Discussion notes from the RobustRailS Mini Conference October 3 2013

David Pisinger and Jørgen Thorlund Haahr, DTU MAN

Implementing Decision Support Systems

The following questions were discussed

- What are the main barriers?
- Getting from prototypes to real implementations
- How can we make it easier to make new tools?

Comments

Main barrier is the people and the new processes to be learned
Not easy to estimate the cost/benifit of cancelling a train against
Everybody has to agree on what the optimal solution is.

- People have different opinions and perspectives

Another barrier is a historic way of thinking.

- Need to remenber greater goals and work together
- Not only care about own performance
- Not contract-driven (requires effort to keep energy)
- ”We normally do it this way”

Researchers can feed ideas that contractors may pick up and implement in years.

The barriers are how to solve them.

- People are barriers
    - They are conservative
    - Takes time to build trust
    - Come from different departments
    - People are used to guard to their space
        - Need to involve people from the beginning
        - Need to have the planners on your side from the beginning

Solution approaches have to be very fast, dispatchers need to get feedback *right away*. Need to feel that they do something while they wait.

The dispatchers usually work across the different subproblems. A solution that only considers one subproblem in isolation is not ideal for them.

Use play-back to illustrate benefits and effects of support systems.

- Need to build system confidence
- Visualisation is very important
- Show difference between their and the systems solution
- Tell them that their jobs are not threathned
- Their professionalism is threathned
- They will have more time for other (fun) stuff

Must interact with existing software to be successfull

Standard data-interface would be helpfull

Customers are concerned with data security.

Replace a human decision.

- Almost any method will be better
- Difficult to prove

Combinatorial explosion, making it difficult to optimize.

Leaders need to understand the vision

- Allocate needed time and resources

Realtime is more complicated than planning

- No time to do iterations
- Create good and efficients interfaces

Process-tuning is important.

Get an overview of decisions to make

- Priorities, values
- what must or cannot be left to humans
- Describe the consenquenes

Jesper Larsen and Simon Henry Bull, DTU MAN

- How do different components work together with robustness (sometimes they may even work against each other).
- There is a need for a better "feel" for robustness which could be obtained by a single clear measure
- Service intentions from BaneDanmark will make a focus on pax robustness.
- Robustness means ability to absorb delays and ability to recover the schedule.
- Improve robustness in planning (link between planning and execution is not strong).
- Development of contingency plans.
- Finding bottlenecks.
- Maybe optimal complex plans are too complex and therefore difficult to recover disruptions.
- Socio-economic impact – we don't know the contents and detailed impact of robustness.
- There is already a UIC norm for robustness which is time per pax. Customer punctuality could be central.

José Soler and Aleksander Sniady, DTU Fotonik

- Capacity and obsolescence limitations of GSM-R welknown….and common to all deployments (not only the Danish one). Solutions may depend on new standards from 2018, which may make the current deployments on the Signalling Program obsolete.

- A minimum amount of the money invested in equipment related to the Signallinng program, ends up in Danish industry. Mostly foreign technology providers. The tendency should be reversed.

- Danish Railway industry, very selfcentered, isolated of collaboration, from a technology perspective, with non-danish partners. Out of existing technological discussion forums (technological = industry + operators + research). Needs are solved based on purchases to the outside.

Anne E. Haxthausen and Linh Vu Hong, DTU Compute

Formal methods for the development and validation/verification/testing of software for railway control systems are being used in other countries. This summary gives highlights from the discussions on how formal methods can be adopted in the Danish railway industry.

- What are the *barriers for adopting formal methods* in Denmark:
    - It is not required, only recommended to use formal methods
    - People in the railway industry do not have a clear picture of the benefits
    - The railway industry has standard processes to follow, they do not know how to combine it with formal methods
    - People lack education and experience in using formal methods

- Suggestions for what can be done to *facilitate the adoption of formal methods* for Danish railway systems:

    - Motivate: Success stories and explanations of the benefits of formal methods should be explained in reports, on web pages etc for industrial people. (Most existing literature is written for researchers.) Some important benefits are how to save man power and how you develop products with fewer errors.
    - Formal methods people should help explaining how formal methods can be integrated with the existing processes.
    - Educate people, employ people already having the experience, collaborate with universities, use PhD students.
    - Introduce formal methods gradually, first on small cases, later on larger cases.

Alex Landex and Lars Wittrup Jensen, DTU Transport

Network Effects

- Usually planners only plans locally, both in the planning of timetables and maintenance (however when planning maintenance work, planners are beginning to coordinate planning – case of Lillebælt)
- A level of decision support is missing as strategic and tactical decision is “on paper” and detailed timetabling is done using highly sophisticated software. A DSS is missing that can help planners on the tactical/strategic level in timetabling, but at the same time communicate to politicians and other decision makers.
- It was then discussed how network effects for trains could be avoided by using “independent train systems”
    - Secondary delays can be reduced for trains
    - Delays for transferring passengers might be much higher if they miss the transfer (compared to a direct train)

- Passengers will need to transfer more often, this is especially a problem on long journeys where people can have a lot of luggage
- Using independent trains systems means that there is a higher need for station capacity (transfer stations) but a smaller need for line capacity
- A simulation of train and passenger delays can increase knowledge on how independent trains systems affect passengers

Otto Anker Nielsen and Jens Parbo, DTU Transport

- There might be historical reasons for not focusing on the passengers.
- Put more focus on the availability of services rather than on specific departure times.
- Regarding passenger punctuality, operators should emphasize the services in a journey which is hardest to replace, and often has the largest impact on passenger travel time when cancelled.
- Distinguish between passenger groups and how they perceive delays (e.g. commuters vs. occasional users).
- Passenger perceivance – passengers tend to remember the (very) bad experiences more clearly and for a longer time compared to the good ones.
- A future research topic could be to examine the passenger flow on large stations.