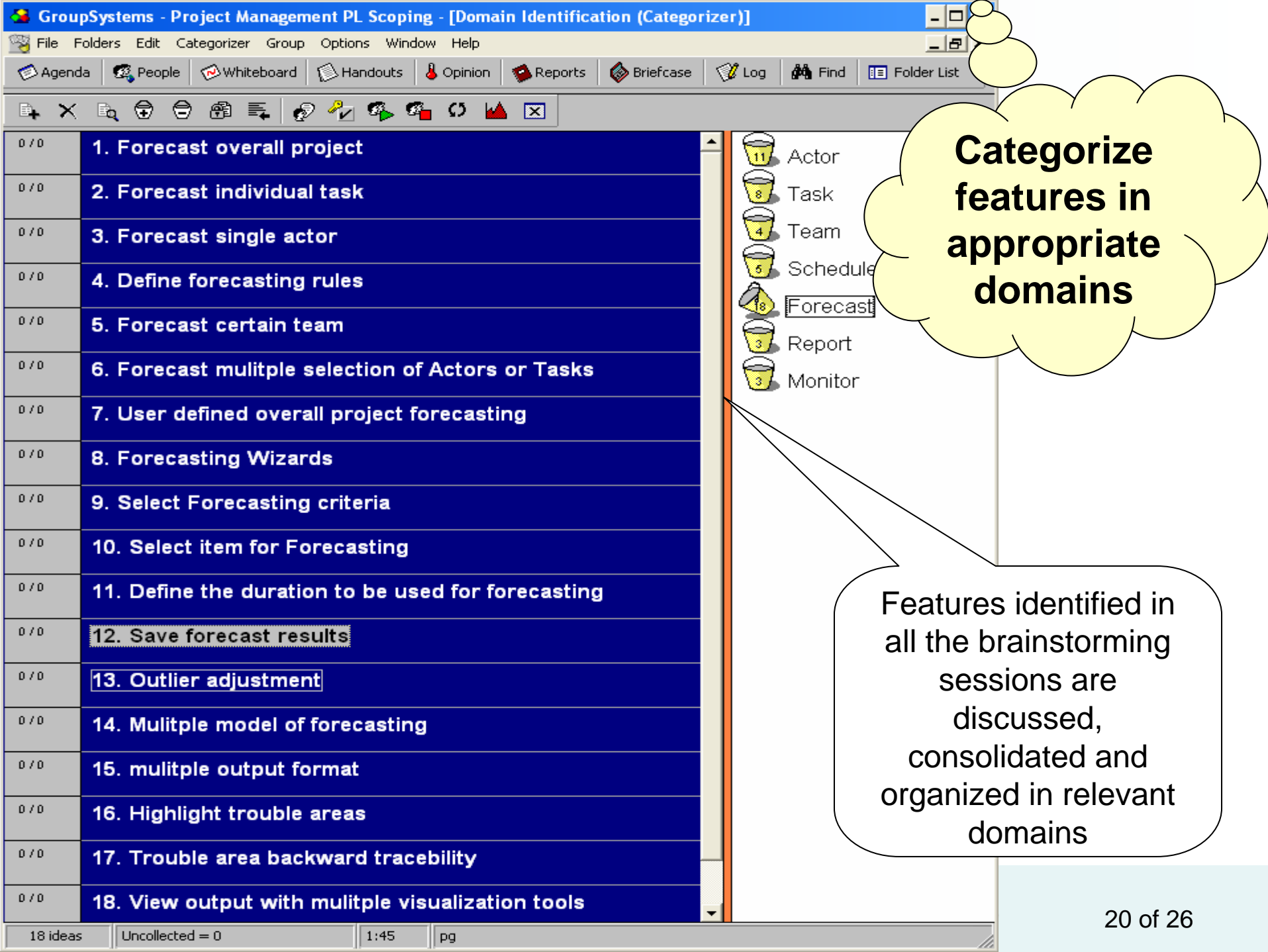
6/0 Discussion #5

- incorporate busy/free information from a groupware system like MS Exchange
- Milestones
- create interim report at certain time specified by user
- track changes in the original plan
- Track individual tasks
- Track certain person or group of person e.g. team

Append
Before
After

Submit Spell Keywords Close Help

For each new domain features are elicited through brainstorming



Categorize features in appropriate domains

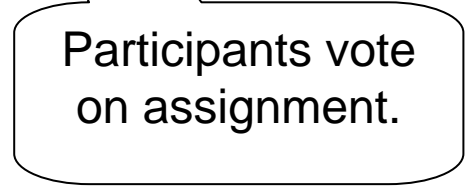
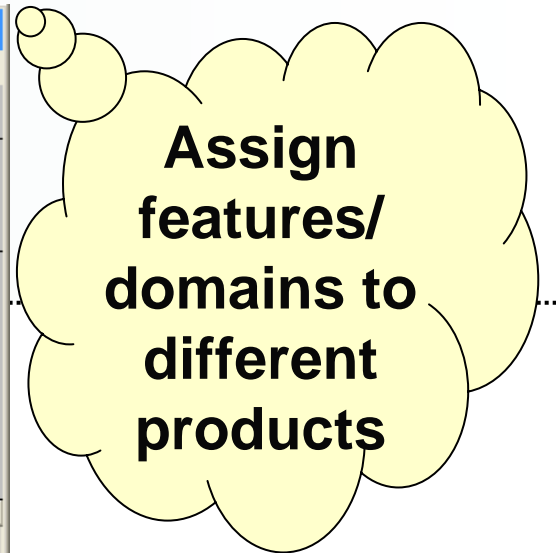
Features identified in all the brainstorming sessions are discussed, consolidated and organized in relevant domains

Report (6 of 6)

6.6 Select style of report

Products (1 of 3)
1. Stand Alone

	Domain\Feature	Stand Alone	Networked	Online
5.	Forecast			
5.1	Forecast overall project	Y	Y	Y
5.2	Forecast individual task	Y	Y	Y
5.3	Forecast single actor	N	Y	Y
5.4	Define forecasting rules	N	Y	Y
5.5	Forecast certain team	N	N	Y
5.6	Forecast multiple selection of Actors or Tasks	N	Y	Y
5.7	User defined overall project forecasting	N	N	Y
5.8	Forecasting Wizards	N	Y	Y
5.9	Select Forecasting criteria	N	N	Y
5.10	Select item for Forecasting	N	N	Y
5.11	Define the duration to be used for forecasting	N	N	Y
5.12	Save forecast results	Y	Y	Y
5.13	Outlier adjustment	N	N	Y
5.14	Multiple model of forecasting	N	N	Y
5.15	multiple output format	N	Y	Y
5.16	Highlight trouble areas	N	N	Y
5.17	Trouble area backward traceability	N	N	Y
5.18	View output with multiple visualization tools	Y	Y	Y
6.	Report			
6.1	Select Items for report	N	N	Y
6.2	Select format of report	N	N	Y
6.3	Report generation wizard	N	Y	Y
6.4	Project forecast report	Y	Y	Y



1. Tracking

Green cells signify agreement among participants.

Red cells highlight those features on which statistically significant disagreements are present among participants.

Voting results

	Domains / Features	...r version with b	...red Edition (Access ov	...Edition (PDAs, Smart
1.	Tracking			
1.1	show ressource effort per milestone	SA(3.83)	SA(3.83)	SA(3.83)
1.2	show critical path	A(3.17)	SA(3.83)	SA(3.50)
1.3	show total cost spent at certain time	SA(3.67)	SA(3.50)	A(3.17)
1.4	show cost alternatives when assigning resources	D(2.17)		
1.5	print reports for different roles (e.g., management, sa	SD(1.33)		
1.6	show cost per task	A(2.83)		
1.7	send automatic notifications to project members (e.g.	SD(1.33)		
2.	Document Generation			
2.1	description of project members	SD(1.33)	A(3.33)	D(2.33)
2.2	weekly/monthly timesheets for project members	D(1.83)	SA(3.67)	D(2.00)
2.3	progress overview document for sales/marketing	D(1.83)	SA(3.67)	A(2.67)
2.4	project status comparison based on two dates	D(1.83)	SA(3.83)	A(2.50)
2.5	automatic distribution of selected reports to subscribe	D(1.67)	SA(3.83)	D(1.67)
2.6	self-defined templates for reports	A(2.50)	SA(4.00)	A(2.50)
	Total	29.33	48.33	34.00
	Mean	D(2.26)	SA(3.72)	A(2.62)
	STD	0.87	0.18	0.65

For red cell participants discuss and reveal their reasons and later on revote.

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Our approach is...

- ▶ ...Based on proven approaches and tools
- ▶ ...Agile
 - ...Highlighting a shared vision
 - ...Identifying success-critical stakeholders
 - ...Based on extensive stakeholder involvement
 - ...Supporting collaboration
- ▶ ...Minimizing separation of concerns

Open Issues

- ▶ the best sequencing of steps is not yet found
- ▶ how much architectural conformance issues should be dealt with at the scoping stage?
- ▶ yet we have only dealt with creating the product map
 - Domain potential analysis and reuse infrastructure scoping activities are not yet included in the process
- ▶ conduct „real-world“ case study

End of Presentation

- ▶ Thank you for your attention!
 - Questions?
 - Feedback