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Psychology of space tourism marketing, technology, and sustainable development: From a literature review to an integrative framework

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Abstract

Space tourism, a niche segment of the aviation industry, has radically altered the private sector. A noticeable trend in this market has been the development of commercial space with numerous start-ups and ventures underway. Adopting a concept-driven approach, we conduct a hybrid review to sketch the emerging market areas in space tourism and provided insights into tourists' behavioral responses. Our results are supplemented by an analysis of public viewpoints on space-faring to gauge their alignment with academic views on space tourism. We also develop an integrative framework to elucidate how personality interacts with scenario to influence the feelings, thoughts, and behaviors of space tourists and their responses toward space tourism. We recognize critical gaps in previous literature and propose the following recommendations to guide future research: 1) Conceptualization of travel services and tourism typology in the new space market; 2) theoretical contribution on pragmatic and semantic levels; 3) need for empirical and multi-disciplinary studies; 4) investigating the role of ethical issues on bilateral arguments toward commercialized space tourism; 5) integrating stakeholders' perspectives to maximize the socioeconomic impacts of space tourism and environmental sustainability; 6) media platforms and application of new technologies; and 7) role of scientific journals in knowledge enhancement.

KEYWORDS

adventurous services, commercial space tourism market, hybrid review, psychology of space marketing, space aviation, space travel, sustainable development and strategy, technology innovation

1 | INTRODUCTION

Once solely under the government's purview, space tourism has begun to develop rapidly in the private sector as a form of adventure tourism. The development of transportation during the

mid-nineteenth century served to catalyze the tourism industry. Innovations in transportation (e.g., hyperloop trains, self-driving vehicles, and supersonic airliners) have been important milestones in realizing the possibility of commercial space tourism. SpaceX's first civilian space flight in 2021, and the contributions made by visionary

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entrepreneurs and private companies like Jeff Bezos (Blue Origin founded in 2000), Elon Musk (SpaceX founded in 2002), and Richard Branson (Virgin Galactic founded in 2004) have attracted extensive public interest (Giachino et al., 2022).

Supply chain has long been the primary obstacle in the commercialization of space tourism. Designing space services is complex and technology-driven, and the cost of lead items and resupply pose a challenge. However, the industry is fueled by the public demand and the intervention of private sector in manufacturing the space equipment, coordinating the growing number of entities, and applying a new collaborative method (Wooten & Tang, 2018). The demand for orbital and suborbital space travel is forecasted to increase up to USD 214,94 billion by 2030 (Hurley, 2022); greater the demand, greater the preservation potential of that innovation (Danov, 2020). Consequently, the concept of “space market” encompasses new start-ups, policies, and threats that profoundly alter existing and new value chains, and creates new needs. Thus, the relevant stakeholders' (i.e., tourists and business institutions) responses to the new space tourism market must be gauged.

The response toward creating a cislunar economy has been multifaceted because of rising interest from several stakeholders. The market, consisting of both investors seeking financial opportunities and future passengers wanting to experience space travel, is estimated to be worth USD 2.7 trillion by 2040 (Olya & Han, 2022). Space aviation tourism has become a burgeoning niche for start-ups to expand their travel and tourism-related services as they compete with established industry heavyweights. Space start-ups from Silicon Valley attracted investments of approximately USD 21.8 billion from 2000 to 2018 (Denis et al., 2020). Therefore, the impact of space start-ups has become more tangible with significant increase in venture funding since 2018 owing to new investors and enterprises worldwide. The year 2021 set a record by attracting over USD15 billion in total financing, breaking the USD 7.7 billion record of 2020 (BryceTech, 2022). However, BryceTech concludes start-ups will need to mitigate investors' concerns like the consumers' uncertainty as potential space tourists to sustain such levels of investment.

Despite its high demand, commercial access to space raises critical issues regarding the configuration of psychological traits and situational forces directing participants' responses toward space travel and the sustainability of such demands. First, existing conceptualizations of space tourism are often misleading because of misconceptions about the legitimacy and reality of commercial space tourism (Olya & Han, 2022). Existing literature confirms controversial debates regarding the psychological marketing strategies adopted to realize space flight as a reality. Therefore, misleading conceptualization occurs in designing adventurous and idiosyncratic space services, and concerning the legitimacy of ethical issues (e.g., cooperation of entities in the industry trade group pollution in the space environment, protection of heritage sites, General Data Protection Regulation [GDPR], human biomedical issues) in the market (Denis et al., 2020; Masson-Zwaan & Freeland, 2010). Second, based on the theory of Economic Development, the emergence of new industries entails difficulties in understanding

and predicting consumer behaviors (Schumpeter, 1961). Under this theory, innovative services must have specific and noteworthy differences to stimulate favorable behavioral responses among potential consumers (Ostrom et al., 2021). However, in the space travel industry, consumers may avoid services that are conceptually and practically different because of a lack of important elements (e.g., competitive offerings, variations in service features, market share performances) (Crouch et al., 2009; Olya & Han, 2022). For instance, because space travel involves complicated protocols, extensive training (e.g., underwater training) is necessary to meet medical screening criteria to ensure that tourists can physically deal with weightlessness and high velocities. Tourists also need to undergo psychological preparation (e.g., mandatory quarantining) to behave and react appropriately in the outer-space environment (Reddy et al., 2012). Finally, each individual's dream of space travel is unique. Therefore, this study focusing on the earliest customers of space tourism products would significantly interest companies and business managers alike. Owing to its relatively recent emergence, there is a lack of scientific research on the general and broad conceptualization of space tourism regarding marketing and psychology. For example, how and to what extent do technological advancements and disruptive innovations contribute to incremental demand in the space tourism market, and, finally, who will be among the first to travel to space under the label of a “space tourist”?

The literature on modeling space travelers' behavioral responses is limited. Owing to the lack of participants who have experience in space travel, there is a dearth of review studies considering different research designs and theoretical foundations to explain how potential tourists respond to commercialized space tourism (Crouch, 2001; Olya & Han, 2022). There is a further lack of comprehensive discussion on the inclusion and configuration of sociocultural and situational moderators that influence consumer behavior at the individual and macro level (Denis et al., 2020).

There is a paucity of research that not only systemically reviews the pertinent research in the space tourism market, but also critically analyses discourses on the psychology of space marketing. We performed a hybrid review to fill this gap. This hybrid form, comprising systematic and narrative approaches, was chosen to demonstrate the evidence of research progress on a meta-level, unpack the various conceptual, theoretical, and methodological perspectives at play, and identify the intellectual gaps in the psychology of the space tourism market. Subsequently, the findings are supplemented with semantic analyses on social media to reflect broad and in-depth insights from real-world academic and public perceptions to devise a framework for future research. This approach offers several substantial multilateral contributions. First, systematic reviews enrich the body of knowledge of the space tourism market. Second, narrative reviews map the intellectual structure of psychological lens in commercialized space tourism marketing and illustrate how the inclusion of psychological traits on elemental, compound, and situational levels can explain the participants' surface emotions toward space aviation. Third, through a semantic analysis of public comments made on social media, this study reflects the initial

viewpoints of potential participants in space tourism. As a synthesis of this review study, based on the model of motivation and personality (discussed later), we develop an integrative framework for the academic study and practice of sustainable space tourism. Finally, we map future research avenues from two perspectives—the extant literature and potential participants—which helps researchers and practitioners understand potential gaps in the literature, and consumers' personality traits and behavioral responses toward participating in space tourism.

2 | CONCEPTUALIZATION OF SPACE TOURISM AS AN ADVENTUROUS AND IDIOSYNCRATIC ACTIVITY

Historically, the first commercial venture in (orbital) space tourism occurred in 1990 when a Japanese journalist—Toyohiro Akiyama—spent a week aboard the Russian space station. The first commercial human space flight took place in 2001. Among the first of these flights was the USD 20 million trip by Dennis Tito, who spent 7 days aboard the International Space Station. A space tourist is “someone who tours or travels into, to, or through space or to a celestial body for pleasure and/or recreation” (Harrington, 2017). However, the algorithm of who *will* travel to space based on who *has* done so is debated upon. Space tourism participants seek novel vacation experiences, making them key market players. Therefore, further research should be conducted to determine the extent to which consumers could experience and adopt new space tourism technologies and such innovative services (Beery, 2012). According to the European Space Agency (2008), space tourism is an “activity that will encompass the execution of suborbital flights by privately-funded and/or privately operated vehicles and the associated technology development driven by the space tourism market.”

“New tourism” refers to adventurous and idiosyncratic activities that outweigh the high level of risk involved therein (Mehran et al., 2020). The adventurous component of space travel is, as Goehlich (2005) points out, rooted in the idea that “exploring [the] frontiers of space stimulate the spirit in the same way as climbing Mount Everest.” Masson-Zwaan and Freeland (2010) claim that such a touristic activity is designed for a small number of tourists who are both capable of accepting certain risks and prepared to do so. Thus, “new” space tourism attracts individuals who are risk-takers and novelty seekers. The perception of new adventures and exclusive experiences, like weightlessness and seeing Earth from space, drive the demand for space travel. Furthermore, space trips comprise several exploratory opportunities like novel types of accommodation, hotels, and offers that significantly contribute to the evolution of commercial space (Denis et al., 2020) and market demand (Danov, 2020).

From a marketing point of view, “new space tourism” encompasses new start-ups, policies, and threats that significantly alter existing value chains, and creates new needs (Denis et al., 2020).

3 | MATERIALS AND METHODS

To establish a framework for future research agendas, various types of review studies can be utilized, including structured systematic reviews (Snyder, 2019), meta-analyses (Barari et al., 2021), conceptual-narrative reviews (Paul et al., 2021), framework reviews (Kannan & Li, 2017), hybrid reviews (Mehran & Olya, 2019), and narrative reviews (Dabić et al., 2020). A hybrid review combines conflicting outcomes and advocates novel guidelines for a specific area of research with reference to certain methodological approaches and theoretical backgrounds, and structures and contexts (Paul & Rosado-Serrano, 2019). With the aid of hybrid search criteria used in prior framework developments in consumer psychology and market research (Dabić et al., 2020; Mehran & Olya, 2019), this study identifies the intellectual gaps in the space tourism market, subsequently devising a framework for future research. To delve deeper into space tourism research, we integrate elements from systematic analysis and conceptual-narrative review, followed by a semantic analysis of public viewpoints posted on social media. Thus, this study demonstrates evidence of research progress on a meta-level and unpacks its theoretical and methodological contributions. Ultimately, however, it uncovers the data scarcity present in the space tourism market and concludes the need for further research.

3.1 | Inclusion criteria for subsequent analyses in systematic reviews

This study combed through literature across two major academic databases—Web of Science (WoS) and Google Scholar—to ensure that all key and credible sources were covered. The search process involved using the following keywords: “space tourism,” “commercial space,” “space travel,” “space industry,” “space technology,” “space tourist,” “space agency,” “space trip,” “astro-tourism,” “space activities,” and “space adventure.” We used these keywords to conduct an initial screening of article titles and abstracts and downloaded 222 articles. To meet the objective of this study, we refined the records and limited the subject areas to “hospitality leisure sport and tourism,” “management,” “social science interdisciplinary,” “psychology,” “international relations,” and “environment.” We used the following inclusion criteria: First, we focused on the characteristics of adventure tourism in the context of space tourism and consumer behavior; second, we limited our sample to studies that focus on the socio-political and environmental issues around space travel. Our exclusion criteria comprised languages other than English, and non-relevance to the study objective. We also limited the time of publication between 2001 and 2021. This timespan was chosen based on the research evolution that occurred after the first commercial human space flight in 2001. After disregarding studies not directly related to commercialized space travel, the sample size was reduced to 54 peer-reviewed articles (WoS = 46; Google Scholar = 8; SSCI = 48).

3.2 | Narrative review analysis

The narrative review, as a methodological approach, is a critical component of developing theoretical frameworks and building conceptual models (Mehran & Olya, 2019). By expanding a narrative discussion, the research construction was clustered within each classification of antecedents (Czarniawska, 2004). This study conducted a narrative review to identify the relevant theoretical debates and possible heterogeneities around participants' psychological traits at different levels by critically reviewing the antecedents, research gaps, theoretical lenses, implications, and methodological approaches. The narrative analysis in this paper proposes an in-depth articulation of how space tourism participants' behavioral responses are formulated, comprehended, and presented by leading authors.

3.3 | Semantic analysis of social media content

The results of the semantic analysis of social media posts supplement the findings of the systematic and narrative reviews to describe potential participants' viewpoints toward commercial space travel. This is achieved by measuring the emotional polarity and subjectivity as the linguistic style of YouTube comments to translate commenters' internal thoughts and emotions (Munaro et al., 2020). Semantic analysis provides an in-depth understanding of such users by extracting the main concepts where the users views are demarcated as viewpoints (Areni, 2021; Osborne & Ruggeri, 2013). Semantic web technologies are progressively being adopted as the prevailing mechanism to aggregate, organize, and make sense of social web content by linking it with ontological concepts (Ricci et al., 2015). Furthermore, mining social media content is a standard practice for understanding opinions expressed in public. YouTube comments, for example, can be used to deduce the emotions encountered immediately after experiencing the feeling of a space journey in an online video. We chose YouTube as it is an accessible source of social web data and is reportedly among the top three most prevalent websites since October 2007 (Appendix A). The information available via YouTube includes quantitative indices such as user-generated content (e.g., comments) through which each concept can be viewed under different perspectives depending on the subjectivity of the user, thereby yielding tailored semantic connections or relationships.

Subjectivity value is a measure of how personal the text is; if the analyzed text refers to personal feelings, experiences, or similar, then the value will be high since it is subjective. Conversely, it is considered an objective comment if it lacks keywords such as “my,” “I,” and similar. The measurement scale for subjectivity varies from +1 being an “extremely subjective” text and 0 being “extremely objective.” Opinion mining also provides quantitative models wherein viewpoints are compared by measuring the polarity (positive to negative sentiments) of each comment (Osborne & Ruggeri, 2013). Polarity represents the degree to which people express emotion as well as the valency thereof. The scale for polarity ranges from −1 to +1, with +1 being an “extremely positive text” and −1 an “extremely negative text.”

The results of this hybrid review are complemented with a social media review analysis depicting a broad map that reflects the extent to which the academia and public (as potential participants) have a shared vision of the space tourism market. Furthermore, we investigated whether YouTube user comments can be mapped to certain psychological factors categories in developing this study's framework.

We used Google charts API to collect data from YouTube. From Top, YouTomb, and Random, we selected 24 videos which were targeted to the audience on YouTube to generate more views and comments for analysis. From 197,177 initial comments on 24 videos (comments and replies on comments available for extraction using the YouTube API), a total of 108,322 top-level comments (responses to the main video) were extracted and processed using a language model trained with the Python open-source libraries spaCy (spacy.io), nltk (nltk.org), and TextBlob (textblob.readthedocs.io). Responses to comments were excluded because they were a reaction to the comments and not the video (Malik & Tian, 2017). The analysis provided numerical values for polarity and objectivity. By calculating and assessing the mean value and standard deviation for objectivity, we estimated an overall sentiment reflecting users' initial thoughts toward commercialized space tourism.

4 | RESULTS AND DISCUSSION

4.1 | Findings from the systematic review

Table 1 outlines the general distribution of articles to discover the essential outlets for publication in a particular research area within journals. *Acta Astronautica* is the leading outlet in disseminating space tourism research, accounting for 24.07% (13 out of 54) of the studies in our sample. Other journals are *Space Policy* (seven studies), *Tourism Recreation Research* (four), *Journal of Sustainable Tourism* and *Tourism Management* (three each), *Journal of Travel Research*, *Current Issues in Tourism*, *Advance in Space Research*, *Mobilities* (two each), *Annals of Tourism Research*, *Potchefstroom Electronic Law Journal*, *International Journal of Aviation Research*, *Aeronautics & Aerospace Engineering*, *Astropolitics*, *European Journal of American Culture*, *Journal of Physics*, *Asia and Space Tourism*, *International Journal of Tourism Research*, *Engineering*, *Journal of Tourism Futures*, *Geoforum*, *Journal of China Tourism Research*, *Development Southern Africa* and *Journal of Vacation Marketing* (one each). Finally, the research was conducted across a wide variety of scopes, including the challenges of human space travel (e.g., acceptable risks, ethical and medical dilemmas, and insurance service risks), the antecedents of space traveler behavioral intentions (e.g., motivations, expectations, and conceptualizations of space technology for recreational purposes), marketing (e.g., pricing strategies, digital communications, public relations, sociocultural and economic impacts, innovations in space travel technology), sustainability of space tourism, and other tourism concepts (e.g., astro-tourism conceptualizations and adventure tourism), thereby signifying the widespread implications of review studies in this

TABLE 1 Journals disseminating studies on space travel behavior.

Journals	Articles	Reference	Scope of research
<i>Acta Astronautica</i>	13	Collins and Autino (2010); Bensoussan (2010); Chang (2020); Chang (2015); Rosa (2013); Davidian (2021); Denis et al. (2020); Frans (2013); Hobe (2010); Masson-Zwaan and Freeland (2010); Peeters (2010); Penn and Lindley (2003); Webber (2010)	Sociocultural and economical contributions of space tourism; perspectives on insurance; overview of the history of space tourism; business opportunities in suborbital space tourism; challenges for the insurance sector; market characteristics of space tourism; conceptualization of commercial space tourism; private human space flight as adventure tourism; legal challenges of private space tourism activities; legal challenges of human space travel; marketing of personal space flight; requirements and approaches for a space tourism launch system; overview of the history of space tourism
<i>Space Policy</i>	7	Frans, (2011); Forganni (2017); Goehlich (2005); Goehlich et al. (2013); Loizou (2006); Shelhamer (2017); Students et al. (2001)	Legal aspects of private space flight; EU space tourism policy; ticket pricing strategy for space tourism market; marketing view of commercialized space tourism; motivations for human space flight; designing a space tourism spacecraft: dreams, realities, and challenges of commercialized space tourism
<i>Tourism Recreation Research</i>	5	Cohen (2017); Peeters (2018); Prideaux and Singer (2005) Spector et al. (2017); Spector (2020)	Sociological perspective of sustainability of space tourism; sustainability of space tourism; marketing challenges of space tourism; acceptable risk in space tourism
<i>Tourism Management</i>	3	Cater (2010); Crouch et al. (2009); Reddy et al. (2012)	Astro-tourism conceptualization modeling consumer choice behavior in space tourism; research recommendations for the future of industrialized space tourism
<i>Journal of Sustainable Tourism</i>	3	Frost and Frost (2021); Scott (2020); Toivonen (2020)	Motivations of frontier tourists toward sustainable space tourism; environmental and geopolitical concern toward branding of space tourism destinations; sustainability of space tourism
<i>Annals of Tourism Research</i>	1	Spector and Higham (2019)	Space tourism in the Anthropocene
<i>Current Issues in Tourism</i>	2	Chang (2017); Soleimani et al. (2019)	Consumer attitudes toward innovative technology of space travel; astro-tourism conceptualization
<i>Journal of Travel Research</i>	2	Crouch (2001); Olya and Han (2020)	Marketing of space tourism; modeling travelers' intention toward space-faring
<i>Advance in Space Research</i>	2	Collins (2006); Marsh (2006)	Commercial tourism development on the lunar surface; ethical and medical dilemmas of space tourism
<i>Mobilities</i>	2	Damjanov and Crouch (2018); Johnson & Martin (2016)	Media prospects of virtual space tourism; conceptualization of space technology for recreational or leisure purposes
<i>Potchefstroom Electronic Law Journal</i>	1	Ferreira-Snyman (2014)	Legal challenges of space tourism
<i>International Journal of Aviation Research</i>	1	Winter and Trombley (2019)	Type of consumer willing to travel to Mars
<i>International Journal of Tourism Research</i>	1	Tasci et al. (2021)	The social representations of space tourism and their relations to attitude and behavior towards space tourism
<i>Aeronautics & Aerospace Engineering</i>	1	Savino et al. (2013)	Transportation challenges for space tourism
<i>Astropolitics</i>	1	Launius and Jenkins (2006)	Type of space travelers
<i>European Journal of American Culture</i>	1	Margolis (2020)	Sociocultural aspect of space tourism

(Continues)

TABLE 1 (Continued)

Journals	Articles	Reference	Scope of research
<i>Journal of Physics</i>	1	Duan (2020)	Modeling space tourism expectations
<i>Asia and Space Tourism</i>	1	Lele (2018)	Space tourism in Asia
<i>Engineering</i>	1	Wilson (2019)	Space tourism news and highlights
<i>Journal of Tourism Futures</i>	1	Cole (2015)	Space tourism policymaking
<i>Geoforum</i>	1	Beery (2012)	Geographical competition for space tourism
<i>Journal of China Tourism Research</i>	1	Wang et al. (2021)	Tourists' engagements in outer-space tourism activities
<i>Development Southern Africa</i>	1	Jacobs et al. (2020)	Astro-tourism as a vehicle for sustainable tourism
<i>Journal of Vacation Marketing</i>	1	Olya and Han (2022)	Customer avoidance responses and behaviors in space tourism

*Note: The reference and scope of each study is separated by (;).

TABLE 2 Research methodology.

Research method	Number of publications	Authors
Conceptual	38	Beery (2012); Bensoussan (2010); Chang (2015); Chang (2020); Cohen (2017); Cole (2015); Collins (2006); Collins and Autino (2010); Crouch (2001); Davidian (2021); Denis et al. (2020); Ferreira-Snyman (2014); Forganni (2017); Frans (2013); Frans, (2011); Goehlich et al. (2013); Hobe (2010); Johnson & Martin (2016); Damjanov and Crouch (2018); Launius and Jenkins (2006); Lele (2018); Loizou (2006); Scott (2020); Margolis (2020); Marsh (2006); Masson-Zwaan and Freeland (2010); Peeters (2018); Peeters (2010); Penn and Lindley (2003); Prideaux and Singer (2005); Rosa (2013); Shelhamer (2017); Spector (2020); Spector and Higham (2019); Spector et al. (2017); Students et al. (2001); Webber (2010); Wilson (2019)
Quantitative	10	
Econometrics modeling of pricing strategy (secondary data)		Goehlich (2005)
Survey (close-ended)		Crouch et al. (2009); Olya and Han (2020); Olya and Han (2022); Tasci et al. (2021); Wang et al. (2021); Winter and Trombley (2019); Chang (2017)
Econometrics modeling of expectations (secondary data)		Duan (2020)
Econometrics modeling of transportation for long-duration space tourism (secondary data)		Savino et al. (2013)
Qualitative	3	
Interviews (individual)		Cater (2010); Frost and Frost (2021); Soleimani et al. (2019)
Mixed-method (qualitative and quantitative)	3	
Survey and interviews (focus group)		Jacobs et al. (2020); Reddy et al. (2012); Toivonen (2020)

*Note: The authors of each study is separated by (;).

emerging context. Furthermore, around 70% of the studies (38 out of 54) had a holistic lens on conceptualization in a specific area (i.e., the conceptual methodological approach) and called for further research.

Table 2 outlines the research methodology applied to space tourism market research in the last two decades (2001–2022). In terms

of research orientation, 38 studies are conceptual, 3 are qualitative, 10 are quantitative, and 3 are mixed-method. As shown in Table 2, most of the studies are conceptual because of the challenges of data collection.

Figure 1 demonstrates the multiple theoretical lenses used to carry out this research. This study classifies the most common

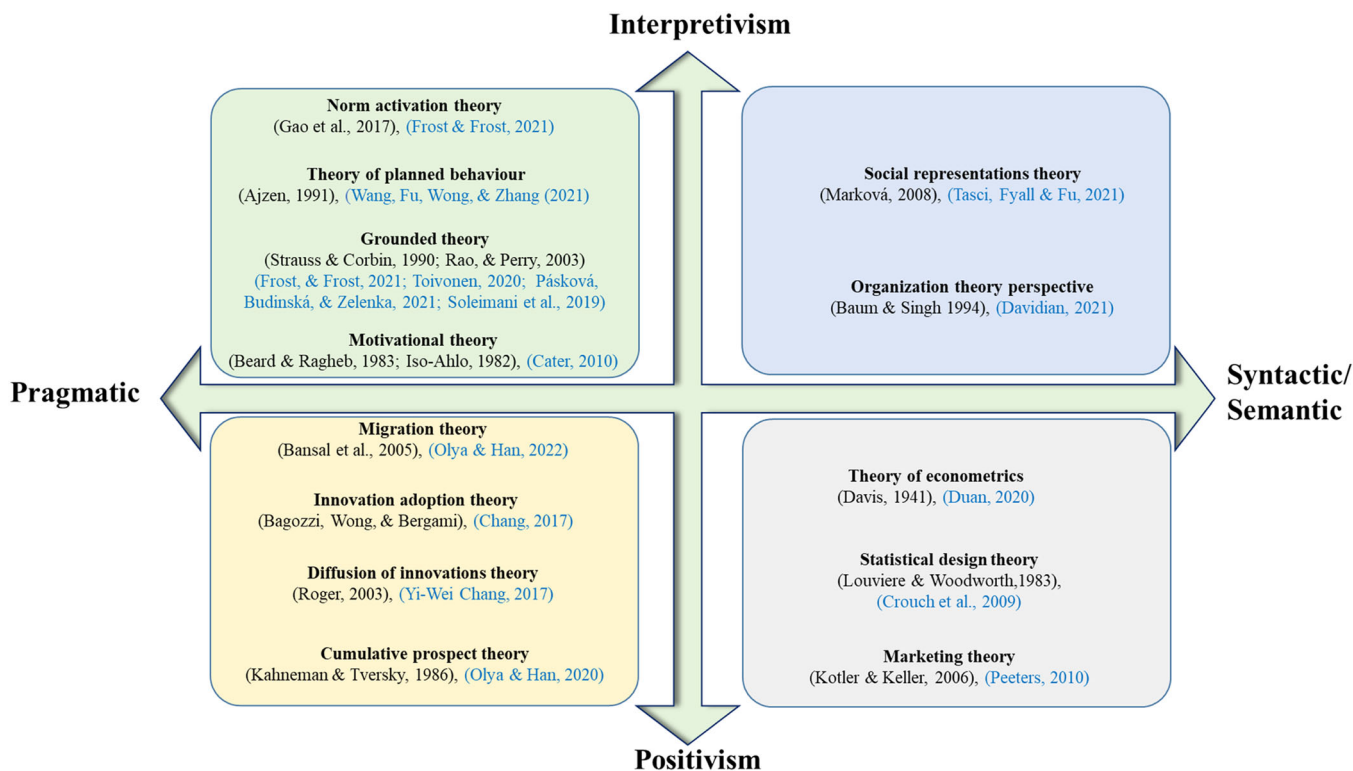


FIGURE 1 Classification of theories in the space tourism.

theories in space tourism based on two criteria—level and function. Pragmatic and syntactic/semantic are two levels of theories (Olya, 2023). The pragmatic level view focuses on modeling the attitudes and behaviors of tourists toward space travel. Contrarily, the semantic paradigm relies on logical judgments with various assumptions and hypotheses (e.g., econometrics modeling of expectations of space travel) and this level characterizes theories that apply to real-world events (e.g., evolution change mechanisms to calculate the degree to which space tourists want to engage in outer-space activities). For example, in their respective studies, Duan (2020) applied econometric theory, Davidian (2021) applied organization theory perspective, and Peeters (2010) used marketing theory at the semantic level.

However, the ontological and epistemological assumptions of the research represent the function of these theories that engage positive and interpretive approaches. In the positivistic approach, reality is objective, so deductive methods are applied to the investigation (e.g., proposing and testing consumer attitudes toward the innovative technologies of space travel). Contrarily, the interpretive approach delineates reality rather than a subjective interpretation thereof. It emphasizes an individual's attitude toward space tourism using inductive methods. For instance, Cater (2010) applies motivational theory at the pragmatic level with an interpretivism function. Accordingly, Figure 1 depicts a general gap of theory application at different levels with diverse functionalities in the space tourism market. Specifically, the theoretical contribution at the semantic level

could address the complexity of antecedents impacting the modeling of participants' behaviors in space tourism as an international real-world event.

4.2 | Findings from the narrative review

The narrative review aims to map the intellectual structure of psychological lens in the commercialized space tourism market. Therefore, based on the general model of motivation and personality, this section defines the conceptual underpinnings of tourists' responses (either favorable or unfavorable) toward their participation in space travel across each elemental, compound, situational, and surface trait.

4.2.1 | Theoretical lens on the psychology of space tourism marketing

The extant literature proposes that consumers' individual characteristics significantly impact the acceptance and adoption of new technologies, encompassing various attitudinal and behavioral responses that contribute to their decision-making process (Acheampong & Cugurullo, 2019). Therefore, this study applied the Meta-Theoretic Model of Motivation and Personality (3M) to develop an integrative framework that elucidates how personality interacts with situations to influence feelings, thoughts, and behaviors. This

helped us reflect on a combination of three theoretical approaches—evolutionary psychology, control theory, and trait theories of personality—to develop a model that could potentially explain the behaviors of space travelers (Mowen et al., 2007; Scott & Mowen, 2007).

The model of motivation and behavior particularizes the motivational mechanisms of personality traits in affecting consumer behavior in different contexts; it has been extensively applied in consumer research to predict behavior (Chang et al., 2019).

4.2.1.1 | *Elemental traits*

The “big five” approach is considered a typical compromise model in the classification of personality traits (Fortunato & Furey, 2009). According to Mowen (2000, p. 21), the big five—comprising “openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism”—are considered the most basic and general of human traits. These were later compounded with “material needs, need for arousal, and physical/body needs” to form his eight elemental traits.

Certain types of cognitive design are predominant among individuals willing to travel to space, and the achievement of space travel itself promises to change the personalities of travelers. The discrepancies in reported results reflect the complexity of personality elemental traits when it comes to choosing to embark on space travel. Based on an analysis of Antarctic voyage personnel data, Grant et al. (2007) found that those who were characteristically well-adapted had a high openness to experiencing space travel. However, a data analysis of 65 NASA astronauts associated low openness and high agreeableness with superior performance. In one of NASA's recruitment projects, final-stage astronaut applicants had lower neuroticism and higher extraversion, conscientiousness, and agreeableness than the general population (Musson & Keeton, 2011). In another report, astronauts of the European Space Agency were reported to have lower neuroticism and higher openness to new experiences, agreeableness, and conscientiousness than US Air Force pilots (Maschke et al., 2011).

The essential trait needed for arousal, illustrated as “the desire for stimulation and excitement” (Mowen, 2000; p. 29), could be important in modeling the behavior of space travelers. Tourists are typically eager to participate in novel tourism activities like space tourism, which can thereby contribute to an increase in their arousal and pleasantness (Wang et al., 2021). Sensation-seeking may influence tourists' need for arousal to make their first travel experience more enjoyable (Reddy et al., 2012). The choice of a non-conforming lifestyle could account for this trait, as adventure travelers tend to have a strong desire for risky and adventurous activities involving speed and danger (Gilchrist et al., 1995).

The evolutionary perspective proposes that consumers must compete to gain access to limited sources of information (Mowen, 2000). Winter and Trombley (2019) noted that scientific development, fulfilling the need for exploration and adventure, and the goal of alleviating resource shortages on Earth are the main motivational reasons for space travel. Resource scarcity contributes to the

promotion of space travel and exploration of potential new sites for human habitation. This perspective may provoke a sense of grandeur in those who simultaneously perceive the value and vulnerability of Earth and seek a novel tourism destination, thereby entering a competition with others (Spector, 2020).

The need to protect and enhance the body as an elementary trait is significantly highlighted in the literature, commercial sectors, and social media. According to Mowen et al. (2007), early humans who manipulated their evolution by controlling the environment using body resources had a competitive advantage.

4.2.1.2 | *Compound traits*

Like physical compounds, compound traits are partly comprised from the effects of compound elemental traits and are cross-situational in nature (Mowen et al., 2007). The literature in consumer behavior has hitherto explored this field in the context of consumer technology and innovation adaptation, and adventure tourism and travel industry (Chang et al., 2019; Scott & Mowen, 2007). In the context of technology adoption, consumer innovativeness has been seen as a fundamental trait that influences behavior in the “new space” market. Drawing on diffusion of innovations theory, innovativeness refers to “the degree to which an individual or other unit is relatively earlier in adopting new ideas than other members of a system” (Rogers, 2003; p. 22). Literature confirms that social innovation increases the positive attitude toward space tourism (Giachino et al., 2022). From a risk/reward perspective, perceived novelty can be considered a salient affective belief that plays a significant role in innovation adoption in space tourism (Chang, 2017).

An “enduring disposition to seek information resources” (Mowen, 2000; p. 72) could also motivate space travelers to fulfill their need for exploration. This trait could explain potential participants' quest for insight and knowledge over and above the potential risks. According to Frost and Frost (2021), frontier tourists may be mountain climbers, for example, who appreciate viewing the world from a great height and want to explore unspoiled environments and educate others on conservation matters. According to Winter and Trombley (2019), as participants become more educated in space aviation, the decision-making process is affected as they transition from cognitive to affective processing. Additionally, participants who are also more familiar and knowledgeable with space travel show higher levels of willingness in comparison to those who just feel it would be fun. According to Spence and Helmreich (1983, p. 41), competitiveness traits such as “the enjoyment of interpersonal competition and the desire to win and be better than others” could further explain such a desire. Space flight may provide these individuals with intrinsic rewards and a sense of autonomy and competence. Seeking novelty is an inherent characteristic in travelers. The main compound traits drawn from the literature include cognitive motivation, hedonic motivation, and social norms, including the need for uniqueness, escape, gratification, novelty-seeking, and knowledge enhancement (Crompton & McKay, 1997; Olya & Han, 2019; Pearce & Lee, 2005). It is generally believed that the concept of escape is predominant in many holidaying motivations

and the desire for escape is driven by the need to avoid social contact and find solitude and calm (Beard & Ragheb, 1983; Olya & Han, 2020). Nevertheless, in the context of space tourism, motivational concepts are interpreted in the same manner, and so the literature calls for further research.

4.2.1.3 | *Situational traits*

Situational traits are described as “the unidimensional predispositions to behave within a general situational context” (Mowen, 2000; p. 21). These traits result from interactions between basic personality characteristics and environmental and situational contexts (Schneider & Vogt, 2012). We classified situational traits into either social-value or self-value consciousness (Chang et al., 2019).

4.2.1.3.1 | *Social-value consciousness*. According to belief-importance theory (Petrides, 2010), personality traits have a significant influence on one's beliefs in achieving goals and their prominence in terms of the time and effort put into attaining them reinforced with motivations, values, and beliefs. The social-psychological theory of motivation (Steinmayr & Spinath, 2008) relies on social needs and is defined as the need to surpass qualifications to reach a certain standard of excellence (Reeve, 2009). According to sign value theory, consumers' needs are considered cultural compositions in which social status is enjoyed when users consume a particular service (Cho & Kerstetter, 2004). According to Olya and Han (2022), sign value has a mooring effect on an individual's avoidance of space tourism, since socializing with other participants at the top of the social hierarchy may motivate them to change their decision to go through the complicated process of space-faring. Currently, only celebrities and wealthy individuals have had the opportunity to travel to space; having the chance to join such an elite group could influence the desire for space tourism in the future. Relying on conspicuous consumption theory (Wang & Griskevicius, 2014), individuals consume high-end products/services as an opportunity to show off how they are capable of doing things that are otherwise difficult to imitate.

The previously futuristic idea of innovative space services has become a realistic target for businesses today; therefore, marketing physical stimuli as features of an experience influences travelers' consumption behavior (Wang et al., 2021). The ongoing socio-technical momentum of “extra-planetary motilities” is transforming the environment of travel and mobilities within global media cultures in the space travel decade (Damjanov & Crouch, 2018). Presently, media has become a significant source of social representation of space tourism, including news media, documentaries, and movies (Tasci et al., 2021). Further, science fiction reflects the development of potential futures in entertaining genres like films, gaming, music, and literature (Winter & Trombley, 2019). Media may also contribute to the existing social excitement for space travel. This social atmosphere can be utilized in marketing strategies (Toivonen, 2020). Likewise, interviews with astronauts on social media (Cater, 2010) have shaped potential travelers' initial expectations.

Technological advancements (e.g., artificial limbs, infrared ear thermometers, freeze-drying tech) by NASA for the purposes of space travel can benefit people on Earth across commercial, industrial, and technological fields (Northon, 2018), and be a valuable source of inspiration for cultural and artistic creativity (Winter & Trombley, 2019). For example, the popularity of space center tourism in the 1970s in the United States coincided with the second wave of mass tourism in the media, heralded as “America's Gateway to Space.”

Commercial interests in developing the space tourism industry have contributed to geopolitical and security agendas (e.g., the weaponization of space). Such environmental hazards have direct effects on climate change and other forms of environmental damage.

4.2.1.3.2 | *Self-value consciousness*. As sub-dimensions of sign values, symbolic meaning and social interaction reflect the desires of potential travelers to declare their ideal self-image, role position, personality, social position, feelings, or lifestyle through their travel choices (Cho & Kerstetter, 2004). The results of the literature review demonstrate that a person's attitude and emotional traits can affect their general willingness to travel, especially in times of uncertainty (Chang, 2017). An emotional response from travel participants may influence their decision, their choice of travel location and activities engaged in (Olya & Han, 2020). The uncertainty and risks associated with space aviation, combined with the newness of the innovation adaptation process, may evoke a diverse spectrum of emotions, and either favorable or unfavorable responses. Based on Winter and Trombley (2019), feelings such as happiness, distress, or surprise could have predictive value regarding which type of person may be willing to travel to Mars, in that instance. Winter et al. (2014) further theorize that emotional responses may play an important role in a traveler's trust in their pilot in a travel scenario. Trust and attitude could also be important factors in the context of space aviation.

In the context of commercial space aviation and other diverse forms of adventure tourism, participants' perceptions of acceptable risk are shaped through the process of social construction (Spector, 2020). Space tourism can be conceptualized as a subcategory in “new tourism” since although participants perceive high levels of risks, the sense of adventure and uniqueness may outweigh them (Olya & Han, 2022). According to cumulative prospect theory, “diminishing sensitivity” and “loss aversion” account for the fact that individuals overvalue losses in adventurous activities more than gains in space aviation (Olya & Han, 2020). Olya and Han (2020) illustrate that potential space tourists make decisions by assessing the weights of different gains (social motivations, life experience, information acquisition, etc.) and losses (safety, psychological, financial risks, etc.) that are associated with space travel. Safety risks may play a dominant role in determining participants' intention to travel to space. These may include concerns regarding the design of the spacecraft and its launch process (Zhang & Wang, 2022) accommodation facilities in space destinations, training requirements (Reddy et al., 2012), crowdedness, and the duration of preparation for space travel (Crouch et al., 2009).

4.2.1.4 | Surface traits

Surface traits characterize an individual's most tangible, context-specific, and enduring characteristics and belief patterns (Scott & Mowen, 2007). Surface traits of space tourism consumers are context-specific owing to the peculiarity of adventurous activities (e.g., sense of weightlessness and watching Earth from space), and the result of combined elemental, compound, and situational traits (Schneider & Vogt, 2012). However, there is limited research on how the combination of these traits contribute to the immediate behavioral responses of space tourists (Crouch et al., 2009; Olya & Han, 2022).

The results of the hybrid review reveal that there are two different lines of arguments to explain surface traits. The first involves criticism regarding commercialized space travel and social envy and asks, "Is it really time for commercialized travel?" (Launius & Jenkins, 2006). Avoidance responses are generally affected by participants' situational traits, predominantly trust, risk and complexity perception, and environmental and cultural norms. To expand on these behavioral responses, we point to the operational risks of commercial space travel noted above and various medical dilemmas due to microgravity (e.g., loss of bone density due to the concomitant loss of calcium, decreased muscle strength, decreased blood plasma, decreased cardiovascular efficiency, "space adaptation sickness") (Marsh, 2006). The second argument concerns favorable reactions toward commercialized travel, which include boastful behavior and positive word-of-mouth responses reinforced by the media.

According to the literature, situational traits like environmental and legal dimensions and risks associated with commercial space travel determine the positive and negative responses of tourists. Therefore, to retain potential tourists' interests in space-faring, commercial space flight corporations need to focus on their compound traits (e.g., innovativeness, variety-seeking, sign value, self-esteem). Marketing strategists need to target individuals who have a positive attitude toward space-faring, adventurous characteristics, high sign values, and good self-esteem (Olya & Han, 2022). For example, well-off people who are passionate about extreme sports and are willing to accept all manner of safety risks and insurance costs can be targeted. Further, consumers who are accustomed to innovation make recommendations that influence other consumers (Chang, 2017). Start-ups and innovative operators could also make travel packages with more acceptable risks (Olya & Han, 2020). Leybovich (2009, p. 25) specifies that "risk is critical to the experience of adventure activities, to make them worth the participant's time, resources, energy, and possibly even health and life." This means that a well-established and functional culture needs to be shaped to manage societal consistency through the rule of societal law and social norms.

4.3 | Results from the semantic analysis of social media

The role of social media in deciding about trips at the information search stage (Matikiti-Manyevere & Kruger, 2019) is much debated in the literature. Owing to a lack of widespread experience in space travel, news and other visual materials in social media act as influential tools

that draw on gratifying motivations (e.g., adventure and novelty), and the risks and uncertainties associated with space travel. In accordance with worldwide engagement and attachment to Web 2.0 technology and social media platforms, service industries like tourism and travel have started considering such technologies as effective mechanisms to interact with customers. Aligned with this trajectory, we used social media contents to enrich the framework of the psychology of space tourism marketing by including the viewpoints of the public as potential participants of space tourism. We used YouTube comments in which users had the opportunity to watch a video related to space tourism and reflected their initial intention immediately thereafter.

As noted earlier, we derived 108,322 top-level comments on 24 videos that reflected the general public's viewpoints as potential participants. Table A1 in Appendix A shows top-level comments on videos that had been viewed 148,745,678 times (e.g., CNN, NBS, and Bloomberg), and were uploaded on YouTube between 2018 and 2021. We extracted top-level comments from the YouTube API and excluded comments that were responses to the main comments (Malik & Tian, 2017).

Figure 2 illustrates the scatter plot of sentiment analysis including the polarity and subjectivity of the comments. The subjectivity of the comments shows the extent to which respondents reflected their own intention toward participating in space services, while the polarity explains their positive or negative orientation toward space travel.

The results revealed that out of 108,322 comments, 33,190 reflected positive sentiments (31%), 19,811 reflected negative sentiments (18%), and 55,317 were neutral (51%) toward space tourism activities (mean = 0.0638; STD = 0.2967) (Table A2, Appendix A). In terms of subjectivity of the comments, out of the 108,322 comments, 71,936 were objective (66%), 33,109 were subjective (31%), and 3,273 were neutral (3%) (mean = 0.3124, STD = 0.3666) (Table A2, Appendix A).

The combination of polarity and subjectivity results in scatter-plots demonstrated important information as commenters are more interested in objective and neutral point of views. For example, "Jeff's Blue Origin's target is to reach Andromeda galaxy! Maybe that's why they are not in a hurry" or "This is all for the elites! [,] this is all it is." The objective responses demonstrated that the market of space tourism is yet emerging, wherein most comments lacked the personal reflection of how they see themselves traveling or generally using space tourism services. The positive and objective comments outweighed the negative and subjective responses toward space travel. Literature of social media analysis in space tourism discussion confirm the dominance of positive sentiments surpassing the negative sentiments by many emotional folds such as trust and anticipation (Gulati, 2022). It could be interpreted that most people could still not imagine themselves undertaking space-faring trips owing to the complicated protocols, eligibility criteria, and/or the associated travel costs and risks. For example, "Branson's method seems very passenger centered with minimal payload priority. Bezos using a payload forward platform for passenger travel seems to do double duty... Eventually though, the high risk/cost of payload rockets will be deprioritized as materials get sourced and manufactured, more and more, in the vacuum of OUTER SPACE." This comment is positive

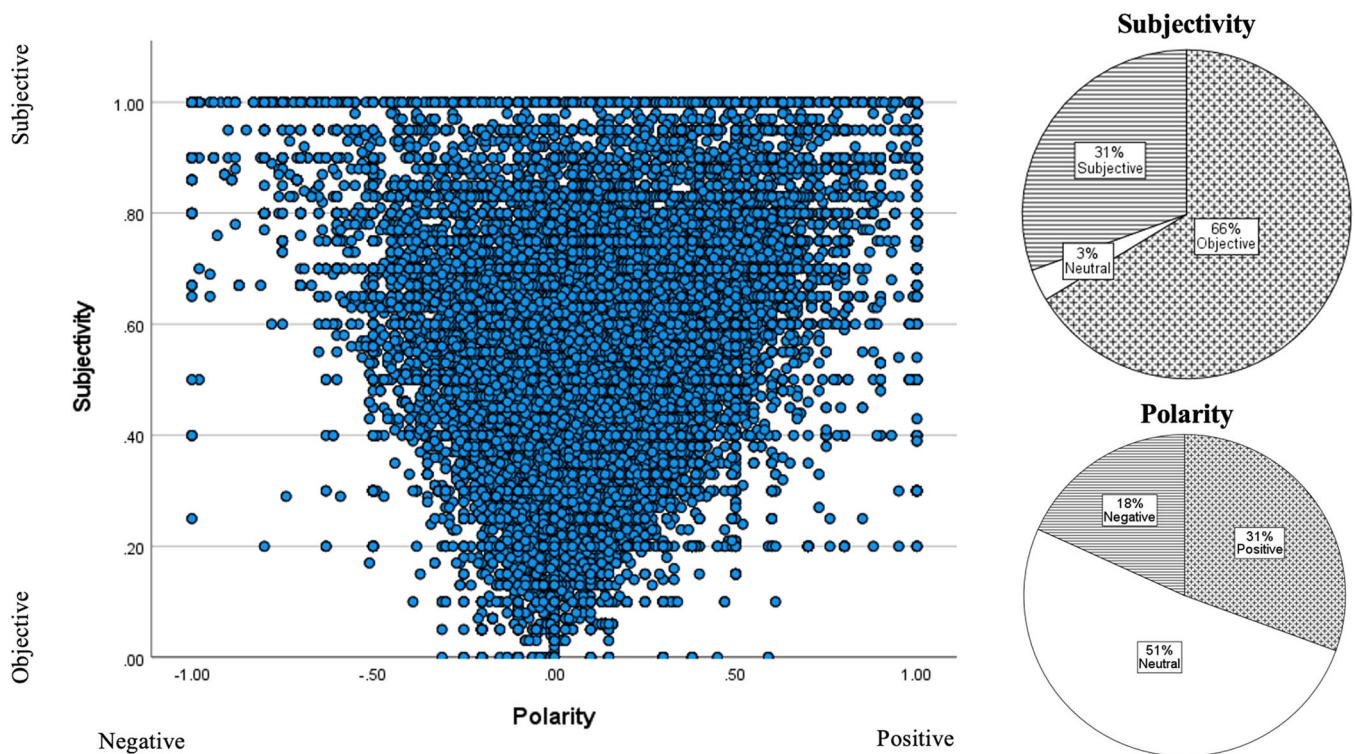


FIGURE 2 The results of sentiment analysis emotional polarity and subjectivity reflected in YouTube comments toward space travel.

and objective. In line with the results of the narrative and systematic review, the market shows an averagely positive intention toward commercialized space travel. However, there is a general concern regarding the brands, facilities of the operators, safety, and health issues. For example, *“Bezos’s trip seems more risky. I’ve never even heard about any test flights involving Bezos’s Blue Origin, but there have been several coverages of Virgin Galactic’s test flights in the past.”*

Consequently, the objectivity of the responses in the semantic analysis also indicated the need for a conceptual integrative framework that explains the motivations and personalities of potential travelers willing to travel to space. The social construction of acceptable safety risks needs to be theorized as the industry’s expansion is currently saturated with remarkable uncertainty (Spector, 2020). There is a synergy between the results of the narrative and semantic analyses using social media as some emerging situational traits (environmental sustainability, social envy billionaires, biomedical issues, anti-gravity, etc.) may be affecting public’s the responses. This is supported by the results of the narrative review and is more thoroughly discussed in the previous section.

5 | THEORETICAL IMPLICATIONS

5.1 | Integrative framework

By systematically mapping the extant studies and critical analyses in space tourism service research, this paper reveals the scarcity of

theoretical and methodological contributions and data shortages in modeling space travel intentions. More experimental and empirical research is needed in this field. Based on the findings of this narrative review on the intellectual structure of individuals’ psychological traits, we conceptualized and categorized the antecedents of responses to space travel (as either favorable or unfavorable) into a four-level hierarchy. These findings contribute broad and in-depth insights into how consumers respond. The results of the semantic analysis on social media confirm several complex factors that lead to uncertainty about space travel. Based on the model of motivation and personality (Mowen, 2000), this study proposed a framework that is expected to encourage consumers toward participating in commercialized space tourism (Figure 3). We supplemented the results of this hybrid review on previous research on commercialized space tourism with a semantic analysis on public opinion published on social media (Table 4).

5.2 | AGENDA FOR FUTURE RESEARCH

5.2.1 | Conceptualization of travel services and tourism typology in the new space market

Our review shows the multifaceted context of “new space” in the travel and tourism industry. However, there is a lack of scientific research on the specifications of service perceptions in space tourism. In the hospitality industry, “space food” and recreational activities take on a novel characteristic. Accordingly, it would be interesting to research the

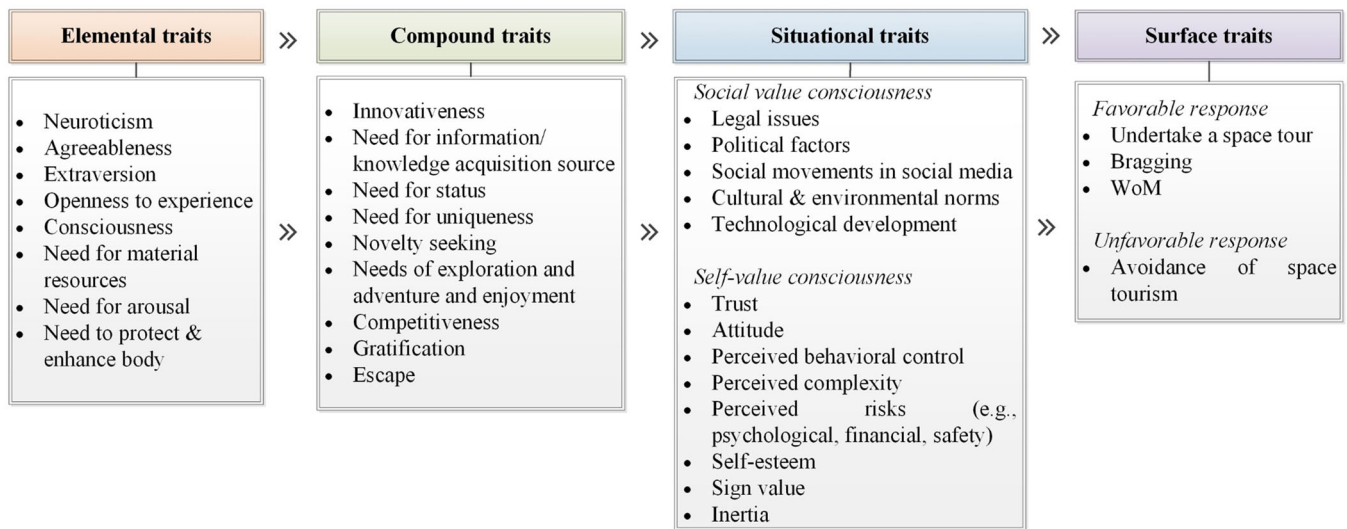


FIGURE 3 Integrative framework of the psychology of space tourism marketing.

potentials of new accommodation and transportation modes that can meet the needs and wants of tourists in outer space. Furthermore, additional research is needed to conceptualize space-faring activities (e.g., orbital hotels and lunar flights) across different types of tourism (e.g., memorable experience tourism, alternative tourism, nature-based tourism, niche tourism). For example, astronomical ecotourism camps in deserts, “tall ship astronomy” cruises, visits to rocket launch sites, self-discovery in the form of scientific astro-exhibitions, and planetarium visits could be categorized as part of the astro-tourism industry (Pásková et al., 2021; Scott, 2020).

5.2.2 | Theoretical contribution on both pragmatic and semantic levels

Based on the results of the systematic review shown in Figure 1, there is a general lacuna in the application of theory in the context of space tourist behavior. The narrative review findings also reveal the complexity of compound and situational traits in the articulation of tourists' behavior at the surface level and the scarcity of empirical research in this area. Therefore, positivist and interpretivist theoretical advancements at the pragmatic level could address the complexity of psychological traits' configurations that play decisive roles in their positive or negative behavioral responses. Theoretical advancement at the semantic level may perhaps shrink the current gap in modeling market demand elasticity at a macro scale (Crouch et al., 2009; Duan, 2020). For example, the application of positivist semantic theories could address the global concern toward space market characteristics as a real-world event by considering the pricing strategies for suborbital travel (e.g., seats and accommodation) to model consumer choice behaviors (Boyle, 2021).

Moreover, further theoretical contribution is required in the consumer behavior area which can then be applied onto modeling

consumer behavior in novel and adventurous activities of space-faring services. Table 3 lists some relevant theories recommended for future research to explain space behavior activities of tourists.

5.2.3 | The need for empirical and multidisciplinary studies

Our systematic analysis revealed that 69% of the studies (39) were conceptual and only 5% (3) used mixed-method approaches. The synthesis of this review calls for more multidisciplinary studies with empirical data and mixed-method approaches to address the multidimensional and idiosyncratic aspects of space tourism. Future research may use broader disciplines in the natural sciences field and apply their contributions to the area of psychology and marketing. Further, space travel needs greater involvement from end users (i.e., travelers) to contribute to the “codesign” of service development and delivery. For example, research in service innovation (e.g., innovation adoption and diffusion) may help gauge why some travelers adopt space travel while others do not; the results thereof may lead policy-makers to efficiently and effectively market new services for each target. We recommend conducting empirical research to test our proposed integrative model.

5.2.4 | Investigating the role of ethical issues on bilateral arguments toward commercialized space tourism

Misconceptions around the legitimacy of commercialized space travel services raise complex ethical questions relevant to the future development of space tourism law. They include the following: What are the consequences of pollution in the space environment? How can “heritage sites” in space be protected? What would happen if

TABLE 3 Recommendation of theoretical contribution in space tourism services.

Author	Journal	Theory	Scope of the research	Recommendation of theoretical contribution in space behavior activities
Sung et al. (2022)	<i>Psychology & Marketing</i>	Disfluency theory	Psychological mechanism contributes to the positive effects of perceptual disfluency	To what extent perceptual disfluency could lead to perceived novelty, perceived innovativeness, and intention to participate in space tourism activities
Brick et al. (2022)	<i>Journal of Consumer Psychology</i>	Shared consumer decision-making	Shared consumer decision-making of two necessary components of power—an individual's influence over and a partner's engagement in the decision	Space tourists' shared decision-making in relationship with different stockholders with different status or structural power in the supply chain
Claudy et al. (2015)	<i>Journal of the Academy of Marketing</i>	Behavioral reasoning theory	Adoption in consumers' innovation adoption decisions	Explain the reasons for and against adoption of space tourism toward innovative service activities
Fishbach and Woolley (2022)	<i>Annual Review of Organizational Psychology and Organizational Behavior</i>	Structured-based model for intrinsic motivation	Intrinsic motivational, organizational, cognitive, and social psychology	How to increase intrinsic motivation of space tourists toward using space-faring services
Maseeh et al. (2022)	<i>Psychology & Marketing</i>	The Attitude Behavior Context theory	Anti-consumption behavior of consumer	To what extent ecological concern, religiosity, mortality salience, and perceived behavioral control influence anti-consumption attitudes and intention toward space travel services and tourist wellbeing
Min and Schwarz (2022)	<i>Journal of Consumer Psychology</i>	Life history theory and uncertainty orientation theory	Psychological Control and Novelty-Seeking as opportunity and risk	Explain the exploration of novel options by space tourists based on their perception of instances of personal capability and predictability of the world
Moriuchi (2021)	<i>Psychology & Marketing</i>	Unified theory of acceptance and use of technology	Behavioral intentions and use of a technology in AI	Investigate the factors associated with consumer's intention to adopt technologies in space travel and acceptance of space transport system

TABLE 4 Future research pathways.

Thematic area	Research gap	Research questions
Conceptualization of travel services and tourism typologies in the new space market	Lack of scientific research on specifications and typologies of travel services in the space market	What is the future of new accommodation and transportation that can meet the needs and wants of tourists in outer space? How can leisure activities (e.g., orbital hotels and lunar flights) be conceptualized as different types of tourism?
Theoretical contribution in modeling tourists' behavioral responses toward space-faring at both pragmatic and semantic levels	General gap of theory application in the context of space tourist behavior	Which theoretical constructs could explain the behavior of tourists at different stages of their decision-making? What theoretical underpinnings could address consumer market demands at the macro scale?
The need for more empirical and multi-disciplinary studies and the application of novel methodologies	Predominance of the use of conceptual methods in the context of space tourism and lack of empirical studies	How could the combination of the situational and compound traits of space tourism participants contribute to their positive or negative responses toward space travel?
Investigating the role of ethical issues on bilateral arguments toward commercialized space tourism	Misconceptions around the legitimacy of commercialized space tourism	What tourism activities are "appropriate" in space tourism in the context of national and international laws supporting humankind, living organisms, and nature? How could ethical issues affect counterarguments toward participation in space tourism?
Integrating stakeholders' perspectives to maximize the socioeconomic impacts of space tourism	Scarcity of concentration on and scholarly attention to how start-ups and other stakeholders benefit from marketing strategies and design tour packages for space travel	What are the personalized marketing communication tactics at the consumer level and for industrial clients? To what extent can we maximize the socioeconomic impacts of space tourism by involving all the stakeholders in co-designing commercial space tourism services?
Media platforms and the application of new technologies to enhance the knowledge engagement of potential tourists	A dearth of realistic representations of travel to outer space	Which social media platform(s) and contents could contribute more to participants' knowledge enhancement and engagement to reflect their initial thoughts?
Role of scientific journals in knowledge enhancement	Emergence of the space tourism context in business and marketing journals	What disciplines are involved in space tourism? How could interdisciplinary and multi-disciplinary advance the knowledge and practical challenges of space tourism?

SpaceShipOne were to explode or crash (Launius & Jenkins, 2006)? What is the GDPR for satellites developed for scientific or commercial use (Denis et al., 2020)? This study argues that commercialized space tourism is progressing in the real world. NASA has already invested in the private market to establish private space tourism stations. However, environmental and sustainability concerns, as well as human biomedical issues and adaptation in accordance with skepticism and social envy, may obstruct this path. Nevertheless, these barriers will not deter humanity's hubris or brazen desire to challenge the current frontiers and current boundaries in search of new tourist destinations and sources of wealth. Future research should investigate how ethical issues affect counterarguments to space tourism.

Increasingly, countries and institutions are making practical efforts to address these global issues toward the sustainability of

the space tourism market. For example, New Zealand's "Ban Geoengineering & Weather Modification" introduced a new dimension of sustainability for space expansion, citing arguments for the sustainability of resources, energy, survival, and military supremacy. However, there is insufficient research on how these procedures could affect the public's thoughts on space tourism.

5.2.5 | Integrating stakeholders' perspectives to maximize the socioeconomic impacts of space tourism and its environmental sustainability

The findings of this hybrid review replicate the potential global demand for secure investments that would ensure the sustainability of the space tourism services. For instance, countries like US are

working on developing several lawsuits to control the levels of environmentally harmful emissions arising from space-faring activities (Scott, 2020). However, to address environmental issues at high altitudes, the cost of environment-monitoring satellites could be reduced by lowering the cost of space travel, allowing organizations to invest in climate research and environmental policymaking (Collins & Autino, 2010). Chang (2017) also sought to measure functional, social, hedonic, and cognitive motivations to model environmental sustainability of space travel for Taiwanese people. Therefore, national and international projects of cooperation between research institutes and space market industry could contribute to the optimization of socioeconomic and environmental impact of space tourism. The geopolitics of “commercial space aviation” paves way for international marketing competition. Hence, game theoretic aspects of the different stakeholders in the market would be of invaluable interest allowing the exploration of each stakeholder's socioeconomic incentives in the space tourism market. By establishing private space tourism stations and outsourcing the responsibility to private start-ups, NASA administrator Bill Nelson aims to increase tourist destinations, and opportunities to work and live in space (Howell, 2021). Commercial space entrepreneurs Elon Musk and Peter Beck recently launched the self-styled “Humanity Star.” Insurance companies are developing new insurance products related to vehicles, passengers, and third-party liability in orbital and suborbital space tourism (Rosa, 2013). Therefore, this study recommends that future researchers investigate the personalized marketing communication tactics used in the space market considering both the consumer and industrial client.

5.2.6 | Media platforms and the application of new technologies

The hybrid review discussion indicates toward public's insufficient experience to sufficiently reflect on their actual intentions and behaviors in the context of space tourism. Nevertheless, commercialized space exploration is not the responsibility of governments; the burden is on private institutions and entrepreneurs to develop space tourism packages and solutions including ticket-selling strategies, planning eligibility, and regulations. Therefore, propaganda through the media can provide unrealistic or fictitious experiences of space travel through exaggerated technological capabilities. To address this experimental gap, private institutions must continue investing in media propagation to substitute unrealistic and fictitious representations with real experiences in space and share them on social media to receive public feedback. For example, metaverse environments could enhance the operability and interactivity of the tourist with space services while addressing existing limitations of direct service interaction by designing avatar and metaverse hospitality experiences to create value for consumers and companies (Dwivedi et al., 2022). From an educational perspective, the subject of space and space travel is fascinating to many, and numerous establishments provide space-related

educational programs to simulate space flights. Therefore, social networking platforms based on reliable knowledge-dissemination sources could work to identify and monitor potential space travelers' real concerns, trends, and initial thoughts. In this study, we exported data from YouTube to NVivo software, while other reviews on social media used other analysis methods and software. These could be applied to extract and analyze more opinions from potential consumers in the industry.

5.2.7 | Role of scientific journals in knowledge enhancement

Based on the results of the bibliographic mapping of the sample articles, the distribution in journals reveals that business and tourism journals do not allocate enough attention to this niche market. There is potential for publishing special issues on the space tourism market in the consumer behavior research and psychology of space tourism marketing.

6 | CONCLUSIONS

This article contributes to the existing knowledge of the space tourism market by developing a conceptual framework for modeling travelers' behavioral responses toward participating in space tourism activities. We applied a hybrid of narrative and systematic reviews of 54 articles published in the Google Scholar and WoS databases in the context of the space tourism market between 2001 and 2022. Overall, this study contributes to a better understanding of the psychology of space tourism and the conceptualization of potential tourists' personality traits. The implications of this study relate to how stakeholders (both private institutions and start-ups) should invest in scenario construction and designs based on psychological stimuli in this novel market.

DATA AVAILABILITY STATEMENT

The data set used in this research are available upon request from the corresponding author. The data are not publicly available due to restrictions, that is, privacy or ethical.

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APPENDIX A

Trends in the space tourism market

Space tourism is comprised of orbital and suborbital markets differentiated by the speed of vehicles (Goehlich, 2005). According to the European Space Agency, space tourism is an “activity that will encompass the execution of suborbital flights by privately-funded and/or privately operated vehicles and the associated technology development driven by the space tourism market” (ESA, 2008, p. 19). The concept of commercial space travel shaped by suborbital launches with people onboard is now becoming a reality.

Orbital space flights provide space tourists with the opportunity “to have a return-trip to the International Space Station (ISS), based in an orbit about 400 km above the Earth’s surface,” while suborbital space tourism refers to “flights at an altitude of up to around 100 km above the Earth’s surface, including an experience of about 5 min of weightlessness” (Rosa, 2013; p. 236). Orbital and suborbital space travel are considered interdisciplinary contexts in academia and evoke specific discussions. They further engender new legal and marketing issues in the tourism industry. For example, as a high-risk tourism activity, the role of the insurance sector comes into play. The first professionally trained suborbital flight astronaut was American Alan Shepard, on May 5, 1961. Recent report has projected that, the global sub-orbital space tourism market is projected to reach \$396.6 million in 2031, at a compound annual growth rate (CAGR) of 24.46% during the forecast period 2021-2031. (Martins, 2022). This type of tourism insurance would target the high revenues of space activity and transfer the risks undertaken by tourism companies to insurers to secure their financial stability (Penn & Lindley, 2003). However, insurable risks and the efficiency of the insurance market are still undefined because of the dearth of trials, homogeneous exposures, and statistical data analysis available in commercial space tourism (Rosa, 2013).

The concept of orbital space hotels drew the attention of researchers in the early discussions around space tourism. In 1999, Hilton reportedly considered making a USD 25 billion investment in a space hotel and estimated that a 2-week trip would initially cost USD 2 million per person, falling to USD 415,000 by the fifth year. In 2003, US citizens were asked whether desired to go on a space adventure and stay in a hotel for 5 days, and what percentage of their annual salary they would be willing to spend on such a trip (Penn & Lindley, 2003). The survey outcomes appeared fairly optimistic in that they disguised that everyone who intended to buy a ticket would, actually, do so. In 2002, Space Adventures advertised accommodation in an orbital hotel and lunar flights as well as a range of other activities, but in 2005 their project was canceled because of leakages in industry development (Prideaux & Singer, 2005).

Astro-tourism

The literature covers several types of space tourism and leisure activities. Astro-tourism, which discusses lunar and Martian voyages, is a nature-based form of tourism that has been studied as a new means of conceptualizing tourism destinations (Soleimani et al., 2019). Discovering and experiencing outer space could be explained

and considered cosmic phenomena and alternatively labeled as “special-interest tourism” or “niche tourism.” Specific activities within astro-tourism include viewing solar eclipses, auroras, and other space objects on dark-sky sites that minimize light pollution (Scott, 2020). Other activities, such as visiting rocket launch sites, scientific astro-exhibitions, planetariums, and engaging in virtual reality programs could be categorized as part of the astro-tourism industry (Pásková et al., 2021).

In 2012, New Zealand established the Aoraki MacKenzie International Dark Sky Reserve to invest in astro-tourism. In January 2018, Rocket Lab in the USA launched the Humanity Star, which was hoped to become “one of the brightest objects in the night sky” (NZ Herald, 2018). People gathered at “Night Station” observatories to stargaze using telescopes. Constant growth in astro-tourism is proved by the fact that one of the US national parks receives 1.3 million visitors in a calendar year (Collins & Autino, 2010). Furthermore, Canada, Finland, Iceland, Greenland, Scotland, and Russia attract a notable number of “aurora tourists” annually. In Jordan and Chile, visitors can attend “astronomical ecotourism camps” in deserts to observe the night sky and solar events (Jacobs et al., 2020). In the North American Great Lakes area, there is another “emerging niche product” called “Tall Ship Astronomy Cruises” that provides tourists with the unique opportunity to experience the night sky from the sea (Soleimani et al., 2019). The Czech Republic boasts dozens of observatories equipped with state-of-the-art technology and is home to many professional and amateur astronomers (Pásková et al., 2021).

Commercial market trends

Two notable events in the history of aerospace shaped an emerging milestone in the space tourism industry. First, in 1927, Charles Lindbergh won the USD 25,000 Orteig Prize for achieving the first nonstop trans-Atlantic solo flight (Spector, 2020). Second, in 2004, the Ansari X Prize of USD 10 million was awarded to the private spacecraft SpaceShipOne, which was financially backed by software billionaire Paul Allen (Beery, 2012). After the historical achievement of attaining an altitude of 367,442 ft, a new private industry for space tourism appeared in the market and broke the trend that had hitherto seen space flight as solely the domain of governments (Chang, 2015). In 2013, SpaceShipTwo was built with the explicit purpose of space tourism. To support the private sector, NGOs like the Space Tourism Society, Space and Future, and HobbySpace as well as private companies such as SpaceX, Orbital Sciences, Bigelow Aerospace, and Virgin Galactic, and magazines like *UniGalactic Space Travel* were established to disseminate knowledge of space tourism (National Aeronautics and Space Administration NASA, 2011). Between 2001 and 2009, only seven hopeful tourists realized this dream (one went twice) by taking the Russian Government’s Soyuz launch vehicle and spacecraft to the multi-national ISS.

Space is, thus, becoming a destination not only for astronauts but also for tourists. Although 24 American astronauts have orbited the moon and three have made two trips there, only 12 have walked on its surface (Zelazko, 2021). After the success of Rocket Lab’s maiden

TABLE A1 Thematic analysis data.

#	Title	Producer/page	Comments	Views	Year	Link
1	Space: The Next Trillion Dollar Industry	Wendover Productions	2557	3,179,938	2018	https://www.youtube.com/watch?v=hiRBQxHrxNw
2	Why SpaceX, Virgin, & Blue Origin Are Betting On Space Tourism	CNBC	998	766,933	2020	https://www.youtube.com/watch?v=R_LqgcndmAo
3	A giant leap in a new era of commercial space travel	Sky News	42	24,664	2021	https://www.youtube.com/watch?v=zYGDeGrTwIM
4	The exciting future of commercial space flight	Interesting Engineering	8	10,84	2019	https://www.youtube.com/watch?v=E-koiMk7sFI
5	Inside SpaceX's Mission to Send Humans into Deep Space Foreign Correspondent	NBC	1253	451,451	2021	https://www.youtube.com/watch?v=qlnkR8P7q3M
6	Space: The Final Business Frontier	Bloomberg Quicktake	693	807,44	2019	https://www.youtube.com/watch?v=VlbZTyBuFIQ
7	SpaceX Lands All 3 Falcon Heavy Boosters for the First Time	Jett Quasar	5852	4,554,256	2019	https://www.youtube.com/watch?v=sf4qRY3h_eo
8	Richard Branson Announces You Could WIN A TRIP TO SPACE	Omaze	1129	8,599,448	2021	https://www.youtube.com/watch?v=l-F4Q9cvpf8
9	Elon Musk on how Falcon Heavy will change space travel	The Verge	4756	3,050,525	2018	https://www.youtube.com/watch?v=I7LJluB2CHE
10	British billionaire Richard Branson returns to Earth after historic Virgin Galactic space flight	South China Morning Post	4671	1,369,879	2021	https://www.youtube.com/watch?v=rVKGTYxtqxU
11	What Exactly Does Space Travel Do To Your Body?	Life Noggin	2017	1,138,609	2016	https://www.youtube.com/watch?v=sil97hz8o2w
12	Commercial Space Flight, The Moon Landing, and Aliens	PowerfulJRE	3136	912,784	2020	https://www.youtube.com/watch?v=XjBm8BB6-R4
13	How Jeff Bezos and Richard Branson's Space Flights Will Differ WSJ	Wall Street Journal	1947	806,362	2021	https://www.youtube.com/watch?v=CkrTe3BOuuA
14	In 2004, Elon Musk said this about the future of space travel	CNN	1420	630,031	2020	https://www.youtube.com/watch?v=ao5OdiwKp5k
15	3 Unexpected Dangers of Space Travel	SciShow Space	601	490,980	2016	https://www.youtube.com/watch?v=fX8g3wcUY5l
16	Richard Branson reaches edge of space on Virgin Galactic flight	CNBC Television	1424	479,920	2021	https://www.youtube.com/watch?v=jSlldllridsg
17	Can SpaceX Make Point-To-Point Space Travel Profitable?	CNBC	700	251,782	2019	https://www.youtube.com/watch?v=t40hlvzEvvY
18	Virgin Galactic may (finally) make space tourism reality	CNN Business	425	205,255	2018	https://www.youtube.com/watch?v=kS1J-ZSaecw

TABLE A1 (Continued)

#	Title	Producer/page	Comments	Views	Year	Link
19	Why Space May Be Your Next Vacation	Bloomberg Quicktake	309	134,294	2021	https://www.youtube.com/watch?v=E8hqHOBmZzg
20	What Will Space Tourism Be Like?	Primal Space	346	137,518	2020	https://www.youtube.com/watch?v=eH-xm9G9QBk
21	See Japanese billionaire blast off into space	CNN	308	27,869	2021	https://www.youtube.com/watch?v=gZZ9LaV2zb4
22	Virgin Galactic Unity 22 Space flight	Virgin Galactic	11,800	4,117,272	2021	https://www.youtube.com/watch?v=ZPrB3WvnZpE
23	Jumping From Space! - Red Bull Space Dive	The Random Theorizer	150,340	122,009,361	2016	https://www.youtube.com/watch?v=E9oKEJ1pXPw
24	The space balloon that could take you into orbit	Sky News	72	3,739	2021	https://www.youtube.com/watch?v=fhey4NSwU2c
Total			312,624	148,745,678		

*Link of data analysis.

satellite in May 2017, some countries focused on commercial opportunities and tried to “make themselves competitive by luring private firms” to enter the global space industry (Scott, 2020).

As of May 2020, the NASA astronaut's corps has 48 “active” astronauts (Mars, 2016). NASA reported that the annual payloads on all launches worldwide from both public and commercial institutions range from 70 to 90 launches and are increasing. In 2020, it further reported 114 orbital launches and four suborbital (crewed) launches, with 12 travelers in total (Kyle, 2020). The three-day SpaceX launch on September 15, 2021, as the first civilian spaceflight broadcast in the media, reflected a real-time experience of space life (Freeland, 2021).

Companies in this field need to know who their initial targets for this niche segment of adventurous travel are and how to increase positive reinforcement through word of mouth. Transportation and accommodation in the space tourism industry has had a drastic impact on its socioeconomic growth (Collins & Autino, 2010). The Voyager Station claimed it could accommodate 280 tourists as the first commercial space hotel in 2027, purporting that would be akin to buying a cruise ticket (Mafi, 2021). The hospitality services include traditional “space food” and recreational activities that would be extremely novel and adventurous because of the weightlessness of the environment. In terms of simulating the experience for participants, the company noted that “... the physics involved in sleeping within a space hotel is similar to spinning water in a bucket. Much in the same way one can spin a bucket in a circle, keeping the water inside of it ... This makes comfortable rooms and stylish bar experiences possible” (Mafi, 2021).

NASA also opened a space hotel for which each entrepreneur-astronaut will pay USD 55 million. Hotel accommodations in space is evidently fast becoming a reality; however, the cost is estimated to be about USD 100,000 per night (Chang, 2020; Ferreira-Snyman, 2014). Based on an Axiom Space report, its start-up is planning to “launch a node module, research & manufacturing facility, crew habitat, and large-windowed Earth observatory to form the ‘Axiom Segment’ of the ISS,” which is projected to start in 2024 (Tangermann, 2020). In the summer of 2021, astronauts on the ISS celebrated the summer Olympics in orbit with swimming and sharpshooting activities, and even a new sport called no-handball in the weightless experience, and 65 astronauts announced that they would commemorate the next summer Olympics in France in 2024 (Howell, 2021). In December 2021, NASA awarded Blue Origin, Northrop Grumman, and Nanoracks contracts to build private space stations and financed them with \$120 billion, \$160 billion, and \$125.6 billion, respectively (Sheetz, 2021). By establishing private space tourism stations, NASA administrator Bill Nelson aims to increase the number of tourist destinations, even going so far as to enable people to work and live in space. Furthermore, by outsourcing this to private companies to private companies, NASA can save more than \$1 billion annually and, thereby, invest in the exploration of more distant parts of the solar system (Euronews, 2020). Therefore, the market is becoming increasingly competitive. Recently, Virgin Galactic's Richard Branson and Amazon founder Jeff Bezos took early

TABLE A2 Top-level comments.

Video name	Total comments	Top-level comments
Space: The Next Trillion Dollar Industry	2557	1837
Why SpaceX, Virgin, & Blue Origin Are Betting On Space Tourism	998	512
A giant leap in a new era of commercial space travel	42	29
The exciting future of commercial space flight	8	7
Inside SpaceX's Mission to Send Humans into Deep Space Foreign Correspondent	1253	787
Space: The Final Business Frontier	693	436
SpaceX Lands All 3 Falcon Heavy Boosters for the First Time	5852	2884
Richard Branson Announces You Could WIN A TRIP TO SPACE	1129	446
Elon Musk on how Falcon Heavy will change space travel	4756	3213
British billionaire Richard Branson returns to Earth after historic Virgin Galactic space flight	4671	2234
What Exactly Does Space Travel Do To Your Body?	2017	1321
Commercial Space Flight, The Moon Landing, and Aliens	3136	2216
How Jeff Bezos and Richard Branson's Space Flights Will Differ WSJ	1947	1041
In 2004, Elon Musk said this about the future of space travel	142	741
3 Unexpected Dangers of Space Travel	601	307
Richard Branson reaches edge of space on Virgin Galactic flight	1424	631
Can SpaceX Make Point-To-Point Space Travel Profitable?	700	361
Virgin Galactic may (finally) make space tourism reality	425	197
Why Space May Be Your Next Vacation	309	172
What Will Space Tourism Be Like?	346	156
See Japanese billionaire blast off into space	308	151
Virgin Galactic Unity 22 Space flight	11,783	7,036
Jumping From Space! - Red Bull Space Dive	152,008	81,570
The space balloon that could take you into orbit	72	37
Total	197,177	108,322

steps in opening up space tourism. The prospect of advances in commercial space exploration touches on an aspect of humanity's collective future: whether to continue as Earthlings or develop into a spacefaring civilization (Cohen & Spector, 2019).

According to Virgin Galactic, people interested in space travel must be in reasonable physical shape and pass a five-day training course, which includes practicing in microgravity to ensure safety and comfortability during periods of high acceleration. Origin Blue have tougher eligibility criteria: participants need to be able to climb seven flights of stairs (the height of the launch tower) in under 90 s (Boyle, 2021). It also has a prescribed height requirement of 5'0"–6'4" (152–193 cm) and a weight of 110–223 pounds (50–100 kg). The cost of seats for suborbital space travel in 2022 ranges from

\$200,000–\$250,000 per trip and companies are trying to reduce the price to make travel more commercially viable (Boyle, 2021). For example, Space Perspective, a Florida-based company, is taking space tourists on its Spaceship Neptune, a balloon-shaped pressurized capsule, for \$125,000 a seat. While this trip is only 19 miles far from the boundary of space and weightlessness, they have sold out all 300 seats for 2024. Elon Musk and SpaceX are also investing in the space tourism game, but its plans for a longer journey will cost the company tens of millions of dollars (Chaturvedi, 2021). A new space race has also begun in the cinema industry. It was announced in 2020 that a Hollywood movie starring Tom Cruise would be the first to film scenes in space, while Russia aims to beat this by sending an actor to space in 2021 (Sharf, 2020).