Industrial Marketing Management 122 (2024) 37–47

Contents lists available at ScienceDirect

Industrial Marketing Management

journal homepage: www.elsevier.com/locate/indmarman

Prospective market shaping: A discursive analysis of possible future autonomous vehicle markets

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ARTICLE INFO

Keywords:
Prospective market shaping
Visioning
Identity work
Future markets
Autonomous vehicles

ABSTRACT

Investigating innovation ecosystems during their early stages of development is critical when considering how these nascent activities shape future technological direction and markets. This paper prospectively investigates how actors in these ecosystems discursively construct future markets, particularly when the past cannot be considered indictive of the future, as is the case of disruptive technologies, such as autonomous vehicles. An interpretative research approach is followed with discourse analysis that focused on discursive activities undertaken by our participants. A framework of symbolic actions conducted by ecosystem actors contributes to our understanding of activities undertaken at the fuzzy front end of innovation ecosystem emergence. This framework focuses on activities conducted at micro, *meso* and macro levels as participants prospectively construct future markets. Our findings highlight that future possible value propositions are embedded within market visions as participants position themselves and outline their roles in such future markets.

1. Introduction

For many years, we have been hearing about the seemingly imminent arrival of autonomous vehicles (AVs), however they remain somewhere over the horizon, despite decades of proclamations and debate. According to the Society of Automotive Engineers' widely referenced AV classifications (0–5 Driving Automation Levels), where level 5 involves full automation on any road or conditions without human input, we are only seeing partial-automation levels 2 and 3 on the road today, due to technological limitations and legal restrictions (Harb, Stathopoulos, Shiftan, & Walker, 2021; Wang, Huang, Li, & Li, 2021). A wide range of visions are being debated, suggesting if or when, AVs will deliver positive societal benefits such as reduced road fatalities, equality in mobility and greater productivity; and/or negative externalities such as urban sprawl, declining physical activity or increased pollution and congestion from 'empty runs' (Fagnant & Kockelman, 2015; Martin, 2021; Sun, Olaru, Smith, Greaves, & Collins, 2017). Yet, this phase of market emergence is not just meaningless 'talk', it is fundamentally shaping the technology's direction and scope of integration into society. These discussions also reveal how managers are making sense and strategizing within the business ecosystem being transformed by the technology (Penttilä, Ravald, Dahl, & Björk, 2020). There is therefore a need to unpack the discourses around emergent technologies from an innovation ecosystem perspective to better understand the symbolic market shaping practices being employed (Pattinson, Nicholson, & Lindgreen, 2018). This paper focuses on how future AV markets are discursively constructed and claimed by stakeholders within innovation ecosystems.

Nascent innovation ecosystems are driven by future visions in what Kindström, Makkonen, and Kaartemo (2023) call the *fuzzy front end*, where market shaping processes are 'serendipitous, multilinear, uncoordinated and distributed' (p.57). Investigating future visions is important if we are to consider not just present market work but possible future market work (Hawa, Baker, & Plewa, 2020) and address critical societal issues where the past is not indicative of the future (Halinen, Nordberg-Davies, & Möller, 2023). Brown, Colville and Pye (2015, p. 272) argue that prospective sensemaking orientations are currently lacking, despite their potentially huge scope for 'contributing further to our understanding of how we make sense about the future'. To date, most market shaping studies (Hawa et al., 2020) and B2B network research more generally (Abrahamsen, Halinen, & Naudé, 2023), have taken a retrospective perspective rather than considering future aspirations (e.g. Halinen et al., 2023). Thus, this study contributes to the under researched area of prospective market shaping approaches

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https://doi.org/10.1016/j.indmarman.2024.08.003
Received 23 October 2023; Received in revised form 28 June 2024; Accepted 6 August 2024
Available online 13 August 2024

incorporating future market visions within the fuzzy front end of technological innovation.

We explore AV innovation ecosystems through incorporating various actors' visions, including those accessed from peripheral and emergent stakeholders (Schoemaker, Day, & Snyder, 2013) who, while not currently involved in economic transactions, can affect market shaping processes (Mele, Pels, & Storbacka, 2015). This stance reflects the need to look beyond 'some well-defined market actor driving the process' as has often been accentuated in market shaping research (Kindström et al., 2023, p. 51). As shown in related automotive industry contexts, actors throughout the ecosystem can engage in proactive identity work and strategic actions to 'alter their context via a transformative vision for themselves and the industry overall' (Jacobides, MacDuffie, & Tae, 2016, p. 1961). Similarly, Sprong, Driessen, Hillebrand, and Molner (2021) show how markets for Low Emission Vehicles were shaped by manufacturers' strategic decisions to challenge incumbents, manage complex ecosystem relationships with intermediaries and regulators, and achieve 'market legitimacy' (2021, p. 450). To reflect the high levels of uncertainty around market emergence in the AV context, our research captures identity work and future visions from diverse ecosystem members, anticipating diverse, ambiguous, and contested observations between actors (cf. Jasanoff, 2015b; Kindström et al., 2023). By broadening the scope of analysis, this paper addresses a recognized gap in the market shaping and B2B ecosystem literature which often lacks stakeholder perspectives beyond focal firms (Aarikka-Stenroos & Ritala, 2017; Nenonen, Storbacka, & Windahl, 2019).

In speaking about what they think the future AV market will look like and how it will impact their firm and industry, managers reveal insights into their anticipated strategic responses and where they seek to play in the impending market. We argue that key elements of market shaping in developing sectors can be analysed in terms of the multitudinous ways in which markets are signified and represented within different stakeholders' identity work and visions (cf. Nenonen et al., 2019). Specifically, our research question considers: How do AV innovation ecosystem actors discursively construct and claim future markets? This study offers an interpretive mapping of AV innovation ecosystems actors' symbolic actions (Khanagha, Ansari, Paroutis, & Oviedo, 2022) via discourse analysis of participant interviews. To align with our stated focus, we purposefully sampled managers with direct involvement in AV strategy/policy from across the innovation ecosystem in two country contexts – the United Kingdom (UK) and Australia. We develop a framework of micro (individual), *meso* (network) and macro (ecosystem) level activities undertaken by managers when discursively interpreting their identity work and future visions. Thus, enabling us to better understand the strategic aspects in claiming future markets and recognize how multiple overlapping or contradictory perspectives can exist between and even within managerial visions.

2. Theoretical background

2.1. Innovation ecosystems

The business ecosystem concept is complex; used loosely and is interrelated and nested within overlapping perspectives such as market systems and fields (Aarikka-Stenroos & Ritala, 2017; Möller, Nenonen, & Storbacka, 2020; Pattinson, Nicholson, Ehret, Velu, & Ryan, 2023). Current research on innovation ecosystems focuses on more stabilized or existing systems such as Cisco's ecosystem (e.g. Khanagha et al., 2022), with further research in disruptive technologies and their innovation ecosystems required (Pattinson et al., 2023). This paper focuses on innovation ecosystems which are "characterised by innovation driven-goals and related uncertainties over value creation and capture" (Aarikka-Stenroos & Ritala, 2017, p.25), given that current actors within an AV ecosystem are focused on developing AV innovations within the transportation sector (Pattinson et al., 2023). From a B2B marketing perspective, innovation ecosystems could be considered precursors to commercial markets and therefore their activities are strategically relevant.

While innovation ecosystems are often described as firm-centric with a focal actor driving innovation (Aarikka-Stenroos & Ritala, 2017; Khurana & Dutta, 2021) our research doesn't privilege such actors' as per previous research (e.g. Baker & Nenonen, 2020; Cortez, Freytag, & Ingstrup, 2022; Taillard, Peters, Pels, & Mele, 2016), and instead follows conceptualizations of Möller et al. (2020) who describe an ecosystem's early development as consisting of open and loose relationship configurations with interdependencies leading to emergence. Given the early emergent and disruptive nature of the AV ecosystem, this paper involves a range of ecosystem actors to incorporate diverse and peripheral notions of AV futures (Mele et al., 2015; Thomas & Ritala, 2022). Such radical and disruptive innovation phases may be considered as latent (Khurana & Dutta, 2021); birth stage (Han, Zhou, Lowik, & de Weerd-Nederhof, 2022) or the fuzzy front end (Kindström et al., 2023) and often lacks ecosystem support (Aarikka-Stenroos & Ritala, 2017). As emerging ecosystems have less materially observable characteristics or processes than those that are more mature (Khanagha et al., 2022), a more nuanced approach is needed (Hannigan, Briggs, Valadao, Seidel, & Jennings, 2022) thus, aligning with our prospective approach focusing on visioning and identity work. Pattinson et al. (2023) further emphasizes the lack of research on ecosystem origins and the importance of understanding early activities and processes that may lead to innovation emergence.

2.2. Visioning in innovation ecosystems

Within nascent innovation ecosystems, storytelling and future oriented narratives are important sense-giving tools allowing "actors' the ability to perceive interpret and construct meaning" (Beckert & Bronk, 2019; Brown et al., 2015; Garud, Schildt, & Lant, 2014; Möller, 2010, p. 364; Möller et al., 2020; Nenonen et al., 2019). In established B2B markets such as automotive or transportation, managers may be relatively familiar with their immediate ecosystem and the estimated impacts of incremental innovation. This understanding may not be as relevant for more radical or disruptive innovation such as the case with AVs, which may develop into ecosystems which bear little resemblance to existing structures and processes. Given the uncertainty around future market emergence and organizational preferences to "see around the corner" (Möller et al., 2020, p. 8381) there is a need to interpret how diverse actors "visualize and imagine uncertain futures" (Beckert & Bronk, 2019, p. 16; Meyer, 2019). This aligns with the view that some firms seek to develop 'blue ocean strategies' to capture new demand away from competitive constraints (Kim & Mauborgne, 2014). Therefore, our approach augments the retrospective temporal perspective found in previous research (Garud et al., 2014; Hawa et al., 2020), through focusing on prospective sense-making perspectives that include visioning (Brown et al., 2015).

It is important to gain a sense of how diverse network actors wage what might be termed 'the battle of ideas', or 're-framing contests', over their sector's future (cf. Dowling & McGuirk, 2022; Jacobides et al., 2016) particularly when exploring the early phases of ecosystem emergence (Möller et al., 2020). Outcomes from these re-framing contests are shared visions, considered key components of ecosystems (Han et al., 2022). For example. Cortez et al. (2022) illustrate that a consensual shared vision is necessary when developing an ecosystem brand. During these early stages of ecosystem development actors communicate visions through interactive processes of compromising and competing so visions become continually re-imagined and shared resulting in further alignment during ongoing visioning processes (Cortez et al., 2022; Han et al., 2022; Jasanoff, 2015a; Kindström et al., 2023). Shared visions allow ecosystem actors to aim for common goals and align their processes to achieve future value propositions, yet there is a lack of research focused on how these visioning processes emerge (Pattinson et al., 2023). This paper investigates visioning processes

during early emergent stages.

Drawing on notions of socio-technical imaginaries (Jasanoff, 2015a; Longhurst & Chilvers, 2019), visioning (Autio & Thomas, 2014; Möller, 2010; Schepis, Purchase, & Ellis, 2014) and storytelling (Garud et al., 2014) this paper incorporates the importance of future narratives as essential for setting future expectations even among those who may doubt such narratives (Konrad, Markard, Ruef, & Truffer, 2012). Future orientated narratives are crucial for shaping future expectations and the dynamics of actor interactions (Autio & Thomas, 2014; Beckert & Bronk, 2019; Konrad, Markard, Ruef, & Truffer, 2012; Jasanoff, 2015a; Flaig, Kindström, & Ottosson, 2021). Yet, these future narratives may not prevail unless they are 'appeal[ing], believable and worth attaining, even through immense struggle and sacrifice' (Jasanoff, 2015b, p. 330). To achieve this, ecosystem actors need to make technology appear comprehensible, plausible, and attractive, when overcoming uncertainties in both technological feasibility and possible future value creation (Möller et al., 2020). While no actor can control possible future narratives, such narratives are important for coordinating actors along innovation trajectories (during the early phases there can be multiple trajectories); influencing institutional forces; and achieving technological legitimacy (Konrad et al., 2012; Beckert & Bronk, 2019; Flaig et al., 2021). While Möller (2010, p.364) highlights that visioning outlines 'the construction of future' and 'is always present' such processes often embed possible future opportunities and value (Laari-Salmela, Mainela, & Puhakka, 2015). Thus, visioning can be viewed as a cognitive process and a core aspect of strategizing (Abrahamsen et al., 2023) even though future visions during the early stages of ecosystem development can be diverse and contradictory (Kindström et al., 2023). Therefore, investigating both consistent and contested visions is important for understanding how ecosystems may evolve (Mutter, 2021).

2.3. Identity work in innovation ecosystems

Underlying the visions being communicated, actors are constructing their identity by indicating how they can add value and the symbolic actions they expect to undertake to achieve their vision, thus, highlighting the importance of considering activities leading to ecosystem emergence (Ellis & Hopkinson, 2020). Given the diversity in how future markets are signified and represented (Mele et al., 2015) consideration of how actors' construct their possible future identities and position themselves relative to other ecosystem actors needs investigation. Such positioning narratives depend on the credibility of the identities constructed; the ability to communicate an attractive development agenda and possible future value creation and capture (Khurana & Dutta, 2021; Möller, 2010).

Actor identity work is influenced by an actors' network position and involves both how they portray their own identity and evaluate other network actors (Ellis & Hopkinson, 2020; Huemer, Håkansson, & Prenkert, 2009). Khanagha et al. (2022) investigating a platform ecosystem, highlight the importance of both material and social components within positioning and re-positioning processes of identity work, particularly when communicating possible future value propositions. They highlight that "stories, analogies, labels and novel concepts" are important for developing distinctive value offerings that strengthen their identity within the ecosystem (ibid, p.498). Actor narratives "argue persuasively for a 'landscape' of next possible actions, upon which the 'positions' of all those who must take part are clear" (Ellis, Rod, Beal, & Lindsay, 2012; Shotter, 1993, p. 157). While visioning may highlight next possible actions, the landscape of ecosystem early development is not necessarily clear, yet, identifying and evaluating other network actors is important for future market shaping processes (Kindström et al., 2023). Therefore, further research is required into actor identity work within early development ecosystems, particularly in relation to developing value propositions via positioning and re-positioning strategies.

While ecosystem actors undertake identity work they may have mutually reinforcing narratives (Araujo & Harrison, 2002) leading to ecosystem identity work (Cortez et al., 2022; Thomas & Ritala, 2022). Similar concepts include collective market work (Baker & Nenonen, 2020); network identity (Huemer et al., 2009); and ecosystem brand (Cortez et al., 2022). Ecosystem identity work and market work are similar in that actors: undertake similar activities (e.g. developing vision; building relationships/ coalitions); encompass multiple organizing actors; are nested within social, economic, political and technological systems; and are ongoing processes of emergence and stabilization (Flaig et al., 2021; Möller et al., 2020). While, both concepts highlight the contestation and conflict of activities across multiple actors, this paper takes a prospective orientation in that participants are considering future possibilities, similar to futures research (e.g. Meyer, 2019), rather than retrospective perspectives of prior visions and activities (Baker & Nenonen, 2020; Flaig et al., 2021).

3. Methodology

3.1. Empirical context

The choice of the AV market was driven by the expected disruption to existing automotive and transportation sectors, such as changes to vehicle ownership models; public service provision; B2B supply chain relationships and urban planning (Fagnant & Kockelman, 2015; Sun et al., 2017). While powerful OEMs have historically played critical roles in transforming industry structure (Jacobides et al., 2016), the digital and connected nature of AVs opens up potential for new entrants, such as tech firms, to upend traditional industry dynamics. As a radical innovation with far reaching impact in areas such as public mobility, insurance and law enforcement, the AV ecosystem engages with government and complementary service-providers to ensure that institutional obstacles to product testing and use, can be overcome (Docherty, Marsden, & Anable, 2018). Given the broad potential of AV technology across different industries, we limited our focus to AV use in public contexts.

Given international AV innovation ecosystems vary in scale and development, we purposely selected two revelatory contexts of market emergence as our research settings (Yin, 2003): UK and Australia. These markets have important similarities and differences relating to AV development and policy approaches, enabling us to capture a diverse range of managerial visions to analyse. With a connected history, these countries are both English-speaking, advanced economies, with similar governance and legal systems, which facilitated comparison. From an AV perspective, the UK rates higher on overall preparedness for the technology (KPMG, 2020), has a larger and more active automobile sector, and has invested more in AV innovation with an aim of becoming a global leader (Department for Business, Energy, & Industrial Strategy, 2021). In contrast, Australia also has AV-related strategies across different levels of government but is emphasizing the deployment/ implementation of AV technology to support its large service sector (Schepis, Purchase, Olaru, Smith, & Ellis, 2023). Rather than engaging in context comparisons, the dual research settings enable us to explore diverse participant perspectives across innovation ecosystems.

3.2. Research design

Our research focused on capturing managers' AV future visions which allowed us to investigate the symbolic actions performed by multiple stakeholders in AV ecosystems (cf. Khanagha et al., 2022; Reypens, Lievens, & Blazevic, 2021). This entailed using an interpretative research approach where data collection mainly consisted of participant interviews, with the unit of analysis focused on the individual level. We align our analysis of identity work with the 'identities in networks' perspective (Huemer et al., 2009 p. 56), which considers how identity is used to communicate actor orientations and competencies relative to others in their network. This broader perspective of identity is suited to our context, given that it recognizes the social role of identity

work, which managers also apply to organizational and network levels (Ellis & Hopkinson, 2020; Schepis et al., 2014). We also embrace the closely related ecosystem concept due to its emphasis on the evolution of networks of interconnected actors (Pattinson et al., 2023;). To enhance the credibility of our data, we triangulated participant views with documents, internet-based data and observations at industry events, as noted below (Maxwell, 1996).

Our sampling process commenced by compiling a list of ecosystem stakeholders via our reading of AV-related reports, press releases, white papers and websites of private and public sector organizations active in AV innovation in both country contexts, as well as attendance at two industry events (a trade show and seminar). These insights revealed the range of organizational categories (e.g. industry, government, research) considered relevant or influential in the AV innovation context. We identified specific organizations to contact and reached out to managers in senior positions directly engaged in AV innovation for their respective organizations. We then used snowball sampling when participants suggested different members of the ecosystem, resulting in a diverse breadth of stakeholder organizations (cf. Mele et al., 2015) as indicated in Table 1.

A total of 34 semi-structured face-to-face and online interviews were conducted, all following the same semi-structured interview protocol and lasting an average of 50 min. The interviews began by asking participants to reflect on what AV technology would mean for their own organizations, before considering the potential benefits and risks of AVs more widely. They were then asked to describe their views on the most attractive and likely future visions for the development of AV technology. We invited participants to talk about the critical actions that they felt must occur for their visions to be realized, leading to a discussion on who they considered the most important stakeholders and how they perceived these actors' roles within the ecosystem.

Table 1
List of participants & stakeholder organizations.

Participant	Role	Organization Type
	UK	
UK1	Head of Strategy, Programme & Comms	Government Dept
UK2	Associate Professor, Transport	University
UK3	Programme Manager, Smart Cities & IoT	Industry Trade Association
UK4	Head of Technology Trends	Research Centre
UK5	Senior Technology & Innovation Manager	Industry Trade Body
UK6	Secretary General	Industry Trade Association
UK7	Professor, Computer Vision & Image Processing	University
UK8	Research Economist	Local Governance Institute
UK9	Partner, Travel & Logistics	Innovation Consultancy
UK10	Managing Director	Electric Vehicle Consultancy
UK11	Strategic Traffic Manager	County Council
UK12	Lead Engineer, Vehicle Sensing	Car Manufacturer
UK13	Director of Insurance Research	Research Institute
UK14	Superintendent	National Policing College
UK15	VP Vehicle Automation	Car Manufacturer
	Australia	
Aus1	Research Fellow	Research centre
Aus2	Director/Autonomy Lead	Consultancy/Mining Company
Aus3	Community Member	Car Owners Club
Aus4	Professor - Transport	University
Aus5	Director	State Department of Transport
Aus6	Chair	State Disability Council
Aus7	Project Manager- Automated Vehicle Reforms	State Department of Transport
Aus8	Assistant Transport Planner	State Department of Transport
Aus9	Managing Director	AV Consultancy
Aus10	Policy Manager – Transport and Roads	Local Government Association
Aus11	President – Research & Strategy	Innovation Consultancy
Aus12	President - Operations	Innovation Consultancy
Aus13	CEO/ Director	AV Manufacturer
Aus14	Policy Manager	Industry body
Aus15	Academic – Transport engineering	University
Aus16	Policy Manager	State Government Development body
Aus17	Policy Manager	State Infrastructure body
Aus18	Professor – Travel Behaviour	University
Aus19	Head Engineer	AV Manufacturer

3.3. Approach to data analysis

We pursued a two-stage approach to data analysis, with an aim to consider broad patterns across our data, before thoroughly examining the discursive practices of specific participants. Thematic analysis was conducted in the first stage, following Gioia, Corley, and Hamilton (2013) approach to coding. This involved line-by-line coding of interview transcripts to identify 1st order concepts based on participant language, followed by 2nd order themes which began to categorize concepts into data patterns drawing on the extant literature, and finally aggregate dimensions. Initial analysis resulted in numerous codes, 1st order concepts were categorized based on the research focus (future possible markets/ visions as discursively constructed via stakeholders and their activities to construct such markets/ visions). Coding structure including exemplar quotations and interpretation is given in the data supplementary. In line with similar approaches (e.g. Nenonen et al., 2019), we employed the constant comparison method at the first and second steps, while the final aggregate dimensions were related to each other. During the constant comparison method of categorizing concepts to themes and the reading from the literature it was noticed that the 2nd order themes were aligning with levels such as undertaking activities to develop possible future individual organizational identities in relation to AV(micro); activities conducted within dyads or networks (*meso*) and perceptions of broader future AV market (macro). The final coding structure shows how each analytical step relates to each other and reveals the three levels (macro, meso and micro) which were identified, as shown in Fig. 1.

Discourse analysis was utilized at the second stage to develop an understanding of how these 2nd order themes were employed via various linguistics forms such as metaphors, grammatical constructions and argumentative patterns (cf. Ellis et al., 2012). This discourse analysis approach is rare in B2B research, however, is also recognized as offering new opportunities to understanding concepts from a deeper or alternative perspective (Kohtamäki & Rajala, 2016). For initial analysis, a subsample of eight interviews were selected representing the broadest range of participant types (i.e. UK6/UK7/UK13/UK14/UK15/ Aus2/ Aus7/Aus13 – see Table 2). Selective coding was used to relate the emergent discursive categories to the themes identified in the initial stage and map stakeholders' social constructions. All three authors did the coding in parallel, facilitating constant comparison of our interpretations. Checks were undertaken on selected transcripts to monitor levels of inter-coder agreement (Saldaña, 2015); these were found to be high at 90–95% similarity. QRS*Nvivo software was utilized to store and display data and coding structures. Following the detailed analysis of the subsample, the broader dataset was analysed to identify similar discursive practices occurring in other transcripts, see data supplementary for further detail. To demonstrate the representativeness of these findings across the whole sample, the selected quotes in the coding structure table (data supplementary) are taken from the remaining interviews. To provide sufficient depth in this paper we necessarily confine our presentation to the talk of a subset of eight stakeholders, thereby aligning with other discourse analysis studies in B2B contexts, which utilize detailed segments of data to represent their findings (Ellis et al., 2012; Nilsson, 2019). Data analysis output includes a framework of symbolic actions that emerged from participant discourse.

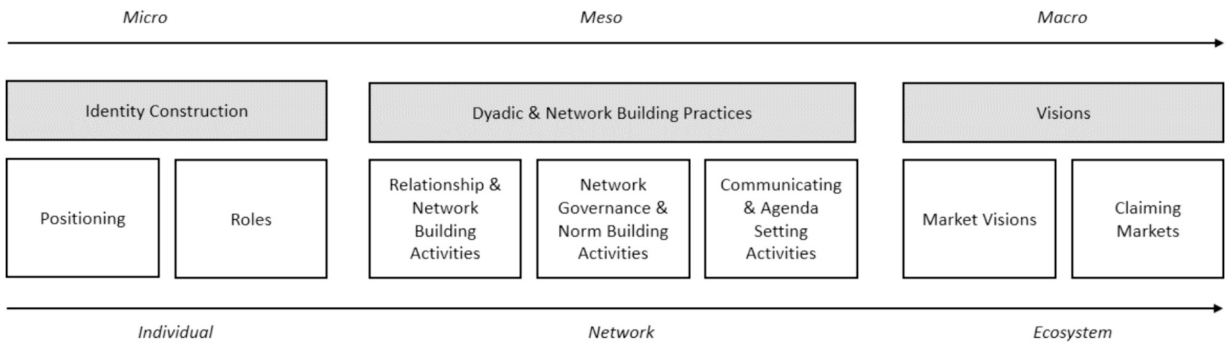

Fig. 1. Framework of Symbolic Actions.

4. Findings

In line with our framework depicted in Fig. 1, we expand on the discursive construction of future claimed markets at each level: micro, meso and macro.

4.1. Identity work

AVs are expected to disrupt current automobile and transport markets, consequentially changing participating actor roles, including their own. Participants focus on the changing roles of "*government*", "*suppliers*", "*OEMs*" and the entry of new technology-focused actors. New entrants include supply chain participants with new technological capabilities such as light detection and ranging (LIDAR). In relation to AV shuttle buses Aus13 described how they are disrupting traditional supply chains through incorporating new technological approaches (i.e. 3D printing) and consequently supply chain partners (New Zealand company built the base). Thus, changing conceptualizations of how future transportation vehicles may develop, while also constructing their own identity as an AV manufacturer

"*Not only were we intending to manufacture but we have started manufacturing … it was a vehicle that was 3D printed, at least the shell of it was … by a company in Shenzhen in China. The base of the vehicle was built by a company in New Zealand and the electronics and everything that make it work was built by our company*" (Aus13).

While new entrants are disrupting existing actor perceptions, UK7 indicated that possible future large technologically focused new entrants, while not yet participating, are evaluating how they could participate in this future market.

"*but there's people, so then you can see all this going on and you're sitting on the sidelines and you're Samsung or one of these other big tech giants, Hitachi, all right, I want a bit of that*" (UK7).

Many participants discussed the role of government, as an important in AV innovation ecosystem development. A UK example of how the material perspective, '*advice of technologists*', is leading policy development while the social perspective, '*human behaviour experts and economists*', is not strongly incorporated. Consequently, resulting in technology lead policy, not previously used and which could result in opening unknown outcomes.

"*I think it's quite rare for UK Government policy to be technology led so this will be one of the rare examples where it was, so it may be interesting to see how it pans out*" (UK6).

Narratives focusing on participant self-positioning and positioning relative to others drew on actor capabilities', particularly in relation to new disruptive technologies required for AVs. For example AUS13, a new entrant, self-positioned themselves as having the capabilities to build their own automated driving system entity, which they considered would give them a manufacturing advantage within their future (regional) market.

"*we had certain electronic capabilities that could enable us to build our own autonomous drive system, and we felt that there was a lack of that capability in this sector in this part of the world"* (AUS13).

Others perceived existing suppliers as needing to re-position themselves relative to emerging technological requirements as described below:

"*Bosch who make a lot of our vehicle components at the moment are really positioning themselves very, very well as the camera manufacturer*" (UK7).

"It's not the same, it's not always the Bosch of the worlds, they have the best solution when it comes to autonomous solutions" (UK15).

UK7 and UK15 describe an exemplar repositioning strategy from Bosch in relation to new requirement for sensor technology and solutions and that "*certain dominant players, they will be 'Bosched' aside*"(UK7) as they will not competitive in this new market. Thus, highlighting while technology is changing and actors are "*vying for this market*" (UK7) existing suppliers need to focus on technology renewal and development capabilities.

4.2. Dyadic and network building practices

Discursive narratives considering dyadic practices focused on relationship and network building activities; communication and agenda setting; and network governance and norm building. Given the nascent AV innovation ecosystem the above codes align with previous conceptualizations of open and loose relationships where interpreting others imagined uncertain futures is important (Beckert & Bronk, 2019; Jasanoff, 2015b; Meyer, 2019; Möller et al., 2020).

Relationship and network building activities involve developing collaborations to access necessary capabilities and consider different business models for the future. AUS13 described creating a relationship to access world-class cyber-security capabilities. Therefore, envisioning cyber-security as critically important and actively accessing these capabilities.

"*we have created a relationship with an Israeli company which is Hungarian owned, they're very, very good at cyber security. We found the Israelis to be good at security full stop, so we're intending to introduce that particular cyber security module into our vehicle*" (AUS13).

Network building activities tend to focus on future possible business models and accessing capabilities to implement these models. UK15 described future solutions where their "*customer may become their competitor*" they need to develop a network of partnerships with the vehicle (their input) as one component. Thus, indicating awareness of potential future changes to network structure and a need to pre-empt the approaches of others in the ecosystem. Lack of capabilities in areas such as: changing infrastructure; IT solutions; and resource access to new technology; need to be accessed through numerous partnerships if they are going to participate in an AV future.

"In order to offer that full solution, you can't do it alone, … automated vehicle as a kind of, as an enabler or subcomponent, for that full scope, it would be foolish to believe that you could do that alone, and therefore you need a lot of partnership" (UK15).

Government participants are active in facilitating network

Table 2
Examples of talk illustrating symbolic actions and visions in prospective market shaping.

Participant	Identity construction		Dyadic and Network Building Practices			Markets	
	Positioning	Roles	Relationship and Network Building	Network Governance and Norm Building	Communicating and Agenda Setting	Market Visions	Claiming Markets
UK6 – Secretary General, Industry Trade Association	Positioning relative to society: *it's not technology for its own sake..*[it is] *about society and all those things*	Future Industry Role of UK: *we make cars here.. I'm sure we'll carry on doing that, but the R&D ..is all done elsewhere*	UK Industry Internationally Connected: *whole CAV thing is now different … UK only projects, financed by Innovate UK… same people are usually also in European projects. Quite well connected.*	Enforcement of AV maintenance: *different enforcement, enforcement around people doing their downloads and doing their updates like they're supposed to*	Lack of communication: *no one talks about this* [costs], *it's* [not] *been resolved, that's because the conversation is being had by technologists and transport specialists and they are not used to costing anything*	Vision around expected legislative change: *it's really hard to see a British Government actually making it illegal to have a driver car, as opposed to a driverless one, but that's a hard one to picture*	Market Actors claiming high status image: *"just going to be the Ferrari over the next few decades … something that you ride around in showing what a high status individual you are*"
UK7 – University technology designer	Comparing Market Entry: *they* [manufacturers'] *will be the last into this market because they're driver's cars*	Evocative terms to describe roles*:* Suppliers being '*squeezed out'* or'*Bosched*' by others'.	(De)constructing networks*:* Newer companies having '*disruptor*' roles and making '*big changes'* to the network.	Market agency re: accepting norms: *markets willing to accept* conditions and set standards for how AVs handle *crucial edge case[s] of safety*	Communicating with the public: "*that image …that ended up on the front page of the National Program, so hey, we did well in terms of publicity"*	Social outcome of tech development: AVs claimed to offer '*societal benefits'*, including '*mobility*' '*enabled*' by new technology.	Claiming differences in the autonomy market: *"[Company X] products, that market is very different from [Company Y], .. not really overlapping .. everybody accepts that"*
UK13 – Director of Insurance Research	Positioning relative to major stakeholders: *strange position we are a kind of technical go-between.. insurers and vehicle manufacturers, and those two have to coexist*	Role in relation to the safety narrative: *understand where those [*AV] *trends are, influence* [members] *to keep people safe*	Constructing relationships with members: Relationships build through working on "*quite a few funded projects that many of our insurer members are involved with"*	Constructing standards: "*We know what manufacturers are going to be doing in five years because we kind of tell them what to do"*	Communicating with stakeholders: "*go-between between the insurers and the vehicle manufacturers… we act as a sort of conduit to try and help both parties understand their perspectives"*	Constructing a vision of mixed traffic: "*[AV] vehicles.. work on rules and logic and they're either going to be very frustrating for other road users, or people will just take advantage of them, ..just take the mickey"*	Claiming vulnerability of the AV market: "*unless you've got a very good strong customer proposition .. you could end up killing it stone dead*"
UK14 – Constabulary	Positioning Role within the broader context: *Policing is just one part of the system*	Role in relation to the safety narrative:*.. we lose about 90 people a year*	Building relationships focused on ethics: *Solving ethical issues will involve* [relationship building with] *home office and engagement with the manufacturers*	Constructing a compliance narrative: *.Fully automated is a game changer* [for anticipated compliance processes of policing]	Satirical take on possible future media communication: *mixed fleet environment ..* [car] *through human error, collides with an autonomous vehicle and still creates fatality or serious injury, well you can see the debate playing out can't you?*	Constructing a position for 'human' agents: *what we do is obsolete. It takes away the very concept of being a driver*	Claiming a market for future others: "*we're part of the future of the market, but actually our children are the prime market aren't they*"
UK15 – Traditional car manufacturer	Claiming future repositioning: *first of all you're competing with your current customers*	Moving beyond mere talk to construct identity*:* Firm '*putting our money where our mouth is'* by creating '*separate company'* for B2B AVs.	Communication activity: '*Dialogues*' claimed to be taking place between firm and trade bodies on (B2B) '*driver employment*'	Constructing a safety governance narrative*:* Car manufacturers '*building a safety framework*' as they '*can't rely on the government to come in and say okay, we have approved your solution and hereby it is safe*'	Communicating trust: "*I think that there needs to be some other organization that comes in and really instils some kind of overall societal or governmental trust in these solutions"*	Complexity of visions: Debates occurring around realistic aspirations in visions "*In which direction should we go? Should we for example aim high for buses in cities? When do we believe that they will be automated*?	Claiming links between distinct AV markets: *breakthrough within autonomy .. in the commercial vehicle space first .. moving technology, from a pas car to a truck, has proven to be less of an obstacle than .. many industry observers thought initially"*
AUS2 – Director Autonomy Mining Company	Lack of Positioning of major players: [Australia] *haven't been influenced .. evident by the complete*	Role of Research to grow the network: *create research*	Relationship building between traditional competitors: *So they're joining*	Standardization of Rules: *some sort of system and rules based system to*	Communicating through political processes: *in Australia public transport is quite an*	Adding negative outcomes into future visions: *they're not the utopia that people*	Claiming shuttles as a "new" space in the transport market: "*Toyota signed with Uber to*

(*continued on next page*)

Table 2 (*continued*)

Participant	Identity construction		Dyadic and Network Building Practices			Markets	
	Positioning	Roles	Relationship and Network Building	Network Governance and Norm Building	Communicating and Agenda Setting	Market Visions	Claiming Markets
	lack of anything we've done in this space	*capability before industry.. and before governments will come along*	*forces so BMW and Mercedes is probably the best example of arch rivals forces in the automation game*	*manage that…* [traffic congestion]	*election issue .. it's usually in the top three*	*think .. likely to cause more issues than they're going to solve*	*make a shuttle in that space.. carry 15 people".*
AUS7 – State/Gov dept. project manager	Comparing influence relative to others: the *whole of Australia is a pretty small market.. I think we very much see ourselves as ..make sure that we're in line with international standards*	Claiming a navigator role*:* '*We've… mapped out all the policy deadlines … (and) when research bodies are getting to conclusions'.*	Constructing a 'network' & communication activity: Acknowledging existence of a '*big kind of network … that we need to bring up to speed'.*	Constructing an international governance narrative: *we're a signatory .. UN agreements ..so that would probably be the leading influence.*	Communicating a single government voice: "*we're kind of trying to work to get, to make sure the message is consistent across all of those agencies*"	Constructing a state vision for all departments*: "we're going to provide a framework.. it affects insurance. Registration licensing safety.. network of people*"	Giving agency to the market: *WA (Western Australia).. "let the market bring these products in"*
AUS13 – AV manufacturer	'Capabilities' identity*:* '*…certain electronic capabilities that could enable us*', noting '*lack of that capability*' in sector.	Role of drivers as chaperones: *what we call chaperones in the vehicles.*	Relational activity*:* Claim to have '*created a relationship'* with a '*world-class partner'.*	Requirement for standardization: *need to create .. uniform regulation and legislation first of all for autonomous vehicles, of whatever type they are*	Communicating through trials and experience: "*We've been doing trials which is great,.. Here's a vehicle, have a ride in it, see what you think, great"*	Constructing an ecosystem*: 'the vehicle needs to be part of a system, being its surrounding infrastructure… communication devices'* etc.	Claiming an open market: "*creating a fully open architecture modular type system, .. introduce improvements much more readily*"

governance through developing regulations and policy. Regulations were considered necessary to ensure all ecosystem actors work within a framework of accepted societal practices, however, these regulations needed to evolve with technological advancement. UK15 highlighted how they are working with various governmental agencies to build frameworks for future certification of customers AV use.

"*this won't be a self-certification free for all situation. The government has an incredibly important role to play in this space … to start building some kind of framework to share with authorities to kind of go from separate.. what we need is some kind of a virtual driver's license, at the end of the day and I don't think that we're there yet.. we are doing a lot of advising and education*" (UK15, emphasis added).

Within the Australian context, without a car manufacturing industry, AUS7 (below) indicated that Australia would be an importer of vehicles and "*we're definitely going to be a follower*". Therefore, uniform regulation that fits within an international framework and standardized across Australia will ensure global alignment to normative rules and requirements. This stance reflects a broad view of the innovation ecosystem due to Australia's perceived position as a technology acceptor.

"*there's very little clarity and part of the challenge too … the whole of Australia is a pretty small market for these cars, so I think we very much see ourselves … as we want to make sure that we're in line with international standards. So there's not actually a rush in that sense because they're waiting for the UN decisions and European and American policy decisions*" (AUS7).

Communicating through agenda setting focuses on planning towards achieving their imagined vision.

Aus7 indicates that various Australian government agencies are working towards "*a shared vision*" which will be "*mapping all policy deadlines… in a strategic outcomes document*". Such documents are aimed at not only setting an agenda for facilitating a future AV market, but also communicating their agenda to societal actors as to how they envision future possible scenarios.

Communicating through experiencing the technology, particularly in relation to consumers and/or the public is another process undertaken. UK13 highlighted the importance of communicating value and the limitations of early experiences as possibly limiting value generation perceptions.

"*unless people can see the value in this, they won't be bothered to use it, and from our perspective, the early systems are going to be so limited that there will be a limited uptake. It will be a novelty factor, but what people won't really see their quality of life changing*" (UK13).

Aus13 indicated how they overcame scepticism to improve public support by running trials and the importance of these trials for improving wider societal support. Consequently, communicating benefits and value by encouraging the public to experience what may have previously been unknown.

"*starting the trial there was a lot of scepticism, particularly in social media. By the time the trial was over the trial was intended to gauge the level of support by the users at La Trobe University. That report that came out indicated that the level of support for the autonomous vehicle was very high. The level of acceptance was very high*" (Aus13).

4.3. Ecosystem visions

Analysing visioning and expected future value generation illustrates where actors' might focus future activities to capture future expected value. Participant claimed visions of a possible future ecosystem focused on value generation and their relative position/ contribution towards generating value. Value perceptions focused on 3 main narratives: economic value; value to society and technological value and positioning.

The *economic narrative* focused on value generation by organizations and the importance of AV innovation for economic development. When considering commercial end users there is a "*clear business case [for] commercial where you have repetitive routes quite simple, you can start on one stretch of highway or within one factory and then kind of replicate that as the technology matures"* (UK15). Similarly, Aus2 also discussed "*freight on a highway is probably doable very shortly*". The impact of AVs on logistic processes, particularly freight transport, was considered positive from the perspective of lowering costs; asset utilization and ease of implementation such as using very low passenger traffic routes or dedicated lanes on major highways. Consequently, visions for freight and logistic commercial end users was complementary, indicating shared aspects of

value generation across diverse ecosystem actors.

In relation to end consumers (i.e. AV passenger cars) the economic narrative varied. For example: perceptions on the affordability of AVs in relation to overall value to society varied. Aus13 described as AVs become "*common place*" the "*pricing model will be much more affordable*", yet UK7, UK14 and Aus7 all indicated that overall cost will be too expensive for consumers in the future. In particular, UK14 focused on the implications of enforcement and insurance indicating that "*private ownership in the current environment and you're still trying to maintain a legal and insurance framework, I think it's really weedy, I think it's really difficult*", highlighting the expected changes to pricing resulting from legal/ enforcement implications. Thus, visions focusing on end consumers were contradictory with a lack of shared understanding of possible future value generation.

Participants highlighted country wide economic benefits for example UK13 indicated many countries will benefit: "*we're not alone; all countries … the societal benefits of automation but also the economic benefits for automation*". Aus7 also indicated that they are focusing on "*set[ting] the playing field that it works well for the productivity benefits*" expected for the state, implying future economic benefits from improvements in productivity across all industries.

While most of the discussion above focuses on positive economic value, others indicated possible development of negative economic value. For example, the "*very complicated*" transition of a mixed fleet (both AV and non-AV vehicles using the infrastructure simultaneously) could result in unpredictability for risk management (UK6); lack of scenario testing and development resulting in unknown consequences (UK13; UK15); and unknown transport issues emerging (Aus2; Aus7). Another example of tax issues was raised by Aus2 who highlights tensions will arise between "*government versus industry*" around how such economic value may or may not be generated, with "*US …they understand all these problems, …it's going to be more of an issue for them around tax than anything else, and that AVs are also going to have a tax implication around parking*" Thus, while negative economic value scenarios may emerge and are difficult to currently envision resulting in multiple yet not necessarily complementary nor competing or conflicting visions further emphasizing future uncertainty around possible negative value generation..

The *societal narrative* focused on the value proposition of reducing road accidents where "*safety is probably one of the key drivers of this entire process*" (Aus2). Other positive societal value propositions include: improved mobility for vulnerable groups (e.g. disabled; elderly; infirm) (UK6; UK7; Aus2); liveable cities through reduced congestion or parking requirements (Aus7; Aus13; UK7; UK14; Aus2); and reduced environmental impacts (UK14; UK15). One strong narrative was the importance of societal trust in AVs and the importance of "*building confidence*" (Aus13) for societal benefits to develop. Participants highlight the importance of developing trust through use cases or trails such as UK7 who highlights "*will we get to the point where we completely trust it? Yes I think we probably will. It will take a little bit of time. I think initial use cases*". Others highlighted how the 'mass media' can negate society's confidence through building society's expectations such that "*doing e-mails or whatever, or maybe watch some video when the car is driving along*" but that won't happen as "*we're advocating is, you will be limited to what you can do*" (UK13) thus, creating disappointment or to sensationalizing coverage of "*a fateful accident, because they get sort of disproportional*" to build consumer paranoia (Aus7). Overall, while agreement around the importance of building trust to provide future value to society was important, there was uncertainty and lack of consensus on whether and how trust building will have a positive trajectory.

While the above value propositions are positive, participants also indicated that these future value propositions may not emerge often due to uncertainties in future developments. For example, UK15 highlighted that while the technology will improve safety in the majority of cases, there are "*edge cases*" that will still require driver experience, and further technological improvements. Similarly, UK14 contradicted themself by indicating that this future utopia will "*be good in the end, but there's a lot of pain to get through before we get to that end point*". These contradictions highlight the perceived uncertainty around future scenarios and the negative value generation in trying to reach the positive end game.

Visioning around *technological narratives* highlighted different perceptions on current technological developments relative to AV and uncertainty around future technological trajectories. In relation to current technological perceptions UK13 describes how "*manufacturers will overpromise, and we've seen that with people like Tesla*" such that consumers think that "*I can do what I like with my Tesla*" and that Tesla are "*effectively selling you a false promise*", discrediting Tesla's temporal visions while highlighting their vision as more credible. Aus2 discusses how in relation to AI decision-making that current "*AI can't do that, and it could be years away before we can get to that level of sophistication*", with the emphasis on years away indicating more of a longer-term projection. Aus7 also indicates that the while AVs can solve problems "*you have to have the technology there first*", and that an expected technological threshold is required. Such a technological threshold will vary across actors, with regulatory actors, Aus7, narrating longer-term scenarios before AVs are more likely to be used on public roads.

In relation to future technological development a process of what we call technology road mapping was undertaken where participants drew on the commonly used 6 levels to AV development narrative (refer) where level 5 is perceived as the "*all singing all dancing*" (UK7) step for full autonomy. Though, within the constructed maps the transition stage was perceived as a difficult step, where "*there's a lot of pain to go through in the mixed rounds before you get to the utopian position*" (UK14) with the utopian position being only Level 5 AV traffic. This risky transition was also drawn upon by participants highlighting the importance of considering different scenarios, with the difficulty of "*technology [is] changing quickly*" and "*it's hard to see how adequate regulation is going to keep up*", thus "*hopeful that we will get the best outcome*" (UK6). Aus7 drawing on government simulation data perceives the transition process as extended indicating that "*only around 2035 … 10% of the vehicle fleet*" would be autonomous. Also reinforcing the UK perceptions that the transition stage would be a long-term scenario.

Visions of technological trajectories included multiple possible technology developments with participants drawing on different narrative for navigating (GPS/ LIDAR). Aus7 highlights that LIDAR is a "*need[ed] that technology to actually make them function safely*" and UK7 highlighting that "*GPS is not going to deliver that*" accuracy thus requiring LIDAR. While Aus13 highlighted the benefits of GPS in that software can be quickly updated, when compared to hardware making the resulting upgrades to technology cheaper. Multiple technology trajectories were also discussed in relation to CAV (connected autonomous vehicles) and automated vehicles. UK7 is working with a manufacturer "*targeting connected autonomous vehicles*" considering this as the bigger market and can be transferred to other scenarios such as rail. UK6 also highlights that "*we're very much in the CAV camp*" highlighting camps for two different technological trajectories. This same participant does highlight later that the government narrative focusing on connectivity has now been superseded by a focus on autonomy due to "*Highways England would be looking at a massive bill to make their network ready, and that might not happen, and the other one I think is around the sheer desirability*" indicating the fluidity of change within these narratives. Therefore, visions in relation to technology are quite varied indicating a lack of stability around the technological narrative (Halinen et al., 2023; Jasanoff, 2015a, 2015b; Kindström et al., 2023).

5. Discussion

Taking a prospective approach and focusing on early innovation system development this paper adds to the limited knowledge of 'fuzzy front end' market envisioning and processes. Early market development is not necessarily stable with loose relationships changing quickly, fraught with uncertainty as technological changes disrupt accepted

practices and are not necessarily focused on focal actors (Möller et al., 2020). This paper follows the call from Pattinson et al. (2023) who highlight further research is needed into ecosystem origins and early activities. In this instance, we focus on an innovation ecosystem in a pre-market phase, which may or may not end up resembling current automotive and transport industries given new entrants and new roles for complementary actors.

Our findings highlight how participants discursively construct future AV markets via their identity work (Ellis & Hopkinson, 2020; Khanagha et al., 2022) and dyadic and network building practices (Kjellberg et al., 2012; Möller, 2010); thus attempting to shape future markets as they offer visions on how the AV market should or should not develop (Storbacka & Nenonen, 2011). Table 2 and Fig. 1 offers a tentative framework of some symbolic actions (Khanagha et al., 2022) carried out by innovation ecosystem actors. This specifically highlights how micro level identity work aligns with *meso* level dyadic and network building practices while working towards their espoused visions.

Participants construct multiple visions through claiming future markets, with differences emerging between and within participant visions. Such multiple visions are similar to Penttilä et al. (2020) who suggest actors incorporate multiple frames during strategizing processes or Han et al. (2022), p.119) referring to the 'battlefields' for shared visions during the 'fuzzy front end'. Our findings highlight narratives focusing on future possible economic value creation, whereby participants generally were complementary in relation to AV industrial applications (e.g. freight; mining) but conflicting and competing in relation to consumer end user AV markets. For example, variance in suggested business models and pricing structures or the requirement for dedicated AV lanes/ spaces for many use case scenarios, indicate that consensus from diverse ecosystem participants is unlikely at this early stage (Hannigan et al., 2022; Mele et al., 2015). Such variation in visions are communicated and negotiated by diverse ecosystem actors during agenda construction activities (Möller, 2010; Penttilä et al., 2020).

Embedded within vision construction are notions of possible future value propositions. This is also identified in identity construction, where actors position their organization or others towards fulfilling envisioned value propositions. For example, as per Table 2, UK13 described their organizational position as between insurers and manufacturers, and offering value in communicating and developing standards that both insurers and manufacturers need to work towards. Thus, aligning with Khanagha et al. (2022) and Han et al., 2022, on identity work leading to communicating value propositions. Our findings build onto these arguments where such value propositions are also discursively embedded in future visions. Möller (2010) indicated that value generating activities were embedded within organizations while Ellis et al. (2012) indicate value propositions as a possible future landscape of next actions. We highlight that such future possible value imaginaries are embedded in visioning processes.

Dyadic and network building practices include activities undertaken when discursively constructing and sharing their market visions. While communication and agenda setting have been previously highlighted (e.g. Han et al., 2022; Möller, 2010; Penttilä et al., 2020) and developing capabilities through relationship and network building (Khurana & Dutta, 2021; Möller, 2010) have been discussed in early ecosystem development, the notion of network governance and norm building activities have not emerged during these early stages. Network governance and norm building has been discussed in more mature stages where value creation is recognized through shared goals and clearer ecosystem identification (e.g. Baker & Nenonen, 2020; Flaig et al., 2021; Khurana & Dutta, 2021; Taillard et al., 2016). Our identification of these activities occurring earlier in the innovation ecosystem development stage maybe be due to our prospective methodological approach (i.e. not relying on retrospective data) or that this context is embedded in the transportation sector which is often regulated by governmental actors. Government participants strongly focused on a safety narrative and utilizing policies to support network governance and norm building aimed at positive societal outcomes.

In relation to identity work, previous literature has highlighted the importance of the role dimension for communicating shared visions (Han et al. (2022), or focused on the positioning and re-positioning of actors (Khanagha et al., 2022). Our findings draw on both role and positioning strategies to analyse participant discursive construction. Identity work was recognized as an important discursive element during the 'fuzzy front end' (Kindström et al., 2023), evident in how actors refer to the contribution of key inputs in the future market and how that may disrupt the status quo.

6. Contributions

Following the call from Pattinson et al. (2023) to embrace and own the concept of innovation ecosystems in B2B contexts, this paper contributes to our understanding of the early stages of innovation ecosystem development by taking a prospective approach. One contribution is the framework of symbolic actions, outlined in Table 2 and Fig. 1, illustrating how discursive practices align across the micro (actor), *meso* (network) and macro (broader ecosystem) levels as participants discursively construct future possible visions. With limited research conducted on the early development stages of innovation ecosystems (Kindström et al., 2023; Möller et al., 2020; Pattinson et al., 2023) this framework illustrates activities undertaken at multiple levels and their how such activities may align when participants describe their future visions. This future-orientated temporal focus is applicable to B2B managerial strategy, especially in contexts impacted by technological innovation, where future markets cannot necessarily be understood through existing knowledge.

Our research also addressed the calls for incorporating diverse actor discourse (Khurana & Dutta, 2021; Mele et al., 2015; Möller et al., 2020; Pattinson et al., 2023), rather than focusing on focal actors. Given the early stages of innovation ecosystems often involve high uncertainty and loosely structured relationships (Möller et al., 2020), capturing the diversity of future visions incorporates 'conflicting, competing, complementary and collaborative' (Kindström et al., 2023 p.51) possibilities, as illustrated in Table 2. Therefore, our findings reflect the breadth of multiple market visions that can be quite antagonistic, rather than subscribing to a shared or stabilized vision. Taking a diverse perspective of relevant stakeholders is relevant to B2B contexts, as the development of transformative technologies is influenced by various non-commercial actors such as government and researchers.

The importance of identity construction and (re)construction processes for communicating actor value propositions through their proposed future ecosystem role and position strategies is another contribution. Previous research on ecosystem identity construction doesn't focus on both positioning strategies and role (Flaig et al., 2021; Han et al., 2022; Khanagha et al., 2022; Khurana & Dutta, 2021; Kindström et al., 2023), or how focal actors construct customer identities (Harrison & Kjellberg, 2010). We instead show how actors are anticipating and influencing ecosystem changes, thereby applying identity work to claim future markets.

The importance of network governance and norm building during the early stages of innovation system development is another important contribution. Rather than norm setting only occurring during the later stages of ecosystem development, our participants discursively incorporate these activities into how they envision future ecosystems. Thus, offering an alternative narrative where processes are not linearly allocated to different ecosystem development phases or stages, but rather emphasize the non-linearity and complexity of innovation ecosystems (Han et al., 2022; Nylund, Ferràs-Hernández, Pareras, & Brem, 2022; Pattinson et al., 2018).

7. Conclusions and future research

Within the AV context, the fuzzy front end of innovation ecosystems

appears to be characterized by what we might term 'messy meaning construction.' The existence of many actors, jockeying for position via ongoing identity work, within a series of sometimes complementary, but often contradictory visions, means that our framework of symbolic activities, developed from a discursive exploration of market shaping, can begin to shine a light on this messiness. When considering different levels of market shaping, this is not necessarily a linear or temporal process, with some discourses circulating and presenting future possible value propositions and the actors' position relative to capturing such value. Moreover, non-profit institutional/governmental actors can wield at least as much power as private sector firms in terms of potential visioning (Hess, 2020), particularly focused on guiding governance and normative practices during the early, pre-commercial stages. At this nascent stage, the future as imagined by ecosystem participants remains contradictory, though strong alignment around themes of safety are emerging. Thus, while contradiction between market visions is narrated on the 'battlefield of ideas' important visions that can generate societal value are beginning to align.

As Longhurst and Chilvers (2019) point out, mapping diverse visions can offer an important reflexive basis for market shaping, especially if one considers the issue of 'whose vision counts?', i.e. which actor has the most legitimacy and, ultimately, power, to effect the changes they seek. Although we have gained quite a nuanced sense of the identities and activities outlined in the discourse of our participants as they strive to achieve their desired visions, further research is needed. As our data is limited to managerial interviews, it would be useful to look at practices beyond the symbolic talk that we have unpacked here, in order to plot which (if any) of the imaginaries noted in our analysis will prevail in the development of AVs. Moreover, given our analysis is limited to a cross-sectional snapshot, it would be interesting to study longitudinal trajectories of technological imaginaries through various segments of society (Mladenović, Stead, Milakis, Pangbourne, & Givoni, 2020).

Funding

This research was supported by funding from the University of Western Australia.

CRediT authorship contribution statement

Sharon Purchase: Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Daniel Schepis:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Nick Ellis:** Writing – original draft, Methodology, Formal analysis, Conceptualization.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.indmarman.2024.08.003.

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