

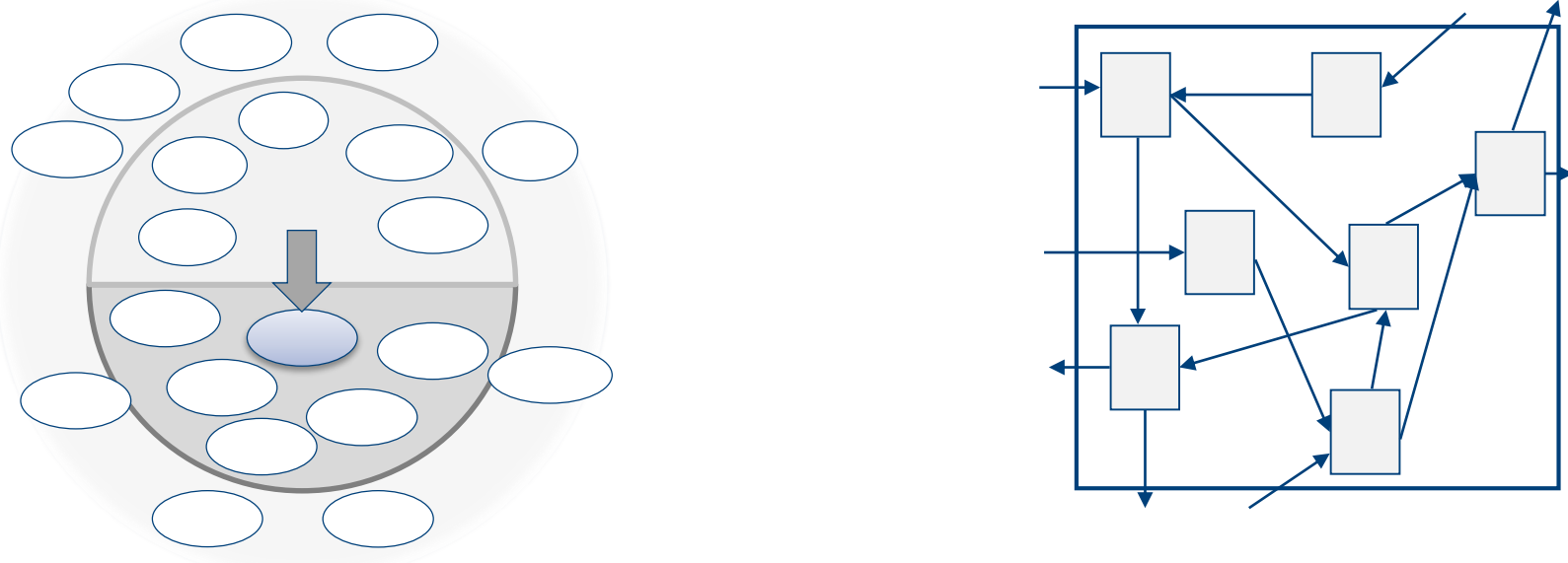
Access-To-Medicines Supply Chain Design: A Stakeholder Framework

Catherine Decouttere*, Nico Vandaele*, Stef Lemmens*, Mauro Bernuzzi**

*Research Center for Operations Management, Katholieke Universiteit Leuven; **GlaxoSmithKline

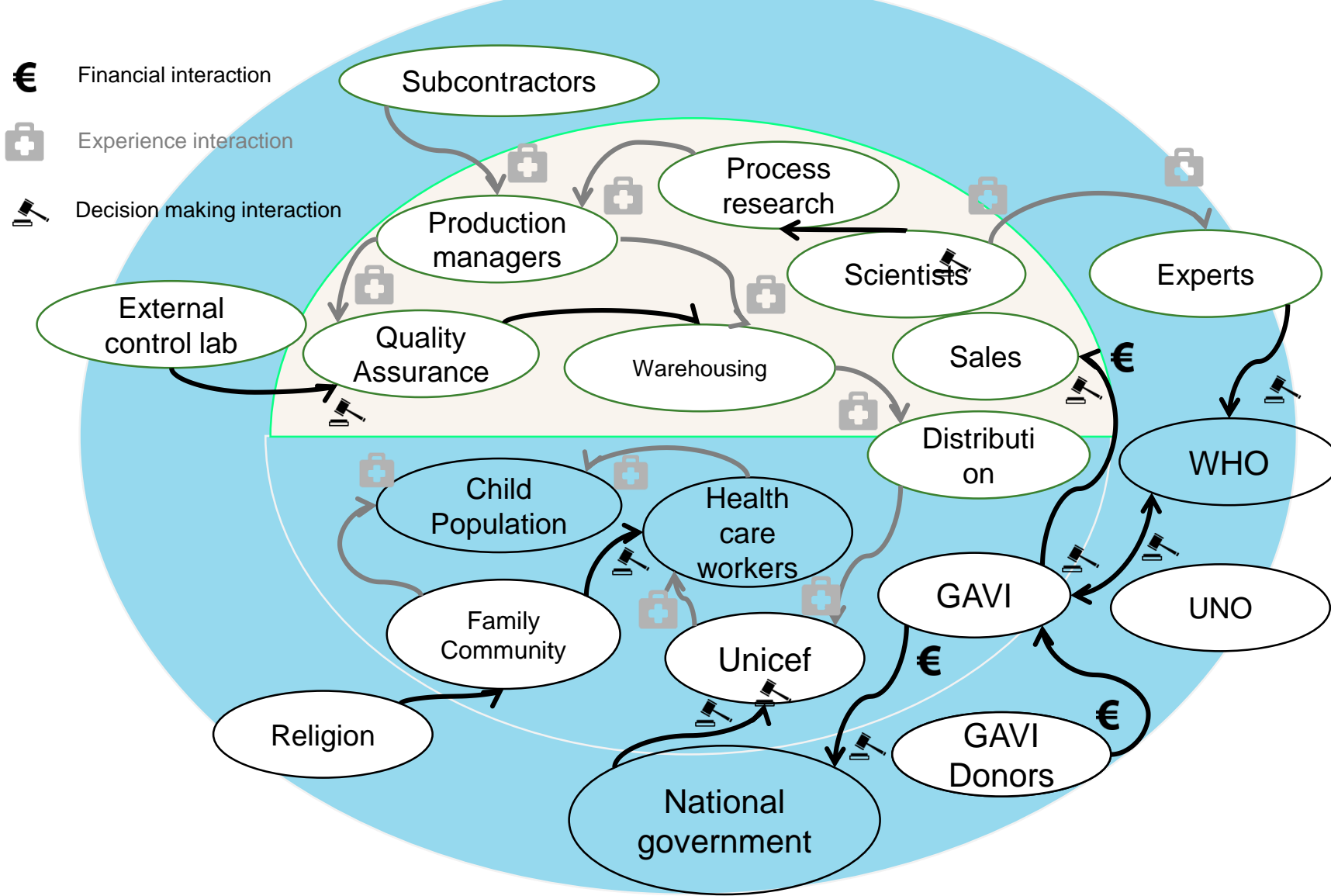
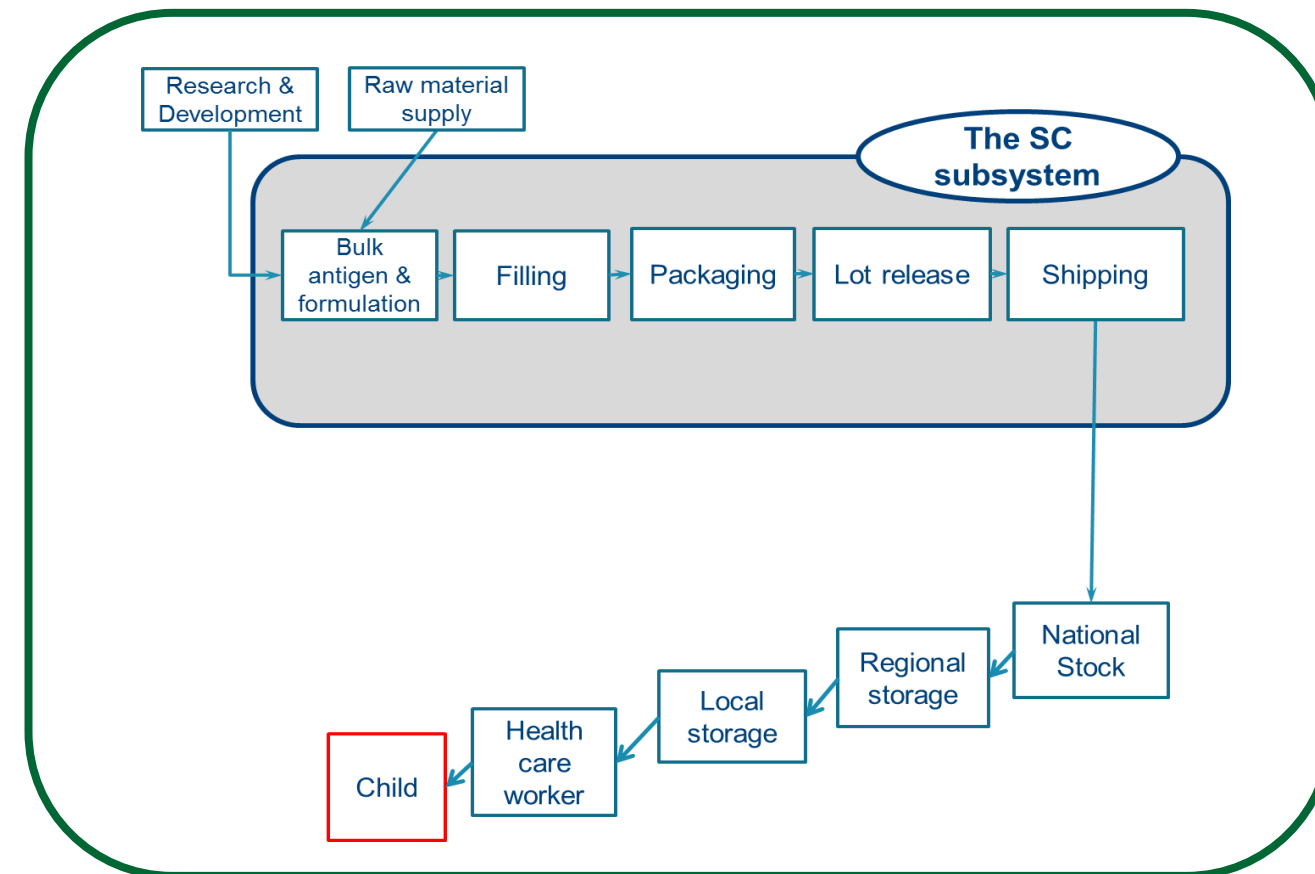
catherine.decouttere@kuleuven.be
nico.vandaele@kuleuven.be

1. Stakeholder analysis & Supply Chain definition

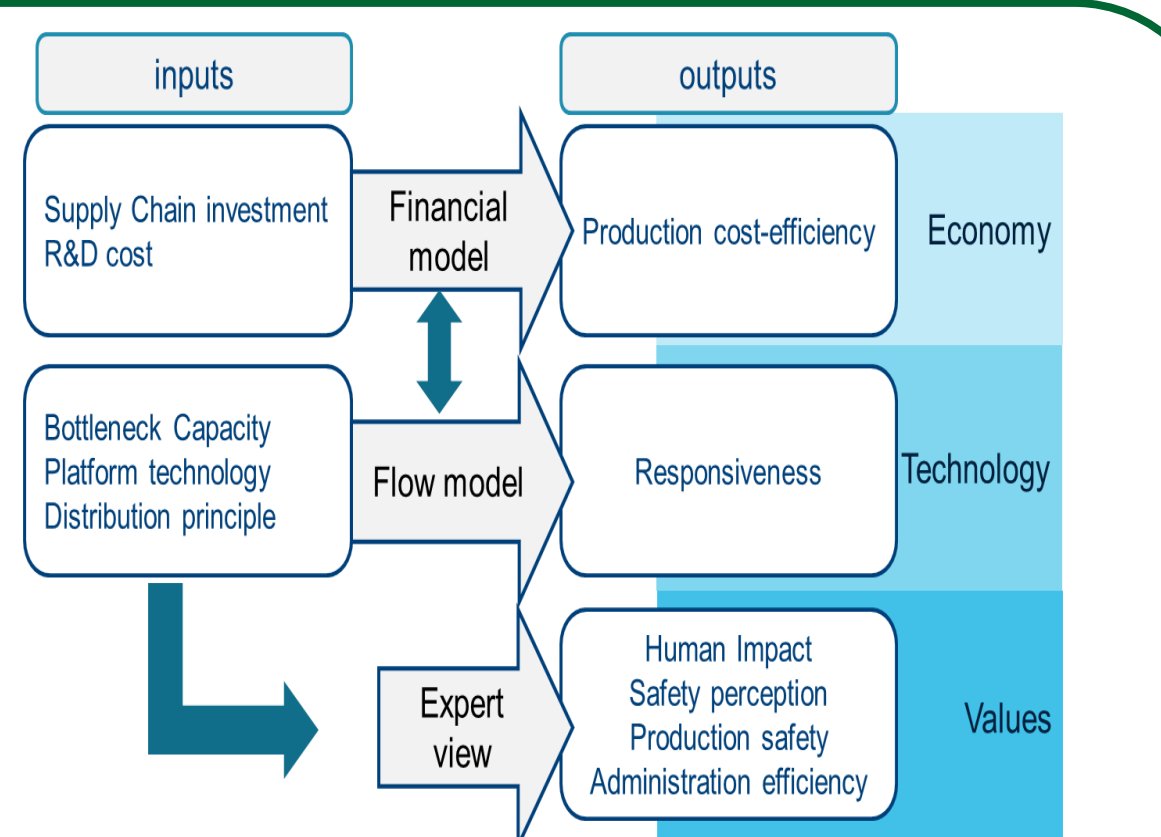
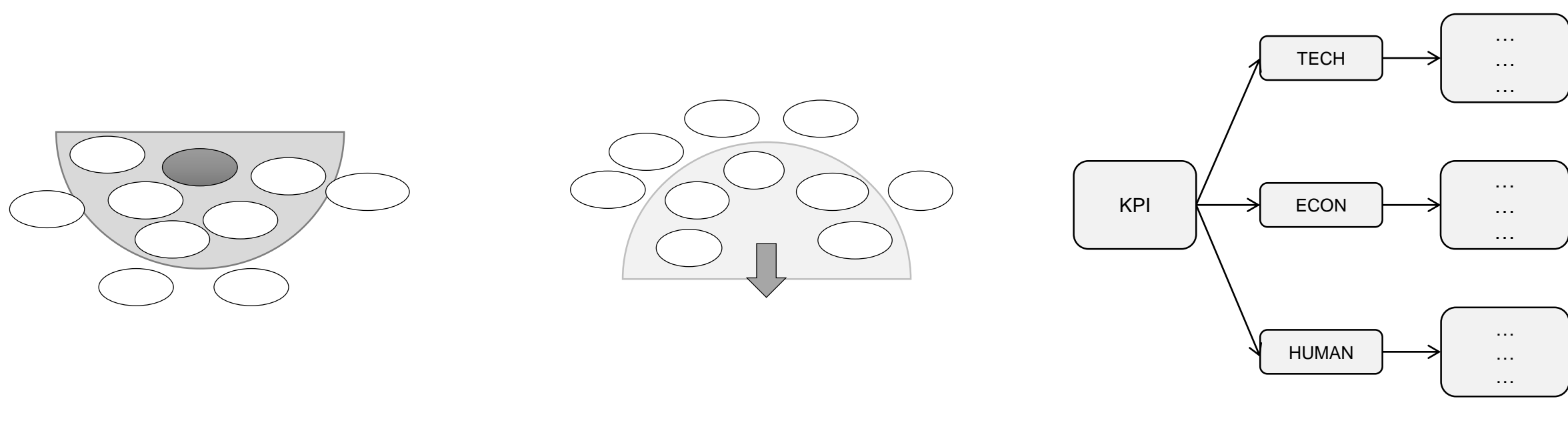


Supply chain definition involves the proper delineation of the flow system borders as they serve as the application area for the Key Performance Indicators. Both resources and flows of the supply chain are identified.

Stakeholder analysis delivers all relevant stakeholders. They are grouped into both internal and external stakeholders relative to the supply chain system. Another important split is the split into supply related and demand related stakeholders. Additionally, the most important financial, experience and decision making interactions are graphed.



2. SC KPI's and SC requirements

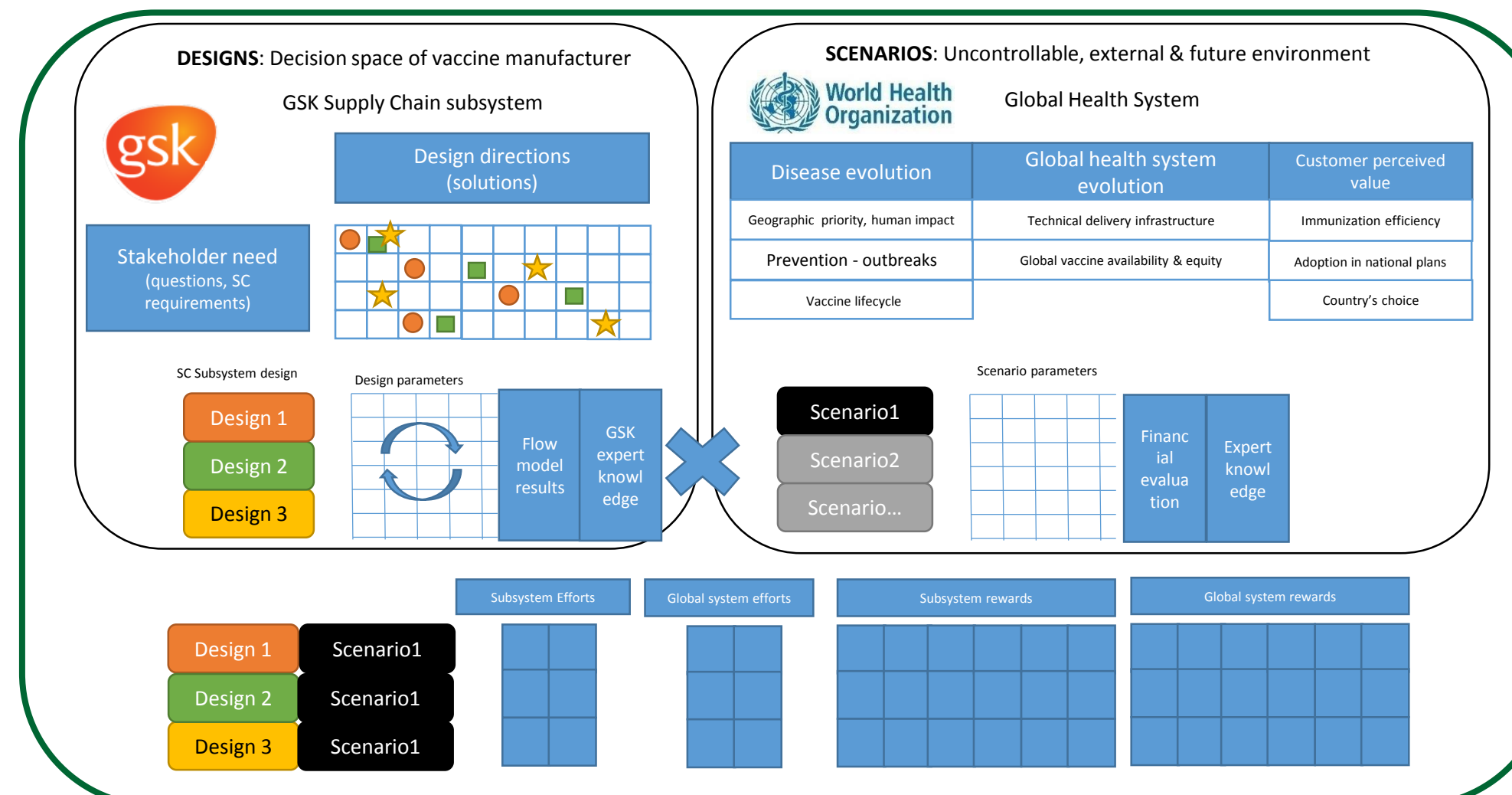
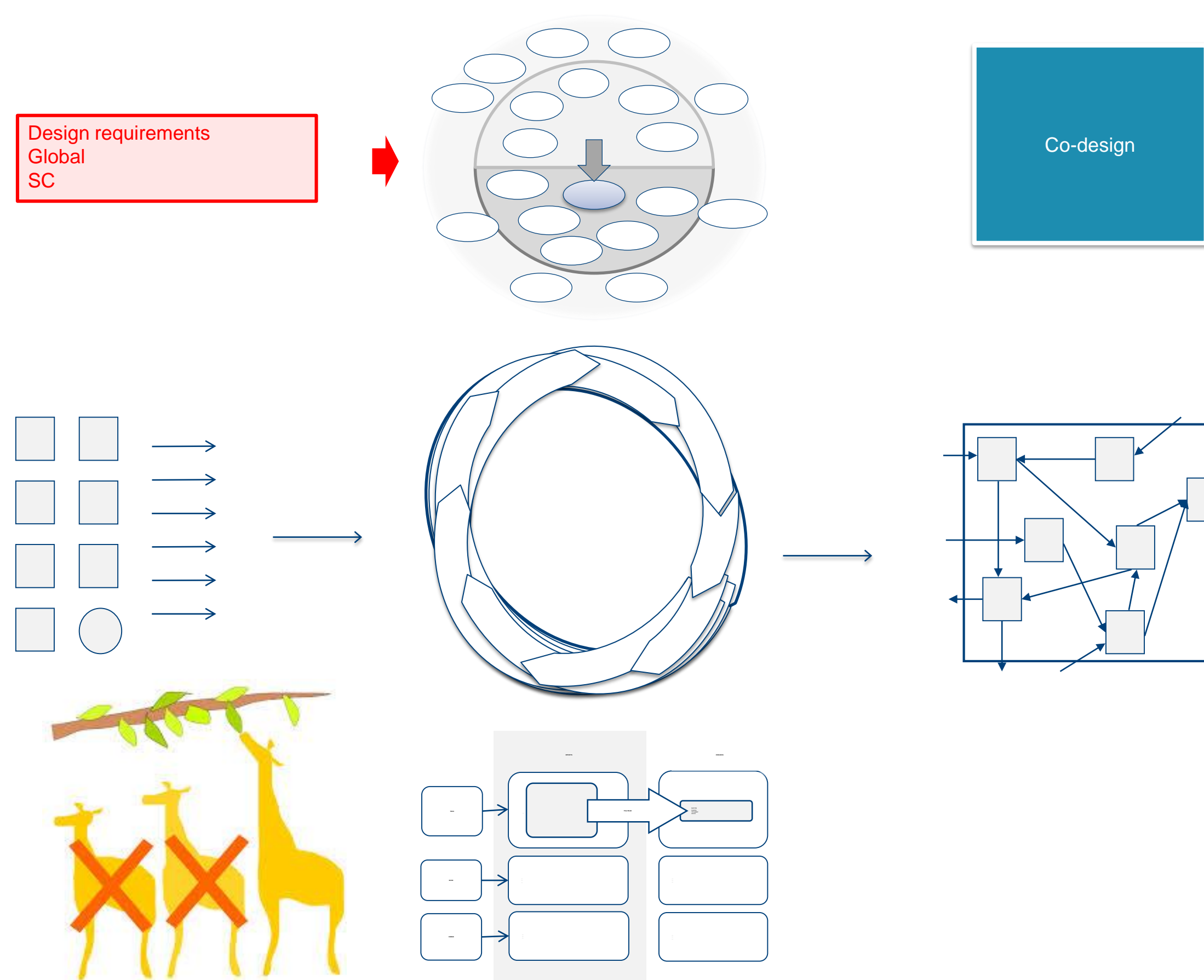


Supply chain KPI's are derived from the various stakeholders, taking into account their diverse interests. From a holistic point of view, we urge for a diverse set to cover both technological, economical as well as human value based KPI's.

Further detail is made in terms of inputs and outputs. These two categories underscore the importance of efforts to setup a supply chain design relative to the rewards this supply chain design returns.

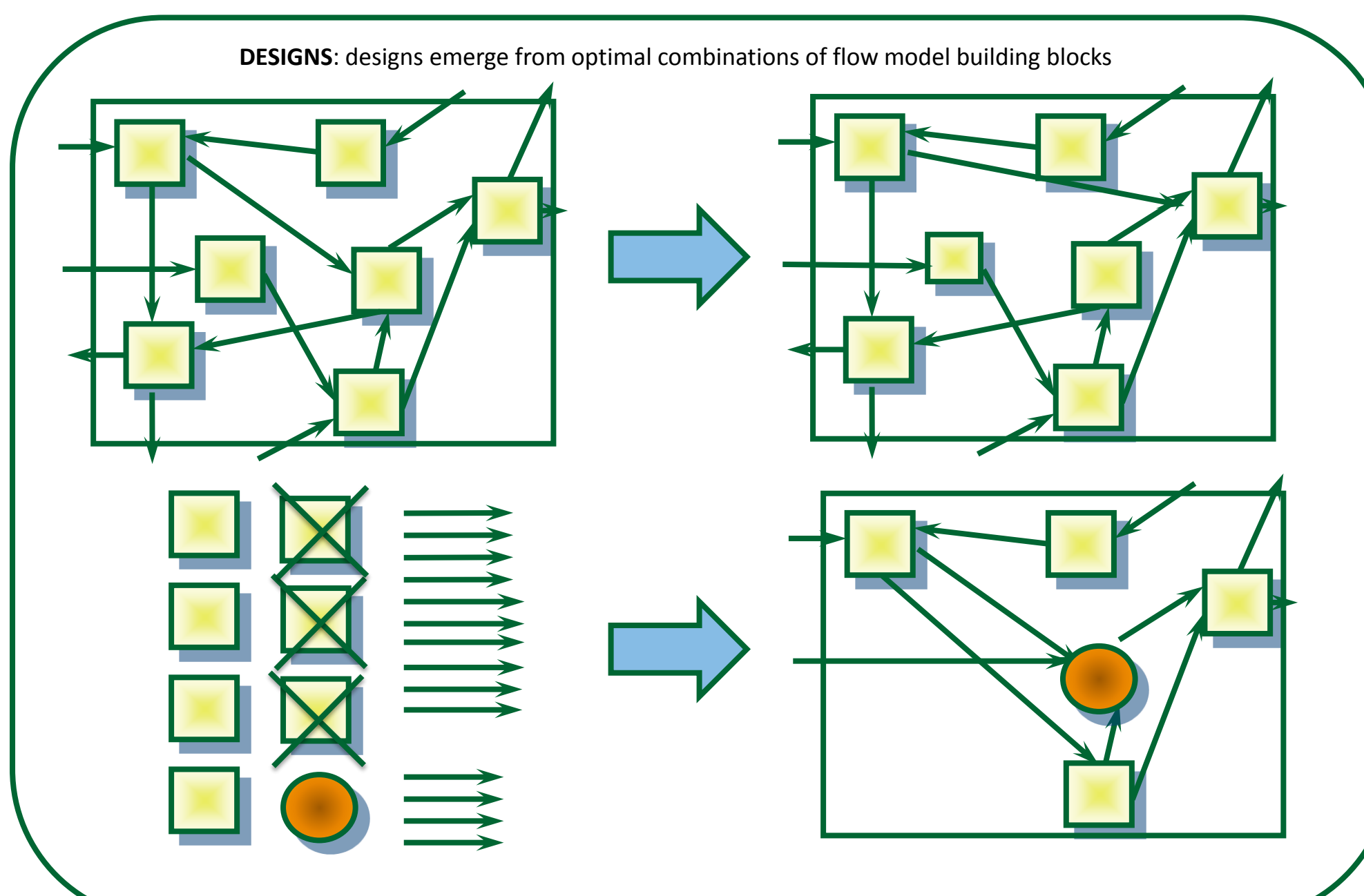
For all KPI's, including the qualitative ones, quantitative metrics are developed.

3. SC design, modeling & scenario generation

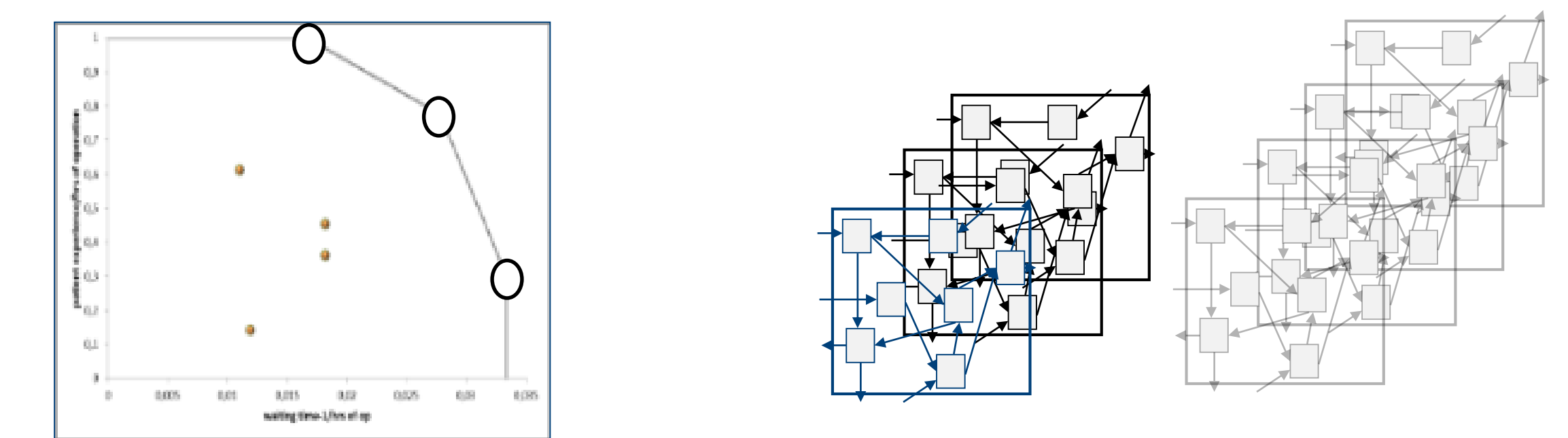


Supply chain designs are generated based on the stakeholders' needs, insights and knowledge in a co-design setting. Designs contain decisions. Whenever possible, these decisions are optimized in a modeling step. Various scenarios are enlisted to resemble the uncontrollable environmental elements.

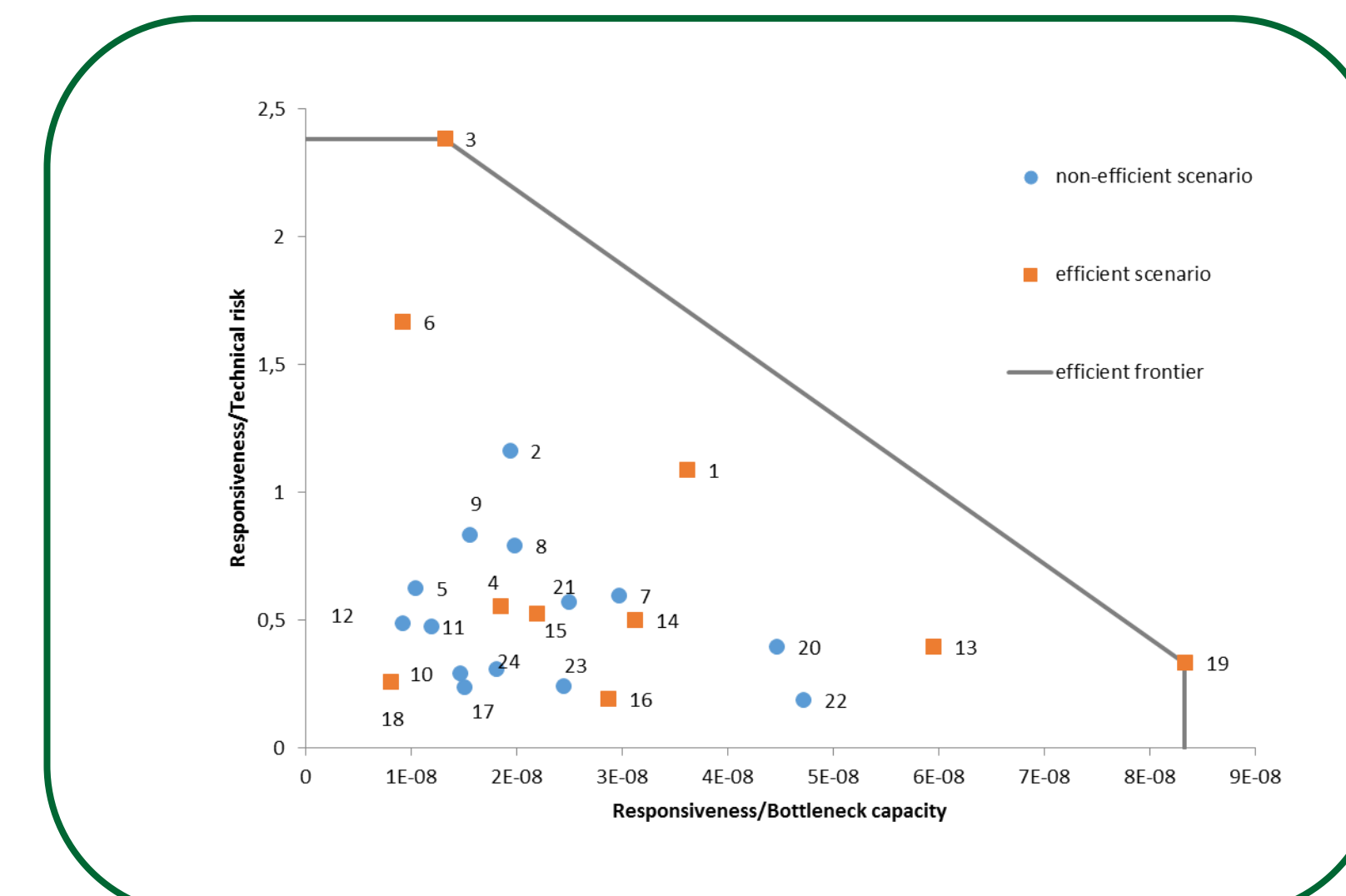
Each design is combined with each scenario, constituting the list of design/scenario combinations, full factorial wise. All design/scenario combinations are assessed in terms of the efforts and rewards defined. Eventually, thresholds filter out underperforming combinations.



4. Scenario ranking



concept	bottleneck capacity [10^6 doses/yr]	input	output	Stakeholder evaluation		
concept	bottleneck capacity [10^6 doses/yr]	input	output	Stakeholder evaluation		
1	60,000,000	2	50,500	17,800,000	2,174	✓
2	120,000,000	2	170,000	36,400,000	2,126	✓
3	180,000,000	1	240,000	55,200,000	2,381	✓
4	60,000,000	2	800	17,200,000	1,111	✓
5	120,000,000	2	100,000	34,400,000	1,150	✓
6	180,000,000	1	165,000	51,600,000	1,667	✓
7	80,000,000	4	310,500	22,400,000	2,381	✓
8	120,000,000	3	370,500	34,000,000	2,381	✓
9	160,000,000	3	430,500	45,600,000	2,500	✓
10	80,000,000	4	255,500	21,600,000	1,176	✓
11	120,000,000	3	308,500	32,800,000	1,429	✓
12	160,000,000	3	465,500	44,266,667	1,471	✓
13	40,000,000	6	65,000	17,200,000	2,381	✓
14	80,000,000	5	175,000	34,400,000	2,150	✓
15	120,000,000	5	205,000	51,600,000	2,632	✓
16	40,000,000	6	35,080	16,600,000	1,149	✓
17	80,000,000	5	136,000	33,200,000	1,205	✓
18	160,000,000	5	165,000	66,400,000	1,299	✓
19	40,000,000	10	200,000	10,800,000	3,193	✓
20	80,000,000	9	210,000	21,600,000	3,571	✓
21	160,000,000	7	335,000	43,200,000	4,000	✓
22	40,000,000	10	180,000	10,666,667	1,887	✓
23	80,000,000	8	190,000	21,333,333	1,961	✓
24	120,000,000	7	315,000	32,000,000	2,174	✓

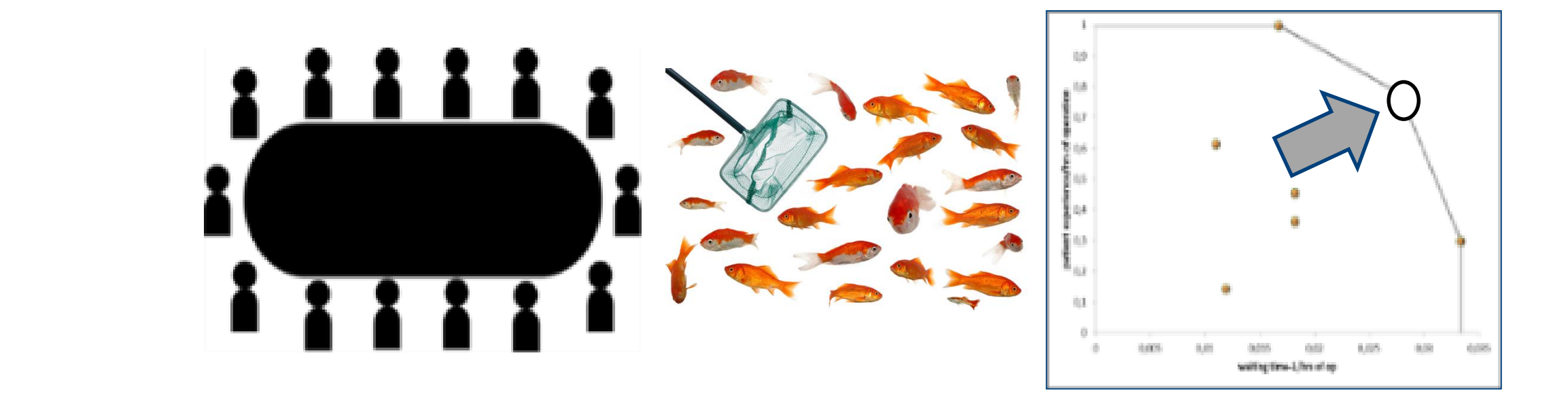


Scenarios are ranked based on the multiple KPI's, both inputs and outputs.

We opt for Data Envelopment Analysis, a non-parametric method. The result is a relative ranking, dividing the entire set of scenarios into an efficient set 'best-in-class' scenarios and relatively non-efficient scenarios. Two-dimensional plots of the multi-dimensional problem are possible.

Arguments for this method can be found in Vandaele N., Decouttere C., 'Sustainable R&D portfolio assessment', *Decision Support Systems*, 2012.

5. Group decision & scenario implementation



The scenario that will be subject for final choice and implementation, will most likely be a member of the efficient set. Various analyses can be made to reveal robustness and sensitivity of the final scenario. Among the efficient scenarios some useful fall-back plans may be present. Reconnecting with the stakeholders, additional elements can be taken into account to choose between the efficient scenarios.