Risk management: The Point of View of Software Maintenance research

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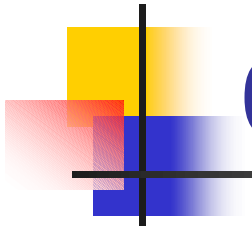
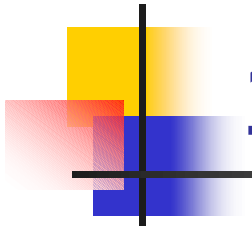


0. Contents

1. The MANTEMA methodology
2. Outsourcing of software maintenance
3. Risk identification and estimation
4. Service Level Agreements
5. Conclusions

1.1. MANTEMA: Main characteristics

- Methodology for Software Maintenance process management
- Developed with Atos ODS Origin
- Five types of maintenance
- Special consideration of outsourcing

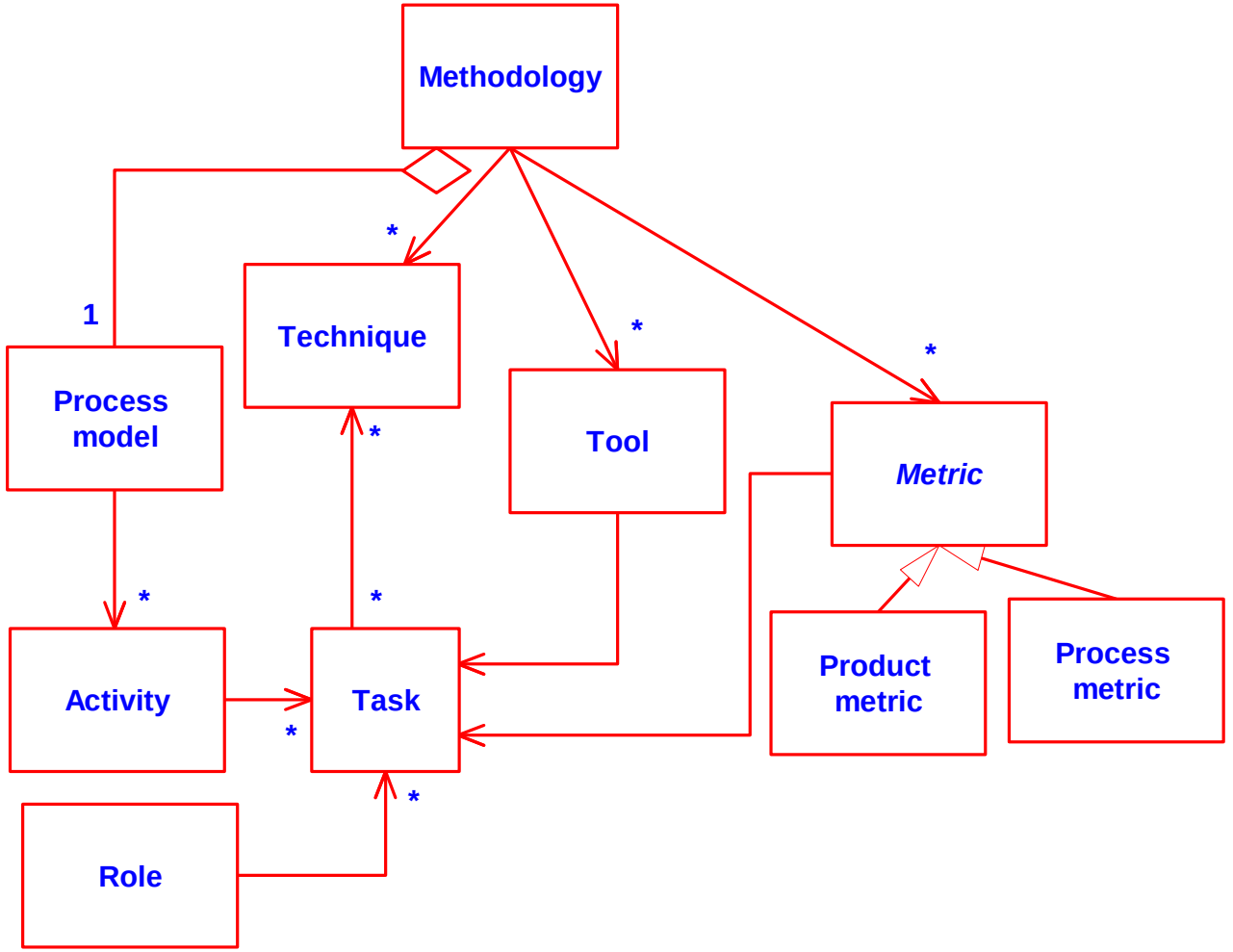


1.2. Concept of “methodology”

- A process model
- Metrics
- Techniques
- Tools
- Deliverables
- Guidelines for management (team structure)

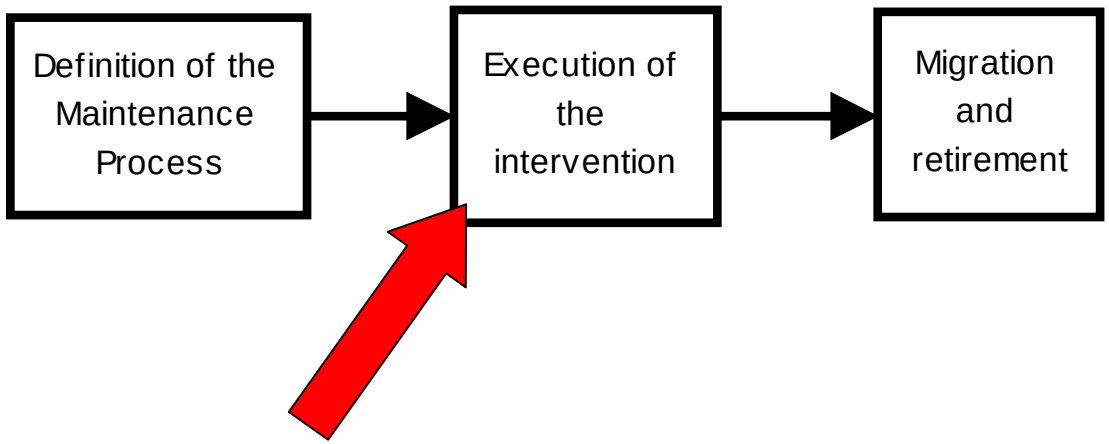
(Adapted from Graham et al., 1997)

1.3 Our idea of methodology

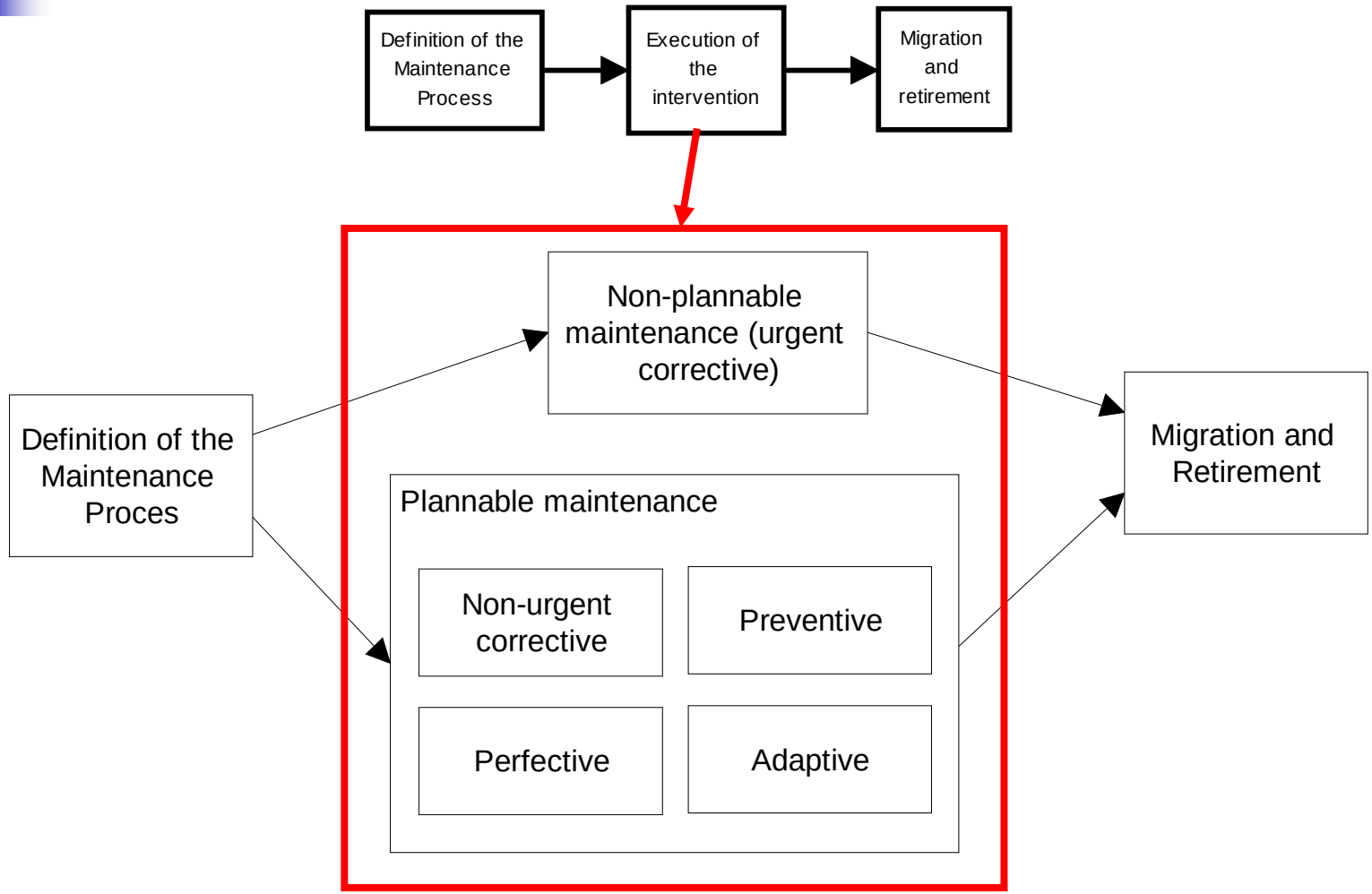


1.4.1. Structure of MANTEMA: process model

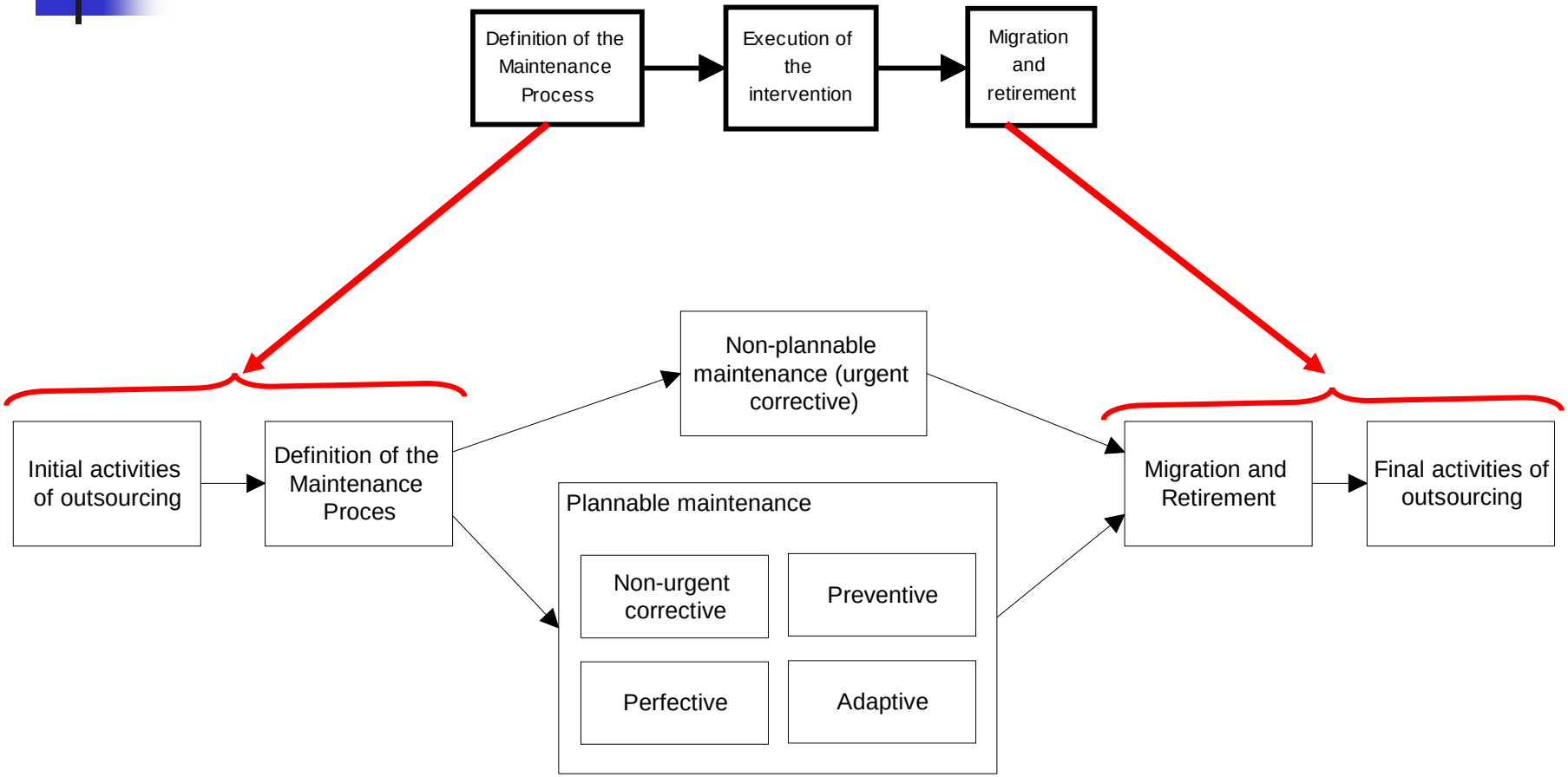
- Based on ISO/IEC 12207



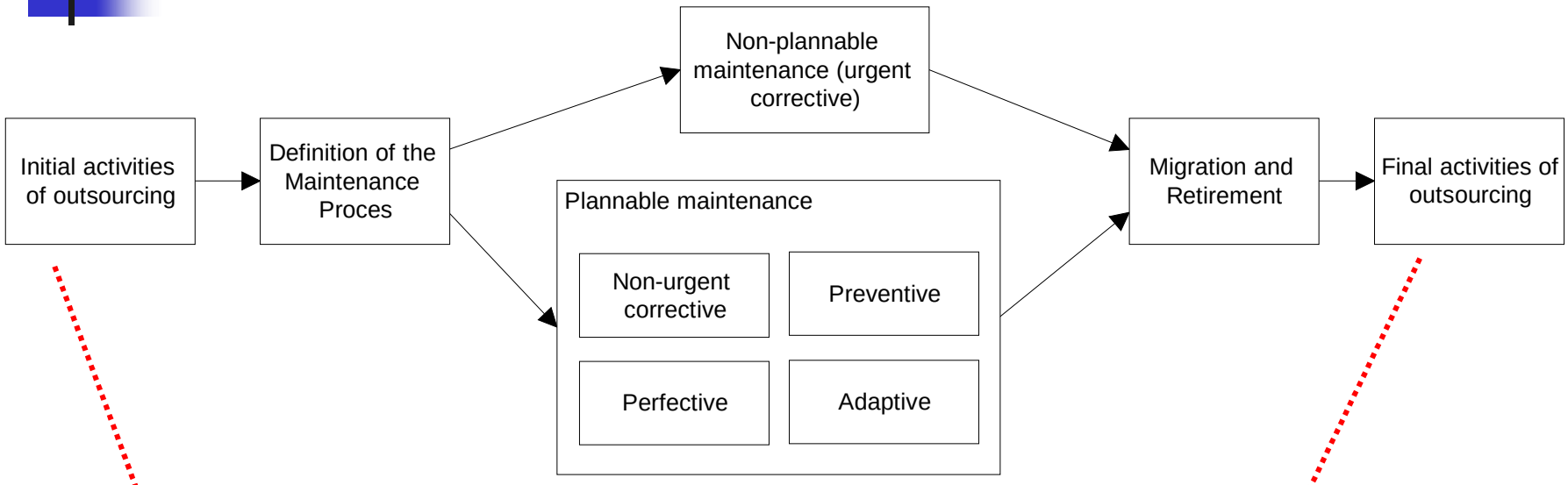
1.4.2. Structure of MANTEMA: process model



1.4.3. Structure of MANTEMA: process model



1.4.4. Structure of MANTEMA: consideration of outsourcing



- Beginning and information collection
- Preparing the maintenance contract
- Contract

- Inventory and documentation delivering
- Training new maintenance personnel
- Definite end of service

2.1. Outsourcing of sotfware maintenance

- Supposed benefits:
  - Employees center their attention on the core business
  - Releasing resources for strategic developments
  - Decreasing costs (savings in personnel, transformation of fixed to variable costs)
  - Increasing productivity (removing of maintenance interferences, “technological associate”)
  - Greater control (interventions are now planned)

2.2. Outsourcing of sotfware maintenance

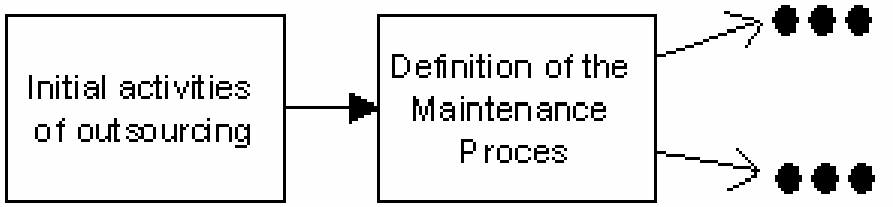
- Drawbacks:
  - Loss of control
  - Loss of a learning source
  - Dependencies of the supplier
  - Variations in the service quality
  - Problems among personnel

From the point of the customer organization

2.3. Outsourcing of sotfware maintenance

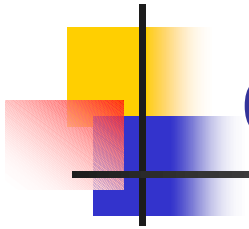
It is important to assess risks also from the service provider point of view

2.4. Outsourcing of sotfware maintenance



- *Beginning and information collection*: the service provider fills-in an “Initial questionnaire”
- *Preparing the maintenance contract*: calculus of Service Level Agreements; risky areas; resource planning for non-plannable maintenance
- *Contract:* signed by the both organizations

3.1. Risk identification and estimation: Initial questionnaire



- A) Organization identification (financial data, personnel, authorized speakers, etc.)
- B) Hardware and software environment
  - B.1) Hardware (mainframes, secondary hardware, network...)
  - B.2) Software (development environment, file system, databases, JCLs...)
- C) Development and maintenance organization (methodologies, techniques, coding standards...)
- D) Applications (for every one: identification, responsible unit, related applications, # of programs, # of reports, # of screens...)

3.2. Risk identification and estimation: Risk questionnaire

- Based on Euromethod's situational factors
- Atos ODS had a broad database of these, never used
- Principal Component Analysis

"Those properties of the situation which generate risks and which should be taken into account in the design of the acquisition strategy" (*Euromethod*, 1996)

3.3. Risk identification and estimation: Risk questionnaire

- 21 decisive situational factors related to:
  - Existing specifications of the application
  - Current team of development/maintenance of the customer...
  - Extern factors
  - IS factors
  - Critical factors of the application
  - Quality of the application
  - Organization factors
  - Methodologies

3.4. Risk identification and estimation: Risk questionnaire

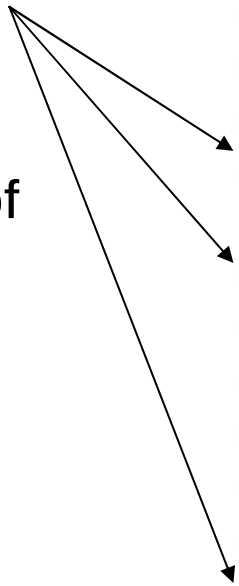
Factor	Subfactor	Value	Mean or weighted value
Existing specifications of the application	High quality of the design level of the system technique architecture		
	High quality of the level design of the software		
	IS requirements are available and clear		
	IS requirements are stable		
Current team of development/maintenance of the customer...	...has a high work capacity		
	...has a high knowledge level of the *Maintainer* referred to the domain of the system		
	...has a high knowledge level of the *Maintainer* referred to the technical environment of the IS		

Values from 1 (*Absolutely agree*) to 5 (*Absolutely disagree*)

3.5. Risk identification and estimation: Risk estimation

Sources of risk

- Existing specifications of the application
- Current team of development/maintenance of the customer...
- Extern factors
- IS factors
- Critical factors of the application
- Quality of the application
- Organization factors
- Methodologies



Risks factors

- Uncertain or unfeasible requirements
- Uncertain interfaces to other systems
- Evolving requirements
- Unpredictable costs for the supplier organization
- Unpredictable costs for the project
- Delays in the delivery
- Poor quality of deliverables
- Increased costs of the project
- Integration problems
- Straining computer science capabilities
- Wrong or unfeasible information system
- IS-adaptation not accepted by actors
- Business implications of project failure

4.1. Service Level Agreements

- NMR_{CA}: *Number of Modification Requests related to Critic Anomalies*
- NMR_{NCA}: *Number of Modification Requests related to Non-Critic Anomalies*
- TRCA: Time of
- TRNCA: Time of
- DevCA: maximum
- *DevNCA*:*maximum*
- PPC: Progressive Preventive Commitments

With no sanction

4.2. Service Level Agreements: the non-plannable maintenance

$$Max\ B = I - C = \sum_{i=1}^{N} (Ii - Ci)$$

$$Max\ B = \sum_{i=1}^{N} \sum_{j=1}^{Ni} (Iij - Cij)$$

N= number of projects; Ni= number of days of the i-th project

4.3. Service Level Agreements: the non-plannable maintenance

$$Max\ B = \sum_{i=1}^{N} \sum_{j=1}^{Ni} (Iij - Cij)$$

$$Cij = Rij + Qij$$

$$\hookrightarrow Qij = Sij \cdot (Eij - Pij)$$

Rij= cost of resources; Qij= cost of sanctions; Eij= actual number of days: Pij= planned number of days

4.4. Service Level Agreements: the non-plannable maintenance

- $\text{Max } B = \sum_{i=1}^{N} \sum_{j=1}^{Ni} \left[Iij - \left(\sum_{t=1}^{F} (Tijt \cdot ht) \right) - Sij \cdot (Eij - Pij) \right]$
- subject to :

$$\sum_{i=1}^{N} e_{ijk}^{t} \leq A_{tK}, \ \forall t, k$$

$$\sum_{j=1}^{N} e_{ijk}^{t} = Tijt, \ \forall i, k, t$$

$$Iij \geq 0 \quad \forall \text{i, j}$$

$$ht \geq 0 \quad \forall \text{i, j}$$

$$Sij \geq 0 \quad \forall \text{i, j}$$

$$Tijt \geq 0 \quad \forall \text{i, j, t}$$

$$e_{ijk}^{t} \geq 0 \quad \forall \text{i, j, k}$$

$$A_{tK} \geq 0 \quad \forall \text{j, k}$$

4.5. Service Level Agreements: corrective maintenance

				1999						2000					
				UC		NUC		Perf		UC		NUC		Perf	
Bank	App#	Programs	Size (LOC)	MR	Eff	MR	Eff	MR	Eff	MR	Eff	MR	Eff	MR	Eff
1	1	253	131.427	15	12	11	20	11	24	1	1	10	9	41	133
1	10	193	82.254	0	0	2	2	0	0	0	0	0	0	0	0
1	11	321	206.500	20	33	63	176	134	463	23	41	95	217	61	186
1	12	10	11.165	0	0	0	0	0	0	0	0	0	0	0	0

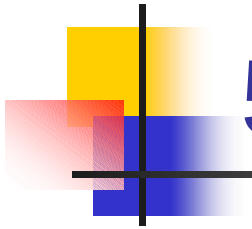
- Data from 55 applications, 16.866 modules, 13.833.000 lines of code
- Data from their maintenance
- Applyied logistic regression to categorize applications in *problematic* or *non-problematic*

4.6. Service Level Agreements: corrective maintenance

- Two equations obtained:

$$P_{UC}(\bar{x}) = \frac{1}{1+e^{-(-2.9822+3.87E-5\cdot size-0,0104\cdot NumberOf\ \mathrm{Pr}\ ograms)}}$$

$$P_{NUC}(\bar{x}) = \frac{1}{1+e^{-(-2.4591+8.10E-6\cdot size+0,0047\cdot NumberOf\ \mathrm{Pr}\ ograms)}}$$



5. Conclusions/contributions

- Risks are important from the service maintenance provider
- Family of techniques for estimating risks, SLAs, etc.
- Integrated into MANTEMA

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