
Tilstandskontroll av vindmøller

Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

b002@significant.no

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1 Problem Statement

Problem Domain

Tilstandskontroll av vindmøller.

Problem Statement

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2 Stakeholder Analysis

ABC AS

100

3 Value Identification

foundation To which degree the foundation is free from damage

tower To which degree the tower is free from damage

cables To which degree the cables is free from damage

rotor blades To which degree the rotor blades is free from damage

rotor hub To which degree the rotor hub is free from damage

brake To which degree the brake is free from damage

gearbox To which degree the gearbox is free from damage

generator To which degree the generator is free from damage

electric controls To which degree the electric control systems is free from damage

yaw system To which degree the yaw system is free from damage

nacelle To which degree the nacelle is free from damage

transformer To which degree the transformer (Grid connection) is free from damage

Name	Unit	Direction	Min	Max
foundation	Enum	HIGH	0.00	10.00
tower	Enum	HIGH	0.00	10.00
cables	Enum	HIGH	0.00	10.00
rotor blades	Enum	HIGH	0.00	10.00
rotor hub	Enum	HIGH	0.00	10.00
brake	Enum	HIGH	0.00	10.00
gearbox	Enum	HIGH	0.00	10.00
generator	Enum	HIGH	0.00	10.00
electric controls	Enum	HIGH	0.00	10.00
yaw system	Enum	HIGH	0.00	10.00
nacelle	Enum	HIGH	0.00	10.00
transformer	Enum	HIGH	0.00	10.00

Table 1: Selected Values

4 Value Extraction

4.1 By Stakeholder ABC AS

Value	Weight	Past	Tolerable	Goal	Wish
foundation	10.00	null	7.00	8.00	9.00
tower	10.00	null	7.00	8.00	9.00
cables	10.00	null	7.00	8.00	9.00
rotor blades	10.00	null	7.00	8.00	9.00
rotor hub	10.00	null	7.00	8.00	9.00

Value	Weight	Past	Tolerable	Goal	Wish
brake	10.00	null	7.00	8.00	9.00
gearbox	5.00	null	7.00	8.00	9.00
generator	5.00	null	7.00	8.00	9.00
electric controls	10.00	null	7.00	8.00	9.00
yaw system	10.00	null	7.00	8.00	9.00
nacelle	5.00	null	7.00	8.00	9.00
transformer	5.00	null	7.00	8.00	9.00

Table 2: Quantified by ABC AS

5 Solution Identification

5.1 Identified Solutions

189b0b57

189b0b57-2dc9-45e6-b0d5-a0ecc4898cc2

5.2 Selected Evaluators

min@n3st.art

min

tolerable@n3st.art

tolerable

goal@n3st.art

goal

wish@n3st.art

wish

max@n3st.art

max

b002@significant.no

Electrician

6 Solution Evaluation

6.1 Evaluated by Electrician

Values	Solutions					
	min	tolerable	goal	wish	max	189b0b57
foundation	0.00	7.00	8.00	9.00	10.00	8.00
tower	0.00	7.00	8.00	9.00	10.00	8.00
cables	0.00	7.00	8.00	9.00	10.00	8.00
rotor blades	0.00	7.00	8.00	9.00	10.00	7.00
rotor hub	0.00	7.00	8.00	9.00	10.00	8.00
brake	0.00	7.00	8.00	9.00	10.00	8.00
gearbox	0.00	7.00	8.00	9.00	10.00	8.00
generator	0.00	7.00	8.00	9.00	10.00	8.00
electric controls	0.00	7.00	8.00	9.00	10.00	8.00
yaw system	0.00	7.00	8.00	9.00	10.00	8.00
nacelle	0.00	7.00	8.00	9.00	10.00	8.00
transformer	0.00	7.00	8.00	9.00	10.00	8.00
Total Score	0.00	84.00	96.00	108.00	120.00	95.00

Table 3: Evaluated by Electrician

7 Value Solution Matrix

7.1 Based on Electrician's evaluation

Values	Solutions					189b0b57
	min	tolerable	goal	wish	max	
foundation	0.00	7.00	8.00	9.00	10.00	8.00
tower	0.00	7.00	8.00	9.00	10.00	8.00
cables	0.00	7.00	8.00	9.00	10.00	8.00
rotor blades	0.00	7.00	8.00	9.00	10.00	7.00
rotor hub	0.00	7.00	8.00	9.00	10.00	8.00
brake	0.00	7.00	8.00	9.00	10.00	8.00
gearbox	0.00	3.50	4.00	4.50	5.00	4.00
generator	0.00	3.50	4.00	4.50	5.00	4.00
electric controls	0.00	7.00	8.00	9.00	10.00	8.00
yaw system	0.00	7.00	8.00	9.00	10.00	8.00
nacelle	0.00	3.50	4.00	4.50	5.00	4.00
transformer	0.00	3.50	4.00	4.50	5.00	4.00
Total Score	0.00	70.00	80.00	90.00	100.00	79.00

Table 4: VSM based on Electrician's evaluation

A Decision Framework

A Framework for making sound decisions. A decision is essentially a mathematical equation that you can compute. Inputs of the decision equation are, a set of values and a set of solutions.

The difficulty and the main work remains in clarifying the input parameters. The better you are able to capture and quantify the inputs, the better result you get, as the garbage in, garbage out (GIGO) principles dictates.

The rest of the appendix describes each part of the DF in details.

A.1 Problem Statement

DF dictates that you need to understand why you HAVE to make a decision in the first place.

Problem statement The problem or the need, can be very broad. The narrower the problem you have, the simpler and higher quality your decision will be. Thus a concise problem statement is crucial.

Problem domain Over time, you learn to group similar decisions together, and thus are able to reuse some aspects of the decision. You might even be able to do automatic decision making, if you are able to narrow the problem well.

A.2 Stakeholders analysis

The need can not exist on its own. It comes from **SOMEWHERE**. So, the question you need to ask yourself is - how has the problem?

Stakeholder Its the Stakeholders how has the problem or the need. Stakeholders, could be a person, a company, a country, or even the law. Its the stakeholders that makes the need concrete, and when the need is made concrete, than we can search for solutions (options).

Weight Some stakeholder is more important. Here you prioritize among stakeholders.

A.3 Values Identification

Values are the specific needs (requirements) that the stakeholders have. Each stakeholders might have a set of needs they want to satisfy. Lets call these needs values. Stakeholders want their values satisfied relevant to the problem at hand. This activity of the Decision Framework involves capturing all important/relevant values that the Stakeholders might have, as precise as possible. The values must be captured in a quantifiable and comparable form. Because, then the solution can be tested against the values, to see how well a solution satisfies.

Name A unique name for the relevant value with respect to the problem at hand across all stakeholders

Scale Of Measure Describe how is the value measured.

Unit What unit of measurement will be used.

Direction What direction is considered useful/beneficial

Min Minimum amount/score

Max Maximum amount/score

A.4 Values extraction

The goal of this activity is to capture / quantify stakeholders values. DF dictates that Past, Tolerable, Goal and Wish state, which all can be placed between the Min and Max state, must be placed. And each stakeholder have to decide for them selves. As well as prioritize among values by the means for weight. By doing so, the quantified values, can be used to test the solution against stakeholders desired satisfaction of a solution for each values [gilb2005competitive].

Weight Weighting determines the prioritization of values in order of highest importance (from 0 to 1) with respect to the stakeholder

Past Relevant only for recurring problem.

Tolerable Minimum acceptable threshold.

Goal Goal threshold.

Wish Wish threshold.

A.5 Solutions identification

DF dictates that only at this activity you start the search for solutions. So, this activity is about identifying all possible solutions, that might satisfy some or all stakeholders values.

Name A unique name for the identified solution

Description Description of the identified solution

Further more DF dictates that you have to identified a scoring function for each identified values. So, an evaluator know how to evaluate each identified solution.

A.5.1 Evaluator selection

You also, have to select one or more evaluator to perform an objective evaluation for each identified solutions.

Name A unique name for the selected evaluator

Description Description of the evaluators

Other properties An evaluator might have multiple properties, such as the price the evaluator might charge to do the evaluation, or level of strictness/expertise reflected via correctness, appropriateness and preciseness.

A.6 Solution evaluation

DF dictates that evaluation have to be performed at this activity. This is probably the most difficult and labour intensive activity of all activities in DF.

Score The end result of solution fitness with respect to value.

Rationale Explanation for why an evaluator have given the given score for the solution with respect to value.

Image Supporting evidence in the form of an image.

A.7 Value Solution Matrix

DF dictates that this activity can be automated, since this is just a calculation. You might encounter a minor difficulty in visualizing the calculated result.

Color coding Color coding indicating solution fitness with respect to stakeholders thresholds.

Solution Score Total Solution score across all values.