From Data to Decision:
Optimising Electric Vehicle Workplace Charging

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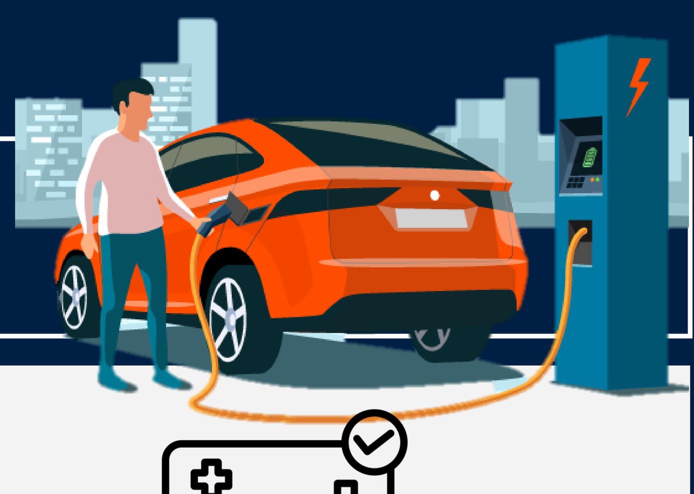

1 | Background & Motivation

Problem context: Electrification of transport creates need for widespread deployment of electric vehicle (**EV**) workplace chargers (**WPC**)

8 million EVs
Annual sales volume by 2030 [+400% (2024)] [1]

82 GWh
+300% electricity demand for EV charging by 2030 [1]

Workplace chargers
+500% forecasted for UK / +200% in DE by 2030 [2,3]

Scope 3 emissions
Firms' reporting obligation of employee commute [4]

Decision support system
Identified need for data-driven decision support to plan and operate EV WPCs [5]

2 | Research Design

Design Science Research Process

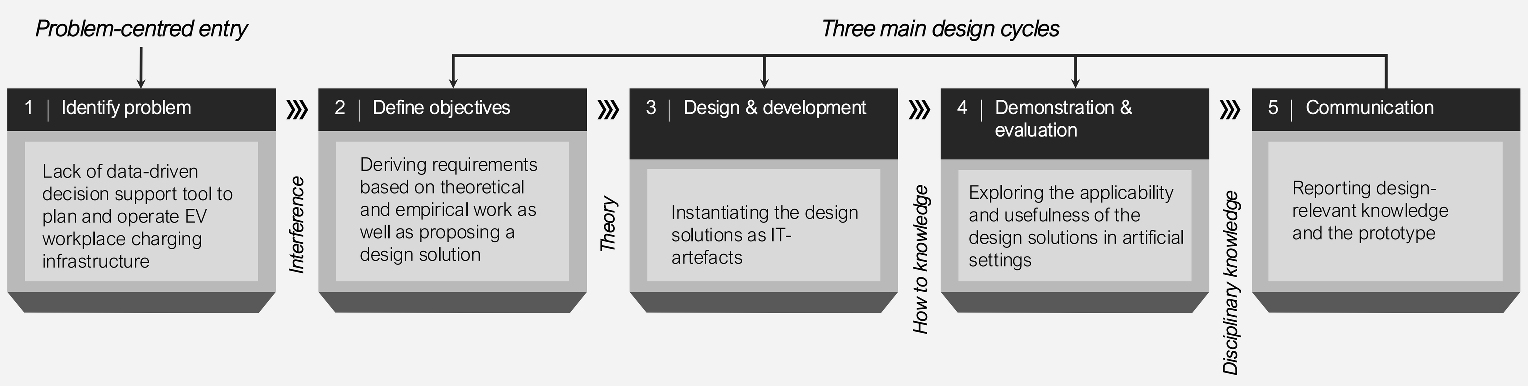

Figure 1. Adopted Design Science Research process with three design cycles. [6]

Research Question: *How can a* ***decision support system (DSS)*** *tailored to firm-specific electricity data help executives evaluate* ***trade-offs*** *between* ***peak demand***, ***charging costs***, *and* ***carbon emissions****?*

3 | Web Application

Development of interactive open-source web application (IT artefact)

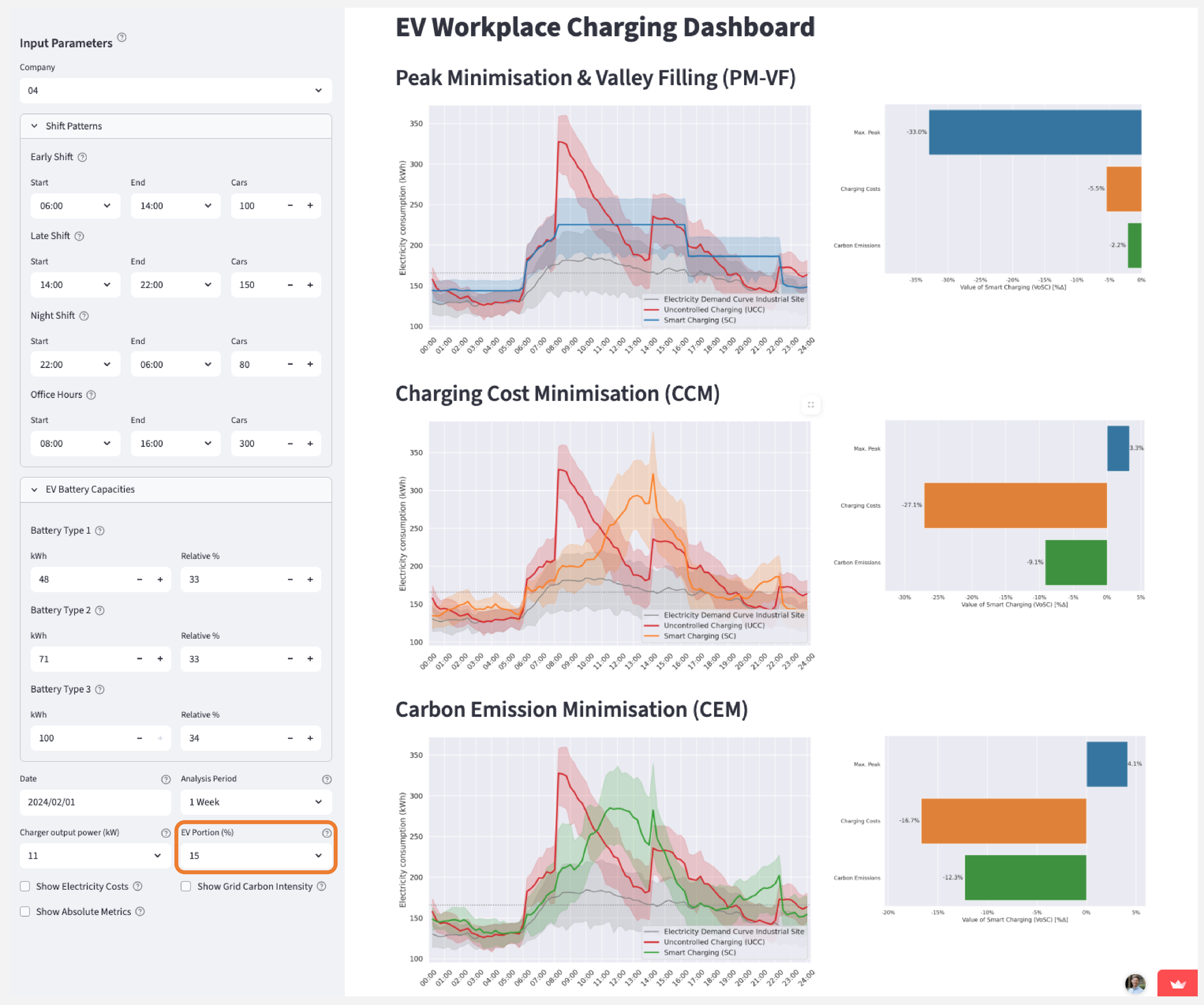

Figure 2. Screenshot of our decision support system (DSS) after final design cycle.

Data pipeline	python
Model formulation	PYOMO
Optimisation	GUROBI OPTIMIZATION
Visualisation	Streamlit

GitHub
available open-source:
github.com/segermarcel

try it yourself

4 | Demonstration, evaluation, and findings

Managerial insights from interviewing business executives from eight firms.

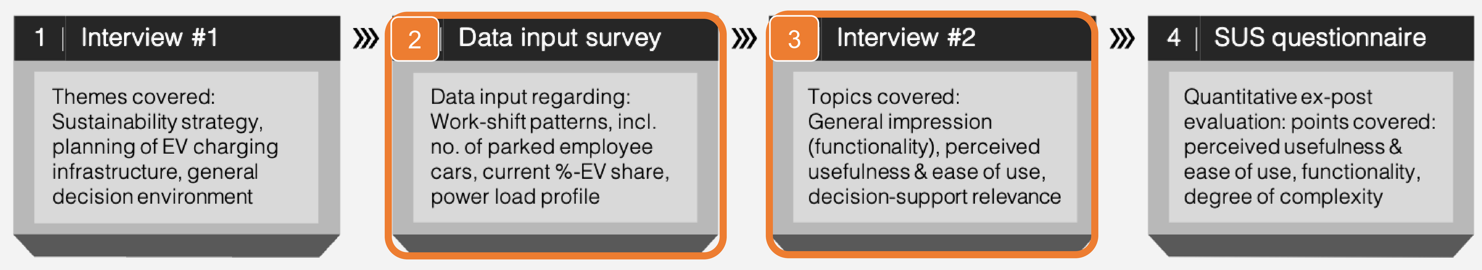

Figure 3. Summary of data collection points for each participating firm.

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DC	ID	Sector	Electricity consumption (p.a.)	Main demand source	Work shifts	# Cars	EV rate (status quo)	Type of analysis
2	1	Media & publishing	20,000 MWh	Printing machinery	AM (06:00–14:00) PM (14:00–22:00) Night (22:00–06:00)	90 80 60	5%	Firm-specific data
2	2	Office supplies	232 MWh	Office buildings	Office staff (08:00–16:00)	50	25%	Firm-specific data
2	3	Healthcare	6,137 MWh	Hospital operations	Fleet (16:00–07:30)	50	10%	Firm-specific data
2	4	Pharma	6,000 MWh	Drug manufacturing	AM (06:00–14:00) PM (14:00–22:00) Night (22:00–06:00) Office staff (08:00–16:00)	100 150 80 300	10%	Firm-specific data
3	5	Paper production	197,290 MWh	Production machinery	AM (06:00–14:00) PM (14:00–22:00) Night (22:00–06:00) Office staff (08:00–16:00)	250 175 80 60	5%	Firm-specific data
3	6	Manufacturing	4,000 MWh	Compressed air generation	AM (06:00–14:00) PM (14:00–22:00) Office staff (08:00–16:00)	100 70 100	30%	Firm-specific data
3	7	Building materials	2,000 MWh	Office buildings, HVAC	Office staff (07:30–17:00)	500	12%	Standard load profile
3	8	Energy infrastructure	1,724 MWh	Production machinery	AM (06:00–14:00) PM (14:00–22:00) Office staff (07:00–16:00)	170 30 140	3%	Firm-specific data

Table 1. Firm-specific modelling inputs from interviewee sample.

3 **We identified six themes that illustrate how our DSS shapes decision making:**

1 | Surfacing and managing decision trade-offs:

"What definitely helps is getting guidance on: How large should I dimension my charging infrastructure? What do I need to consider, what kind of costs and savings are actually involved if I incorporate different automation features?" [ID: 5b]

2 | Changing mental models and strategic framing:

"At the moment, we really don't have anything in our discussions - except maybe what we calculate ourselves somehow. But a tool like this would definitely be a huge support, especially if it provides real values based on company-specific data." [ID: 8a]

3 | Facilitating cross-departmental dialogue:

"A lot of what you usually try to explain just in words is shown visually here - and that makes it memorable. (...) And if the question comes up, like: 'Hey, can we add more charging stations or charge more vehicles? What would that look like?' Then this would be a really great way to analyse and present the impacts. It's just an excellent basis for discussion, and everyone would approach it from their own perspective - and I believe that would really help with making a decision." [ID: 6a]

4 | Perceived usability and adoption potential:

"It is clearly laid out, attractive to use, and not overloaded." [ID: 7a]

5 | External validation and credibility:

"I already like that the red curve reflects reality - that's a good start, because I checked in my own program in parallel, and it looks similar." [ID: 4a]

6 | Overwhelm and complexity concerns:

"I can't use something that suddenly overwhelms me with so much information that I can't see the forest for the trees. I actually need to see the specific information that's supposed to come through - clearly and deliberately." [ID: 5b]

[1] International Energy Agency (IEA) (2025). Global EV Data Explorer.
[2] ChargeUK (2024). Powering ahead to 2030: Current and Future Charge Point Availability in the UK.
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[4] European Union (2024). Corporate Sustainability Reporting Directive 2022/2464.
[5] Seger et al. (2025). Firm level optimisation strategies for sustainable and cost effective electric vehicle workplace charging. npj sustain. mobil. transp. 2 (1).
[6] Peffers et al. (2007). A Design Science Research Methodology for Information Systems Research. J. Manag. Inf. Syst. 24 (3) 45-77.

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