Visualization Organizational Dynamics

. Nemawashi : to prepare the ground.

← ORGANIZATION

← Ground.
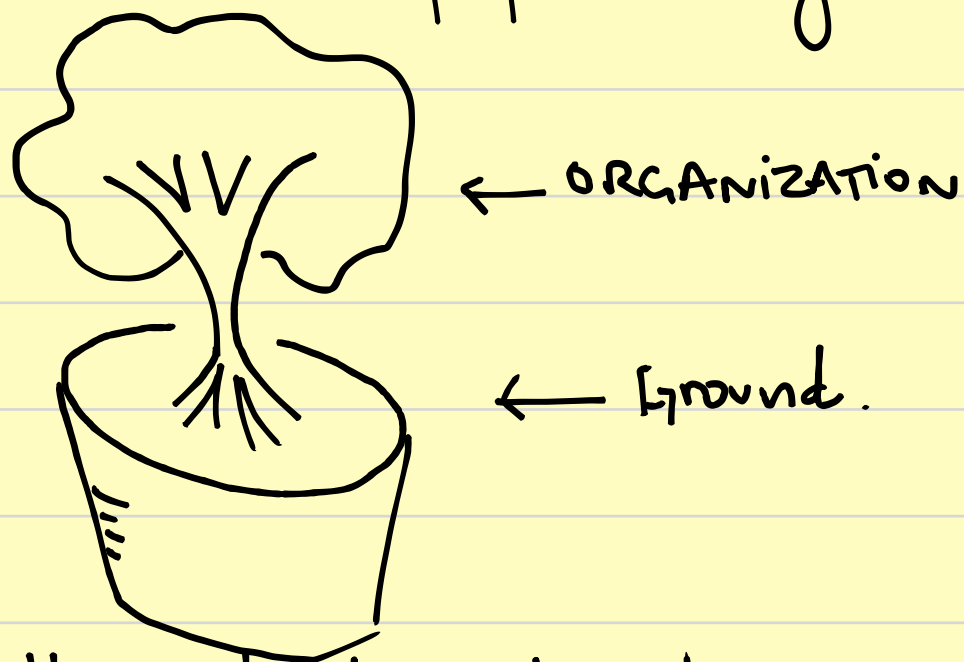
With this method we describe organizational dynamics.
We do so by transforming the information contained in the
KPIs from the management system.

Hypothesis: we have a number of KPIs as a function of time.

$$KPI_i = KPi_i(t) \quad i = 1, \cdots, n$$

for instance: Cost / Lead Time / ROI / Cash Flow / ...

Remember that each KPi describes only one part of
the variability in the system.

£

Inventory

PROCESS

Productivity
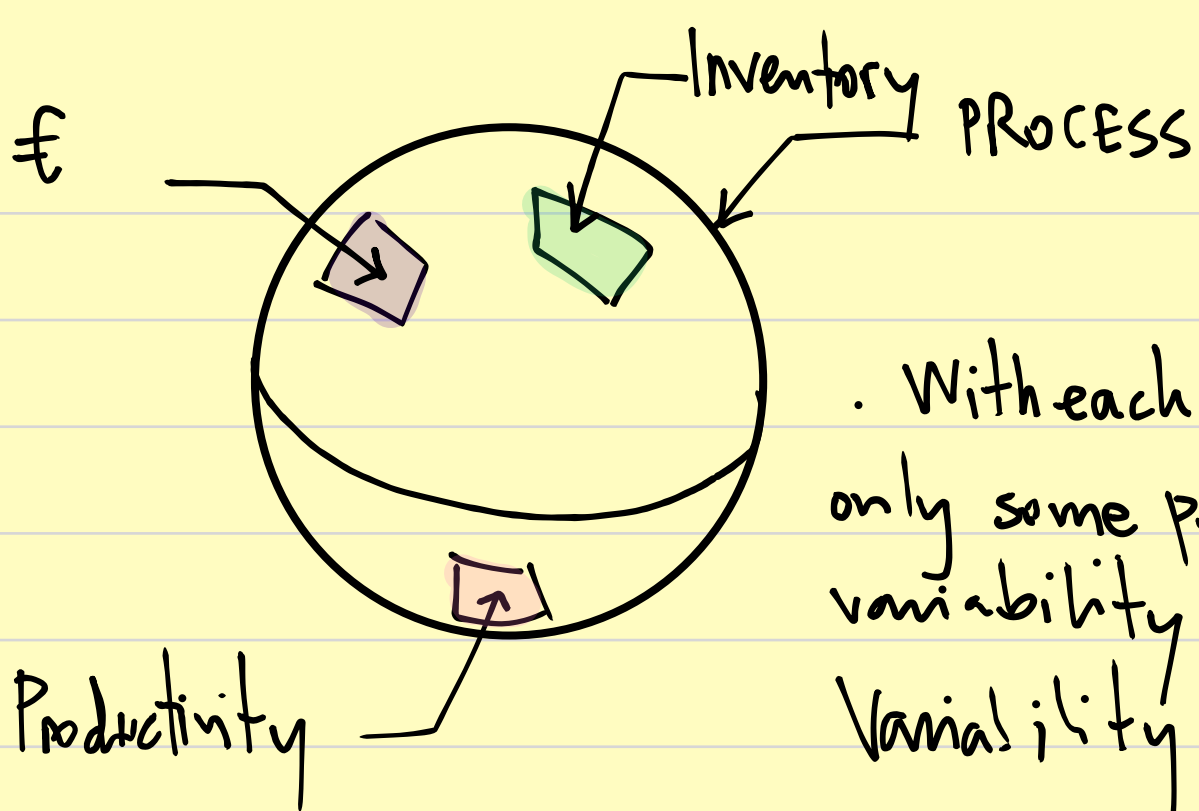
• With each kpi we describe only some portion of the variability.

Variability : $VAR(KPI=x) = \dfrac{\sum (x_i - \bar{x})^2}{n}$

Example. Nemawashi. A KPI System of a factory is 3 Dimensional and has following data:

	Quality [Q] ppm	Delivery Rate [DR] %	Cost [C] €/Unit
CW1	3300	91	17
CW2	2700	93	18
CW3	1800	89	16
CW4	1500	92	15
CW5	1300	95	16

1. Step. NORMALIZE TO COMPARE.

Each KPI is brought in the range btw [0,1]

$$x_i^* = \dfrac{x_i - x_{min}}{x_{max} - x_{min}}$$

Quality [Q] ppm	Delivery Rate [DR] %	Cost [C] £/Unit
CW1	3300	91	17
CW2	2700	93	18
CW3	1800	89	16
CW4	1500	92	15
CW5	1300	95	16

	Q^*	DR^*	C^*
CW1	$\dfrac{3300-1300}{3300-1300}=1$	$\dfrac{91-89}{95-89}=0.33$	$\dfrac{17-15}{18-15}=0.66$
CW2	$\dfrac{2700-1300}{3300-1300}=0.7$	$\dfrac{93-89}{95-89}=0.66$	$\dfrac{18-15}{18-15}=1$
CW3	$\dfrac{1800-1300}{3300-1300}=0.25$	$\dfrac{89-89}{95-89}=0$	$\dfrac{16-15}{18-15}=0.33$
CW4	$\dfrac{1500-1300}{3300-1300}=0.1$	$\dfrac{92-89}{95-89}=0.5$	$\dfrac{15-15}{18-15}=0$
CW5	$\dfrac{1300-1300}{3300-1300}=0$	$\dfrac{95-89}{95-89}=1$	$\dfrac{16-15}{18-15}=0.33$

Step 2. Graphically represent the organizational dynamics.
We could already do it: but in 3D.

$CW_2 [0.7, 0.66, 1]$

$CW_1 [1, 0.33, 0.66]$

?

SIMPLEX

$C^{**}=1$

$Q^{**}=0$

$DR^{**}=033$

$DR^{**}=0$

$C^{**}=0'33$
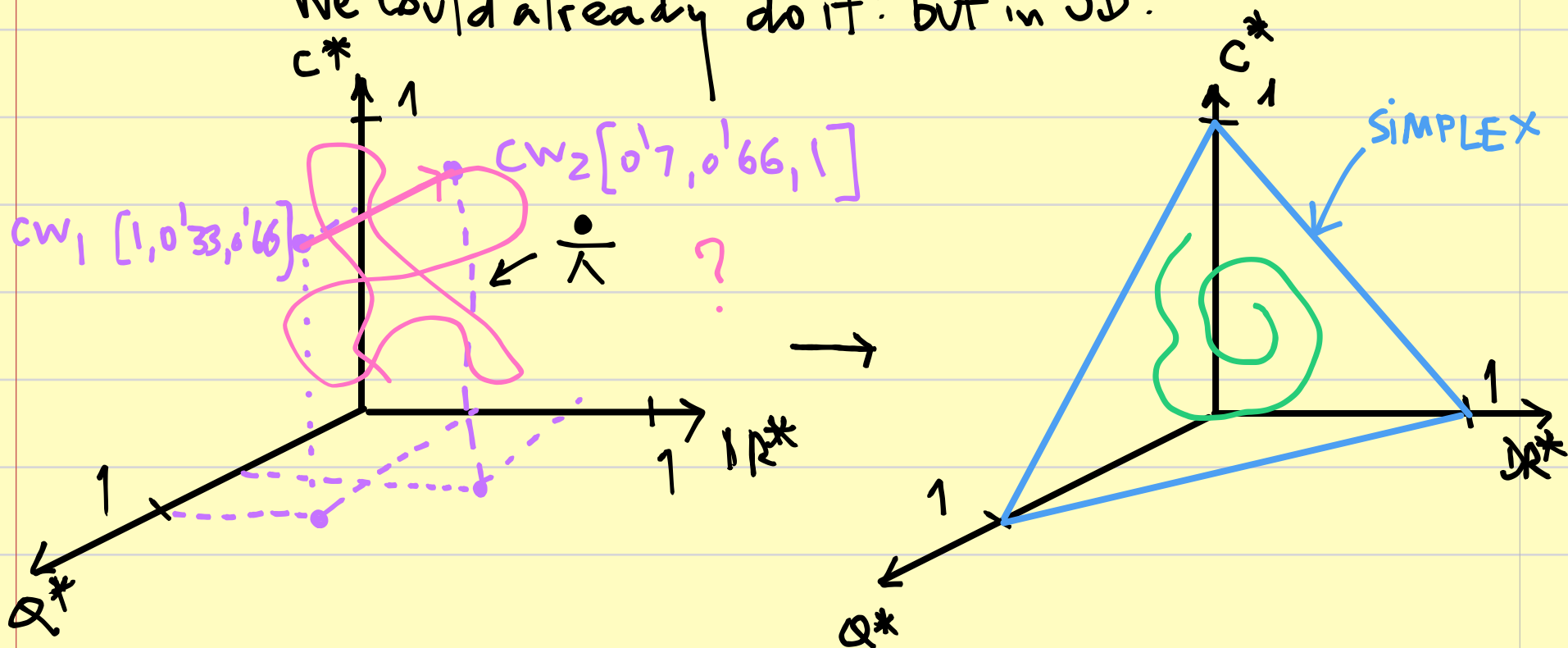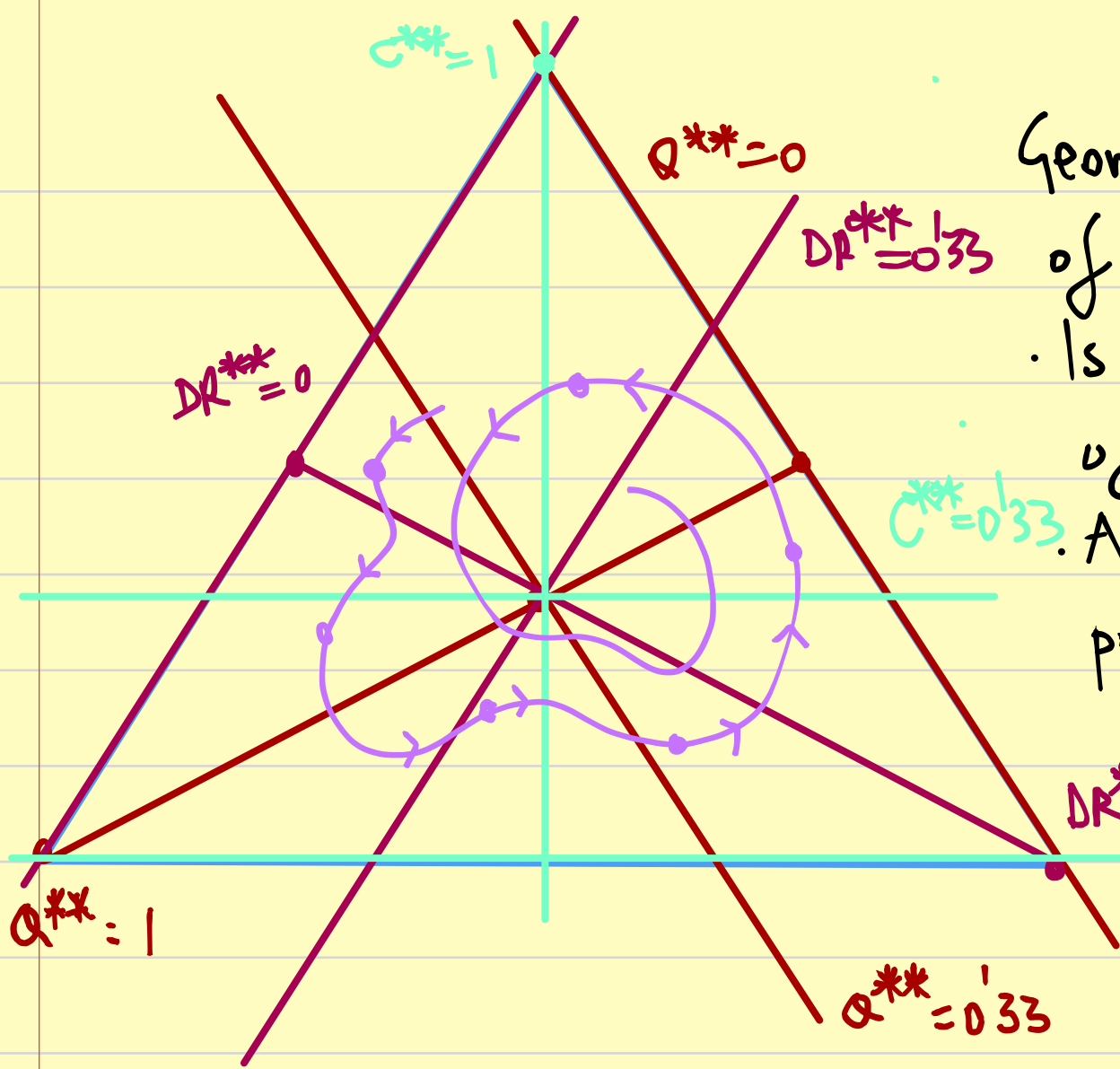
Geometric Characteristics of the Simplex

· Is a 2D representation of 3 Axis.

$DR^{**}=1$

$C^{**}=0$

· All coordinates of all points add up to one.

$Q^{**}=1$

$Q^{**}=0'33$

	Q^*	DR^*	C^*
cw_1	$\dfrac{3300-1300}{3300-1300}=1$	$\dfrac{91-89}{95-89}=0'33$	$\dfrac{17-15}{18-15}=0'66$
cw_2	$\dfrac{2700-1300}{3300-1300}=0'7$	$\dfrac{93-89}{95-89}=0'66$	$\dfrac{18-15}{18-15}=1$
cw_3	$\dfrac{1800-1300}{3300-1300}=0'25$	$\dfrac{89-89}{95-89}=0$	$\dfrac{16-15}{18-15}=0'33$
cw_4	$\dfrac{1500-1300}{3300-1300}=0'1$	$\dfrac{92-89}{95-89}=0'5$	$\dfrac{15-15}{18-15}=0$
cw_5	$\dfrac{1300-1300}{3300-1300}=0$	$\dfrac{95-89}{95-89}=1$	$\dfrac{16-15}{18-15}=0'33$

$$Q^{**} \qquad\qquad DR^{**} \qquad\qquad C^{**}$$

$$CW_1 \quad \frac{1}{1+0'33+0'66}=0'5 \qquad \frac{0'33}{1+0'33+0'66}=0'165 \qquad \frac{0'66}{1+0'33+0'66}=0'33$$

$$CW_2 \quad \frac{0'7}{0'7+0'66+1}=0'297 \qquad \frac{0'66}{0'7+0'66+1}=0'28 \qquad \frac{1}{0'7+0'66+1}=0'42$$

$$CW_3 \quad \frac{0'25}{0'25+0+1'33}=0'43 \qquad 0 \qquad\qquad \frac{0'33}{0'25+0+0'33}=0'57$$

$$CW_4 \quad \frac{0'1}{0'1+0'5+0}=0'167 \qquad \frac{0'5}{0'1+0'5+0}=0'833 \qquad\qquad 0$$

CW5   0 $\dfrac{1}{0+1+0'33}=0'75$ $\dfrac{0'33}{0+1+0'33}=6'25$

Small table (top left):

	Q**	DR**	C**
CW1	$\dfrac{1}{1+0'33+0'66}=0'5$	$\dfrac{0'33}{1+0'33+0'66}=0'165$	$\dfrac{0'66}{1+0'33+0'66}=0'33$
CW2	$\dfrac{0'7}{0'7+0'66+1}=0'297$	$\dfrac{0'66}{0'7+0'66+1}=0'28$	$\dfrac{1}{0'7+0'66+1}=0'42$
CW3	$\dfrac{0'25}{0'25+0+1'33}=0'43$	0	$\dfrac{0'33}{0'25+0+0'33}=0'57$
CW4	$\dfrac{0'1}{0'1+0'5+0}=0'167$	$\dfrac{0'5}{0'1+0'5+0}=0'833$	0
CW5	0	$\dfrac{1}{0+1+0'33}=0'75$	$\dfrac{0'33}{0+1+0'33}=0'25$

Diagram labels:
$Q^{**}=0'297$
$Q^{**}=0'167$
$C^{**}=0'57$
$C^{**}=0'42$
$C^{**}=0'25$
$DR^{**}=0$
$DR^{**}=0'165$
$Q^{**}=0'5$
$C^{**}=0$
DR^{**}
Q^{**}
C^{**}
CW3, CW2, CW1, CW4

4. Step. Management interpretation.

This system is in Alignment on a time point t_j if the distance between $|t_{j-2}-t_{j-1}|$ is bigger than the distance between $|t_{j-1}-t_j|$.

$$|CW_1 - CW_2| < |CW_2 - CW_3| \rightarrow \text{Distance is increasing}$$

so we do not have Alignment in CW3.

$$\left| CW_2 - CW_3 \right| < \left| CW_3 - CW_4 \right| \rightarrow$$ Distance is increasing so we do not have Alignment in CW4.

$$\left| CW_3 - CW_4 \right| > \left| CW_4 - CW_5 \right| \rightarrow$$ Distance is decreasing so we do have Alignment in CW5.

	January								February								March								April					
	M	T	W	T	F	S	S		M	T	W	T	F	S	S		M	T	W	T	F	S	S		M	T	W	T	F	S	S
1	30	31	1	2	3	4	5	5	27	28	29	30	31	1	2	9	24	25	26	27	28	1	2	14	31	1	2	3	4	5	6
2	6	7	8	9	10	11	12	6	3	4	5	6	7	8	9	10	3	4	5	6	7	8	9	15	7	8	9	10	11	12	13
3	13	14	15	16	17	18	19	7	10	11	12	13	14	15	16	11	10	11	12	13	14	15	16	16	14	15	16	17	18	19	20
4	20	21	22	23	24	25	26	8	17	18	19	20	21	22	23	12	17	18	19	20	21	22	23	17	21	22	23	24	25	26	27
5	27	28	29	30	31	1	2	9	24	25	26	27	28	1	2	13	24	25	26	27	28	29	30	18	28	29	30	1	2	3	4
6	3	4	5	6	7	8	9	10	3	4	5	6	7	8	9	14	31	1	2	3	4	5	6	19	5	6	7	8	9	10	11

	May								June								July								August					
	M	T	W	T	F	S	S		M	T	W	T	F	S	S		M	T	W	T	F	S	S		M	T	W	T	F	S	S
18	28	29	30	1	2	3	4	22	26	27	28	29	30	31	1	27	30	1	2	3	4	5	6	31	28	29	30	31	1	2	3
19	5	6	7	8	9	10	11	23	2	3	4	5	6	7	8	28	7	8	9	10	11	12	13	32	4	5	6	7	8	9	10
20	12	13	14	15	16	17	18	24	9	10	11	12	13	14	15	29	14	15	16	17	18	19	20	33	11	12	13	14	15	16	17
21	19	20	21	22	23	24	25	25	16	17	18	19	20	21	22	30	21	22	23	24	25	26	27	34	18	19	20	21	22	23	24
22	26	27	28	29	30	31	1	26	23	24	25	26	27	28	29	31	28	29	30	31	1	2	3	35	25	26	27	28	29	30	31
23	2	3	4	5	6	7	8	27	30	1	2	3	4	5	6	32	4	5	6	7	8	9	10	36	1	2	3	4	5	6	7

CW 18 . ① 2.250314 · ② 20250320 · ③ 20250327

CW 19 . ④ 20250403 . ⑤ 20250410 . ⑧ 20250508

CW 20 . ⑥ 20250417 . ⑦ 20250424 . ⑨ 2025 05 15

CW 21 · Übungen machen . 20250522 .
       Fragen & Antworten .

CW 22 . [①] [⓪] [⑧] [④]

CW 23 . [⑤] [⑥] [⑦] 20250605 ⑩

CW 24 . [⑧] [⑨] [⑩]

CW 25 . [①] [②] [③] [ ] . . . [①]

CW 26 · Probeklausur .