Investigating the Demand-side Solutions to Addressing Barriers in Energy Transitions: Study of Urban Societies in India

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Accelerating Technological Sustainability Transitions by Overcoming Adoption and Diffusion Barriers in Energy Transitions

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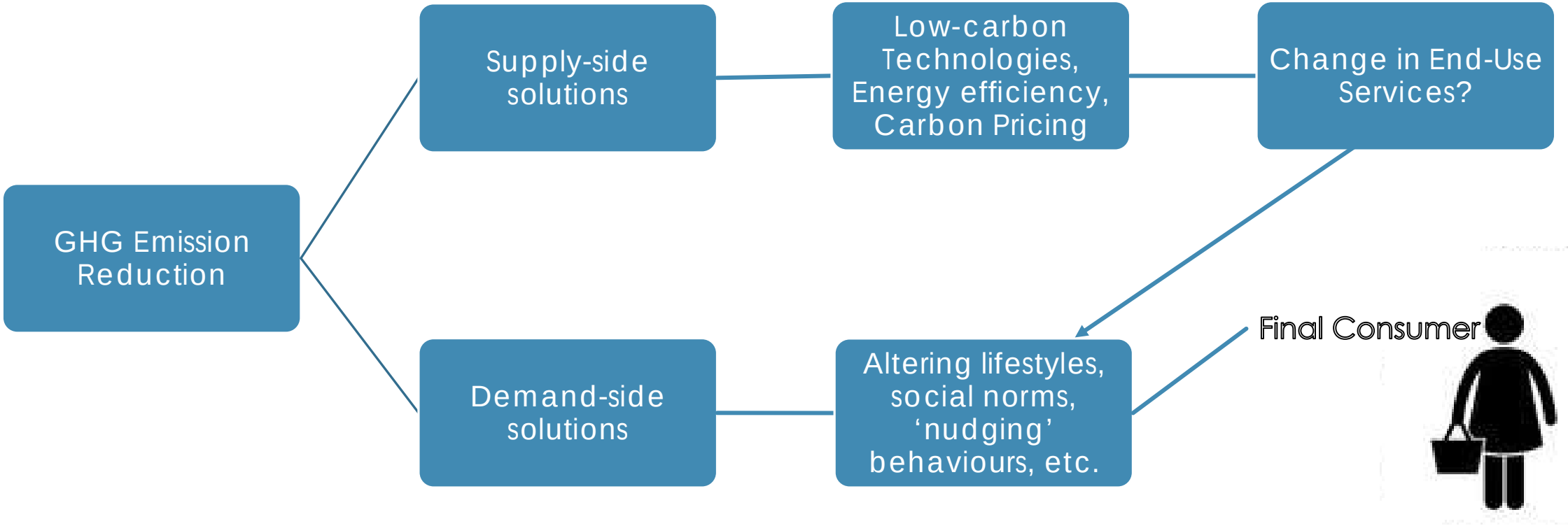
Supply solutions with a Demand focus



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Interplay of Demand-side factors

- Energy demand is driven by factors beyond income – energy ladder shortfall
- Choices between these alternative strategies to provide the same energy service are highly contextual
- Primary economic assumption – Consumer behave rationally, comes under doubt!
- Choice is a reflection of lifestyle and social practices and norms
- Risks and perception based decisions

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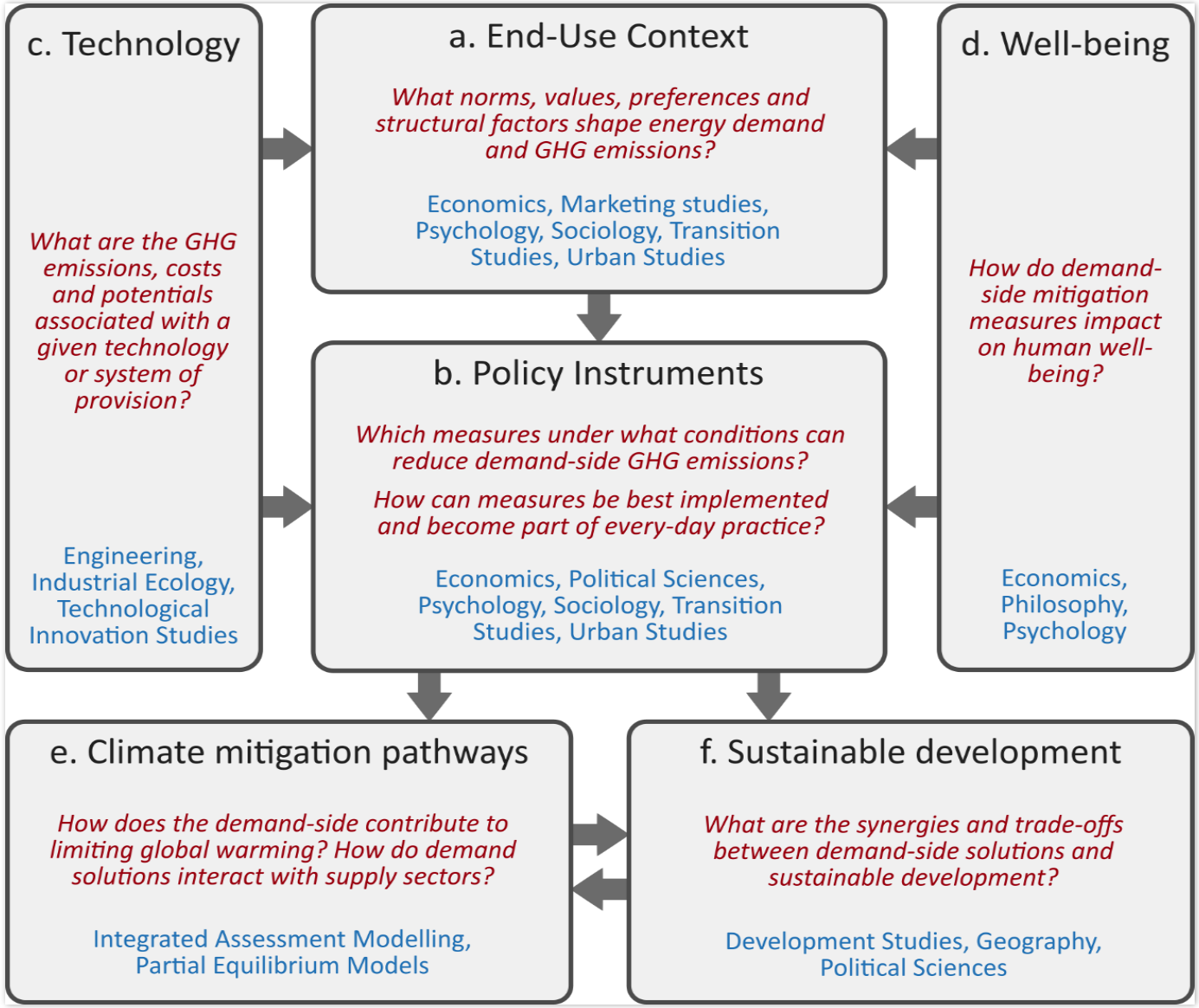

Creutzig et al. (2018) Nature Climate Change

Research Question

- How do non-economic factors such as lifestyle aspirations, social norms and wellbeing needs interact with end-use energy consumption patterns to inform(or inhibit) low-carbon energy choices?

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Why India?

Currently in a stage of rapid urbanization (33%) – cities have specific role in shaping GHG profiles

Relatively low urbanization level – high potential for influencing urbanization trajectory – before carbon lock-in

Diversity in household characteristics across India – interesting case study – explore cultural, social and political factors

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Sectoral Focus – End-use Energy Services

- Transport: Air and noise pollution, traffic congestion, and road accidents that plague urban centers has necessitated a shift away from car dependency
- Space Cooling: Rising summer temperatures, high humidity levels, increases in disposable income – contribute to growing cooling demand
  - Current share of Air conditioners (ACs) in Residential Sector is 5% - expected to rise with rising population
  - Before consumption choices are locked in – opportunity to shape towards low-carbon
- Cooking fuel use: Next step towards clean cooking in India with electricity-based cooking
  - Emission-free at point of consumption
  - Reduce import dependence on petroleum products
  - Make available LPG for distribution in Rural Areas

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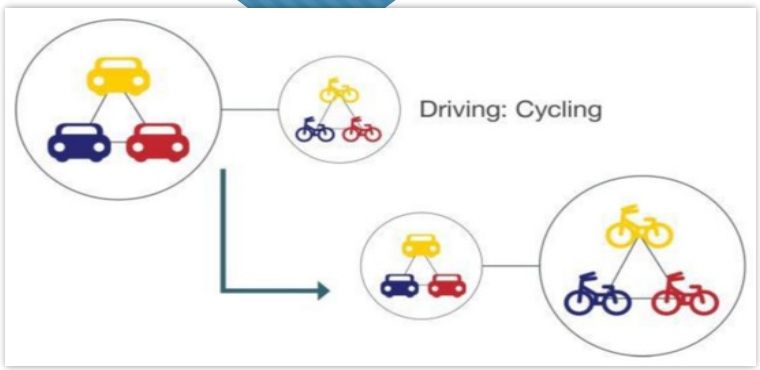
Cases of Energy Transition

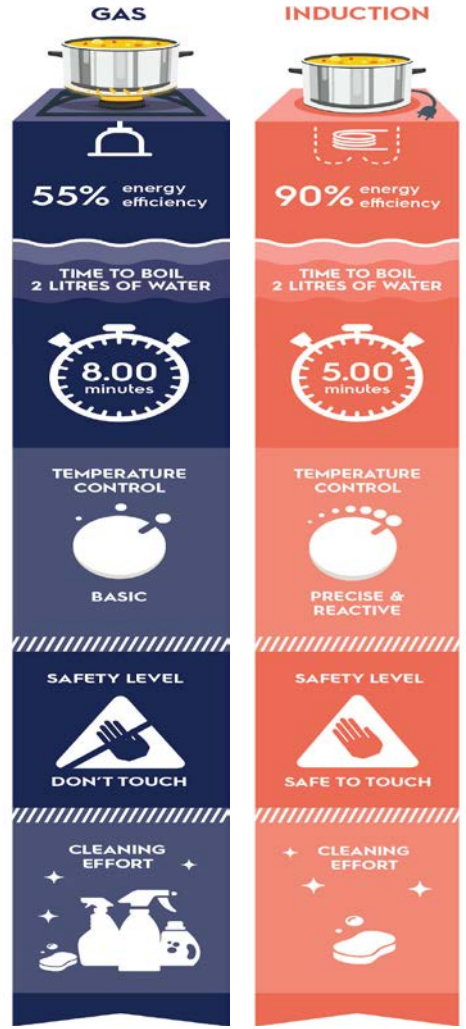


Source: Spurling et.al 2013

Mobility Transition

Space Cooling Transition

Source: Burea of Energy Efficiency, India; bijlibachao.com



Source: Electrolux.com

Cooking Fuel Transition

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Links between energy services, urban settings and wellbeing from a systems approach

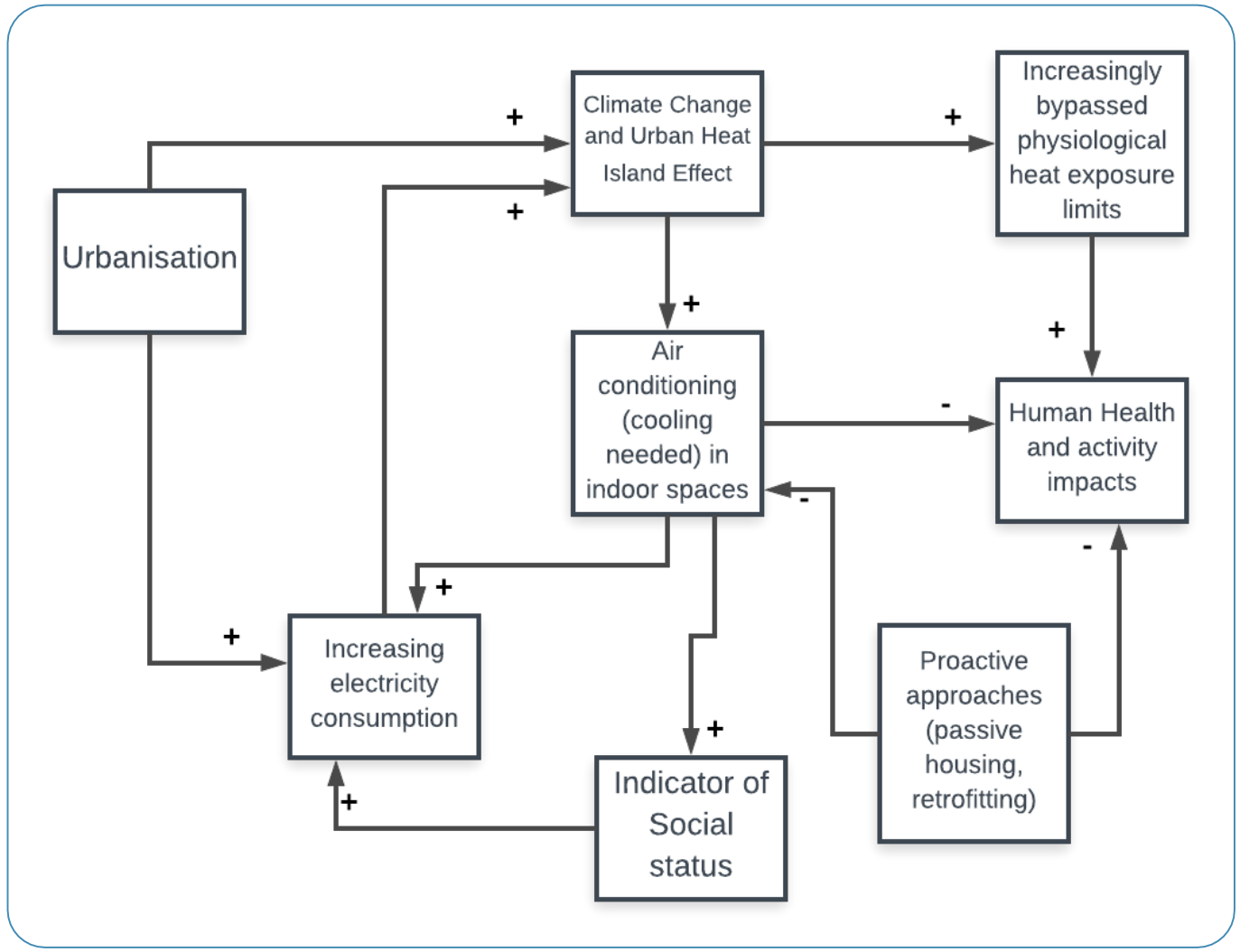
Feedback effects can fasten the carbon lock-in and are currently understudied

Grades of transition barriers:

- Financial (Cost of transition)

- Habitual and Psychological (Perceived cost and benefit)

- Social Practices (Bandwagon Effect)



Source: Adapted from Lundgren and Kjellstrom (2013)

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Analytical Framework

Transition **barriers** – also include **wellbeing** aspiration - limit **transition** pace

Low-carbon Energy Transition

Emission reduction – that satisfy **wellbeing** objectives - promote faster **transition**

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Consumption metrics

Demand focused on useful energy than energy consumed

Sectors and Criteria	Metrics to Measure
Transport Sector - Cars to Bicycle	
Reduced GHG emissions	Distance * No. of trips * Emission Factor * Asset ownership
Well-being - Access to transportation (+) - Better Health (+) - Safety (-) - More disposable income (+) - Travel Time (+) - Land rents (-)	 - Ownership of Asset - Car or Bicycle - Reduced mortality from air pollution, low risk from increased physical activity - Probability of accidents - Cost and O&M of (Car-Bicycle) + zero fuel cost + zero parking fee - Avoided congestion time - Monthly rental (city area – suburbs)
Qualitative criteria - Reduced personal comfort - High social standing from car ownership	

Next Steps...

- Compare - IHDS survey data with data from ethnographic surveys (existing literature on India)
- Identify existing data gaps in developing the **consumption metrics**
- Propose specific energy end-use demand trajectories and transition pathways

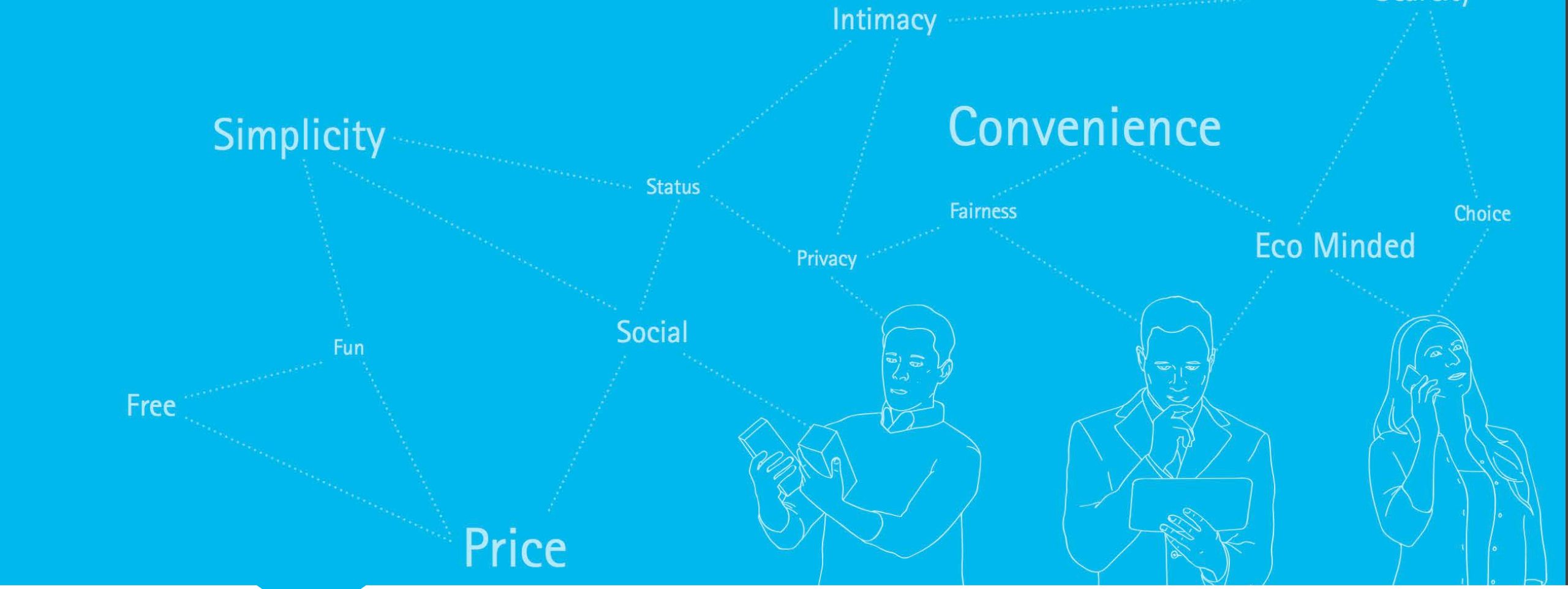

Photo Source: Accenture

Thank you for your attention