**APPLICATIONS OF MULTI-CRITERIA DECISION ANALYSIS AT THE FINNISH ROAD ADMINISTRATION**

**Paper ID number: 7.5.6**

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**Part A: Network-level budget allocation between road keeping products**

**Introduction**
- Integrated allocation framework  
- Includes all major products  
-Multi-criteria analysis and optimization  
-Existing data and subjective knowledge  
-Technically simplified product models  
-Overall analysis and guideline results  
-Interactive managerial workshops  
-Discussion and systemic understanding

**Aggregate value of products**
- Transparent linear-additive model
- Critical specific value of different asset classes
- Incremental weight information
- Investment improves distribution
- Optimization systems distribution
- Decremental value

**Example of main results**
- Annual allocation of given total budget

**Key modes of interactive analysis**
- Computed vs. current allocation
- Which products gain or lose and why?
- Facilitate structured discussion
- Impacts of alternative preferences
- Which products are most sensitive/robust?
- Contributions to customer satisfaction
- Prioritization of products
- Which products gain or lose, first or later, if total budget is increased/decreased?

**Conclusions**
- Workable pilot of integrated analysis
- Reflects key needs and preferences
- Exhaustive life-cycle models not necessary
- Interactive process
- Evaluations and computations provide a structured and transparent framework for facilitated communication and analysis
- Strategic impact evaluation and results analyses workshops, not routine operations management system

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**Part B: Bridge repair programming**

**Introduction**
- Project screening for repair programs
- Large multi-criteria portfolio problem
- Hundreds of bridges per district
- Budget and other constraints
- Several prioritization indexes and data
- Different criteria suggest different programs → how to aggregate?
- Robust Portfolio Modeling methodology
- Incomplete weight information

**Robust Portfolio Modeling (RPM)**
- Multi-criteria project portfolio selection methodology developed at TKK

**Core index as aggregate measure**
- Relative measure of project’s fit into the portfolio → accounts for:
  - Project performance on multiple criteria
  - Incomplete information on criterion weights
  - Estimated cost and competing projects
  - Budget and portfolio feasibility constraints
  - Tentative prioritization → helps focus
  - Transparent → detailed project data shown
  - Does not suggest optimal portfolios

**Conclusions**
- Run repeatedly with several districts
- Matches programming managers’ plans better than single criterion systems → works well for screening purposes
- Portfolio support for programming
- Extended tool with core index values and functionalities for project selection
- Portfolio-level information, e.g., total and average performance or cost of projects, balance among functional classes

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**Related references**


**Acknowledgements**

- Finnish Road Administration, Asset management research program (VÖH, 2003-2007), South-East Finland road district
- Academy of Finland

**Awards for part A research**

- Finna asset management research program (VÖH, 2003-2007)
- Award for one of the program’s best projects
- Institute for Operations Research and the Management Sciences (INFORMS) Decision Analysis Society (DAS)
- Finalist for the 2007 DAS Practice Award

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**Table**

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**Diagram**

- Road district’s annual maintenance budget
- Integrated evaluation and computation

**Figure**

- Quality classes
- Integrated evaluation and computation
- Quality distributions as units of analysis –Standardized and ad hoc classifications

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**Figures**

- Road district’s annual maintenance budget
- Integrated evaluation and computation

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**Graphs**

- Quality distribution
- Critical specific value of different asset classes
- Incremental weight information
- Investment improves distribution
- Optimization systems distribution
- Decremental value

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**Tables**

- Name
- Traffic
- Deficit
- Core
- Sum of
- Signific.
- Project
- Project value
- Maximize
- Portfolio value
- Constraint
- Weight

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**Definitions**

- Core index: as aggregate measure
- Multi-criteria project portfolio selection methodology
- Portfolio value: as a function of project’s core index
- Portfolio value: as a function of project’s core index
- Multi-criteria project portfolio selection methodology
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**Additional notes**

- Robust Portfolio Modeling (RPM)
- Multi-criteria project portfolio selection methodology developed at TKK
- Core index: as aggregate measure
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