Executive Overview: Distribution Project Prioritization

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September 2003

Outline

- Introduction
  - Highlights for 2003
  - P^2 and other players
  - Attributes: lessons learned
  - Next development steps
- Project Objective & Problem Definition
- System Objectives
- Technical Review
- Measurement Methods
- Implementation

Highlights for 2003

- Tailored Collaborations underway
  - BGE: converting from existing in-house system to P^2 system
  - TXU: creating attribute structure and integrating P^2 system into planning procedures; using P^2 to create plan for 2003 and beyond
  - Exelon: creating attribute structure and integrating P^2 system into planning procedures; replacing existing financial model
  - HECO: comparing P^2 with existing procedures; ranking projects
  - Nashville Electric: underway; attribute structure created

Highlights for 2003 (cont'd)

- P^2 and other approaches to prioritization
  - *Non ragioniam di lor, ma guarda e passa* (*Dante*)
  - Competitive claims must be evaluated and compared
  - P^2 is the target
  - Growing interest, related to analysis of Aging Assets
  - Fuzzy *Strategic Asset Management* → Focused *Project Prioritization* + *Repair/Replace of Aging Assets*
    - » Common theme: implement concepts with methodology

P^2 and other players: Summary

	EPRI / VMN	ABB	UMS	Nav-igant
SELLING A SYSTEM ***(Measurement Method & Information System, DB) That:*** (1) provides for corporate memory and corporate learning, (2) Systematizes data gathering and decision making, and (3) Reflects corporate values & culture	***Yes***	***No***	***No***	***No***
SELLING CONSULTING	***No***	***Yes***	***Yes***	***Yes***
MEASURE PROJECT BENEFITS AT THE ENGINEERING LEVEL				
♦ Local area focus	***Yes***	***Yes***	***?***	***?***
♦ Reliability treated as a specific attribute	Yes	Yes	***?***	***?***
♦ Allow comparison of apples &oranges benefits (e.g., reliability & capacity)	Yes	***No***	***Yes***	***No***
♦ Treatment of uncertainty	Yes	***No***	***No***	***Yes***
♦ Explicit treatment of project & portfolio risk	Yes	***No***	***No***	***No***
♦ Measure risk of deferral	Yes	***No***	***No***	***No***
♦ Use discounted present value to measure financial & non-financial effects	Yes	***Yes***	***?***	***Yes***
MULTIPLE ATTRIBUTE VALUE MEASUREMENT - Utility designs company specific value measures based on (1) corporate values & objectives , (2) proven value measurement principles	***Yes***	***No***	***No***	***No***
FORMAL ALGORITHMS FOR – (1) Project valuation, (2) Portfolio selection, (3) Risk measurement, (4) Multi-year budget planning	***Yes***	***No***	***No***	***Yes***

P² and other players : Summary

- P² is a software system owned and used by utilities that contains *capabilities*
- Utilities (not EPRI) create the particular implementation
- Utilities (not EPRI) define what is important in valuing projects
- Utilities learn about project prioritization and effective design of projects by using the system
- Other approaches were created because the market is rich for consultants; they tell you what to do in a consultant's final report.
- *We prefer to think of P² as enabling, not consulting*

Attributes: Lessons Learned

- Projects appear to be done for many reasons
- Relatively few high-level attributes:
  - Reliability
  - Capacity
  - Safety
  - Revenue
  - Quality and Customer Values
- Details matter
- Clarity follows from attribute structure
- Uncertainty matters

Next Steps

- Uniform project reporting
- Complete analysis of uncertainty
- Improve portfolio selection algorithm
- Add reliability analysis capability
- ?

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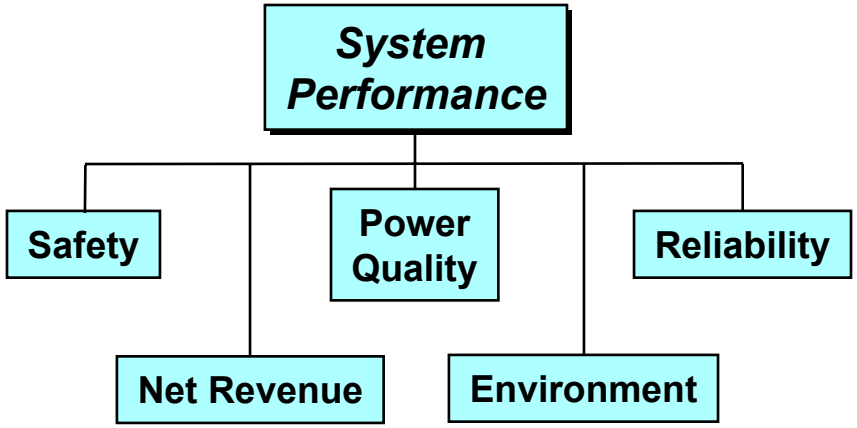
Project Objective

- Create a new planning capability
- For valuing & prioritizing distribution projects
- For picking the "best" portfolio of projects given the project attributes, budget levels, and company objectives
- Features
  - Multi-year
  - Multi-attribute
  - Value driven



Problem Definition

- The company does not currently *quantitatively* evaluate and compare all distribution projects. (A formal, repeatable, and uniform approach for valuing projects does not currently exist.)
- The value of doing a particular project is not compared with the values of competing projects.
- For the projects that are evaluated, the company is not satisfied with the current procedures.

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Scope of Project Prioritization Problem

- Large number of projects
- Multiple performance measures
- Projects done for different reasons
- Analysis of uncertainty
- Risk of deferral
- Respond to budget signals

Characteristics of Project Prioritization System

- Level playing field for all projects
- Resolve differences of opinion rationally
  - Techniques for resolving differences of opinion and determining which differences matter
- Defensible logic for peer review
- Transparent analysis
- Completeness with respect to performance measures
  - Multiple performance measures for multiple objectives
- Bias- and error-free

Characteristics of P² System - continued

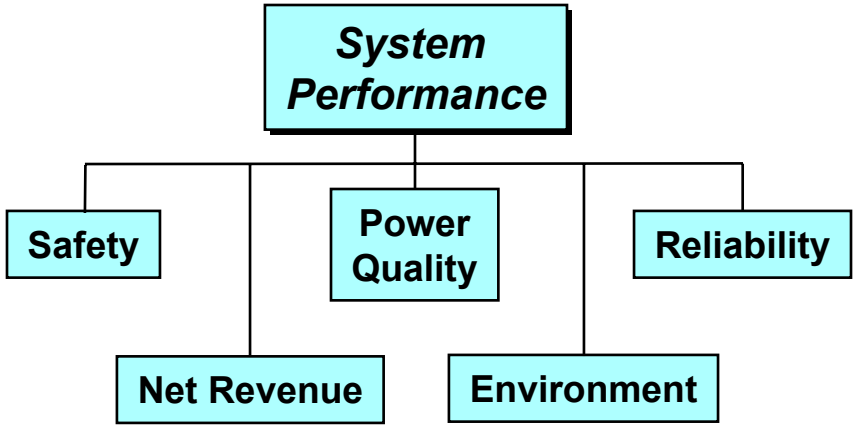
- Practically applicable with respect to time and cost
- Compatible with existing business practices
- Explicit treatment of uncertainty
- Ability to quantify what is lost from insufficient funding
- Software to manage and compare large numbers of diverse activities – client/server database (Oracle, SQL Server)

What we seek to provide

- Completeness: Value measures reflect everything important for decision making.
- Logical Soundness: Procedures and decision rules justified by theory or empirical data.
- Accuracy: Detect and remove errors and biases.
- Practicality: Reasonable cost in time and resources to apply system.
- Acceptability: System is compatible with existing business practices and company values.
- Effectiveness: System produces benefits worth the costs of implementation and application.

What You Should Expect

- A system that is:
  - Multi-year
  - Multi-attribute
  - Value driven
- Three key dimensions
  - Objectives of the project portfolio
    - » minimizing or maximizing important, measurable aspects of system performance
  - Values
    - » capture relative importance of competing objectives.
  - Project attributes
    - » describe how each project contributes to attainment of objectives



Expectations -- continued

- Defensible decision-making
  - document underlying assumptions and decision logic
  - promote consensus
  - provide "what if" analysis
- Use limited resources more effectively
  - eliminate biases and errors
  - promote consistency and level playing field
  - provide insights that suggest new alternatives
  - control the role of politics
- Improve decision-making efficiency
  - incorporate all relevant information
  - involve stakeholders
  - reduce incentives for lobbying
  - motivate action

We cannot...

- Eliminate necessary efforts to identify and collect relevant information.
- Solve the problem without a corporate commitment to implement and apply the system.
- Increase decision defensibility without exposing the logical (or illogical) basis for the decision.
- Ensure that stakeholders with different values and objectives will agree.

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  - Solution Method
  - Required I/O + Transformations
  - System Structure
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Solution Method

- Description of inputs, outputs and transformation procedures
- Interplay between assessed values and objectives
- Delay of project as important alternative
- Measuring values, risks, costs
- Provide:
  - Project rankings
  - Portfolio of projects
  - Allocation of budget
  - Value of additional budget

Required I/O + Transformations

INPUTS

- Corporate budgets
- Projects + Alternatives
- Objectives
- Values
- Attributes

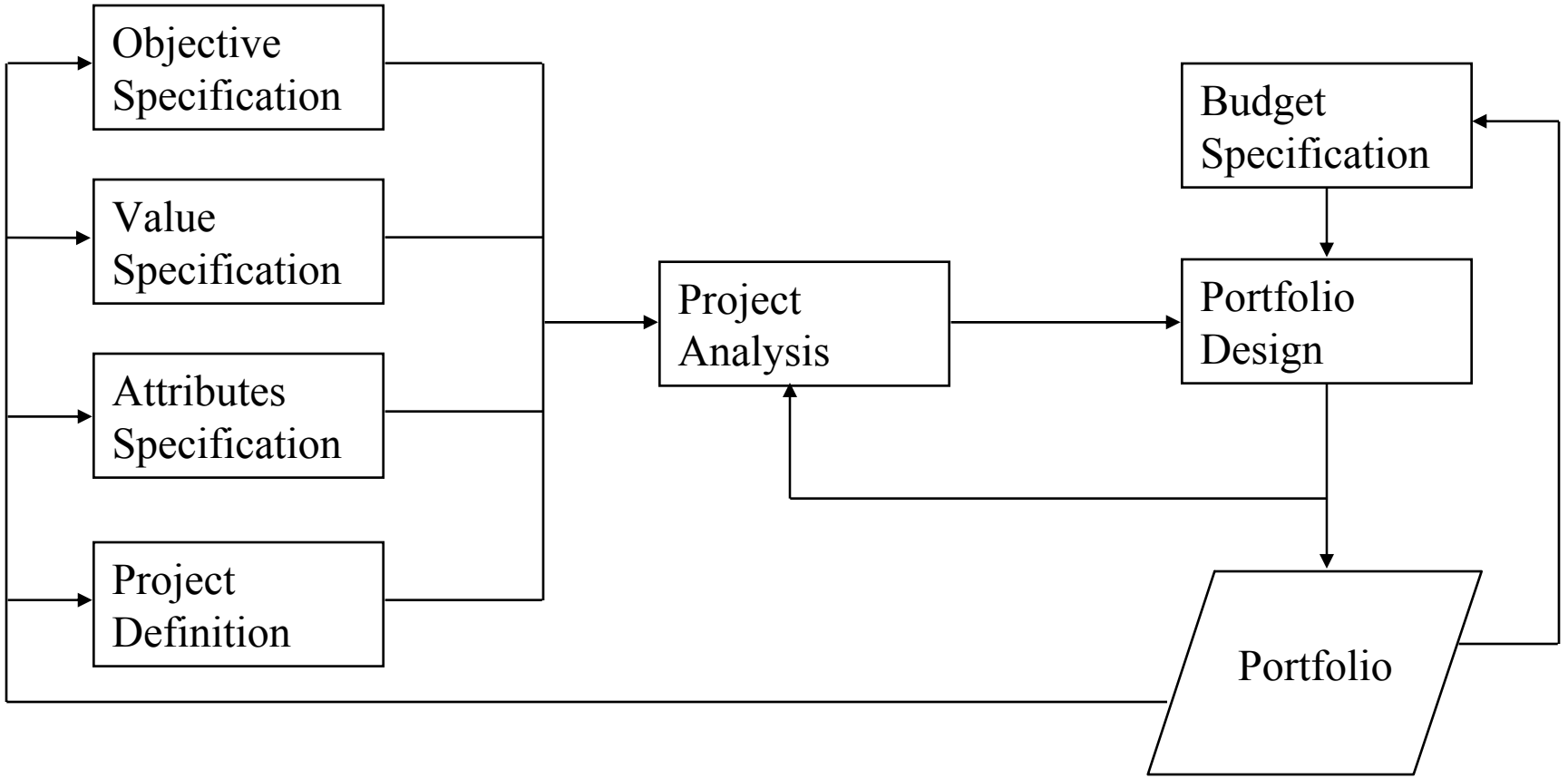
OUTPUTS

- Project Rankings
- Portfolio of projects
- Timing of projects
- Value of additional budget
- Value
- Risks
- Costs

TRANSFORMATION PROCESS

- Attribute + values + objectives → Benefits
- Projects + Alternatives → Budget requirements
- Benefits + budget req'ts → Portfolio
- Δ Budgets → Δ Portfolio

Overview of System Structure



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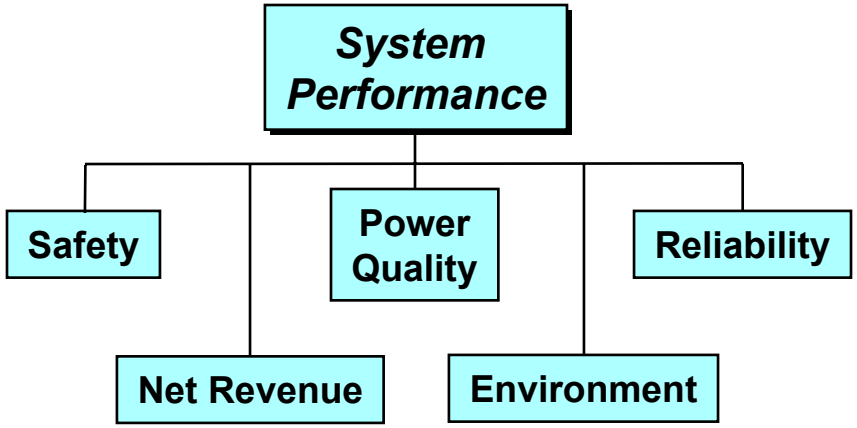
Data Requirements: Attribute Hierarchy

- Identify the reasons for projects – highest level attributes
  - Projects change attributes
  - Highest level attributes are measurable determinants of system performance
  - The relative importance of highest level attributes determines project selection
- Identify lower-level, measurable attributes
- Specify attribute scales, functions and weights that transform measurable lower-level attributes into highest level attributes
- Specify weights on highest level attributes that determine system performance



Assessment Principles

- Principle of Measured Observations (Natural Units)
- Scaled Units Principle
- Risk Assessment Principle
- Comparison Principle
- Principle of Relative Importance

Principle of Measured Observations

- Observation/Measurement
- Observation--What could happen, span the space
- Measurement--How much happens, create the *natural* units
- Example: If an outage occurs, how long will it affect customers?

Principle of Measured Observations--Example

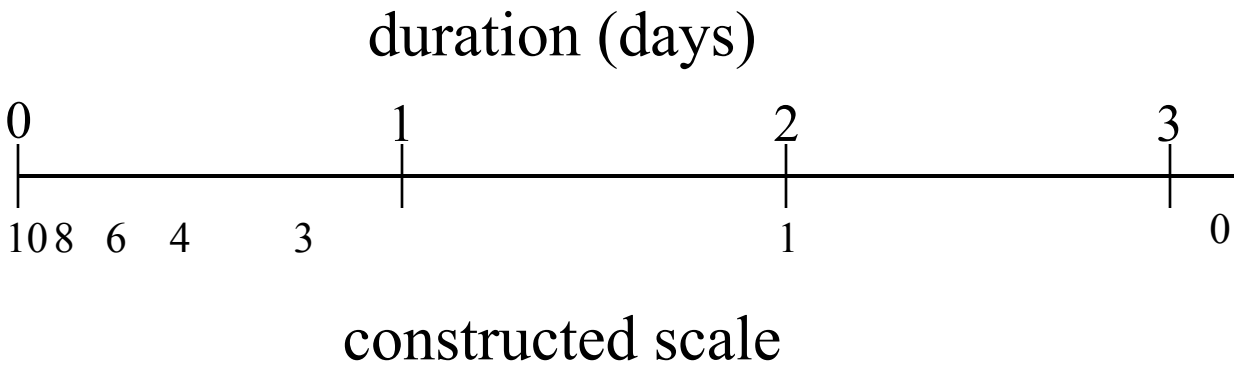
- Outage Duration
- Possible events: transformer trip, transformer fire, explosion, fallen wire,…
- Minimum duration--0 hours
- Maximum duration--several days
- Scale: 0 1 2 3
- Question: How to value increasing duration?

Scaled Units Principle

- Performance measure is a *constructed* scale based on natural units.
- Natural units are readily observable and measurable.
- Scaled units specify relative value of changes.
- Part 1: Apply natural units to identify stops on scale.
- Part 2: Apply scale intervals to set values of constructed scale.
- Example: Project designed to reduce outage duration.

Scaled Units Principle -- Example

Value Scale	Natural Units
10:	None
9:	< 1 hr.
8:	1 - 2 hr.
6:	2 - 8 hr.
4:	8 - 12 hr.
3:	12 - 24 hr.
1:	1 - 3 days
0:	> 3 days



Risk Assessment Principle

- If attribute outcomes are uncertain, encode risks directly.
- There is no attribute called "risk"
- Use either lotteries or statistical expected values
- Example: risk of outage duration
- Use of percentiles: 10-50-90 range
  - Median, or 50th percentile: 2 hours
  - 90th percentile: 8 hours
  - 10th percentile: 1 hour

Risk Assessment Principle—cont'd

- Safety considerations
- Example: What public injuries might follow (or be expected to occur) if incident occurs?

Scale	Lottery	Statistical Exp.
10:	none	none
9:	50% chance of 2D, 5I	1D, 2I
4:	50% chance of 10D, 20I	5D, 10I
0:	50% chance of 50D, 100I	25D, 50I

Comparison Principle

- Relate actual consequences to other known and measurable attribute levels (identify proxy)
- Example: Power Quality
- Proxy: Apply measured observations and scaled units principles and measure the arrival rate of complaints.

Scale	Natural Units (Power Quality)	Natural Units (Proxy)
10:	Best power quality	(0 complaints/wk)
7:	?	(1 complaint /wk)
2:	?	(5 complaints /wk)
0:	Worst power quality	(25 complaints /wk)

Principle of Relative Importance

- Measure tradeoffs
- Part 1: Range Preference -- Relative importance of span ~ fix problem
- Part 2: Strength of preference -- Weights of spans
- Example: Power Quality and Duration of Outage

Part 1: $(0 \rightarrow 10)_{pq} > (0 \rightarrow 10)_{d}$

Part 2: $(0 \rightarrow 10)_{pq} = 100 \rightarrow (0 \rightarrow 10)_{d} = 90$

Conclusion: $.9\ W_{pq} = W_{d}$

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Tasks

- Task 1: Identify Scope of Application.
- Task 2: Attribute Specification
- Task 3: Software Implementation – Administrator Setup
- Task 4: Software Implementation – Project Data Input
- Task 5: Analysis
- Task 6: Reporting