

MID TERM REPORT

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Flexible Job Allocation Decision Support Framework for Small and Medium Size Service Personnel Fleet Using Mobile Phone Terminals

Authors:

Aulanko Antti,
Mehtonen Mark,
Ikäheimonen Janne T.,
Leisti Topi,
Taajamaa Mauno.

Customer contact:

Nokia Research Center
Dr. Jukka Nurminen

Mid term project summary

Project Tasks

In the Project Plan we considered more general solution to the problem at hand. Since the focus changed, as stated belowmentioned section New approach, we have started literary study in order to find more insight. Because mobility and mobile phones are relatively new issues in engineering science and moreover coupled with decision making we have found out that there is very little if any published articles. Thus, this project is about creating something totally new in crossing of those subjects, and of course, this provides very good opportunity for seminar paper or even academic paper. However this all puts great emphasis on our Analysis Phase in order to get tangible results.

Project Resources

Project communication has included meetings, email, customer calls, and an additional customer meeting, which took place at NRC. At this point there is no identified additional need for extra resources.

Project Timeline

There has been change in our focus of the study. Now we are considering usability issues instead of traditional optimization. As stated in Project Plan and we consider the Concept Phase done. The Analysis Phase is under way and the next tasks include an additional literature review and simulations.

Project Risks

The following risks were identified in the Project Plan:

1. *Team work, team members' participation to the project.* All project participants have been active during to project. However, there has not been enough meetings with the professor or the customer (goes for project manager's tasks to organize).
2. *Communications inside the team and to the client.* Email, phone and web-site –communication has been in use. It appears that communication should be even more promptly.
3. *Wrong approach to the problem at hand.* The focus change is a one step back-ward. After an additional customer meeting and some group work the Concept Phase is finished.
4. *Problem is too widely defined.* Because the research area is novel, the Analysis Phase should be kept specific, otherwise usable results cannot be found.
5. *Project schedule.* We are currently in the Research Phase.
6. *Achieving tangible results.* Still to be shown.

And new identified risks:

7. Not enough publications to refer to (might cause extensive simulation effort).
8. Substantial effort needed in the Analysis Phase to find out the right metrics.

New Approach

During a recent meeting, the project team with the customer redefined the focus of the project. The base situation remains roughly the same as earlier, but the project itself will try to answer the following questions:

- What different ways are there to approach the problem?
As indicated in this document, we have already identified half a dozen of ways to present data and partial solutions to the user. The first task of the project team is to identify even more approaches, which may well be quite different from a weighted criteria solution.
- What are the pros and cons of these approaches?
The group will have to develop a way to evaluate the different solutions, e.g. by interviewing experts, simulating situations, or using common sense. This evaluation should result in some approaches being discarded whereas some are kept for further studies. Also, during the evaluation, the approaches themselves should be further developed, so that they would meet better the real world problems. Finally, one single solution should be chosen from the portfolio as definite conclusion based on the study.

- Which approach do you recommend?
After having identified the best way to approach the problem, the chosen solution will be developed as far as possible and then documented for customer purposes. Also the earlier evaluations will be documented in order to provide material for further studies.

Possible solutions to our problem

The greatest difference between earlier project plan and current problem definition is that now we are considering usability in decision making situation, not general optimization problem for task allocation. Thus, system back-end and esoteric optimization algorithms are not in our focus.

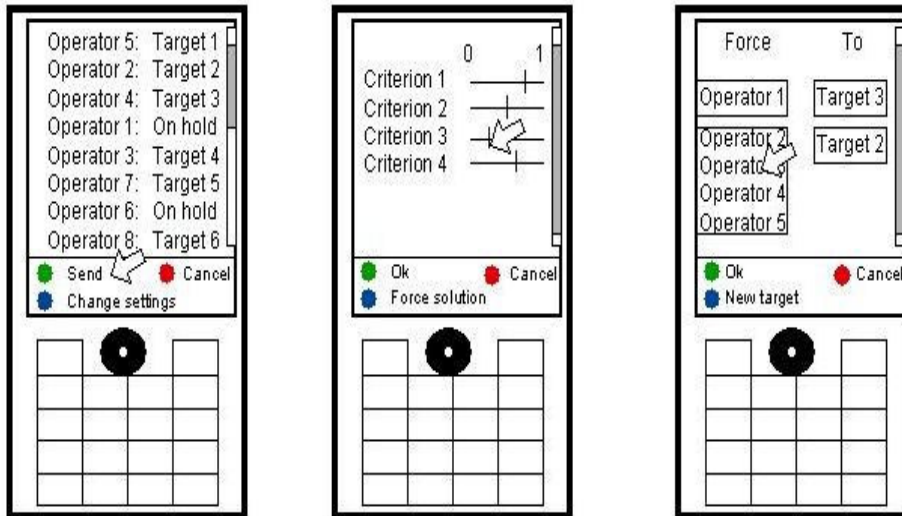
The Decision Support System (DSS) back-end server updates information based on incoming information sources such as GPS-coordinates and firm's ERP-system. In this project we consider the back-end as given, which “somehow magically takes care of” the updating. However we are well aware of the fact that the final suggestion from this study will need substantial implementation effort before it becomes as an integral part of any viable business system.

Mobile phone has very limited screen estate and input possibilities in comparison to personal computers (desktop or laptop). This fact has direct and substantial influence what can and what cannot be expected from the user as she takes in customer calls and interfaces with the DSS.

The DSS provides suggestions deterministically based on the facts it gets from information sources. Optimal or near optimal solutions are expected for the task allocation. The question is what is the good balance between relatively easy user experience so that Decision Maker (DM) actually feels the DSS as worth of using and that from that user experience can be collected enough (or maybe not) information so that DSS can form suggestion. The user experience is the key issue that cannot be overlooked in this study. Next we present some user interface mock-ups and descriptions which we have found out as possible start.

1. Traditional decision making with attributes and weights

Decision maker has a direct opportunity to affect the weight of every criteria. The mock-up pictures are below.

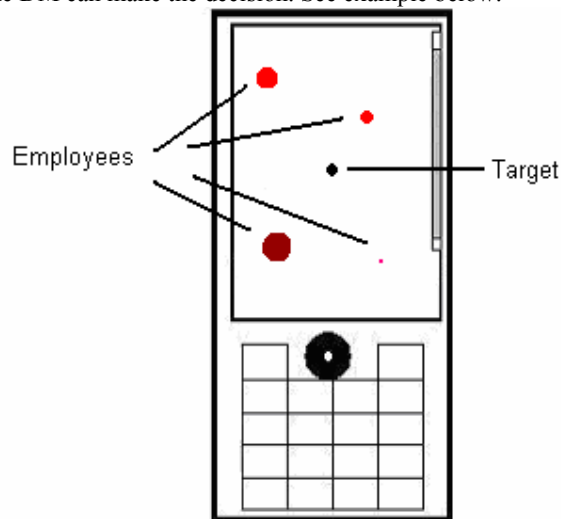


2. Raw data model

The DSS has an attribute vector for each employee. The attribute vector includes values for every specified criteria. As a decision maker talks with a customer, she lists criteria values of the target using a mobile phone. At the same time the DSS compares employee's attribute vectors to target's vector and tells which employee has the most similar vector.

3. Map visualization

In this case, the visual view is a geographical map, which includes the target and all the employees who have the ability to complete the specific task. Important information of each employee is shown with different kinds of visualizations, such as the distance to the target and the size and color of an employee in the map etc. With this information the DM can make the decision. See example below.



4. Table view

After the DM has listed all relevant information about the target using her mobile phone, DSS provides a table to the screen. Table shows information about each employee: travel time to target, tools, skills, and jobs. With this information the DM can make the decision. See example below.

5. Point dot cloud

So-called “fogs” or point dot clouds are used in the visualization of the attributes’ weights. This is similar to www . vaalikone . fi –system which was used e.g. during Finnish parliamentary elections 2003.

6. Schedule Model

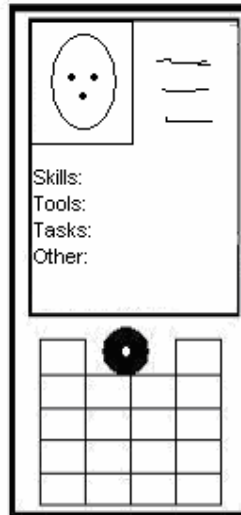
This model is based criticality of the task. It must be given to the DSS as a parameter. Based on that, there is screen which shows schedule about when employee could take on the task. If DM cannot find enough time and/or worker she can redefine criticality of the task. See example below.

8 - 9		---	---	Jim	---
9 - 10		---	---	Jim	---
10 - 11		---	---	Jim	---
11 - 12		---	---	Tony	---
12 - 13		John	---	Tony	Jay
13 - 14	Order	John	Mike	Tony	Jay
14 - 15	---	John	Mike	---	Jay
15 - 16	---	---	Mike	---	---

(Order arrive Monday 13:28)

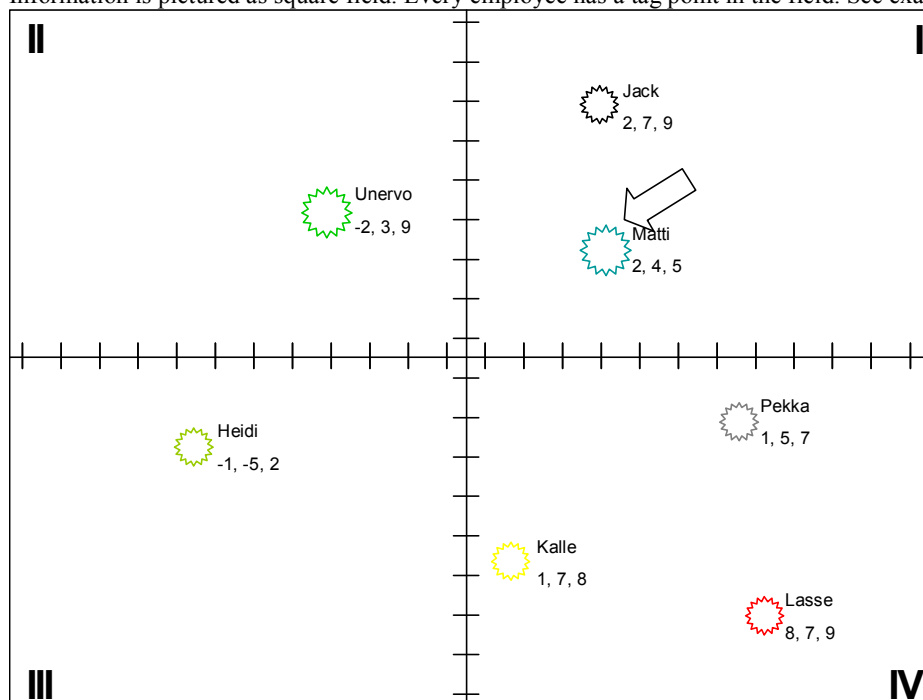
7. Single employee view

The DM can skim information about each employee with her mobile phone. All necessary information to make the decision is shown on the screen (such as skills, tools, allocated tasks etc). See example below.



8. 2x2 Matrix

Information is pictured as square field. Every employee has a tag point in the field. See example below.



Kuva 1 Each employee is shown in a matrix where location in specific area indicates feasibility of that worker for that task.

Feature considerations

The DSS may be able to learn from previous experience, and thus give timely best-practice suggestions. This feature is complex, yes, but as the problem definition states, the back-end system can be as complex as needed.

Because every criteria has its' own scale type: nominal, ordinal, relative, absolute — diagrams shown on the screen must be suited accordingly. This might yield to suggestion that there are supposed to be more than just one type of user-interface.

This mid term report is delivered to the following parties for review:

- SAL course assistant
- Customer.

Project Manager
Janne Ikäheimonen
email: ikis@cc.hut.fi
phone: +358 40 502 7727