Typology of EV journey-making choices, decisions and actions

The Typology represents qualitative narrative from personal interviews with individual electric vehicle drivers [n=88]. Considerations, decisions, activities and behaviour as reported by the participants in this particular sample have been categorised and synthesised to express specific and discrete elements of electric vehicle journey-making. It is not necessarily a definitive list of all electric vehicle driver behaviour – but could be supplemented and expanded upon in further research.

1. PRE-JOURNEY

1.1. Journeys of any length (within or beyond vehicle battery range)

1.1.1. Pre-journey considerations and route planning

Consider mileage to destination, return journey or whole round trip
Consider nature of the journey, i.e. load-carrying needs
Look at paper maps and road atlas
Plot mileage using AA or RAC route planners, Google Maps or similar
Plot mileage using TomTom, Garmin or sat nav in car
Choose the shortest or most direct route to destination
Plan a different route into nearby town or for regular journey to work out most energy-efficient, including at different times of day
Consider whether journey/errand can be combined with another later/next day/at another time
Plot most efficient route between different stops or tasks
Choose and plan 'gentler' route to optimise energy efficiency
Choose and plan route avoiding steep hills, even if it takes longer
Choose to go cross-country to travel at lower speeds, rather than use motorway
Plan around the journey taking longer due to driving more slowly
Plan journey with miles 'in hand' in case of detours, delays or diversions
Check weather forecasts, consider how conditions may affect battery range
Check temperature, consider how this may affect battery range
No pre-planning of journey, known to be well within range (may never go out of car's range anyway)

1.1.2. Determining whether to take EV at all

Choose to take ICE car if journey or round trip is beyond battery range
Choose to take ICE car if journey or round trip is over personal threshold of [psychological] range comfort
Choose to take ICE car rather than EV rather than charge away from home, i.e. to avoid 'hassle'
Choose to take ICE car if no convenient or suitable charging facilities en route or at destination
Choose to take ICE car as no suitable charging facilities within range of home anyway
Choose to take ICE car rather than carry large, expensive charging cable and adaptor
Choose to take ICE car due to time constraints, i.e. prospect of charging stops or downtime
Choose to take (larger) ICE car for load-carrying reasons, i.e. if carrying more than three passengers, luggage, or need to tow trailer
Choose to take other household vehicle (i.e. SUV) if going over rough, bumpy rural roads, i.e. due to low ground clearance of EV, need for off-road ability
Choose to take ICE car due to wanting to drive faster on motorway

Choose to take ICE car if it's very hot/cold and journey or round trip is pushing limits of range (concerns over energy use)
Choose to take EV rather than ICE car on a journey that may involve traffic queues and stop-start driving (i.e. it's more relaxing, more energy-efficient)
Choose to take (small) EV rather than large ICE family car if no need to carry children, pushchairs or large luggage

1.1.3. Determining EV vs other transport modes

Choose to take train or other mode if journey is beyond battery range, full stop
Choose to take train or other transport mode rather than charge away from home
Choose to take train or other transport mode due to lack of convenient charging facilities en route or at destination
Choose to take train or other transport mode due to time constraints, i.e. charging stops and downtime
Choose to make multi-modal journey based on distance and charging availability, i.e. leaving car charging at park-and-ride facility, driving to station
Choose to drive rather than use public transport, if free or advantageous parking for EVs (i.e. at a charging point)
Choose to drive rather than use public transport, if charging offered at destination
Choose to drive rather than take public transport, if journey now costs less than in petrol/diesel car
Choose to drive rather than use public transport, as now feeling less guilty
Choose to use car more for short journeys previously done on foot/bicycle, as now feeling less guilty
Choose to use car more for short journeys previously done on foot/bicycle, as no need to try and save money on petrol/diesel any more

1.1.4. Pre-journey charging

Consider whether a charge is needed before departing on next trip/journey
Check battery charge levels via in-car or charger interface
Check battery charge levels via smartphone or tablet app
Check battery charge levels via iWatch, Pebble, smartwatch app or similar
Decide whether to charge to 80% or 100% overnight or in advance, set charger accordingly
Bear in mind possibility of unexpected extra mileage or detours, charge accordingly
Consider whether to charge at home, or take advantage of free chargers at destination
Consider whether enough range to get to a free charger at destination, or need to charge/top-up at home before leaving
Set charger to charge off-peak or for full charge in time for departure
Reset charge timer if setting out earlier than usual the next day
Rely on automatic charger timing and settings unless outside usual routine
Charge and leave journey till next day/later in the day, if journey not urgent and it's going to be sunny (household with solar panels)
Plug in or switch on charger manually if car not already suitably charged
Use smartphone app to remotely start charging and/or monitor charging progress, if car not already suitably charged
Use Pebble, iWatch or similar to remotely start charging and/or monitor charging progress, if car not already suitably charged
No planning or scheduling of charging, always keep car fully charged

Research available chargers at destination or on intended route, even if unlikely to need them - 'just in case'

1.2. Journeys beyond battery range or involving (non-essential) charging

1.2.1. Considering charging options

Consider whether to rapid-charge on route, or if charging available at destination
Consider length of stay at destination, and whether to slow-charge there
Consider availability of private charging, i.e. at family/friends' houses, client offices
Consider whether to stop to charge on outbound or return trip, if one stop needed
Consider return journey and whether a further charge will be needed

1.2.2. Locating charging facilities and checking charger status

1.2.2.1. Searching and identifying

Do a Google search for chargers
Use Google Maps to check charger locations
Research charger availability and status online or via app using Zap-Map/National Chargepoint Registry or similar
Research charger availability and status via local council or local authority, Source London or similar websites
Research charger availability and status using individual service provider websites or apps, i.e. CYC, Polar, Ecotricity
Research charger availability and status via car maker's own website or app
Check out open-source resources i.e. Plugshare or OpenChargeMap for 'shared' chargers at private houses or local businesses
Ask other EV drivers via social media for any advice/suggestions on charging when planning new or long journey

1.2.2.2. Updating and maintaining knowledge

Update existing knowledge on charger availability and status, i.e. new facilities installed on intended known route or around destination
Consult and update own spreadsheet, Google Doc, Google Maps map or similar personal record of charging locations (often including locations and postcodes, connector types, network providers or access types)
Check own self-developed app (i.e. aggregating feeds from network operators) for charger status on intended route
Update and refresh any apps used
Use app (i.e. BMW i3 app) to 'send to car' charger postcodes from Google Maps as new destinations for the in-car sat nav
Manually enter charger postcodes as 'points of interest' on sat nav
Look at OS map and mark charger locations in pencil
Maintain and update paper list or reference document to take in car

1.2.2.3. Checking of specific charger availability and status

Check with owners of hotels or holiday cottages as to whether charging will be possible, and if so, how to pay for the electricity
Call or email destination to check that charger is working
Call or email service/network providers to check that chargers are working
Check emails for any relevant information from mailing lists signed up to (i.e. Ecotricity)

Look at EV online forums, Twitter or other social media for news on any updates to/problems with charger networks
Choose to take ICE car instead, having found no convenient or feasible charging facility
Make other travel plans, having found no convenient or feasible charging facility
Choose to take ICE car if charging availability looks risky, i.e. uncertain charger status
Choose to take train or other mode, if charging availability looks risky
Check out park-and-ride facilities or splitting journey mode, if charging availability looks risky

1.2.3. Checking charger compatibility and access

Check charger and connector types for compatibility with car, using above reference sources
Make sure of having all necessary RFID tags or network cards to access public chargers; join any networks as necessary
Research weeks ahead of driving abroad, i.e. Rep. of Ireland, France, Holland; request any network cards or RFID tags needed for access to foreign chargers
Download any apps needed for access to new or different national/international charger networks
Pack any needed adaptor cables, connectors, portable equipment (i.e. Nissan Leaf's 'brick')

1.2.4. Adapting journeys and destinations with reference to charging

Choose route according to charger availability, i.e. at motorway services
Plan journey breaks or lunch stops around charging needs and availability
Develop a back-up plan, alternative stop or alternative route in case a charger is occupied/out of action
Plan a detour or to go out of the way, if this enables using a charger previously experienced to be functioning and easy to access
Decide which town to go shopping in, based on on-street or public car park charger availability (or price)
Plan shopping trip destinations to retail parks or specific retailers (i.e. IKEA) based on charging availability (or price)
Choose to visit leisure destinations based on charger availability (or price)
Choose to visit or stop at National Trust property, specifically because they have chargers in key out-of-the-way destinations
Identify charging facilities at unusual places, i.e. local businesses, sports centres or village car parks, when travelling cross-country in rural areas
Identify charging facilities in previously unvisited industrial places, i.e. industrial estates, harbours, agricultural facilities
Plan charging at car dealerships for supplying brand (i.e. Nissan, Tesla, BMW)
Plan route or stop around likelihood of charger being blocked, in use or broken, based on previous experience or feedback from other EV drivers
Plan to stay overnight rather than risk long late-night journey home (i.e. with ref to uncertain charger availability/status, lack of out-of-hours support)
Book hotels or holiday cottages based on charging availability

1.2.5. Considering charging time

Estimate charging downtime depending on speed/type of charger

Plan journey and charging stop(s) around diary or tasks for the day
Plan around the journey taking longer due to charging downtime
Schedule any meetings or appointments to allow for charging stops on route
Build in flexibility to schedule if possible to allow for charging issues, i.e. having to wait for charger or detour to find working charger
Use website or app i.e. Google Maps to see whether a multi-modal journey is quicker and easier, given charging downtime

1.2.6. Considering charging cost

Check out charging fees at destination or on route, including additional parking fees
Plan to charge at free or cheapest facility wherever possible
Cost out journey to see if parking plus charging fees still make driving the cheapest option

1.2.7. Further pre-departure checks, activities and decisions

Use app (i.e. Nissan Carwings, or third-party, i.e. Leafspy, Leaflink) to check charge level a few hours before departure, to allow time for extra top-up
Use app to remotely check state of charge and range to see if a top-up at public rapid-charger is needed, and thus earlier departure (i.e. if no home charging facilities)
Pick up and act upon any low-charge alerts from remote monitoring app
Check apps and/or in-car interface for any further updates to charger status just before set-off
Check social media, i.e. Ecotricity Twitter feed, for further updates to charger status
Decide to take ICE car instead, having found out that charging facility is out of action
Decide to take train or other transport mode, having found out that charging facility is out of action
Make other travel plans, having found out that charging facility is out of action
Defer journey/trip, having found out that charging facility is out of action
Use app to pre-heat or pre-cool car before departure
Use app to pre-heat or pre-cool car while still plugged in, specifically to save battery power when underway
Don't plan until departure, but get into car and fire up the sat nav
Don't plan until departure, but check apps for updates when setting off
No pre-planning, all rapid-chargers known on regular routes
No pre-planning, familiar with charging facilities at all regular destinations
Don't bother to check anything, confident that there will be plenty of chances to charge on the way or at destination

1.3. Additional activities specific to Tesla Model S drivers

Take car to nearest Supercharger the night before if heading off very early
Plan shopping trip around Supercharger availability
Check intended routes first of all for Supercharger availability/status, and then other networks
No pre-planning needed at all, unless expecting to go over 250 miles
No pre-planning at all, assume there will be a Supercharger within reach
No pre-planning, all Superchargers previously used are stored as destinations in the sat nav and new ones within range are automatically identified

1.4. Additional activities specific to RE-EV drivers (Vauxhall Ampera, BMW i3 REx)

Plan to do as much mileage in electric mode as possible, but not stop to recharge

Plan to use electricity for whole journey if possible, even if it means stopping to recharge
Top up with petrol (as don't tend to keep full tank normally, in order to save weight)
Consider where to switch between electric and petrol modes, to optimise efficiency and/or emissions
No pre-planning, will just use petrol engine if electric range runs out

2. JOURNEY

2.1. At departure

Double-check state of charge before start-up
Read Carwings statistics or similar on start-up
Double-check charger availability and/or status when leaving
Set out earlier than would have done in ICE car, to allow for charging issues i.e. charger already occupied upon arrival
Set trip meter to zero when departing, for quick and easy calculation on distance for return journey
Drive straight to nearest rapid-charger or Supercharger if insufficient range or running low (no home charging)
Drive straight to nearby rapid-charger if going out at short notice and car doesn't have sufficient range/not time to charge up using slow home charger

2.2. While driving

2.2.1. Checks and calculations

Keep eye on in-car sat nav, TomTom, Garmin or similar to track remaining journey mileage
Keep in mind distance already done, and distance remaining
Make mental calculations as to remaining battery range
Keep track of range by deducting from 'optimistic' in-car calculation
Think about weather and temperature, and how this may affect range
Minimise use of heater and air conditioning to conserve battery range
Wear coat and hat in winter to minimise use of heater!
Think about use of wipers and lights, and how this may affect range
Think about steep hills (upward) and how these may affect range
Think about steep hills (downward) and effect on regenerative braking
Be anxious about range if there are diversions or road closures
Be comfortable about 'low battery' warning if within a certain known threshold from home
Don't look at range indicator on most journeys, familiar with car's limits

2.2.2. Changes to driving style/driving experience

Drive more slowly than when in ICE car
Be more aware in general about speed
Stick to 60-65mph on motorway
Set speed limiters or active cruise control to keep at lower speeds
Try to drive more smoothly
Accelerate and brake more gently when possible
Drive to maximise regenerative braking
Slow down by lifting off throttle rather than braking, when possible
Slow down much earlier before junctions or traffic light
'Slipstream' behind large lorries when on the motorway
Try to stay within in 'eco zone' on dashboard indicator

Adjust driving style according to remaining range or journey demands
Drive in different modes to test differences in energy consumption
Drive to 'beat' own records for efficiency and range
Be generally much more aware of energy usage than when in ICE car
Be more likely to talk with passengers than in ICE car, due to quietness
Turn radio off to enjoy the quiet driving experience
Be more aware of other road users, i.e. pedestrians, cyclists, horse riders, due to quietness of EV
Appreciate not having to stop at a petrol station, or fill up with 'smelly' petrol or diesel
Drive faster if have a full range, or if only going short-distance
Enjoy rapid acceleration from standstill/low speed
Drive faster and accelerate more now not paying for petrol (as stated by Tesla Roadster owner)!

2.2.3. Driving style, specific to RE-EV drivers

Drive knowing that petrol engine will kick in if battery range runs low
Be conscious of where to use electric and where to use petrol power
'Save' battery power for use in town or during stop-start traffic
Be conscious of automatic switching between electric and petrol power to understand energy usage and efficiency
Drive to 'beat' own record for electric-mode mileage before engine kicks in

2.2.4. Routing and range

Try different route variations to check mileage and energy efficiency
Take extra care to avoid getting lost and adding mileage to journey
Use Waze app or similar to find free-flowing traffic route, to smooth out route and optimise efficiency

2.3. Charging away from home

2.3.1. Dynamic checking of chargers

Be aware of where chargers are in relation to route, 'just in case'
Look out for new chargers and charging facilities when out and about, for future reference
Specifically check charger and connecter types spotted while out and about, for future reference
Check status of next/desired charging point while on route/mid-journey, in time to allow for detour, using app or in-car interface
Check status of desired chargers when a few miles away, i.e. to work out which car park to head for, using app or in-car interface
Check status of rapid-chargers regularly on motorway trips, i.e. to work out whether to stop earlier if intended stop has charger out of action, using app or in-car interface
Use in-car browser to search 'on the fly' for Superchargers [Tesla Model S]
Use in-car mapping and routing to chargers while en route [Tesla Model S]

2.3.2. Charging stops

2.3.2.1. Public slow charging

Park and leave car at slow public charging point, i.e. on-street, municipal car park

Park and leave car at slow public charging point at transport hub or connection, i.e. train station
Park and leave car at slow destination charger, i.e. at supermarket or retail centre, while shopping or doing routine household tasks
Park and leave car at slow charger at leisure destination i.e. National Trust property or RHS gardens, sports centre
Park and leave car at slow charger even if a charge isn't really needed, to take advantage of free electricity and/or parking
Park and leave car at slow charger even if a charge isn't really needed, to use handy parking space
Park and leave car at slow charger even if a charge isn't really needed, to show that public facilities are being used, or to increase visibility/awareness of electric vehicles
Park and leave car to charge at park-and-ride, continuing regular journey or commute by other means (i.e. foot, folding bicycle)

2.3.2.2. Private charging (usually slow)

Charge using installed equipment at house of friends/family
Charge using extension cable and domestic socket at house of friends/family, or similar
Charge at own workplace using installed car-charging equipment
Charge at reserved, private or restricted-access slow charging point, i.e. contract parking, private business car park
Charge using extension cable and standard 13amp socket at own workplace
Charge at other workplaces visited, i.e. for client meetings, using installed equipment
Charge using extension cable and standard socket when visiting clients or similar
Charge using installed equipment at private leisure destination (fixed location; i.e. golf club, gym, hotel)
Charge using extension cable and standard socket at private leisure destination (i.e. sailing club, riding stables)
Charge using auxiliary power source or generator at outdoors event or temporary work site (varied locations, i.e. music festivals, sports events, building sites)
Charge at campsites when on holiday or travelling cross-country, i.e. on long trips abroad
Charge at private facilities owned by strangers, found via open-source 'sharing app' or social media

2.3.2.3. Charging at public fast- or rapid-chargers

Decide to stop at rapid-charger even if not really needed, 'just to test it out'
Stop at fast- or rapid-charger on route, i.e. motorway services
Go out of way to fast- or rapid-charger in non-destination location i.e. business park, dockland
Use fast- or rapid-charger at destination i.e. IKEA, retail park, at arrival or prior to departure

2.3.3. While car is charging

Stay in car or leave only briefly, i.e. to get coffee or use toilet
Have coffee, snack or meal while car is charging
Take part in leisure activity, i.e. shopping, cinema, golf, gym
Take part in work-related activity, i.e. meeting, client visit, getting on with work in café or business lounge
Look at route and charging options for onward journey
Check phone app for any charging network/charger status updates
Check social media for any charging network/charger status updates
Check phone app to monitor charging progress, when desired level reached
Check Pebble, iWatch or similar to monitor charging
Pick up automatic email or alert via charging app when desired charging level is reached
Be conscious that other EV drivers may need charger, and check/look back regularly to see if anyone else is waiting
Use ChargeBump app to communicate with other EV drivers over charger access and needs
Move car on and repark if have enough charge to complete journey, if message received via ChargeBump that someone else needs charger
Leave note on windscreen with mobile number, in case anyone else needs to charge more urgently
Upload photo of charger and any useful information, i.e. on finding location or access, to open-source database or social media/web

2.4. Dynamic decisions and actions

Use public charger if 'caught short' or plans change and need unexpected top-up
Stop quite randomly on long leisure trips as and when spotting a charger, to keep car topped up
Stop earlier on route than actually needed, if/ in case later charging point is inoperable/inaccessible
If running lower on range than anticipated – or if traffic is bad - use park-and-ride and leave car charging
If running lower on range than anticipated but have sufficient energy to get home again, use park and ride but don't leave car charging
If running lower on range than anticipated, divert to nearby known charger
If running lower on range than expected, shorten journey, series of trips or defer errands
Drive very slowly (if safe to do so) to eke out final few miles of range if running lower than expected
Coast downhill to a charger or home, having run out of battery range!
Push car last few yards to a charger or into home/work driveway or parking space, having run out of charge
Call AA, RAC or similar for tow-truck ride home or to working charger

2.5. Public charger access and payment

Use RFID network card or tag to access charging point/pay for charging
Use network members' app to access charging point/pay for charging
Use PAYG app to access charging point/pay for charging
Make contactless debit card payment (latest equipment; from summer 2018)

2.6. Inoperable or inaccessible charging point

2.6.1. Issues arising

Find charger is out of action due to technical issue
Find charger has been deliberately damaged or vandalised
Find charger has not been reset or previous charge 'ended' for new vehicle to start
Find charger is inaccessible outside of business hours
Find charger is blocked by ICE vehicle
Find charger is blocked by other fully-charged EV or PHEV left parked
Finding charger already in use and likely long wait/queue to access it
Find charger access is blocked or inaccessible due to other issue, i.e. supermarket delivery lorries unloading
Unable to find charging equipment at all at a location, i.e. if fitted in obscure position
Be unable to operate charger due to poor mobile reception for app
Be unable to operate charger due to not having right RFID card or tag (i.e. changed to different network operator since last usage)

2.6.2. In event of issues…

Call emergency helpline for remote technical support, i.e. 'unlocking' or resetting charger
Report issue to network provider or chargepoint operator via phone
Report issue to network provider or chargepoint operator via email
Notify network provider or chargepoint operator via social media
Wait in a queue for other working charger at same site
Decide whether range is sufficient to make it home
Decide whether to risk continuing journey to destination
Decide to try again on return journey instead, if sufficient charge to do so
Negotiate to have ICE cars moved for access to charger, i.e. requesting announcement in supermarket, requesting service station staff to repark their own cars, asking at nearby local businesses
Use motorway service road/request access to motorway service road to cross to charger at the other side of a motorway
Drive on to next motorway service station with a rapid-charger
Divert off motorway to another known charger in the area, i.e. at IKEA
Divert off motorway to another known charger, i.e. slow-charger in supermarket car park
Stop for lunch or coffee in a different place than planned, to use another rapid-charger
Divert to friends, family members or business associates nearby for top-up charge to complete onward journey or get home
Look for alternative charger using sat nav or in-car system
Look for alternative charger using Google Maps or smartphone browser
Look for alternative charger using chargepoint mapping app
Look for alternative private charging solution, i.e. using Plugshare app or similar, or via social media
Share news of technical issue via social media, i.e. using Twitter hashtag #ukcharge
Complain about or shame drivers blocking chargers, i.e. using Twitter hashtag #IvebeenICED
Contribute to real-time or crowdsourced updates on charger status
Call AA, RAC or other breakdown service provider for tow-truck ride home or to working charger

2.7. Further planned stops or routine habits

Plug in at public fast- or rapid-charger near work if going on somewhere else before going home
Stop for quick top-up at rapid-charger on way home if running low on range
Stop at rapid-charger on way home if going out again later or early next day

3. POST-JOURNEY

3.1. Recharging – back home

Plug car in to recharge straight away upon return
Plug car in to recharge later, charge to be activated via automatic timer
Plug car in to recharge later, charge to be activated via remote app
Check weather forecasts to decide when to recharge (i.e. to synch with solar panels or wind generation)
Look at weather apps to decide when to recharge
Plug car in to top up, but with a view to fully-recharging at (free) public charger later
Reset charge timer according to next day's plans
Reset charge levels (i.e. 80% or 100%) according to next day's plans
Leave car unplugged if sufficient range left for next day's planned usage

3.2. Recharging – no private facilities

Park at or near home, not charging
Park on-street at public charger
Park off-street at shared charging facility (i.e. within housing development)
Make additional trip later (i.e. after peak demand times) to fast- or rapid-charge, i.e. at nearby IKEA, Tesla Supercharger
Make additional trip later to find on-street slow-charger
Move and repark car again later once charged
Don't recharge post-journey, but plan to charge when setting out on next trip
Don't recharge post-journey, have sufficient range for next trip or to reach convenient charging facility i.e. at workplace or service station en route

3.3. Post-journey analysis

Check mileage travelled and consider battery range achieved
Think about range achieved and factors which may have affected it
Look at in-car stats on trip indicator to further understand driving efficiency
Regularly monitor battery health to check for cell degradation
Download journey data or check data-logger (i.e. for EVStatus, FleetKarma)
Upload data to EVStatus or other crowd-sourced project
Compare data (i.e. on range or energy efficiency) with other drivers via app i.e. Carwings, Leafspy (anonymous)
Input data (i.e. on range, energy efficiency or electricity costs) to own private spreadsheet, self-developed app or similar
Input and share data with other known drivers via GoogleDoc or similar
Input and share data with other known drivers via self-developed app
Make calculations i.e. cost comparison with ICE car, % of renewable energy used
Feed data into own app under development
Share and discuss data with other drivers via web forum or social media
Share and discuss other information, i.e. on charger status, handy observations from journey, with other drivers via web forum or social media
Note successful charging to open-source databases, i.e. OpenCharge Map, or social media/web forums

Share or upload other useful information, i.e. pictures to help find new charging points, to crowd-sourced resources, i.e. OpenCharge Map
Privately update friends and other EV users on new charging facilities spotted, charger status, i.e. via email, text
Feedback of information, observations to EV user group, association, campaign body
Feedback of information, observations to service provider, i.e. complain about malfunctioning charging points to network operator, blocked charging spaces to car park operator