



Multi Actor Multi Criteria Analysis for sustainable city distribution: a new assessment framework

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Sustainable Logistics

Rush and land
use in town



Insecurity in traffic, or
external security
(hazardous substances)



Logistics is a condition for economic activity, but it also
causes nuisance

Congestion



Emissions, bad smell,
noise for residents



Why do urban distribution solutions tend to fail?



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Why it fails



Actors involved

Shipper

Receiver

LSP

Authorities

Citizens

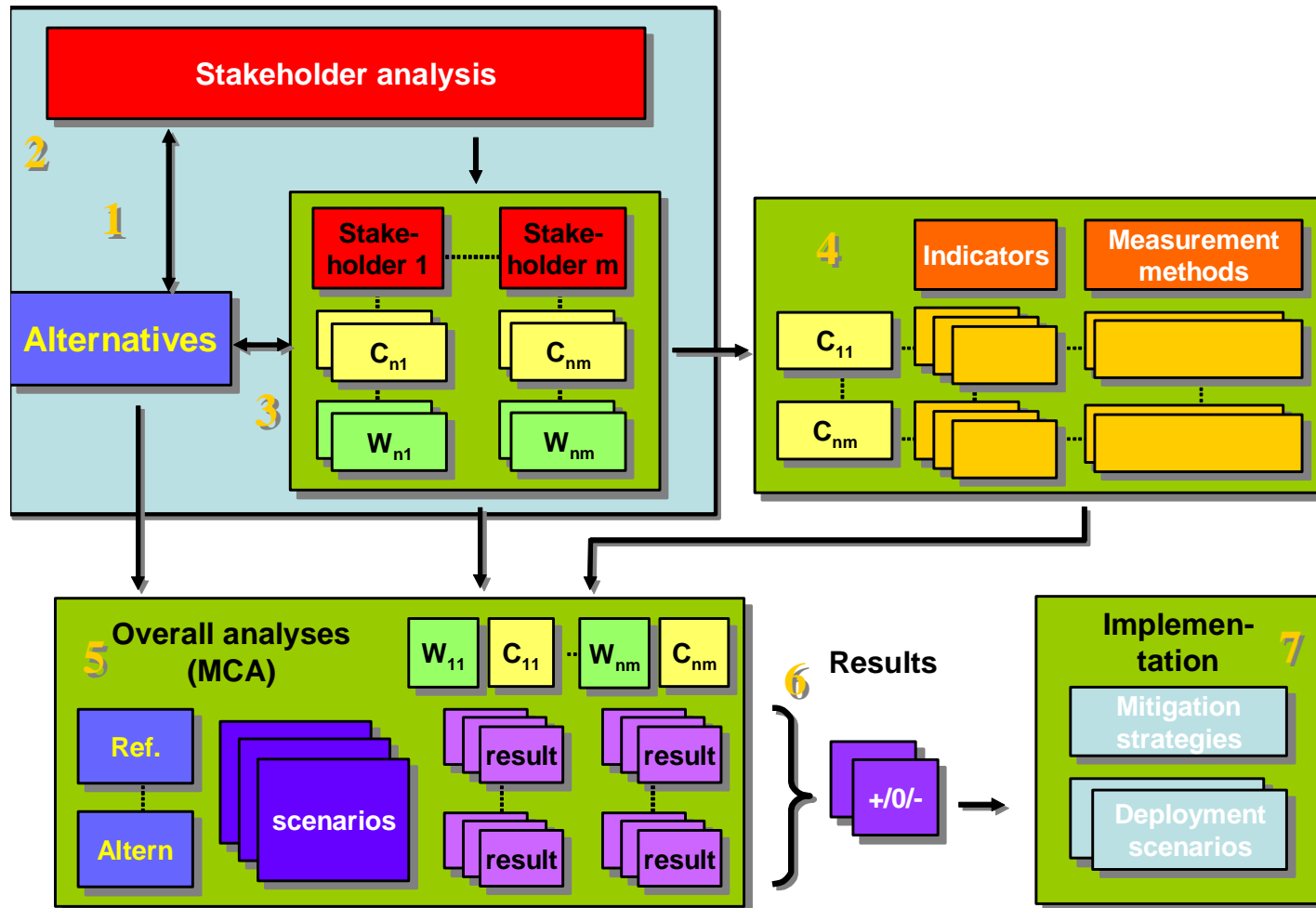
STRAIGHTSOL

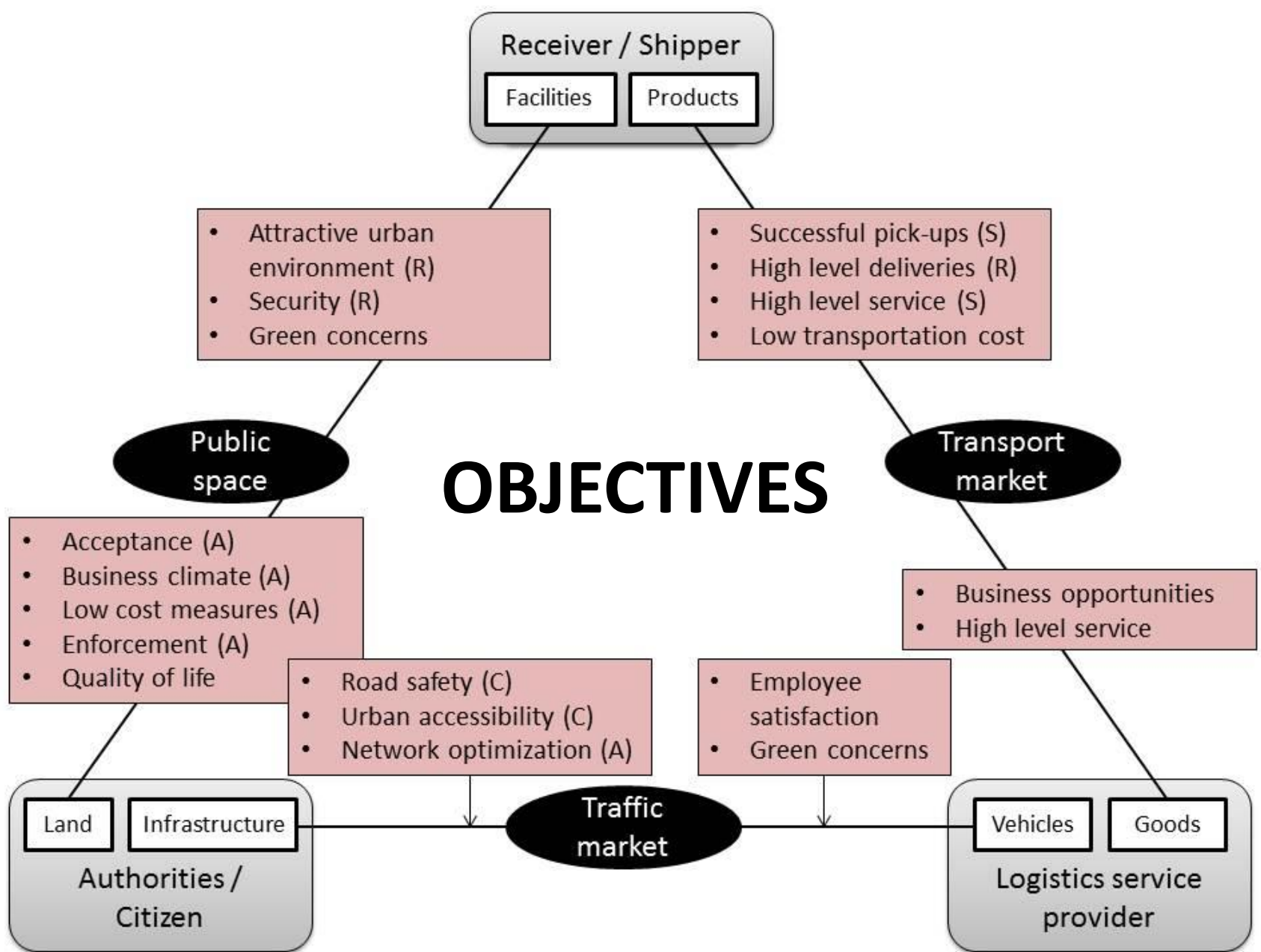
Strategies and measures for smarter urban freight solutions

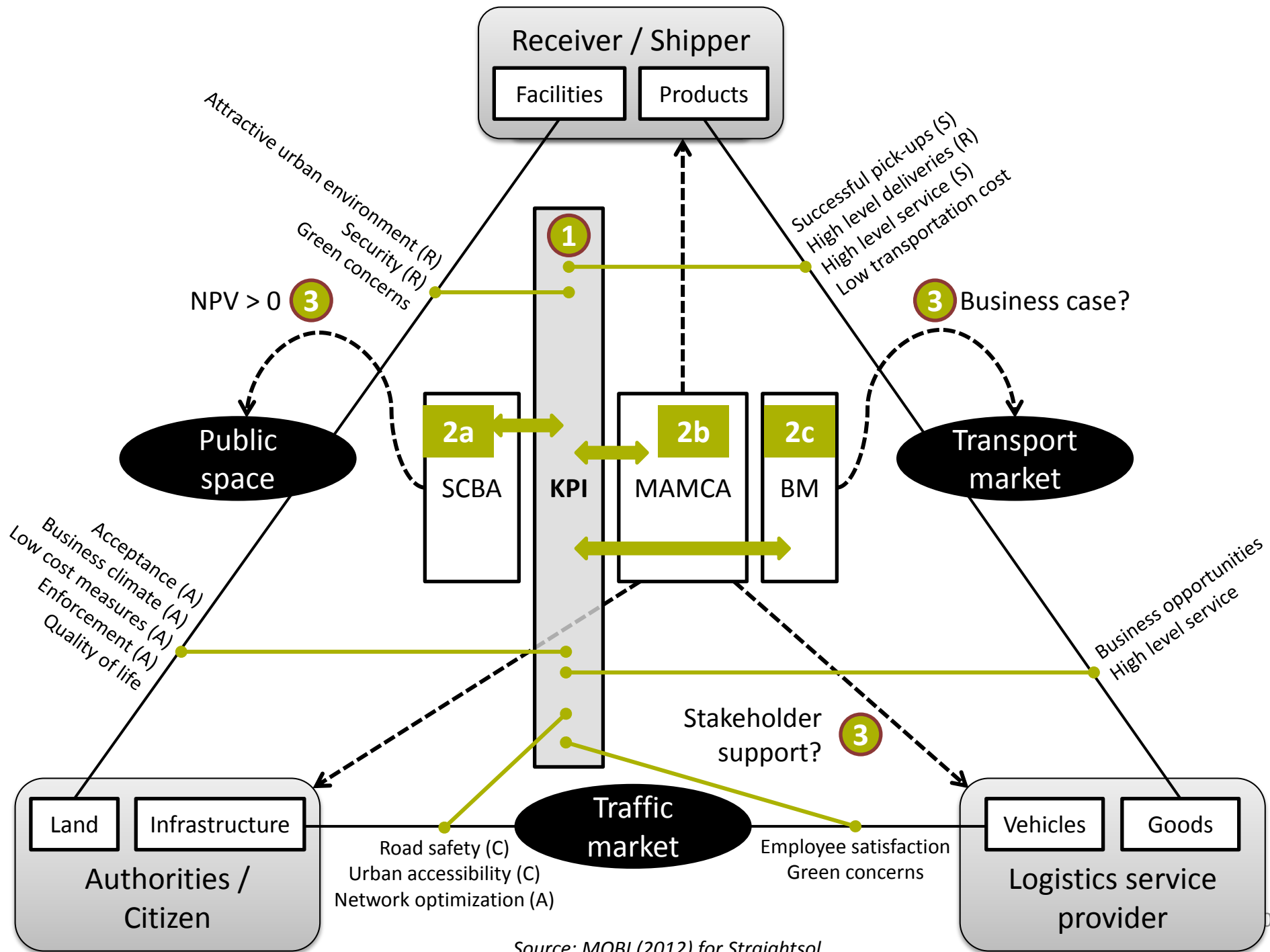


Multi Actor Multi Criteria Analysis

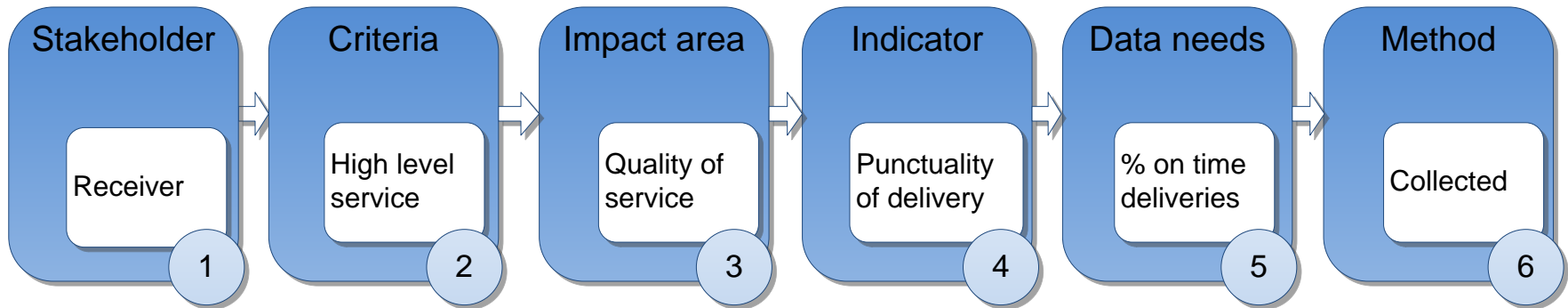
MAMCA (*Macharis, 2004*)







Indicators



Impact area	Criteria	Stakeholder	Indicator
		Shipper	LSP
ECONOMY			Receiver
Low cost delivery		Costs per delivered item	Costs per received item
Profitable operations			Operating benefits
Viability of investment			Return on investment

Oslo Norway : Information sharing in last mile distribution

- ❑ Aim: More predictable and efficient deliveries
- ❑ Venue: Stovner Centre –Steen & Strøm AS, Scandinavia's leading shopping centre company



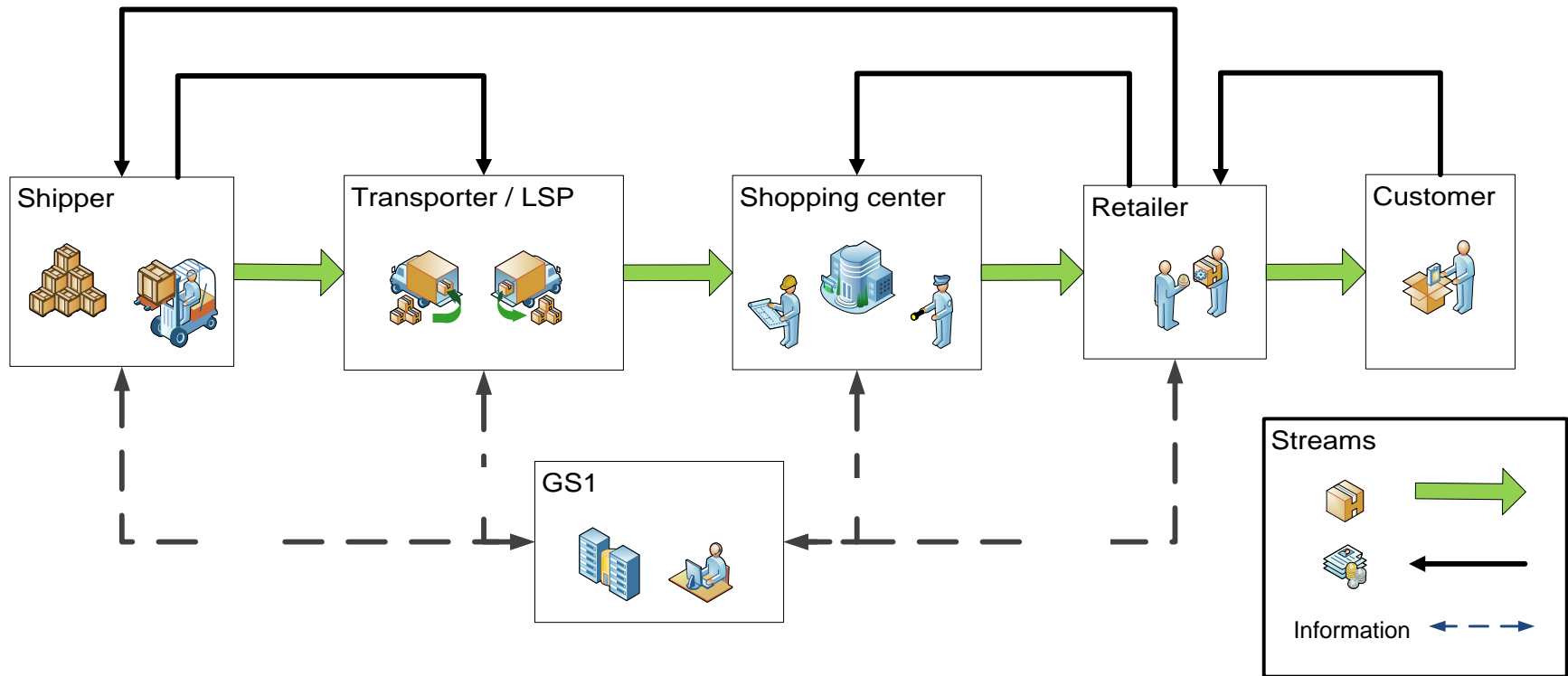
Motivation

- ❑ No manual controls of the receipts in the unloading areas shared by many retail shops
- ❑ Trucks occupy freight reception areas in shopping centres for long times because the norm is that the driver has to accompany the goods from the unloading area to the individual stores
- ❑ Congestion of the unloading area and long in-house delivery time

Motivation

- ❑ A shipment to be delivered on Monday could arrive as early as Friday and as late as Monday afternoon: extra staff/extra hours needed
- ❑ Retailer don't know if their goods will arrive on time
- ❑ Event information from 'checkpoints' in the transport value chain would make planning easier for shops
- ❑ Merchandise delivered on days with many customers can be unguarded outside the shop for almost a whole day exposed for theft

Demonstration: solution proposed



- ☐ Information collection and sharing
- ☐ Buffer storage function

Information collection and sharing



Buffer storage function



Scenarios

- ☐ Business As Usual
- ☐ Demonstration in the shopping center with 6 shops involved
- ☐ Scaled demonstration with 50 shops involved
- ☐ Scaled demonstration with 50 shops involved and a delivery drop off point: instead of security guard, secure lockers

Stakeholders involved

Stakeholder name	Description	Shipper	Logistics service provider	Receiver	Citizen	Local authority
Stovner senter	Shopping centre manager. Facilitator of delivery areas, rents space to retailers		X	X		
Oslo municipality	Local authorities, who support the demonstration. Is involved in the demonstration planning					X
Citizens	Citizens of the city of Oslo and the surrounding area.				X	
Posten Norge Bring Parcels	Logistic Service Provider		X			
Tollpost Globe	Logistic Service Provider		X			
Schenker	Logistic Service Provider		X			
Sentraldistribusjon	Distributes more than 16 million books per year through its warehouses,	X	(X)			
Ark Bokhandel at Stovner center	Book-seller, receives deliveries from Sentraldistribusjon				X	
Nille	Distribution of commodities to 350 retail stores in Norway	X		X		
Jernia	Distribution of hardware to 165 retail stores in Norway and 75 I Sweden	X		X		
Gresvig	Distribution of sport and apparel products to 324 stores	X		X		
Mester Grønn	Wholesaler and retailer flower products to 100 stores	X	X	X		
Dressmann/Varner	Wholesaler and retailer selling apparel products in 400 stores in Norway an 6other countries	X		X		

The multi-criteria analysis methods

- ❑ AHP : Allocation of weights by stakeholders
 - ❑ Expert Choice Comparion for survey
- ❑ GDSS - PROMETHEE - GAIA : Analysis per stakeholder and Multi - actor view
 - ❑ D-Sight for MCDA

Allocation of weights

Which of the two objectives displayed, "Quality of life" and "Enforcement", is **more important** with respect to «City distribution»?

City distribution

City distribution

Quality of life

Enforcement



Quality of life

Attractive environment for citizens

Enforcement

Easiness of compliance

Comment

Navigation Box

Steps: 1 2 3 4 5 6 7 8 9 ... 17 Evaluated: 0/15

☐ Auto advance

Next Unassessed

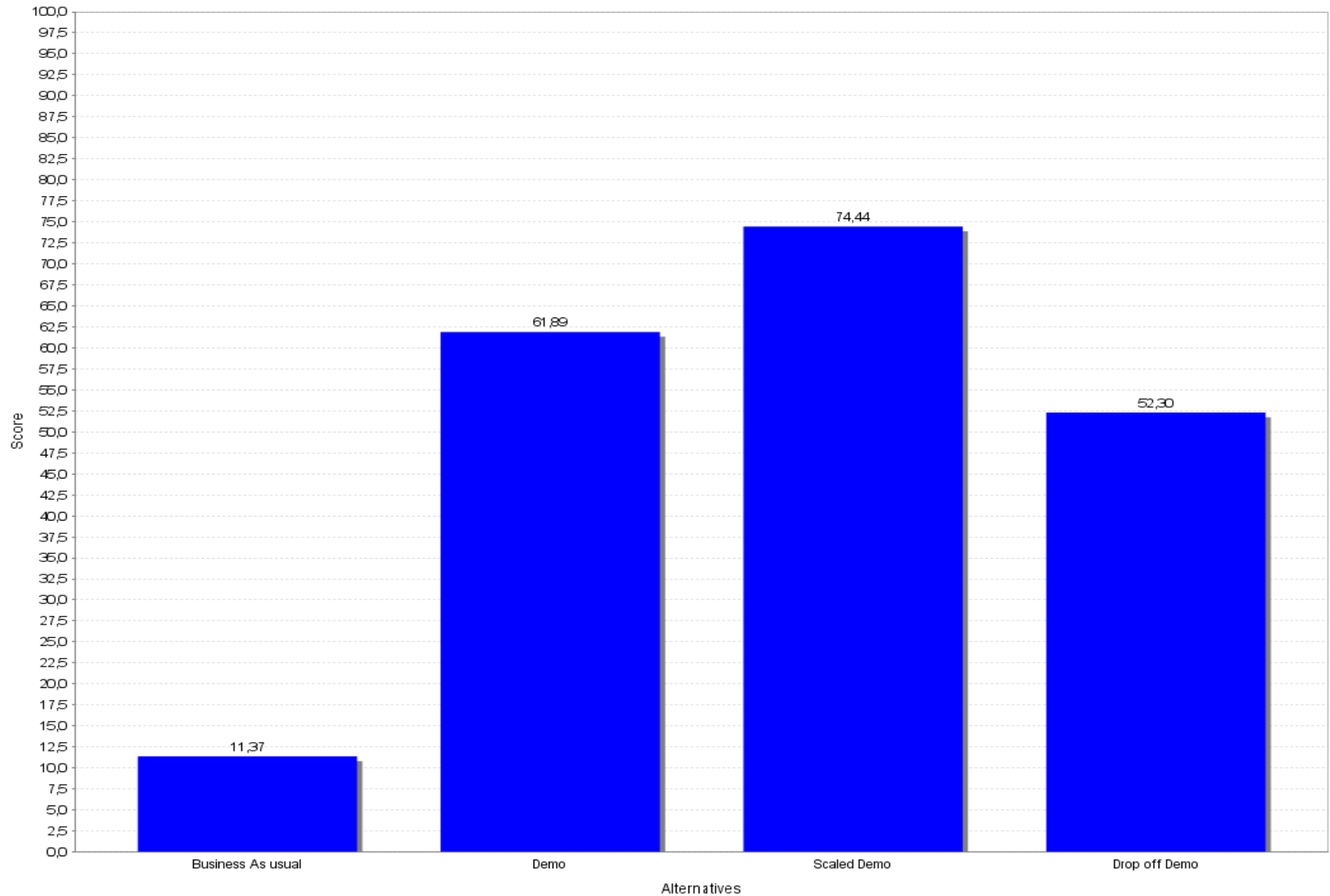
Previous

Next

Stakeholder weights

Stakeholder group	Criterion	Criterion definition	Weight
Logistics Service Providers	Profitable operations	Making profit by providing logistics services	32.1
	Viability of investment	A positive return on investment	17.4
	High level service	Receiver and shipper satisfaction	26.4
	Employee satisfaction	Employees are satisfied with their work and working environment	14.6
	Green concerns	Positive attitude towards environmental impact	9.5
Shippers	Successful pick-ups	Punctual and secure pick-ups with no damage	13.7
	Cost deliveries	Low out-of-pocket costs for transport	51.6
	High level service	Receiver satisfaction	25.6
	Green concerns	Positive attitude towards environmental impact	9.1
Receivers	Convenient high level deliveries	Deliveries that do not compromise the receiver operations	11.6
	Attractive urban environment	Nice and liveable surroundings	5.7
	Green concerns	Positive attitude towards environmental impact	4.4
	Security	Security of the goods, less thefts	17.7
	Transportation costs	Low costs to receive goods	60.6
Shopping center	Quality of service	Deliveries that do not compromise the receiver operations	10.0
	Security	Security of the goods, less thefts	5.0
	Financial viability	Making a profit by providing logistics services	40.0
	Employee satisfaction	Employees are satisfied with their work and working environment	5.0
	Attractive environment	Nice surroundings	40.0
Citizens	Emissions	Reduce emissions of CO2, NOx, PM2.5, PM10	61.2
	Visual nuisance	Less space occupancy by trucks	11.8
	Urban accessibility	Reduce freight transport, less congestion	27.0
Local authorities	Positive business climate	Attractive environment for companies	19.4
	Quality of life	Attractive environment for citizens	15.7
	Social political acceptance	Citizens support for measures	44.8
	Network optimization	Optimal use of existing infrastructure	20.1

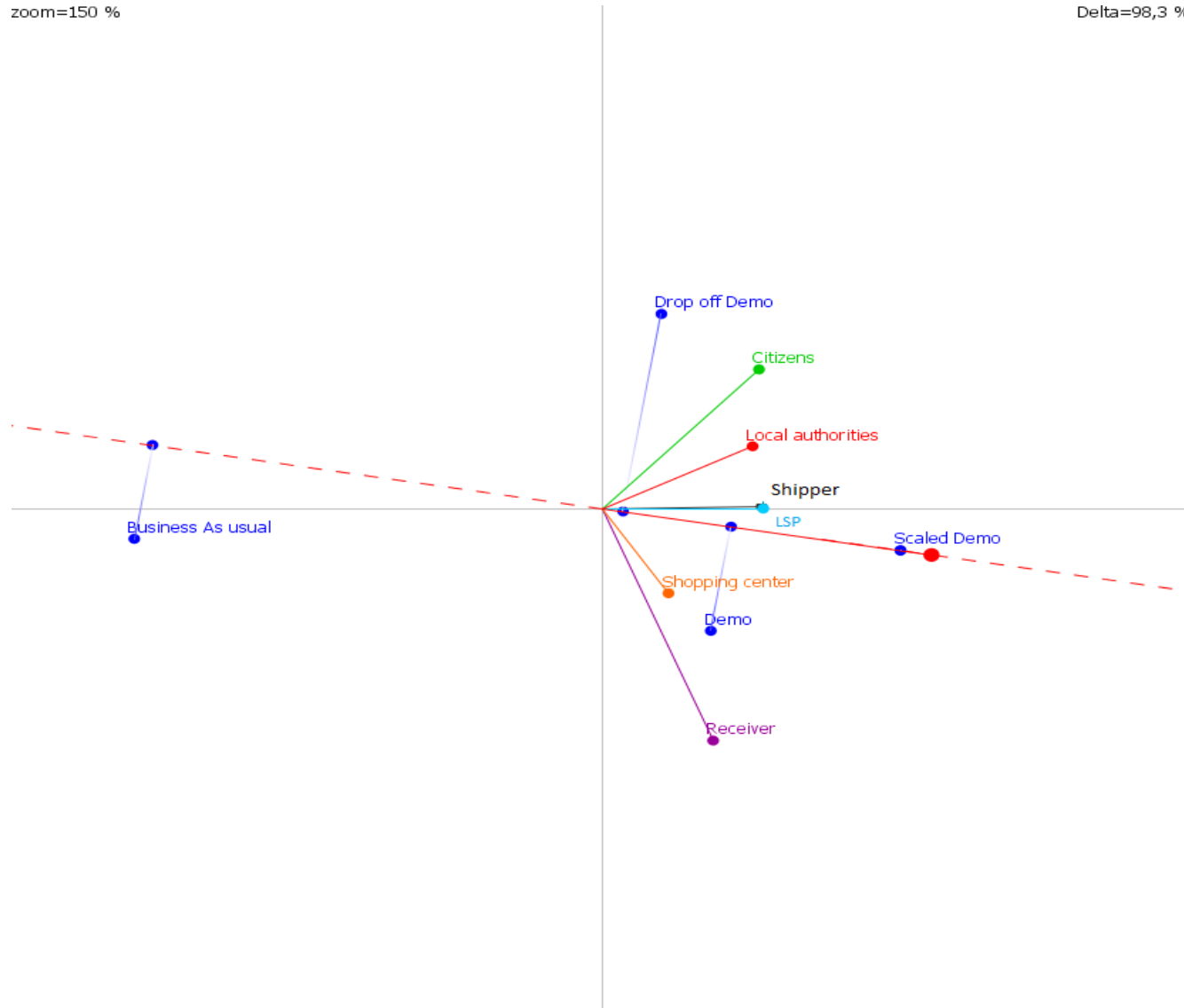
Promethee II - ranking



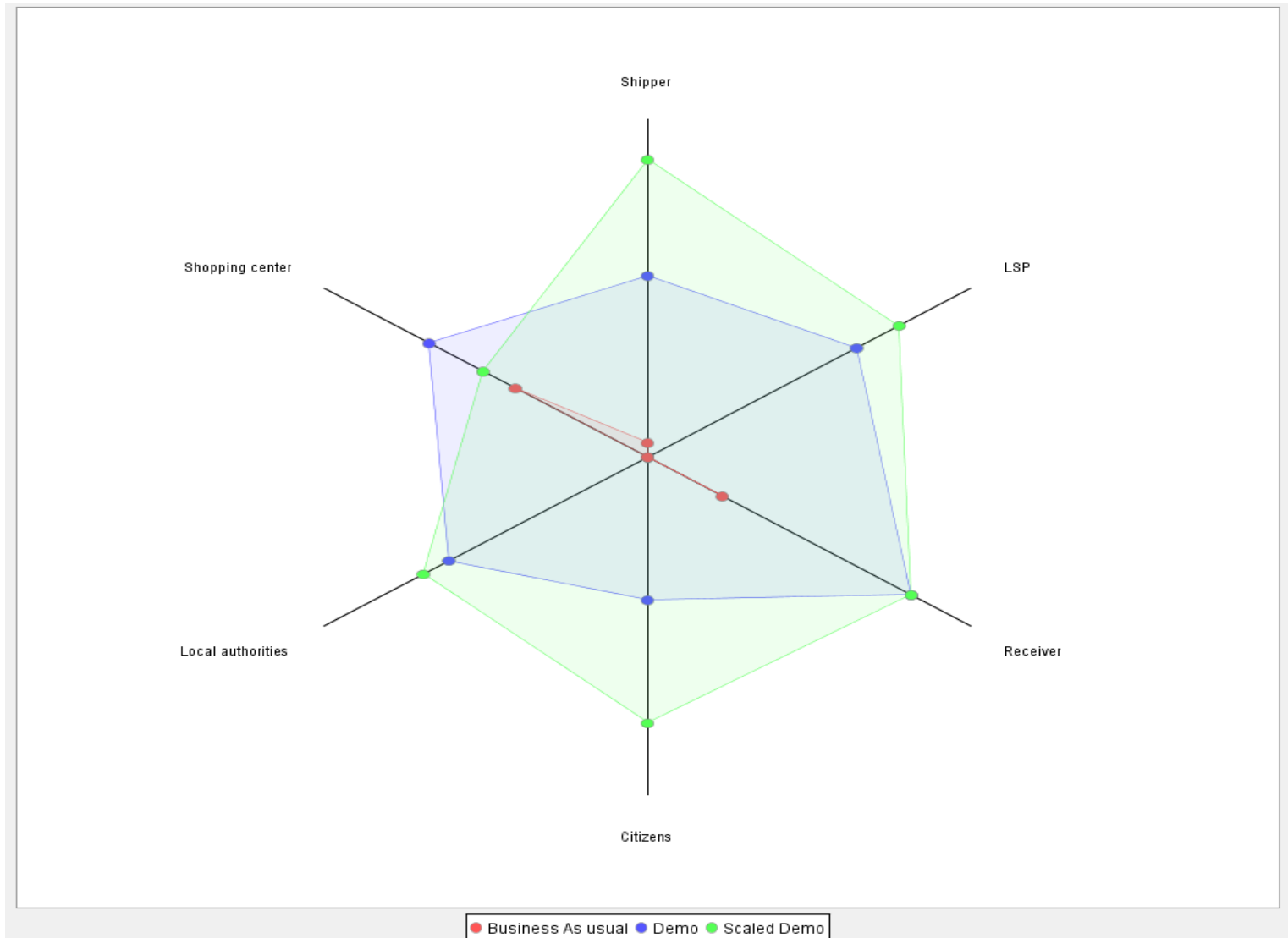
GAIA plane – Multi Actor view

zoom=150 %

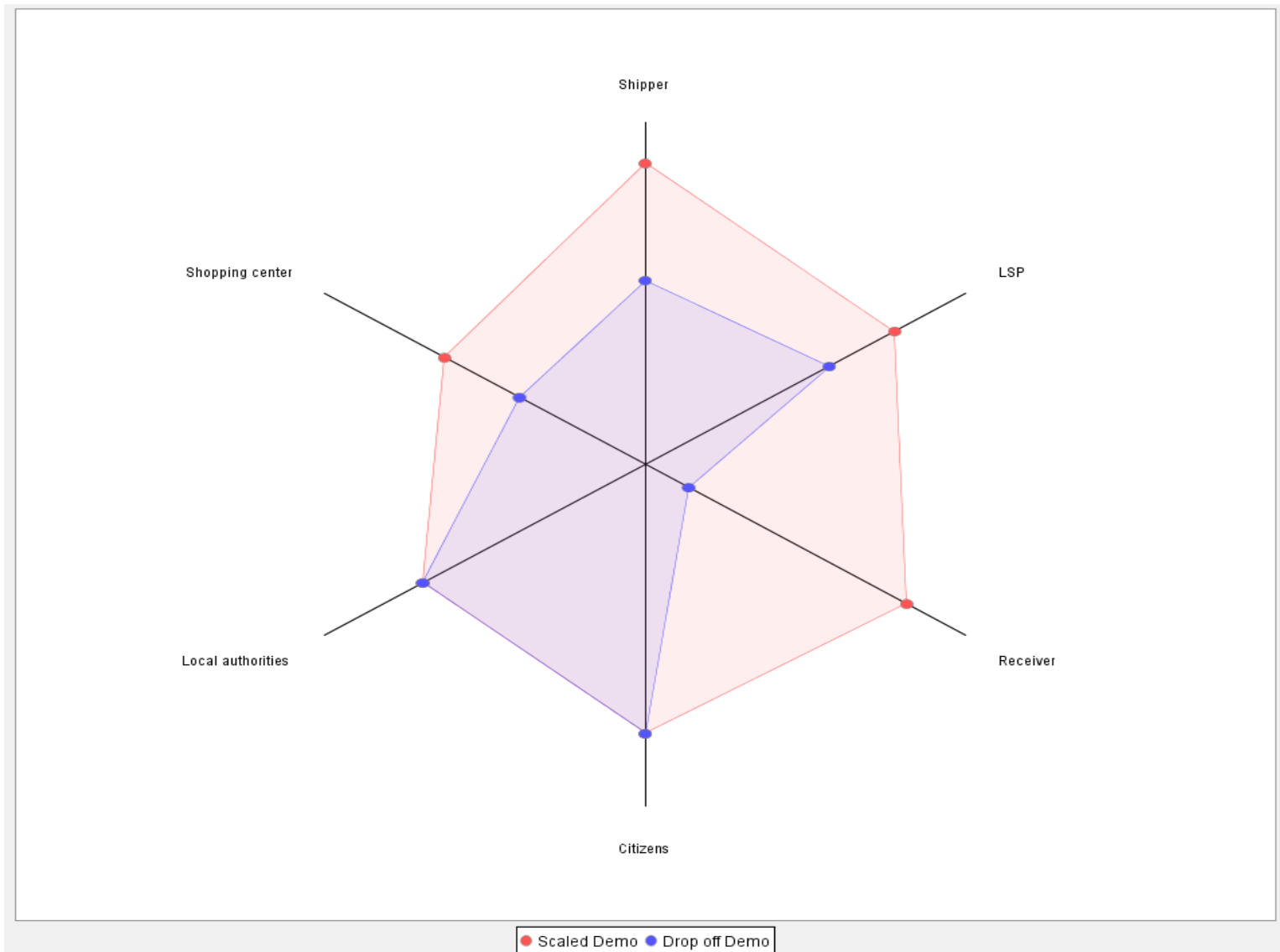
Delta=98,3 %



Spider web – Multi Actor view



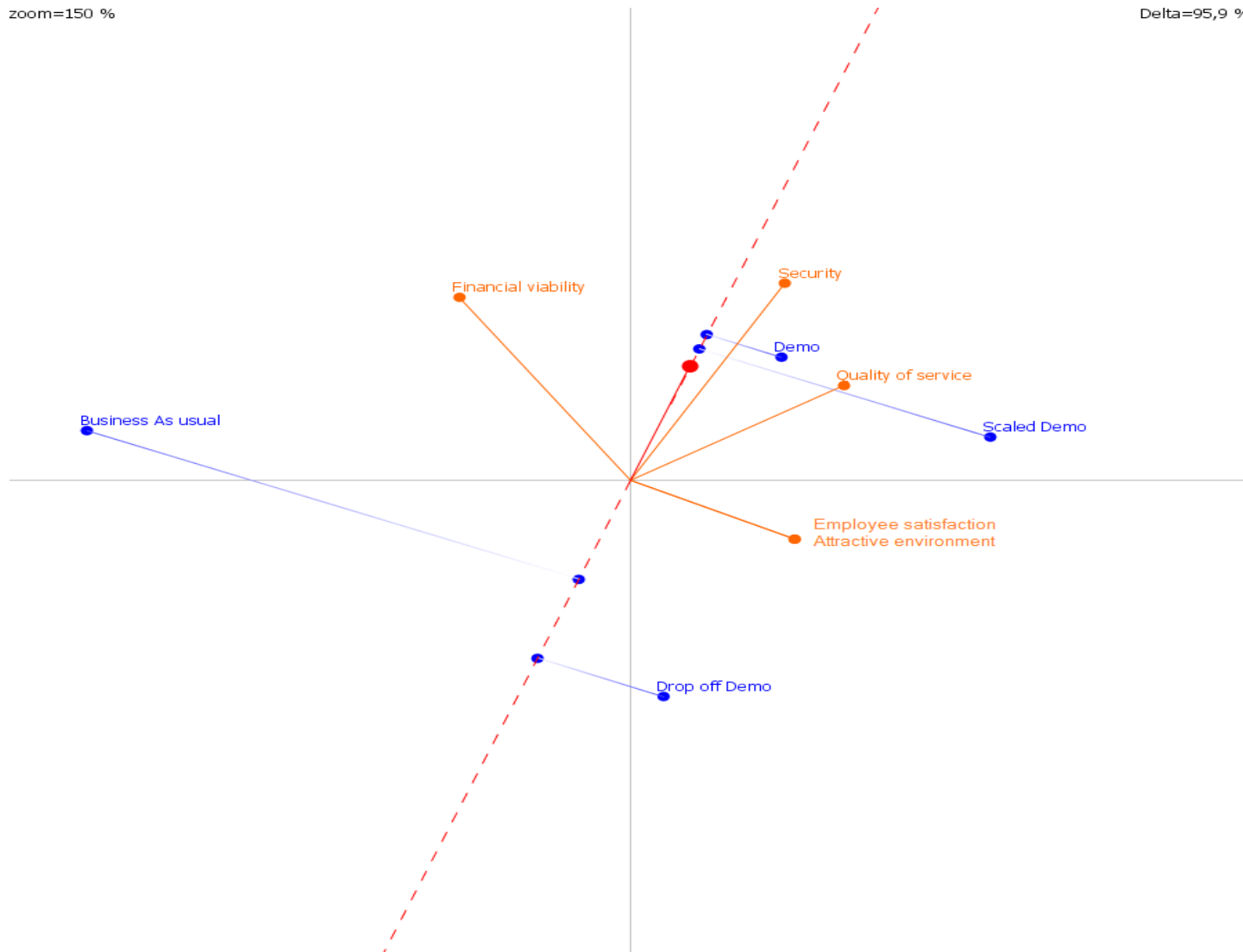
Spider web – Multi Actor view



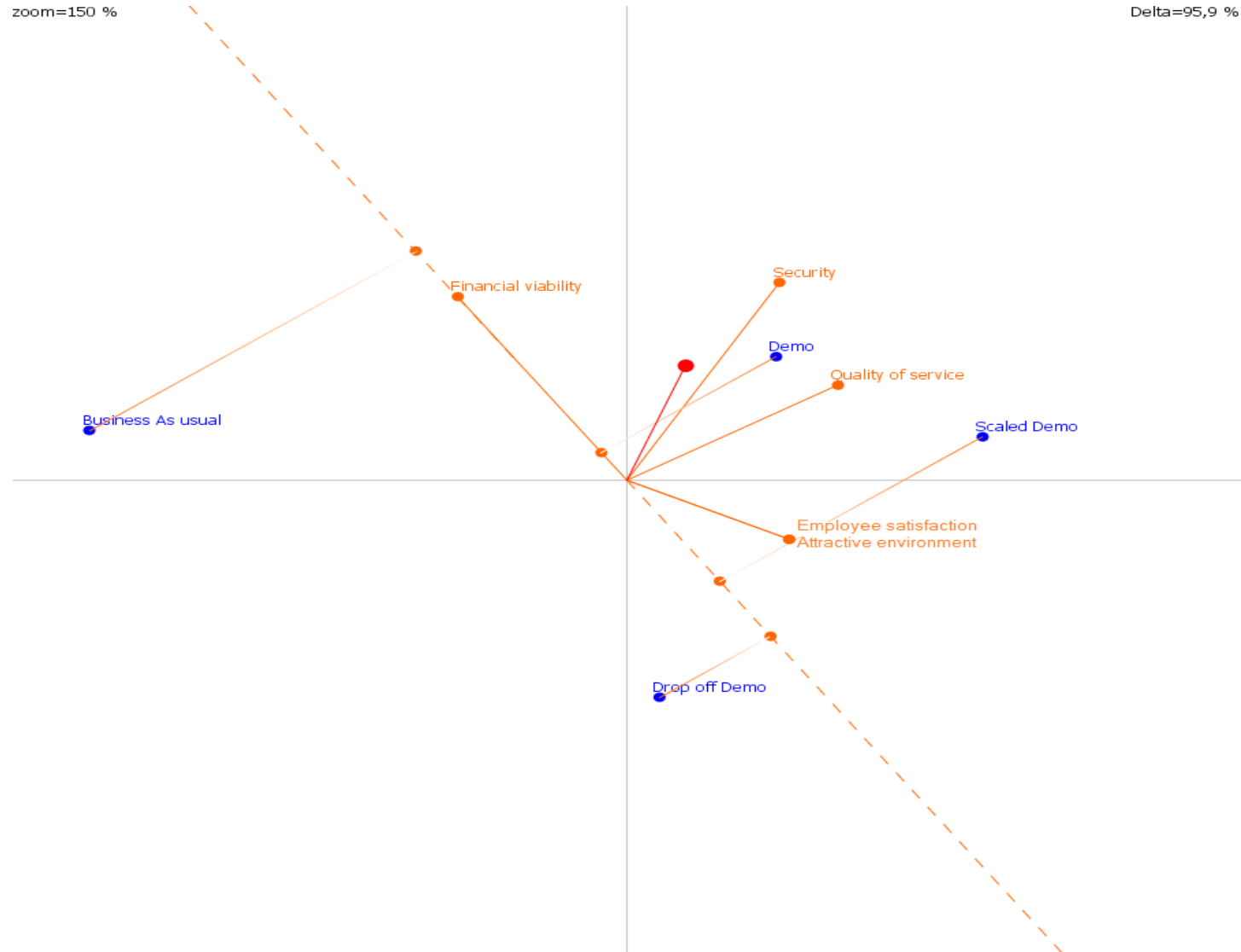
GAI plane – Shopping center

zoom=150 %

Delta=95,9 %



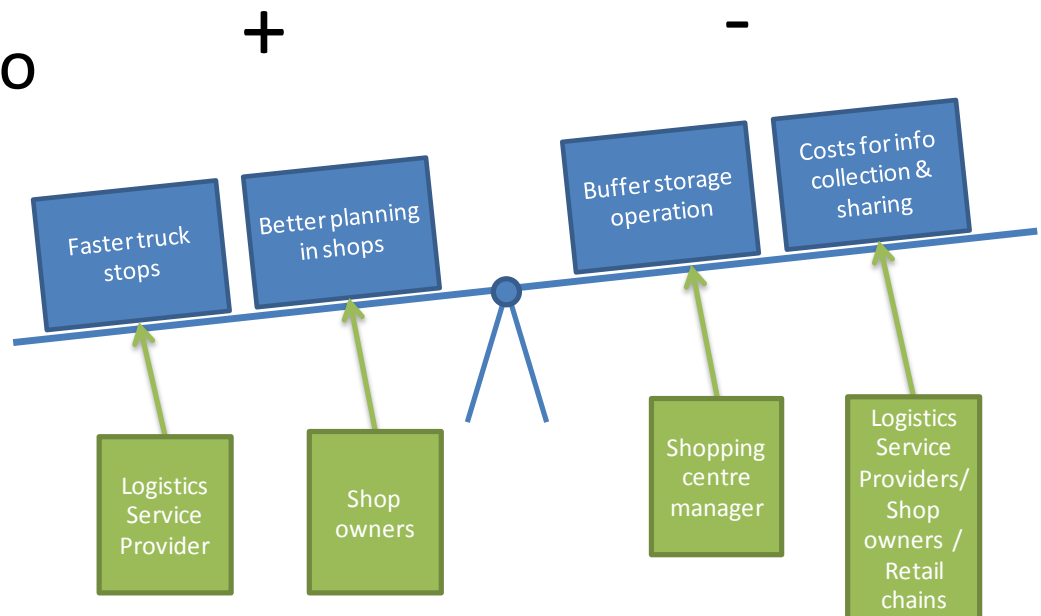
GAI plane – Shopping center



Demo actual outcomes

- ❑ Reduce in-house delivery times to store
- ❑ Better information on expected delivery times
- ❑ Better planning of shop activities due to better last mile supply chain visibility

❑ Benefit to cost ratio
slightly positive



Perspectives and exploitation

- ❑ The demo implied increased contact and understanding between the stakeholders
- ❑ Organisational and business aspects important for further roll-out – transfer of benefits between stakeholders
- ❑ Steen & Strøm : new shopping centre at Økern (design 2014, opening 2018)
- ❑ Logistics service providers interested but wait for initiatives

Conclusions

- ❑ The City Distribution dedicated Multi Actor Multi Criteria Analysis framework is currently applied to STRAIGHTSOL demonstrations
- ❑ Takes into account the objectives of all stakeholders during the evaluation
- ❑ Provides a coherent indicator set linked with concrete applications
- ❑ Input for clear recommendations and road maps for a large scale implementation of innovative concepts throughout Europe

Thank you for your attention!

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