Transition codesign for purposive road freight decarbonisation

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Three preconditions for rapid and radical road freight decarbonisation are identified by Churchman et al. (2023): techno-economically feasible options; a shared understanding of design choices requiring codesign; and a politically and socio-technically feasible codesign framework. This study considers the perspectives of actors and policymakers regarding these preconditions. The case of food deliveries to supermarkets in Great Britain (GB) is reviewed because of this segment's large freight volume, concentration of participants and socio-political prominence.

32 semi-structured interviews were conducted with 37 participants from three groups: industry participants (supermarkets, food manufacturers and logistics service providers); national, regional and local government and transport authorities; and industry institutions and experts. Structured interview data was captured using Jisc Online Surveys and analysed using Python. Unstructured interview data was captured from transcripts and coded in NVivo using grounded theory methods.

There was broad consensus that motive technology transition and/or mode shift to rail is necessary, however views on which specific solutions are techno-economically feasible varied substantially. c.40% of participants saw collaborative freight management as offering decarbonisation potential. Other categories of solution were generally seen as providing incremental rather than radical decarbonisation opportunity.

The study confirms the need for industry participants and policymakers to codesign certain key transition choices. Participants identified that while some decisions need to be made at a national level for all road freight, others need to be made at regional or local levels and/or for individual freight segments. Differing views emerged on whether decarbonisation should be government or market driven and whether it is possible to create a level playing field for smaller operators.

Churchman et al. (2023) identify 24 potentially important socio-technical and political codesign attributes from literature. This study confirms broad agreement on the importance of 11 of these. There are strongly differing views on 4 of the codesign attributes, suggesting potential sources of conflict, and mixed views on the importance of the other 9 attributes.

Key decarbonisation challenges identified are technology uncertainty and immaturity, lack of a clear direction or plan, lack of strategic infrastructure planning or funding, infrastructure chicken and egg, inconsistent incentives and policy, first mover disadvantage and up-front cost, and collaboration barriers.

A further finding is that, due to system and path dependencies, individual design choices cannot be considered in isolation, meaning a codesign pathway is required that defines the sequence and timing of key design decisions. Such a pathway would need to be specified based on a clear understanding of system dependencies and have the support of a critical mass of actors and policymakers. Pathway decisions would then need to be made in a way that achieves sufficient collective buy-in and is robust to scrutiny and challenge, particularly as there are likely to be winners and losers from each decision. This means that an effective

codesign framework incorporating processes, governance, and roles and responsibilities will be required. This will need to embed socio-technical and political codesign attributes and have mechanisms to manage likely codesign conflicts identified in this study.

From a research perspective, the original contribution of this paper is the integration of techno-economic and social science approaches to identify actionable insights for road freight decarbonisation. In terms of theoretical positioning, the study adopts a multi-perspective view that draws on both realist and co-productionist epistemologies. Structured and unstructured data analyses are combined to gain rich insight from interviews with a broad cross section of transition actors and experts. This approach may also be suited to other transitions where actors need to codesign the transition of complex systems.

From a practical perspective, the study confirms transition decisions that need to be codesigned by actors and policymakers and identifies the need for codesign pathways that reflect system and path dependencies. It also considers attributes required in a codesign framework for such an approach to be politically and socio-technically feasible.

Keywords

Road freight, decarbonisation, socio-technical, political, techno-economic, codesign

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