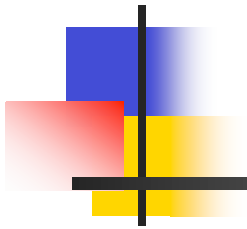

Using Software Quality Characteristics to Measure Business Process Quality

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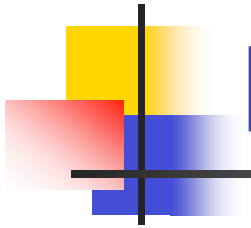
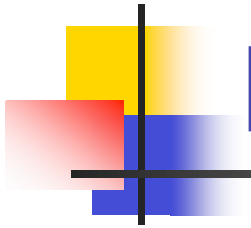
Managing IS Investment

- Advancement of Information System (IS) capabilities and much more investment in IS
  [MIT Sloan Management Review, 2004]
- Few systematic guidelines for measuring IS effects on the organizations with using
  [DeLone, McLean, 2003]
  - **product** based approaches and/or
  - **process** based approaches



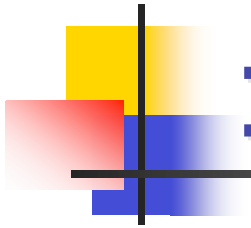
Product Based Approaches

- **Product based approaches** [Brynjolfsson, Hitt 1994]
  - providing crucial information about cost and time related issues
  - having some constraints in
    - identifying IS effects,
    - isolating the contributions of IS effects from other contributors
    - using the performance measures in specific categories of organizations such as in public organizations



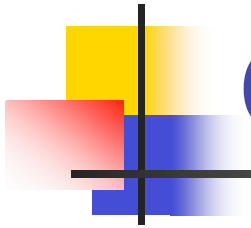
Process Based Approaches

- **Process based approaches** [Mooney, Gurbaxani, Kraemer, 1996]
  - focusing on the effects of IS on business process
  - intention of providing early feedbacks for the potential IS investment alternatives
  - having some constraints in
    - proposing only conceptual level approaches
    - not offering metrics and frameworks for the concrete measurement
  - other well-known studies [Beath, Goodhue, Ross, 1994], [Sambamurthy, Zmud, 1994], [Soh, Markus, 1995]



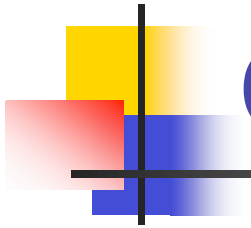
IS Success Measurement Models

- Models for categorizing the studies that measure IS effects [DeLone, McLean, 2003], [Seddon, Staples, Patnayakuni, Bowtell, 1999], [Myers, Kappelman, Prybutok 1997]
- One of the well-known studies, DeLone & McLean IS Success Model
  - having six dimensions as System Quality, Information Quality, Information Use, User Satisfaction, Individual Impact and Organizational Impact
  - here our focus, organizational impact dimension



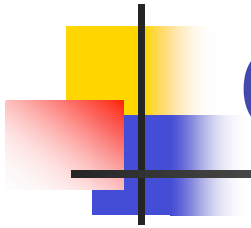
Our Process Based Model

- Importance of business process concept, [Davenport, 1993], [Hammer, Steven, 1994]
  - one of the fundamental assets of the organizations
- The effects of IS on business process (managerial and operational processes), [Mooney, Gurbaxani, Kraemer, 1996]
- Categorizations of the IS effects [Davenport, 1993], [Mooney, Gurbaxani, Kraemer, 1996]



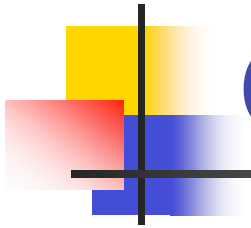
Our Process Based Model

- Lack of business process attribute based frameworks
- Definition of process quality attributes by using Goal Question Metric (GQM) method [Basili, 1992]
- Utilizing the close relationships between software and process [Osterweil, 1987]



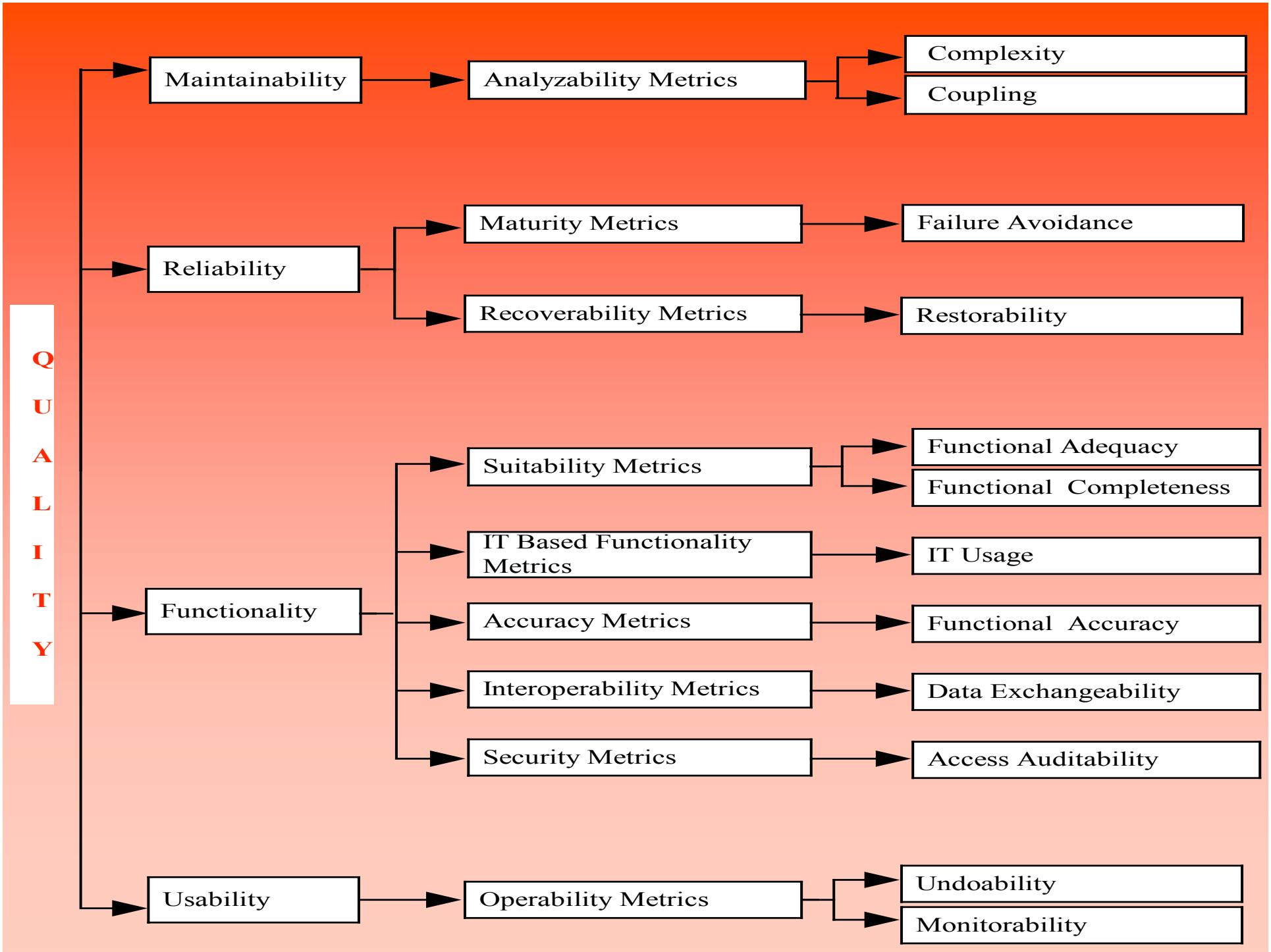
Our Process Based Model

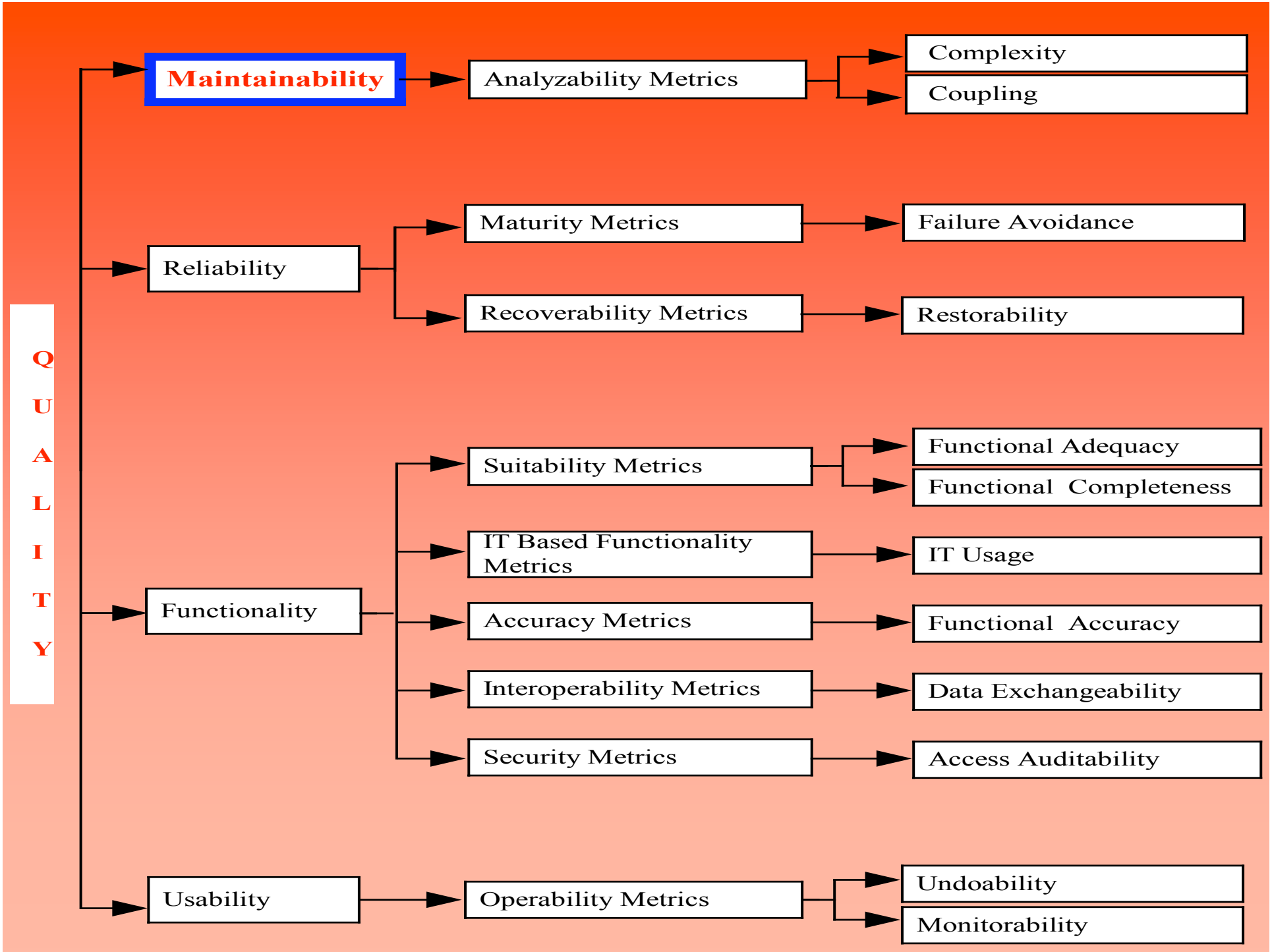
- ISO/IEC 9126 Software Product Quality Model
  - describing a software products evaluation approach
  - presenting a comprehensive specification and evaluation framework
  - evaluation of every relevant quality characteristics
- Our model
  - a complementary process-based approach
  - focusing on the quality aspect of the process



Our Process Based Model

- Structure of the model
  - four-leveled, similar to the ISO/IEC 9126
  - first level, category, quality
  - second level, characteristics, Functionality, Reliability, Usability and Maintainability
  - third level, subcharacteristics
  - fourth level, metrics, to measure the business process quality attributes


QUALITY
Maintainability
Analyzability Metrics
Complexity
Coupling
Reliability
Maturity Metrics
Failure Avoidance
Recoverability Metrics
Restorability
Functionality
Suitability Metrics
Functional Adequacy
Functional Completeness
IT Based Functionality Metrics
IT Usage
Accuracy Metrics
Functional Accuracy
Interoperability Metrics
Data Exchangeability
Security Metrics
Access Auditability
Usability
Operability Metrics
Undoability
Monitorability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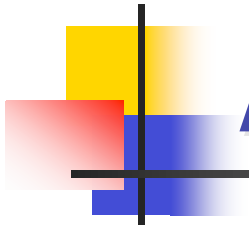
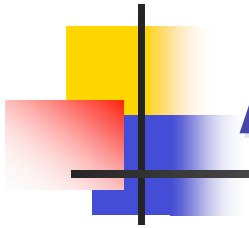
Metric name	Complexity
Purpose of the metric	Calculating the complexity of the business process
Method of application	Find complexity of the business process by means of cyclomatic complexity technique, [McCabe, 1976]
Measurement, formula and data element computations	X=Cyclomatic complexity of the business process
Measurement Type	X = count
Interpretation of measured value	The lower value of X, the better
Input to measurement	Static process definition and its modeling
Focus on	Decisions taken in the activities and classification as unstructured, semi-structured and structured
Example	Activity No: 6 decision of department manager (structured) Activity No: 18 decision of store section staff (structured)

Metric name	Coupling
Purpose of the metric	Calculating the coupling of the business process
Method of application	Find the number of business processes that our sample business process interacts
Measurement, formula and data element computations	X=Coupling of the business process
Measurement Type	X = count
Interpretation of measured value	The lower value of X, the better
Input to measurement	Static process definition and its modeling
Focus on	Interactions with other business processes in the organization
Example	Activity No: 19 Material Purchase business process Activity No: 20 Material Registration business process



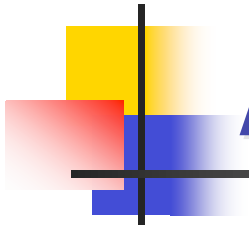
An Experiment

- Implementation on a sample process, in an organization
- The sample process, “Meeting Material Request”, from Warehouse Department of the organization
- Warehouse Department with having 40 staff and 7 basic processes about material operations including Material Purchasing, Material Counting, Material Registration, Material Record Deletion, Material Return, Material Repair and Maintenance
- 5 more departments in the organization
- Two stages in the experiment



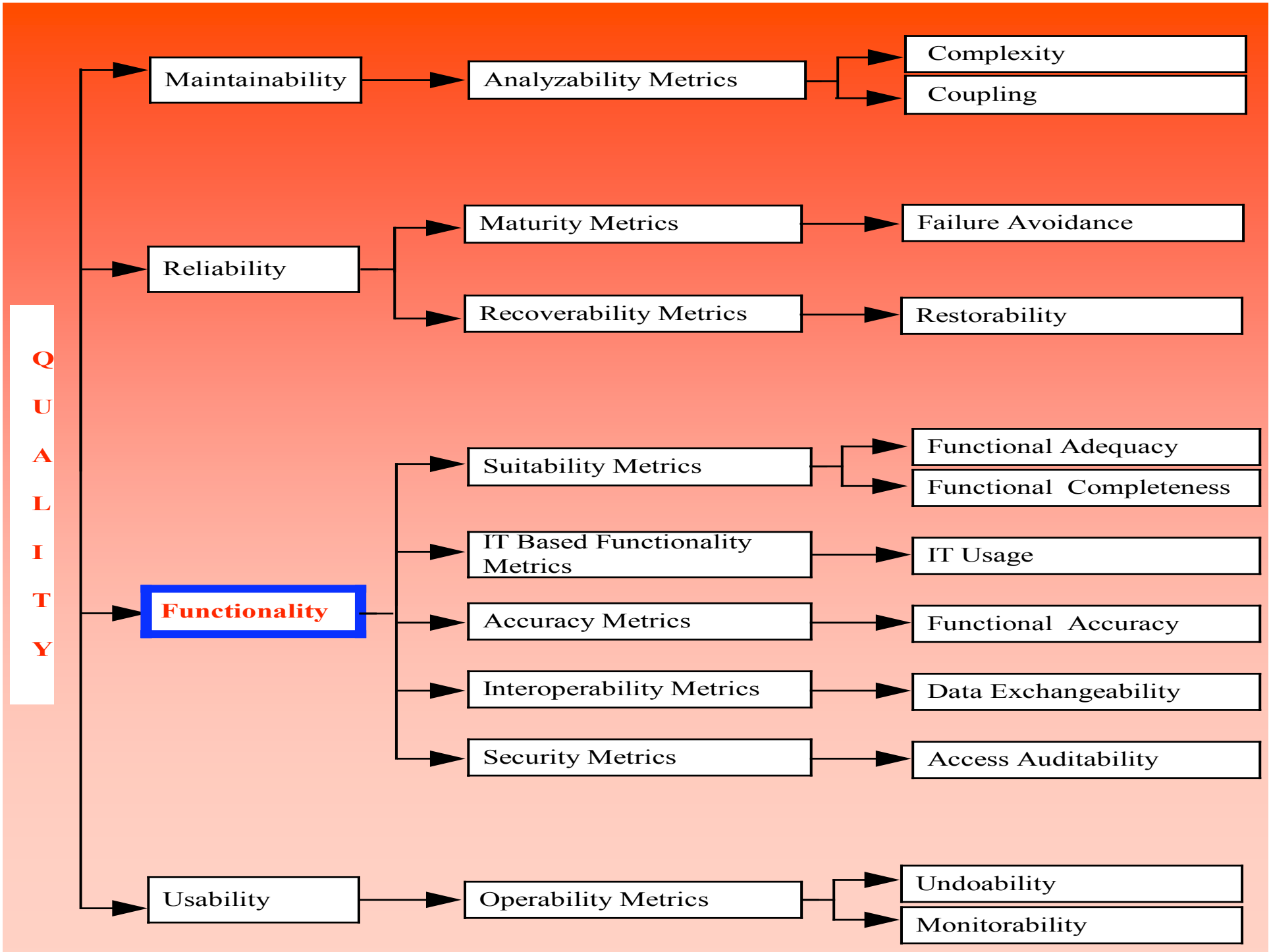
An Experiment (First Stage)

- First stage
  - current state, (AS-IS) form, of the process
  - 29 activities
  - identifying each activity by explaining with actors who take part in, forms, tools and applications that are used in
  - modeling with UML Activity Diagram
  - document based manual works and nonintegrated software tools
  - cycle time, 260 minutes
  - actors' salary based cost, $25,340 for one cycle
  - measuring quality attributes by evaluating activities and the metrics' definitions in the model



An Experiment (Second Stage)

- Second stage
  - using new form, (TO-BE), of the same process
  - forming static process definitions according to specifications of an IS project
  - modeling with UML Activity Diagram
  - endorsed by software application and a central database
  - 24 activities
  - cycle time, 144 minutes for one cycle
  - actors' salary based cost, $16,075
  - measuring quality attributes for depicting the effects of IS project on the process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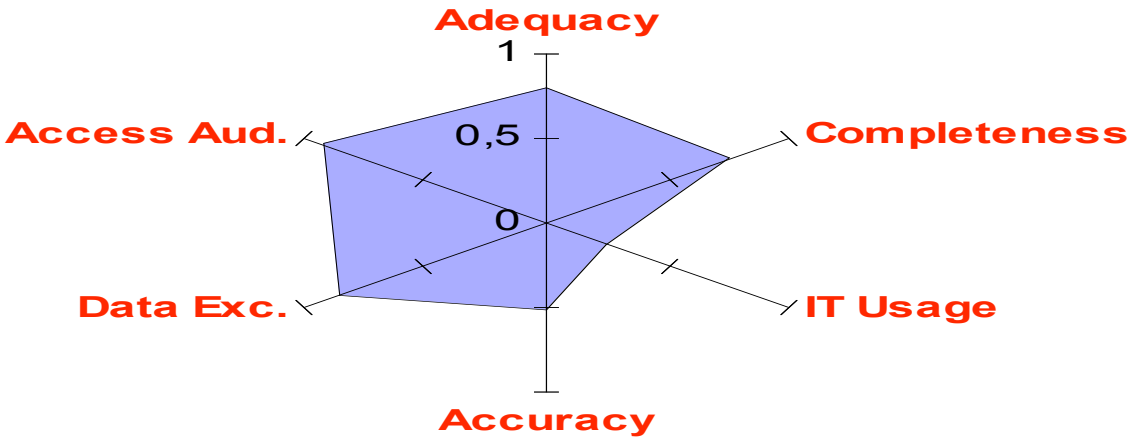
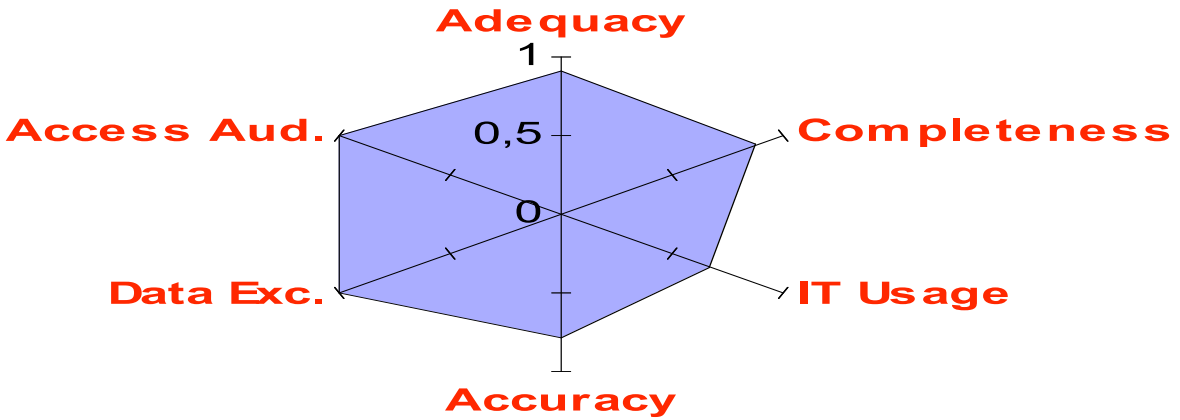
Measuring the Functionality Metrics

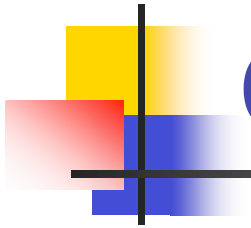
Subcharacteristic	Attribute	AS-IS	TO-BE
Suitability	Functional Adequacy	0.793	0.916
	Functional Completeness	0.759	0.875
IT Based Functionality	IT Usage	0.241	0.667
Accuracy	Functional Accuracy	0.518	0.792
Interoperability	Data Exchangeability	0.857	1
Security	Access Auditability	0.931	1

Functionality of AS-IS



Functionality of TO-BE





Conclusion

- Using in process improvement studies
- Using with product based models
- Difficulties of the application
  - Prerequisite of process modeling
  - High number of processes
- For the future
  - more clear and concrete attribute definition
  - defining correlations between the attributes
  - benchmarking attribute values between the organizations