17-708 SOFTWARE PRODUCT LINES: CONCEPTS AND IMPLEMENTATION

PRODUCT MANAGEMENT AND SCOPING

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READING ASSIGNMENT SEP 28

Shaker, P., Atlee, J. M., & Wang, S. (2012, September). A feature-oriented requirements modelling language. In Requirements Engineering Conference (RE), 2012 20th IEEE International (pp. 151-160). IEEE.

Sections 1-4

Try to understand example, incl. notation and composition

LEARNING GOALS

Costs of variability

Strategic function of variability management

Basic considerations of scoping

SCOPING

"process of *identifying* and *bounding areas* (subdomains, existing assets) and *capabilities* (features) of the product line where investment into reuse is economically useful and beneficial to *product* development."

– M. Becker. Fraun.IESE

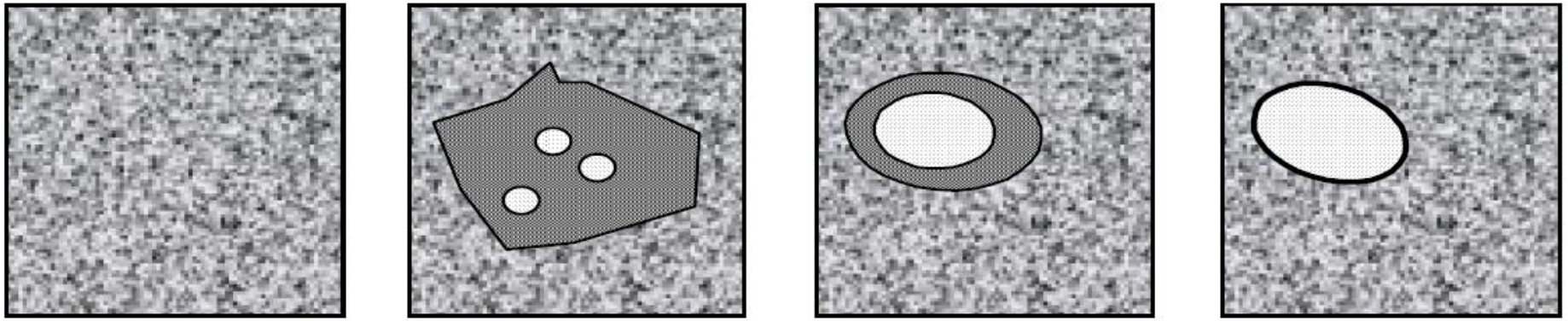
SCOPING

Too broad: unnecessary effort

Too small: lack of reuse, lack of flexibility

Scope considerations

- **Marketing has to know/sell supported features**
- **Management needs to know scope and evolve it**
- **Engineers realize it**
- **QA within the entire scope**



Paul C. Clements. On the Importance of Product Line Scope. In Software Product-Family Engineering. pp 70-78. Springer. 2002

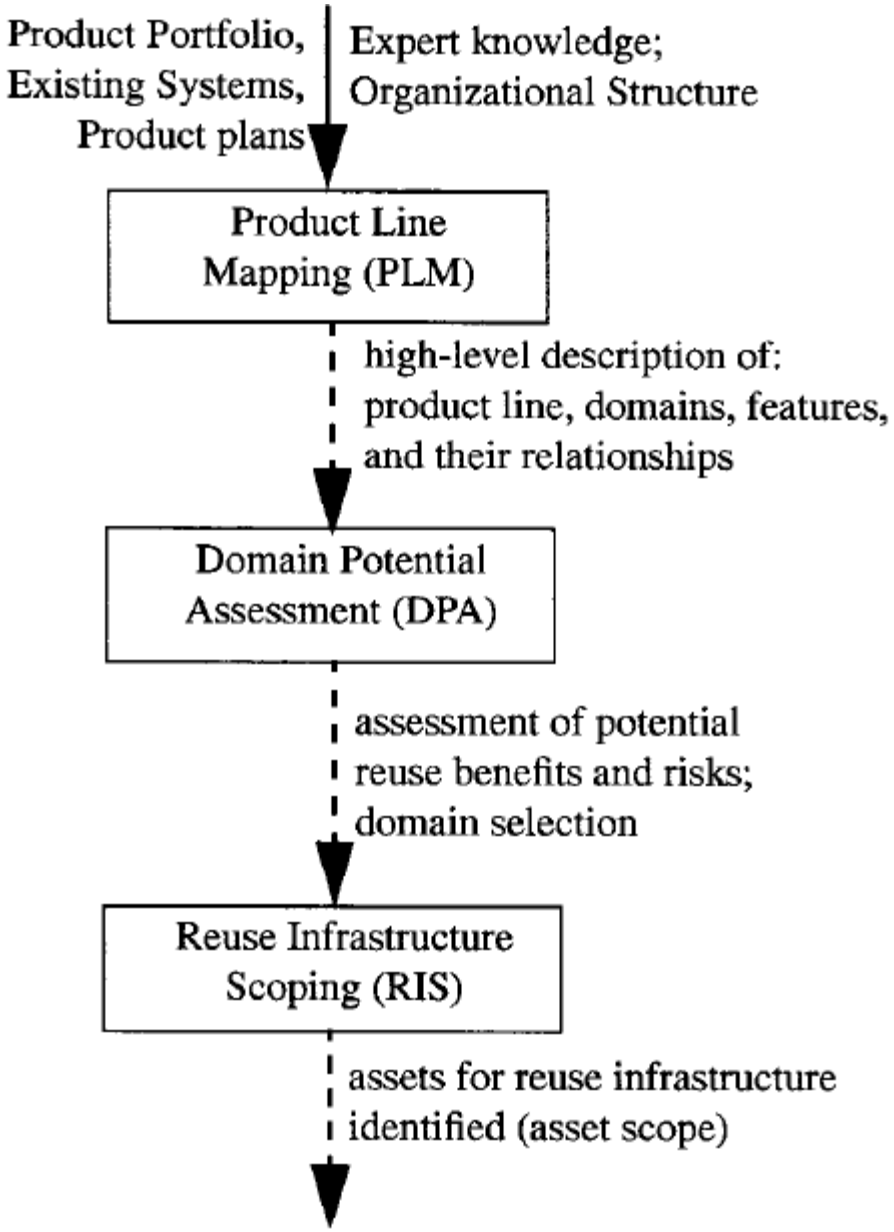
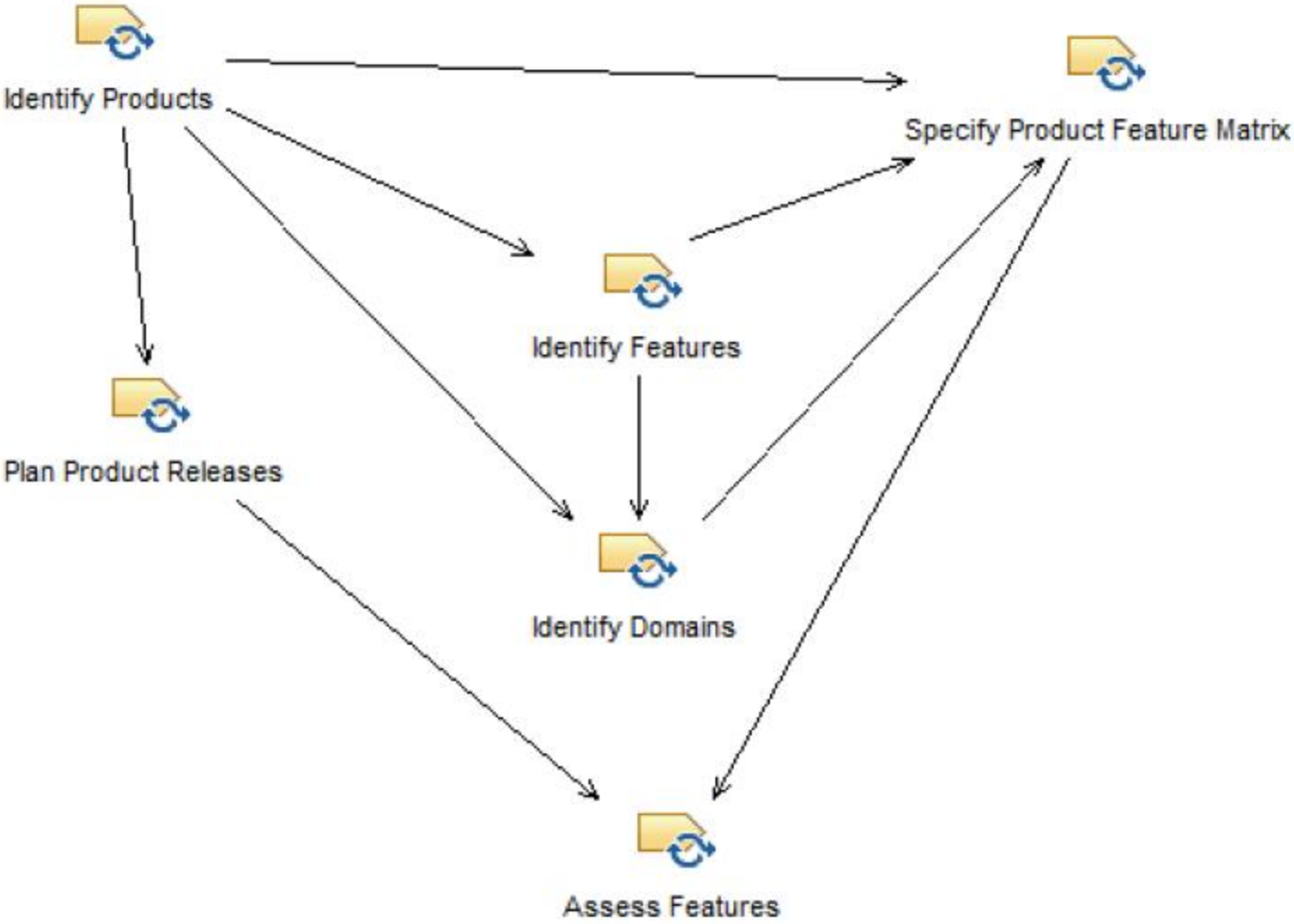


Figure 1: PuLSE-Eco V2.0 Components

Schmid, K. (2002, May). A comprehensive product line scoping approach and its validation. In *Proceedings of the 24th International Conference on Software Engineering* (pp. 593-603). ACM.



John, I., Knodel, J., Lehner, T., & Muthig, D. (2006, August). A practical guide to product line scoping. In *Software Product Line Conference, 2006 10th International* (pp. 3-12). IEEE.

			exist.	planned		potent.
			P1	P2	P3	P4
Domain 1	Sub-Domain 1.1	Feature 1.1.1	X	X	X	X
		Feature 1.1.2	—	X	X	X
		Feature 1.1.3	X	X	—	X
	...	...	...	...	...	...
	Sub-Domain 1.n	Feature 1.n.1	X	—	X	X
		...	...	...	...	...
Domain 2	Sub-Domain 2.1	Feature 2.1.1	—	X	X	—
	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	Feature m.1.1	—	X	—	X

Table 1. Initial Product Map

Schmid, K. (2002, May). A comprehensive product line scoping approach and its validation. In *Proceedings of the 24th International Conference on Software Engineering* (pp. 593-603). ACM.

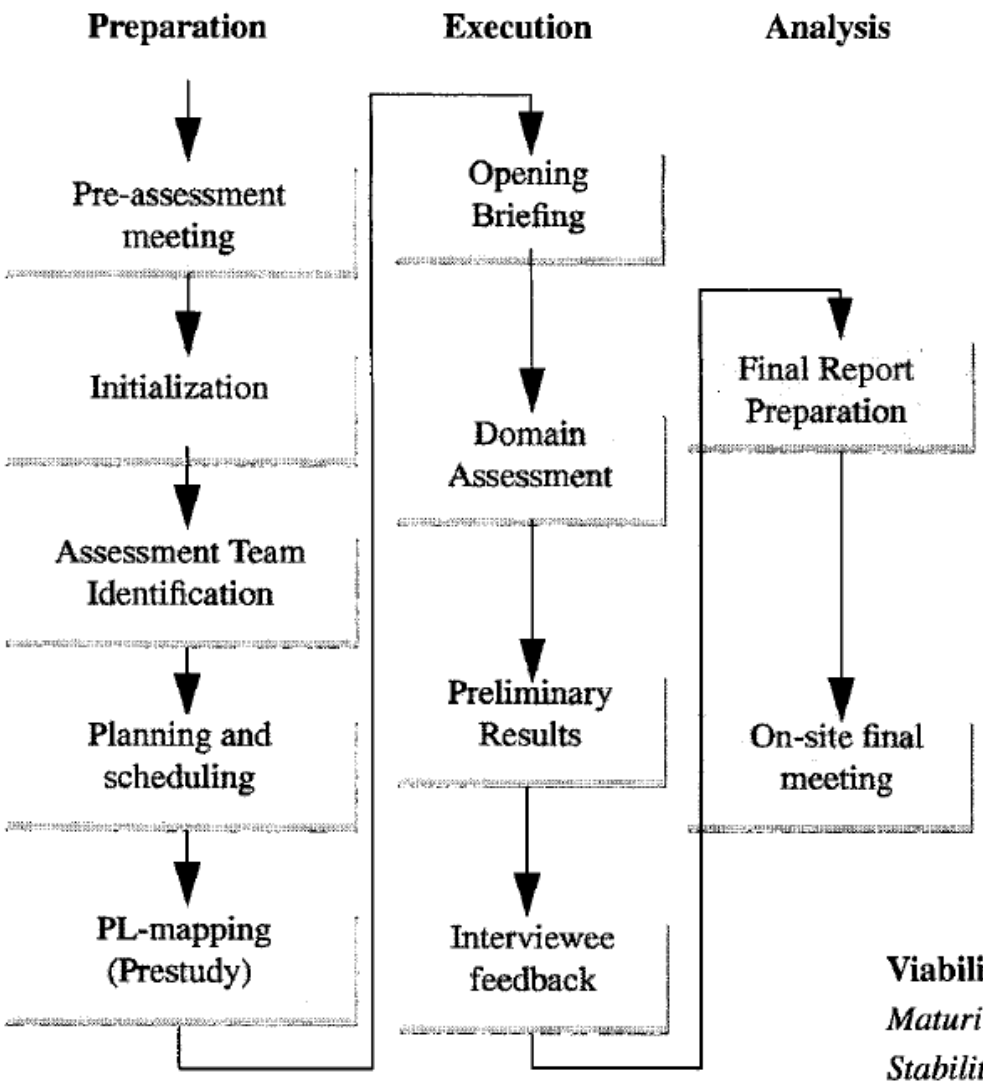
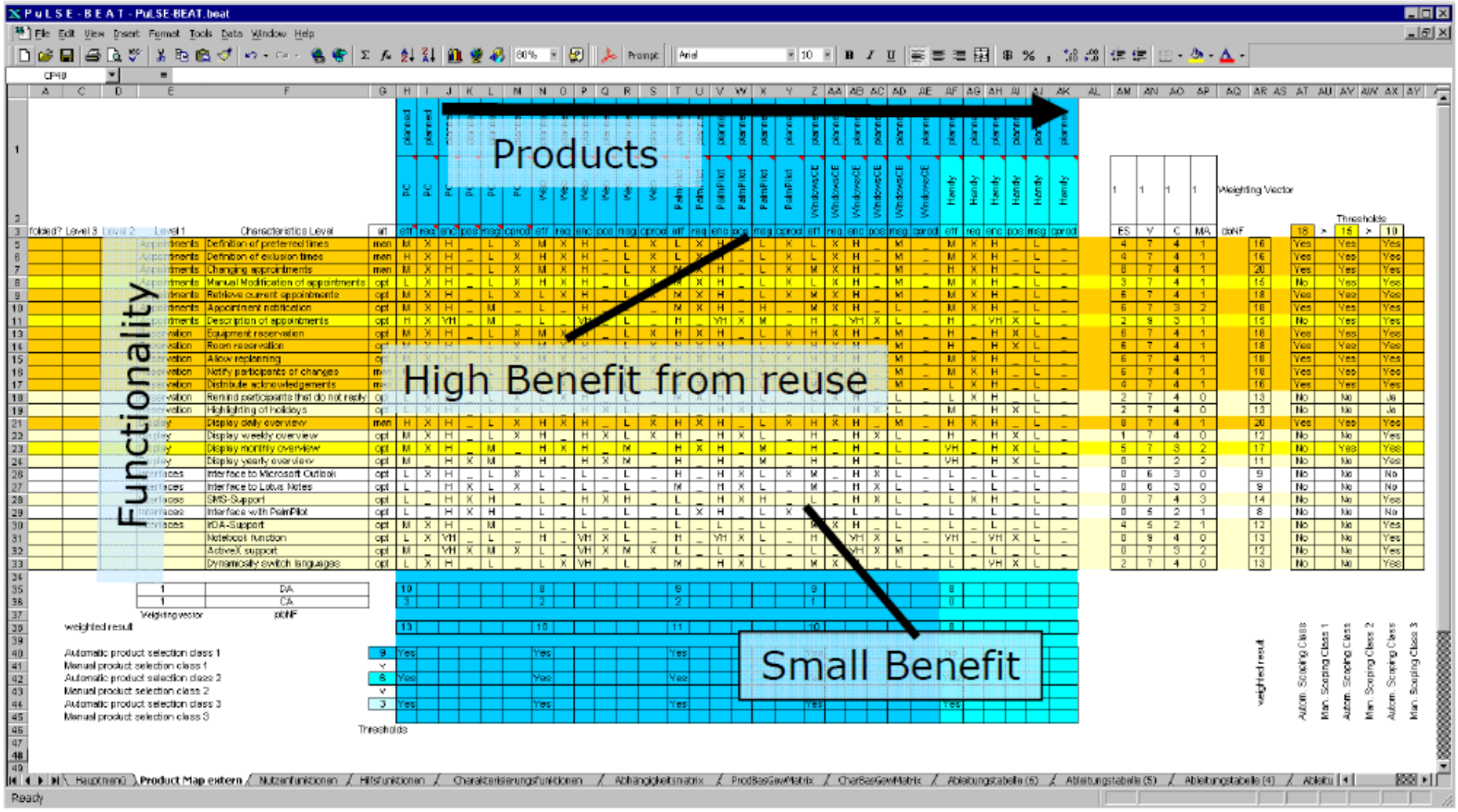


Figure 3: Assessment Process

Viability dimensions	**Benefit dimensions**
Maturity	*Market potential – External*
Stability	*Market potential – Internal*
Resource constraints	*Commonality and Variability*
Organizational constraints	*Coupling and Cohesion*
	Existing Assets

Figure 4: Assessment Evaluation Dimensions


Products
Functionality
High Benefit from reuse
Small Benefit

MASS CUSTOMIZATION IN CAR PRODUCTION

30 years ago

- **Little variability**
- **A single variant creating 40% of all profit**

15 years ago

- **10^20 configurations at Audi**
- **10^32 configurations at BMW**
- **Rarely two identical configurations produced**
- **100 different undercarriages**
- **50 different steering wheels**

PROBLEMS IN CAR MANUFACTURING

High number of variations caused complexity and costs

- **Logistics**
- **Development**
- **Investment in machines and tools**
- **High production costs due to small scale manufacturing**

"But we need variability to satisfy customer demands"

Variability management as strategic project; include developers, logistics experts, and marketing

VARIABILITY MANAGEMENT IN CAR PRODUCTION

- Analyze demand (which features, in which combinations)
  - Eliminate rare variants
  - "We should not develop and product parts that we are not using"
- Consider variability reduction during development
  - Audi saved 5 million Euro by designing the central button panel in the roof interior in a neutral color
  - BMW reduced the number of (all invisible) undercarriage variants from 100 to 4 (left/right steering, with/without sunroof)
  - Bundling of options into packages

COSTS PER FEATURE

Research and Development Cost

Maintenance Costs, Testing, Support

Interactions

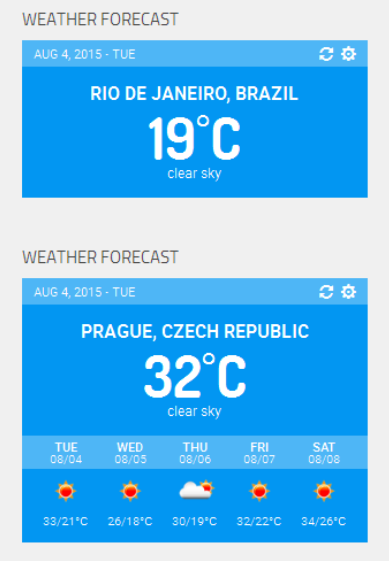






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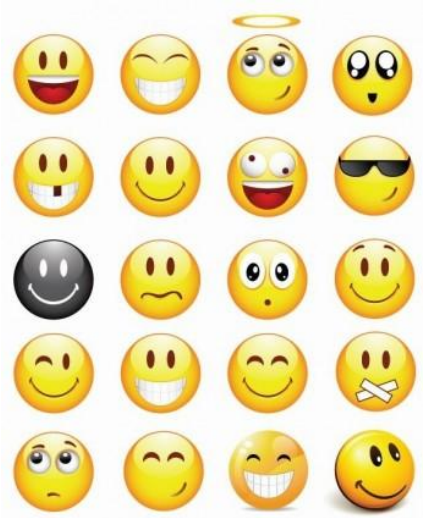
Plugin



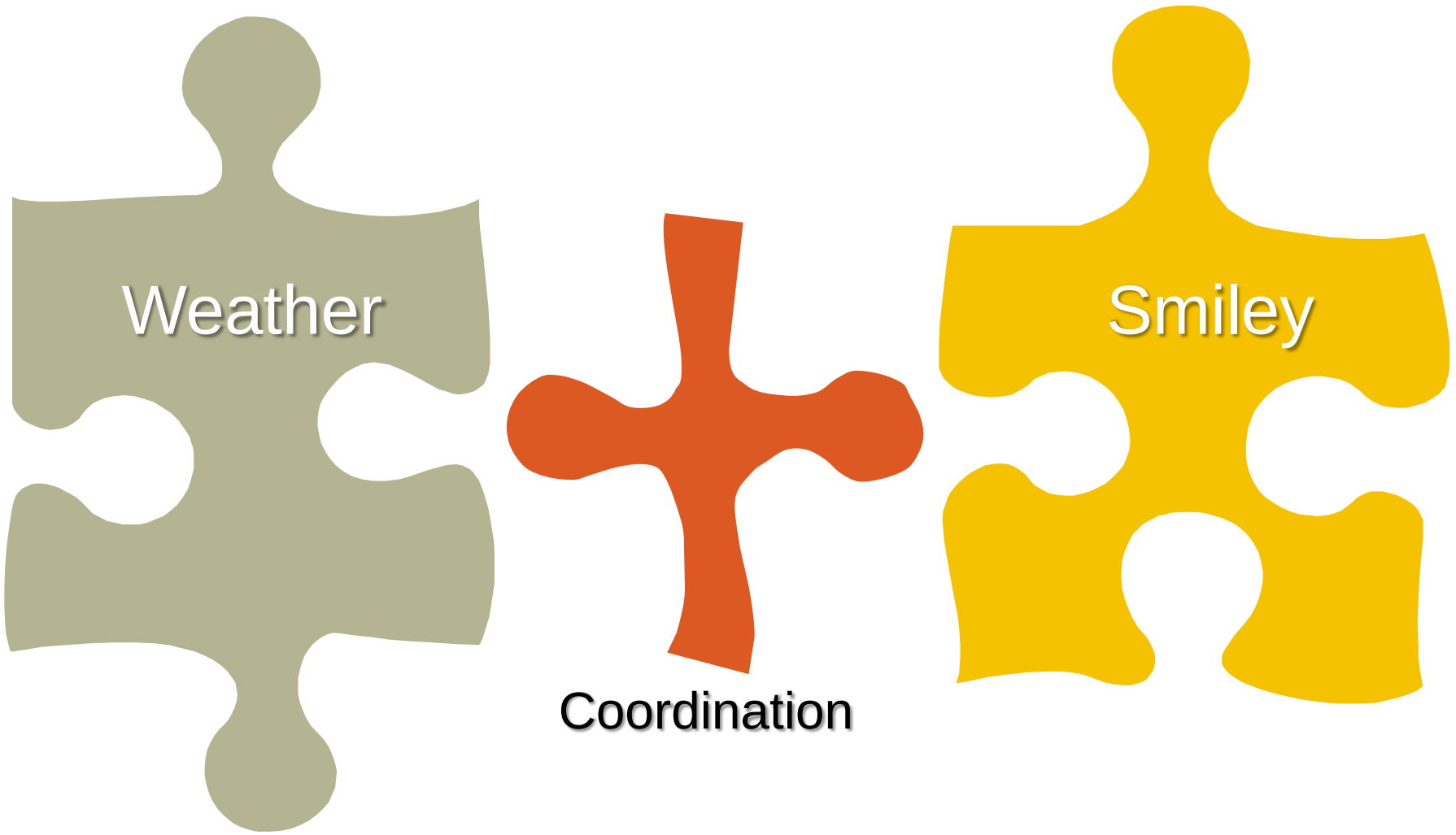
WordPress

:) 8-) ;-) …

Plugin



Today's weather: [:weathe 


Weather
Coordination
Smiley



Scale

FURTHER READING

Paul C. Clements. On the Importance of Product Line Scope. In Software Product-Family Engineering. pp 70-78. Springer. 2002

Frank van der Linden, Klaus Schmid, Eelco Rommes. Software Product Lines in Action, Chapter 2 "Business" Springer 2007

Prof. Dr. Klaus Pohl, Dr. Günter Böckle, Dr. Frank van der Linden. Software Product Line Engineering. Chapter Product Management. Springer 2005

John, I., Knodel, J., Lehner, T., & Muthig, D. (2006, August). A practical guide to product line scoping. In *Software Product Line Conference, 2006 10th International* (pp. 3-12). IEEE.

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