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The impact of growth hacking on firm performance under environmental turbulence: A moderated-mediation analysis☆

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ABSTRACT

The purpose of the study is to examine the influence of growth hacking on marketing capability, disruptive innovation, and firms' performance. Structural equation modeling was used to analyze the data. The results show that growth hacking positively influences marketing capabilities, disruptive innovation, and firms' performance. Further, marketing capabilities and disruptive innovation were observed to mediate the association between growth hacking and firm performance, whereas technological turbulence moderates the association between disruptive innovation and firm performance. The findings suggest that firms can use growth hacking to foster marketing capabilities and disruptive innovation, which may affect firm performance. Besides, firms need to constantly monitor the technological turbulence levels.

1. Introduction

Recent years have seen the growth of alternative marketing approaches as a result of technological advancement and digital revolutions (Sukhraj, 2017; Troisi et al., 2020). Accordingly, the creative decision-making methods gave rise to novel marketing strategies like "Growth Hacking," referred to as "Hacking Growth" (Herttua et al., 2016). This novel approach combines technology and creative thinking to determine the most effective means of business growth (MLT Creative, 2016). Ellis (2010), a start-up counselor and entrepreneur, coined the phrase "Growth Hacking" and defined it as "a process of rapid experimentation across the funnel to learn the most effective way to scale sustainable customer adoption.".

The growth hacking concept has been examined in big data analytics, strategy, and marketing. In this research, the authors adopted the definition of growth hacking, which focuses on the marketing dimensions. In marketing, growth hacking is an essential framework that best captures the consumer life cycle (Troisi et al., 2020). Growth hacking consists of data-driven procedures steered through alternative channels to accelerate measurable metrics, whereas traditional marketing approaches are primarily concerned with raising awareness through conventional media (Sukhraj, 2017). Bohnsack and Liesner (2019) stated that academics and industry professionals realize that growth hacking offers an innovative way to close the gap between strategy formulation and implementation. In recent years, organizational capabilities and data-driven experimentation developed within the organization have increased the organizational competencies to foster technologies and business model innovation (Belitski & Mariani, 2023; Chaudhuri et al., 2023; Vrontis et al., 2023).

Lately, various companies have adopted growth hacking practices, especially in enhancing marketing performance through digital transformations (Apostolidis et al., 2021; Babu et al., 2019). Companies such as Starbucks, Unilever, and IKEA are forerunners in this digital transformation movement. Growth hacking is specifically helpful for marketing in recognizing and solving customer problems (Radzevych, 2024). While practitioners can perceive a future characterized by growth hacking, and a few companies have shown growth with digital transformation, various companies are unsure about the impact of growth hacking on firm performance and are still hesitant to adopt growth hacking practices (PWC, 2024). Further, empirical work on evaluating the impact of growth hacking on firm performance was not carried out in prior research (Vrontis et al., 2022a). Only conceptual

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studies elaborate on the growth hacking concept and its importance in enhancing firm performance. Thus, considering the gap in the literature and illustrating the advantages of growth hacking to organizations, it is imperative to determine how it affects firm performance (Conway & Hemphill, 2019). The findings will assist organizations in evaluating their decisions regarding employing growth hacking.

Additionally, the concept of growth hacking can be related to marketing capabilities. The dynamic capability view (DCV) focuses on developing and changing capabilities and relates them to firm performance. It suggests that a firm's success is shown by its ability to adapt to an ever-changing environment to maintain value creation abilities and gain competitive advantage. The concept of growth hacking suggests that effectively using platforms and technologies that others have not previously used is a prerequisite for expanding marketing abilities (Asseraf et al., 2019; Chaudhuri et al., 2022). Considering growth hacking as a dynamic capability may be beneficial for businesses functioning in various markets, and it is necessary to successfully and efficiently handle such fast-paced complexity (Elia et al., 2021; Mitręga & Wieczorek, 2020). While academicians are now examining how various marketing capabilities can be best established, sustained, enhanced, and leveraged in businesses, growth hacking appears to be a promising strategy for enhancing marketing capabilities by means of integrating and leveraging technological innovations and creative thinking (Morgan et al., 2018). Growth hacking, along with other marketing capabilities and disruptive innovation, emphasizes adopting changes based on the environment (Akter et al., 2020). Thus, it is imperative to analyze how growth hacking, marketing capability, and disruptive innovation affect firm performance (Bargoni et al., 2023).

Firms are affected by various environmental situations and conditions, and in environmental turbulence, the various capabilities and innovations may be severely affected (Leonard-Barton, 1992). In these situations, firms' dynamic capabilities and growth hacking strategies become important (Chatterjee et al., 2023a). Prior research has examined how environmental turbulence affects firm performance and various capabilities, which shows restricted insights that may be gained and obscures the more intricate interaction effects (Ranjan et al., 2022; Vrontis et al., 2022b; Wilden & Gudergan, 2015). Therefore, there is a need to examine how environmental turbulence may influence the association between marketing capabilities, disruptive innovation, and firm performance. Thus, grounded on the gaps reported above and utilizing the propositions of DCV, the present study aims to comprehend how growth hacking, disruptive innovation, and marketing capabilities affect firm performance and how market and technological turbulence play an essential role in such associations.

Thus, this work delves into the contexts of the dynamic capability's perspective, considering how growth hacking impacts marketing capabilities and disruptive innovation and stimulates firm performance. By doing so, this study enriches the literature on DCV and growth hacking. It establishes growth hacking as a vital factor influencing organizations' marketing capability, disruptive innovation, and firm performance. The findings add to the paucity of empirical research examining how technological and market turbulence affect the association between marketing capabilities, disruptive innovation, and firm performance. As a major contribution, the present study also puts forward the idea that growth hacking stimulates a new approach to driving firm performance.

The article is arranged in the following order. The following section explores the theoretical foundations. The third section describes the hypothesis formulation. The methodology and findings of the research are provided in the fourth and fifth sections. Finally, discussion, implications, and future research directions are provided.

2. Literature review

2.1. Growth hacking

Growth hacking was initially introduced as an economical, data-driven strategy for quickly acquiring and retaining customers, primarily for start-ups (Ellis, 2010; Sanasi, 2023). It was allied with a lean methodology by the initial literature and emphasizes constant experimentation and agility (Brinker, 2016; Feiz et al., 2021). As the concept grew, organizations such as Dropbox and Airbnb demonstrated how viral loops, referral programs, and metrics-driven approaches could hasten growth. It has been further popularized to reach out to large organizations seeking innovative ways to scale (Bargoni et al., 2024). Growth hacking has been developed into a more structured and sustainable approach with formalized growth hacking frameworks, emphasizing the customer life cycle and advocating cross-functional growth teams (Troisi et al., 2020). Today's focus on growth hacking has shifted to AI-centric growth plans (Santoro et al., 2024). As a multidisciplinary concept, growth hacking assimilates strategy, marketing, and analytics to promote firm performance (Cavallo et al., 2024). The present work considers growth hacking as a novel marketing approach that can recognize the effective ways a firm can grow (Herttua et al., 2016), utilising data-driven procedures via alternative channels (Sukhraj, 2017).

2.2. Marketing capabilities

A firm's marketing capability is defined as "the ability of an organization to leverage its tangible and intangible resources in an integrated manner in order to understand the complex needs of its consumers, to differentiate its products from those of its competitors, and to establish a superior brand equity position" (Nath et al., 2010; Song et al., 2007). Marketing capability is ingrained in the firm's resource-based view (RBV), which reflects the competencies of market sensing, managing customer relationships, branding, and developing new products and services as essential dimensions of marketing capability (Vorhies & Morgan, 2005). Businesses across different markets face various situations (Asseraf et al., 2019). Marketing capabilities are vital in managing these incessantly developing markets (Hafezieh et al., 2023; Mitręga & Wieczorek, 2020). Strong marketing capability affects several aspects of firm performance, including sales and brand visibility (Vorhies et al., 2011). Firms progressing their marketing capabilities are likely to gain positive results in firm performance (Homburg & Wielgos, 2022; Mu et al., 2018). Disruptive innovation and marketing capability are related and categorized by principles of flexibility, innovation, and consumer centricity (Bargoni et al., 2023). Firms with robust marketing capabilities are ready to classify and advance disruptive innovations to gain a competitive advantage and drive business transformation (Homburg & Wielgos, 2022).

Additionally, prior research emphasizes the importance of organizations developing dynamic marketing capabilities that allow firms to adapt and reconfigure resources in varying market conditions (Vorhies et al., 2011). These capabilities have become more complex with digital marketing, big data, and analytics (Homburg & Wielgos, 2022; Mu et al., 2018; Ranjan et al.,2023). It is crucial to see how growth hacking can develop marketing capabilities in a changing environment.

2.3. Theoretical background

The DCV explores how dynamic market conditions affect firms (Peteraf & Tsoukas, 2017). DCV theory "strains an organisation's ability to adapt, assimilate, and reconfigure firm competencies to answer to rapid technical and market change" (Di Stefano et al., 2014; Teece et al., 1997). In the context of changing competitive scenarios due to a rapidly changing environment, DCV explains firm competitiveness (Deeds et al., 2000; Wu, 2010) and how firms can utilize and convert their resources into better performance (Ferreira et al., 2020).

DCV theory is highly applicable to growth hacking, having substantial technological and method variations. The growth hacking approach may help develop dynamic capabilities that are adaptable and innovation-centric, enabling a firm to develop new resources (Le et al.,

2024; Teece, 2007), supporting the RBV (Barney, 1991). Hence, the present work is also based on the RBV, which supports the ability of a firm to acquire and develop valuable and non-replicable resources.

3. Hypotheses development

3.1. Growth hacking, marketing capability, and firm performance

Growth hacking may be employed in diverse functions in the firm's value chain (Jabeen et al., 2023) and can positively affect firm performance through constant experiments. Firms adopting growth hacking can expect improved performances (Sheshadri, 2021). These improvements may be reflected in various matrices, including customer acquisition, adapting to market variations, and improved competitiveness (Hafezieh et al., 2023; Sheshadri, 2021). Prior research suggests that growth hacking functions are aligned with business methods prioritizing agility, invention, and data-centric decisions, leading to enhanced firm performance (Bargoni et al., 2024; Chatterjee, 2020; Troisi et al., 2020). Robust marketing capability affects various forms of firm performance, including income, brand image, and consumer satisfaction (Vorhies et al., 2011). Firms capitalizing on evolving and advancing their marketing capabilities will be expected to gain positive firm performance results (Homburg & Wielgos, 2022; Mu et al., 2018; Sheshadri, 2020). Thus, growth hacking may help improve the organization's marketing capability. Furthermore, if the marketing capability of organizations is enhanced, it may positively impact overall firm performance. Thus, we propose:

H1: *Growth hacking is positively related to firm performance.*

H2: *Growth hacking is positively related to marketing capability.*

H3: *Marketing capability mediates the association between growth hacking and firm performance.*

3.2. Growth hacking, disruptive innovation, and firm performance

Growth hacking has become an area of increasing focus among practitioners, especially after some well-known digital businesses rose to prominence (Sheshadri, 2020). These digital businesses proliferated by implementing creative, data-driven growth hacking strategies at various growth hacking stages, including hack, viral, and retention (Troisi et al., 2020). A few examples of businesses that have benefited from growth hacking techniques to expand quickly and dramatically are Dropbox, Uber, and Airbnb. Some have concentrated on the hacking approach, such as providing tailored discounts to a specific clientele. Some have taken advantage of virality by running referral schemes, such as Dropbox, which gives users free space in exchange for referring friends, family, or coworkers to the service. Organizations can foster an environment conducive to disruptive breakthroughs by assimilating growth hacking into innovation (Troisi et al., 2020). The agility, experimentation, and user-focussed pattern in growth hacking can accelerate the growth and acceptance of disruptive innovations (Wan et al., 2015). Innovations related to different industry 4.0 technology could also be disruptive at different maturity phases (Chaudhuri et al., 2023; Mariani & Borghi, 2019; Vrontis et al., 2022a). Thus, based on the above argument, growth hacking may positively affect disruptive innovation. Further, disruptive innovation can positively influence firm performance by fostering companies to enter new markets, gain competitive advantage, and respond effectively to changing customer needs (Rahman et al., 2022; Wan et al., 2015; Wang et al., 2023; Zheng et al., 2021). Hence, the following hypotheses have been proposed:

H4: *Growth hacking positively influences disruptive innovation.*

H5: *Disruptive innovation impacts firm performance.*

H6: *Disruptive innovation mediates the association between growth hacking and firm performance.*

H7: *Marketing capability positively impacts firm performance.*

3.3. Technological turbulence

Environmental turbulence exists when there is a sudden change in the technology and marketing scenarios (Wang et al., 2022). Changeability, instability, and predictability are concerned with environmental turbulence affecting firms regarding technology and marketing. (Chatterjee et al., 2023b). Technological turbulence can affect the association between marketing capabilities and disruptive innovation with firm performance (Martin et al., 2020). High turbulence may render marketing initiatives less effective, which means that marketing agility and technology-enhanced capabilities are vital to sustaining performance. In the same way, disruptive innovations are affected by the technological environments since they can quickly seize on the emerging technologies and needs of the customers (Wang et al., 2022). According to previous studies, companies that experience environmental turbulence may find that their technological and marketing strengths become liabilities (Leonard-Barton, 1992). Protogerou et al. (2012) examined the moderating influence of environmental turbulence, which provides restricted insights. Wilden and Gudergan (2015) demonstrate that the specific source of turbulence affects the company, even though the firm's capabilities are well matched with the external circumstances.

Accordingly, we propose:

H7a: *Technological turbulence moderates the relationship between marketing capability and firm performance.*

H7b: *Technological turbulence moderates the relationship between disruptive innovation and firm performance.*

3.4. Market turbulence

Marketing capability relates to an organization's ability to uncover, formulate, and communicate value to buyers, often resulting in superior firm performance (Vorhies and Morgan, 2005). Typically, marketing capability can meet the customer's needs and respond to market requirements; however, in turbulent markets, such capabilities may be enhanced or debilitated (Martin et al., 2020). Turbulent market conditions may lead to the ineffectiveness of conventional marketing plans. Conversely, firms possessing dynamic marketing capabilities can respond to changing scenarios and varying customer requirements (Chatterjee et al., 2023a). The market turbulence can affect the relationship between marketing capability and firm performance (Martin et al., 2020). Similarly, it is argued that the linkage between disruptive innovation and firm performance may be contingent on external market turbulence. At times of market turbulence, market consumers and competitors resist change and prefer regular commodities and activities. Consequently, in such environments, disruptive innovations may not strongly affect the organization's performance. In this light, the firm should become more agile in handling turbulence and gaining an advantage over competitors (Runyan et al., 2008). Prior studies have stated that companies with excellent marketing capabilities can rapidly assimilate external knowledge, enhancing readiness.

Thus, we propose:

H8a: *Market turbulence moderates the relationship between marketing capability and firm performance.*

H8b: *Market turbulence moderates the relationship between disruptive innovation and firm performance.*

Thus, based on the discussion above, a conceptual model is developed in Fig. 1:

4. Material and methods

4.1. Survey and data collection

The data were collected from working professionals in India using a survey. The target respondents were selected from India for a variety of reasons. India is one of the essential members of BRICS countries, having

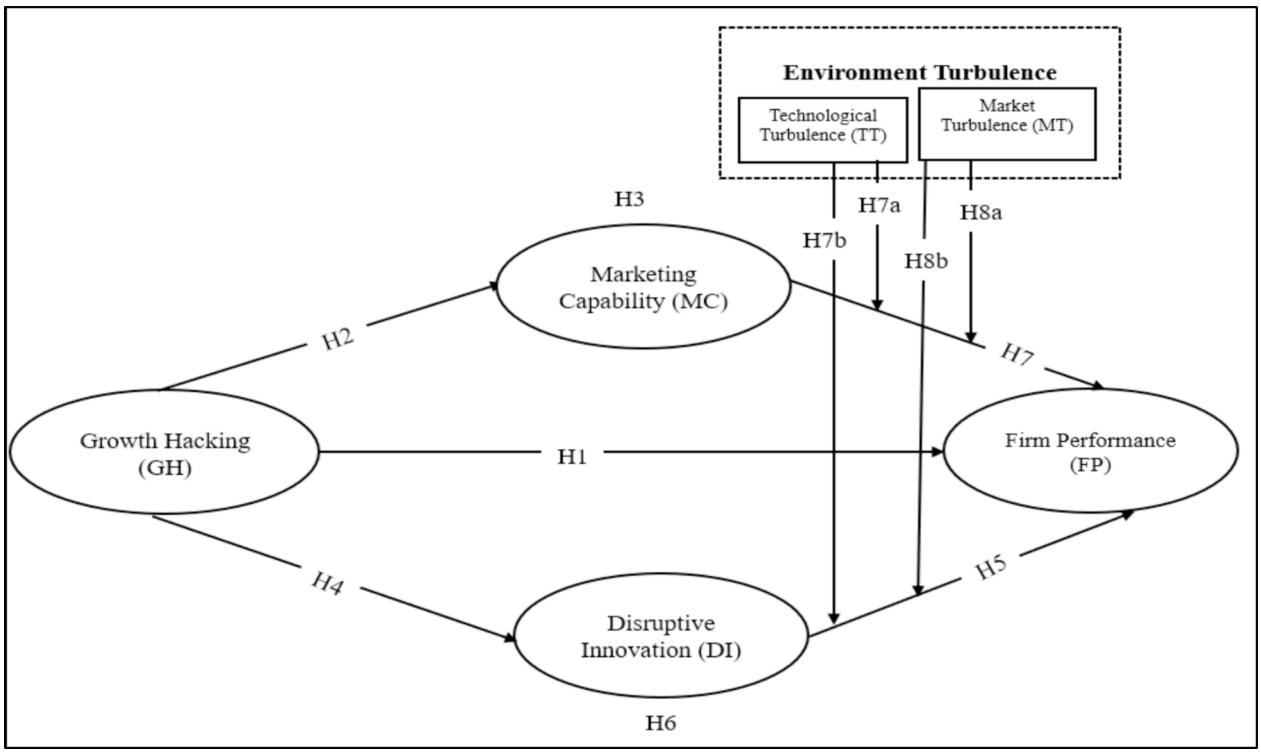

Fig. 1. Conceptual model.

several IT hubs in different locations. India is a rapidly growing emerging economy with continuous and aggressive technological adoption and tremendous growth in the start-up industry, where various organizations use growth hacking for marketing. India will be home to 700 million Internet users in 2025; with many Internet consumers, firms need to develop creative ways of marketing to the audience (Thussu, 2020). Further, India is the third-largest start-up ecosystem globally, boasting over 100 unicorns (Tiwari, 2023). These are usually founded with no capital and utilize the concept of growth hacking. Because cost is critical to a start-up's long-term viability, growth hacking is perfect for start-ups centered on low-cost, data-driven, and viral marketing strategies. Further, digital payments and e-commerce, with millions of daily active users in India, also have high growth potential (Krishna et al., 2023). With growth hacking being a strategic tool to acquire, retain, and convert users in organizations, companies operating in these sectors can enhance their overall success in such a competitive environment.

The respondents were employed in different IT and other service-related organizations. Data were collected using an online survey in English. The survey was conducted between August and November 2023. A total of 700 employees were contacted using surveys from various service organizations in India. A total of 386 responses with missing information were finally used after receiving the responses. A non-response bias test has been performed following the procedure laid down in the study of Armstrong and Overton (1977). For this, an independent *t*-test has been conducted by analyzing the concerned respondents' first and last 100 responses. It has appeared that in both cases, no noticeable difference in results exists. This confirms that non-response bias was not a significant threat in the study. A cross-sectional dataset was used for the present study, consisting of 386 working professionals aged 18 to 54 years, and 69.17 % were male. The response rate was about 55.14 percent. The detailed respondents' profile is shown in Table 1.

Table 1
Respondents' profile.

Demographic	Classification	Frequency	Percentage
Gender	Female	119	30.70
	Male	267	69.30
Age	18–24 years	80	20.74
	25–32 years	134	34.71
	33–38 years	112	29.01
	39–54 years	60	15.54
Position	Senior level (>10 Y Exp)	93	24.09
	Middle level (5–10 Y Exp)	158	40.94
	Junior level (0–5 Y Exp)	135	34.97

4.2. Measurement

Measurement of scale items used in this study was conducted using a 5-point Likert scale (where 5 represents a positive opinion (Strongly Agree/Always) and 1 represents a negative opinion (Strongly Disagree/Never)). Based on Abraham and Pasaribu's (2022) work and Troisi et al.'s (2020), five items are used to measure growth hacking. The items chosen seem appropriate in light of the study's focus on the marketing aspect of growth hacking. Firms' performance is measured utilizing six items from Bai et al. (2023). Marketing capability is measured utilizing five items adopted from Mu et al. (2018). Five items from Govindarajan and Kopalle (2006) were adopted to measure disruptive innovation. Technological turbulence is measured utilizing four items from Danneels and Sethi (2011). Market turbulence is measured utilizing four items adopted by Wang et al. (2022).

5. Data analysis and results

We used partial least square structure equation modeling (PLS-SEM) to examine the hypotheses. Smart PLS 3.0 can predict both formative and reflective constructs at the same time (Hair et al., 2011). In contrast to covariance-based structure equation modeling (CB-SEM), it is less constrictive and has more statistical power. Thus, it becomes a mandatory tool for this study.

5.1. Measurement model

Firstly, the measurement model for the constructs was analyzed. The factor loadings of the items for all variables were analyzed, and they were found to be more than 0.70, except in some cases. The internal consistency reliability of the scales was examined. According to Hair et al. (2010), Cronbach's alpha (CA) values should be above 0.8, and composite reliabilities (CR) should be above 0.80 (recommended value > 0.7), implying strong reliability. The convergent validity is assessed based on average variance extracted (AVE) values for all variables and should be more than 0.5 (Fornell & Larcker, 1981). The results are shown in Table 2.

The discriminant validity is assessed by comparing the inter-construct correlations with the square root of the specific AVEs. The square root of the AVEs is greater than the construct intercorrelations (refer to Tables 3 and 4). Moreover, the heterotrait-monotrait (HTMT) values are less than 0.90; thus, discriminant validity is established. Therefore, the measurement model's discriminant validity is likely satisfactory (Fornell & Larcker, 1981).

Hair et al. (2016) state that the variance inflation factor (VIF) should be less than three, and the result of VIF is between 1 and 3. The standard root mean square residual (SRMR) value was 0.071, below the 0.08 threshold (Hair et al., 2016).

5.2. Common method bias

The results of this study principally rely on the survey data. As a result, the chance of having common method bias (CMB) cannot be overruled. Some procedural steps were initially taken to mitigate the risks of CMB. A pretest and pilot test were conducted to make the recitals of the questions to the respondents easier and more understandable. Respondents were informed that their identities would be kept confidential. Even after that, Harman's single factor test (SFT) was performed to test the chance of having CMB. The results highlighted that the first factor accounted for 22.63 % of the variance. It satisfied the allowable maximum limit of 50 % (Podsakoff et al., 2003). Further, a marker correlation ratio test was also conducted to check CMB, as suggested by Lindell and Whitney (2001). The results of both these tests did not demonstrate any existence of CMB. Therefore, it can be said that CMB did not distort the data.

5.3. Structural model

The results of the hypotheses testing are shown in Table 5. Hypothesis H1 states that growth hacking positively relates to firm performance ($\beta = 0.23$, $t = 3.31$, $p = 0.00$), and this is supported. Hypothesis H2, stating that growth hacking positively relates to marketing capability ($\beta = 0.47$, $t = 10.73$, $p = 0.00$), is supported. The mediation hypothesis H3 states that marketing capability mediates the relationship between growth hacking and firm performance ($\beta = 0.29$, $t = 5.33$, $p = 0.00$), which is supported. Hypothesis H4 states that growth hacking is positively related to disruptive innovation ($\beta = 0.12$, $t = 2.14$, $p = 0.04$), which is also supported. Hypothesis H5 states that disruptive innovation is positively related to firm performance ($\beta = 0.28$, $t = 4.92$, $p = 0.00$), and is supported. Another mediation hypothesis, H6, states that disruptive innovation mediates the association between growth hacking and firm performance ($\beta = 0.35$, $t = 6.33$, $p = 0.00$).

The moderation hypothesis H7a, stating that technological turbulence moderates the association between marketing capability and firm performance ($\beta = 0.12$, $t = 1.82$, $p = 0.07$), is not supported. The moderation hypothesis H7b states that technological turbulence moderates the association between disruptive innovation and firm performance ($\beta = 0.27$, $t = 4.39$, $p = 0.00$). The figure of moderation analysis is shown in Fig. 2. The moderation hypotheses H8a and H8b state that the market turbulence moderates the association between marketing capability and firm performance ($\beta = -0.03$, $t = 0.52$, $p = 0.60$) and disruptive innovation and firm performance ($\beta = -0.06$, $t = 1.17$, $p = 0.24$), and are not supported.

Table 2
Reliability statistics.

Variables	Cronbach's alpha	Composite reliability	Average variance extracted
Disruptive innovation	0.89	0.92	0.69
Firm performance	0.83	0.88	0.56
Growth hacking	0.87	0.90	0.65
Marketing capability	0.93	0.95	0.79
Technological turbulence	0.86	0.90	0.70
Market turbulence	0.70	0.81	0.52

Table 3
Discriminant validity.

Variables	1	2	3	4	5	6
Disruptive innovation (1)	0.83					
Firm performance (2)	0.21	0.75				
Growth hacking (3)	0.13	0.18	0.81			
Marketing capability (4)	0.17	0.25	0.47	0.89		
Technological turbulence (5)	0.02	0.09	0.19	0.18	0.84	
Market turbulence (6)	0.11	0.28	0.02	0.04	0.06	0.72

Table 4
HTMT computation.

Variables	1	2	3	4	5	6
Disruptive innovation (1)						
Firm performance (2)	0.22					
Growth hacking (3)	0.04	0.10				
Marketing capability (4)	0.08	0.06	0.52			
Technological turbulence (5)	0.05	0.12	0.22	0.21		
Market turbulence (6)	0.15	0.33	0.06	0.06	0.09	

Table 5
Path analysis.

Hypothesis	Path	Beta values	T statistics	P values
H1	GH → FP	0.23	3.31	0.00
H2	GH → MC	0.47	10.73	0.00
H3	GH → MC → FP	0.29	5.33	0.00
H4	GH → DI	0.12	2.14	0.04
H5	DI → FP	0.28	4.92	0.00
H6	GH → DI → FP	0.35	6.33	0.00
H7	MC → FP	0.25	4.81	0.00
H7a	MC*TT → FP	0.12	1.82	0.07
H7b	DI*TT → FP	0.27	4.39	0.00
H8a	MC*MT → FP	−0.03	0.52	0.60
H8b	DI*MT → FP	−0.06	1.17	0.24

6. Discussion

The study assesses the influence of growth hacking on marketing capability, disruptive innovation, and firms' performance. Further, the role of technological and market turbulence has also been assessed. This study has utilized DCV theory and considered growth hacking as a dynamic marketing approach that can further impact marketing capability and disruptive innovation, ultimately enhancing firm performance.

The results establish that growth hacking positively affects marketing capabilities. It can be explained as growth hacking may foster innovation, agility, efficiency, and customer-centricity (Troisi et al., 2020), and thus lead to the advancement of the organization's marketing capabilities. Further results indicate that marketing capability

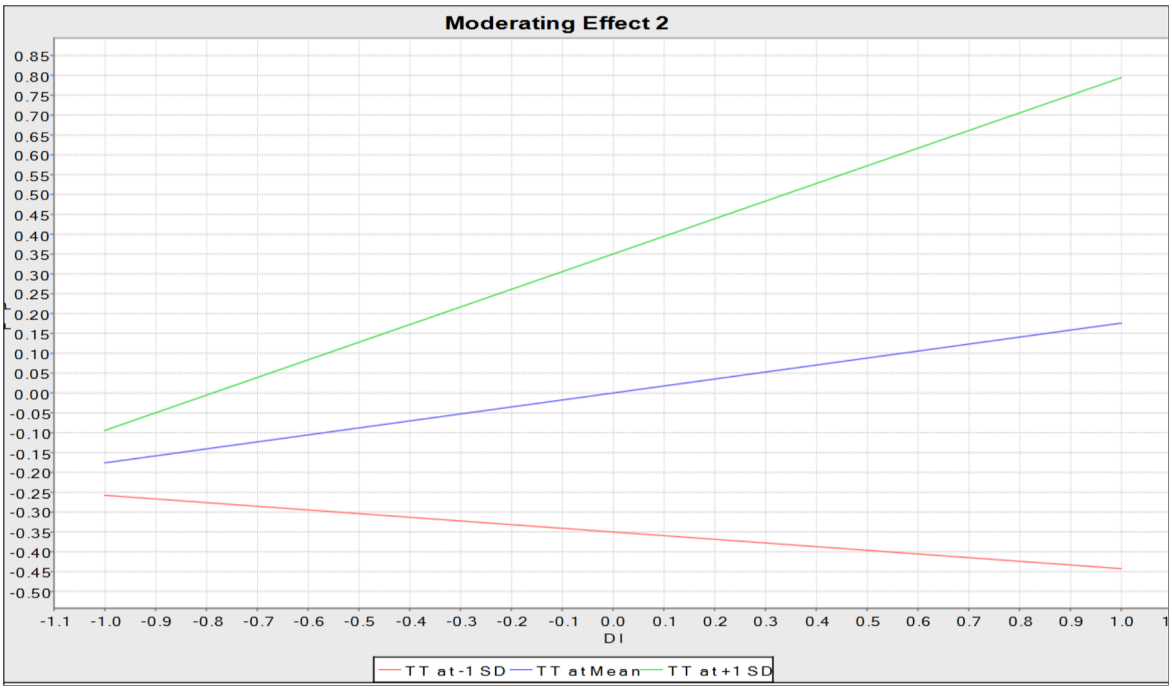

Fig. 2. Moderating effect (DI*TT → FP).

mediates the association between growth hacking and firm performance. It can be explained as a firm's marketing capabilities describe its ability to utilize resources to satisfy customers' demands (Scuotto et al., 2021), which may lead to enhanced market growth, revenue, and firm performance.

Growth hacking is observed to have a positive impact on disruptive innovation. The results can be explained as both growth hacking and disruptive innovation are synergetic, focussing on innovations and alternative ways to facilitate growth (Kilkki et al., 2018). The results support the prior studies, which observed that open innovation positively influences firm performance (Bigliardi et al., 2020). Disruptive innovation is further observed to mediate the association between growth hacking and firm performance. The findings can be explained as disruptive innovations that translate growth hacking activities into tangible outcomes, for example, innovative products, services, or business processes that drive revenue growth, competitive advantages, and firm performance (Bohnsack & Liesner, 2019). Further, growth hacking enhances customer acquisition, market adaptation, and total organizational competitiveness by utilising innovative concepts (Hafezieh et al., 2023; Jabeen et al., 2023).

Furthermore, it has been observed that technological turbulence does not moderate the association between marketing capability and firm performance; rather, it moderates the association between disruptive innovation and an organization's performance. The result can be explained as the technological turbulence emphasizes the novel aspect in designing business processes (Jin et al., 2022); it may facilitate the situations under which disruptive innovations can flourish and influence firm performance. Market turbulence was not observed to moderate the association between marketing capability and firm performance or between disruptive innovation and firm performance. The results suggest that firms with robust marketing capabilities can align their plans in response to changing market conditions regardless of market turbulence. Moreover, companies that excel in disruptive innovation may have a robust internal innovation culture, resources, strong research and development facilities, and strategic foresight to drive innovation consistently, regardless of market fluctuations. In a study by Troisi et al. (2020), it was found that adoption of growth hacking is helpful for exploring the opportunities enjoyed by applying big data analytics as well as cognitive computing in B2B marketing activities, especially, related to three types of firms. Borrowing some inputs from the study of Troisi et al. (2020) and generalizing the outcomes of this study, the present research work has focussed on how growth hacking can effectively help and foster marketing capabilities and disruptive innovation, impacting firm performance. Furthermore, another study (Bargoni et al., 2023) has elucidated that growth hacking is nothing but a business process for quick experimentation (Mariani & Nambisan, 2021; Thomke, 2020) across the entire span of the customer journey, helpful for enhancing the number of customers along with rapid growth of revenue. This idea has been used in the present study to demonstrate how growth hacking could impact the performance of the firms in conditions of environmental turbulence, thus improving environmental sustainability.

7. Concluding remarks

7.1. Implication for practice

This study provides insightful information about growth hacking as a source of creative marketing tactics. In order to enhance a firm's performance, growth hacking can facilitate big data and creativity, which may foster firm performance. Thus, managers may implement growth hacking techniques based on data-driven decisions to improve firm performance. Growth hacking can generate innovative and new marketing strategies and aggregate and analyze structured and unstructured customer data in real-time using big data techniques and analysis methods to aggregate and analyze customer data (e.g., comments and website visits). Growth hacking rationalizes integrating digital technologies in marketing, allowing firms to generate and familiarize marketing capabilities to foster firm performance. Thus, organizations should adopt growth hacking methods to develop and adapt marketing capabilities and improve the firm performance.

Disruptive innovation is a valuable approach that companies may utilize. Thus, managers may recognize disruptive innovation opportunities and incorporate them into their company's competitive strategy. On the other hand, managers must understand that organizations may convert disruptive innovation into company performance through

innovation pace and quality. Moreover, firms should be ready to adopt open innovation that helps to gain overall firm performance. With a new perspective on growth hacking, a deeper understanding of the business can be obtained, leading directly to better and faster decision-making. Environmental turbulence generates considerable uncertainty and unpredictability (Lichtenthaler, 2009). Due to the growth of cutting-edge technologies and external environmental uncertainty, our findings highlight that managers need to continuously monitor the extent to which high turbulence levels, including variations over time, characterize the environment in which they operate. Moreover, managers should prepare appropriate strategies to cope with market and technological turbulence. Thus, the study suggests utilizing growth hacking to enhance marketing capability, foster disruptive innovation, and ultimately improve firm performance while being aware of the threats of technological turbulence.

7.2. Implication for theory

The results of this study present fascinating theoretical concepts, showing how the study of growth hacking has expanded beyond computer research to include other disciplinary fields like management and, more significantly, marketing. The paper focusses on how growth hacking may be used to understand better the dynamics that define high-tech businesses' complete marketing decision-making process when they operate in a business-to-business (B2B) setting. Moreover, it helps to comprehend the evolution of data-driven marketing over time and the potential for future changes, which could help identify new areas to research to learn more about the competitive success of businesses and their customer base (Gupta & George, 2016). This study addressed the need for research to understand growth hacking as a practical business approach to ensure business growth (Hemphill, 2019; Troisi et al., 2020). The novelty of the present work lies in the fact that it is one of the pioneers that empirically establishes the relationship between growth hacking, marketing capability, disruptive innovation, and firm performance, and it supports the theoretical arguments that justify the relationships between these variables. Additionally, the study examines the moderating influence of environmental turbulence on the relationship between variables. The authors suggest using growth hacking as a potential method to increase the efficiency of firm performance. By doing this, the paper advances and modernizes the state of the art in data-driven marketing and for B2B high-tech enterprises. The study of marketing capability and disruptive innovation promotes the development of a research orientation that extends beyond conventional marketing to search for more adaptable strategies that can promptly adjust to abrupt changes within businesses.

The study contributes to the literature by clarifying the notion of growth hacking, which has been interpreted in several ways. Growth hacking's suitability is demonstrated by its capacity to support the innovative and dynamic use of data for making marketing decisions to generate information, value, and success for the business. According to the study's findings, it is rare and unrealistic to construct and apply theoretical models to enhance marketing choices without prioritizing data in a company's concept and decision-making process. Analysing growth hacking's in-depth tactics enables one to concentrate on finding business growth solutions supported by the capacity for "outside the box" thinking.

7.3. Limitations and future research agenda

This study has certain limitations, even though it provides numerous contributions. First, this study examines how growth hacking affects firm performance by mediating the effect of marketing capability and disruptive innovation. Future studies may focus on how growth hacking can affect marketing-related decisions. Second, this study examines how growth hacking is related to technological capability and further affects firm performance. Thus, more studies are required to confirm how businesses employ the growth hacking method to improve firm performance. Third, this study is primarily based on cross-section studies, and future research could use mixed methods and longitudinal approaches. Fourth, the data have been collected from Indian service sector organizations. So, there are external validity issues. Future researchers may collect data from usable respondents spread across the globe so that the results may possess more generalizability. Last, this study conceptualizes the association between growth hacking and firm performance from the DCV perspective. Future studies may use different theoretical approaches, such as affordance theory. Further studies may also explore the influence of growth hacking on various other firm capabilities. Furthermore, this study encourages researchers to explore growth hacking to expand knowledge regarding its use in SMEs. The present study considers growth hacking as a marketing approach. Future studies may also explore growth hacking from various other perspectives, such as strategic or analytical perspectives.

CRediT authorship contribution statement

Yatish Joshi: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Rahul Bodhi:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sheshadri Chatterjee:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marcello Mariani:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix. Measurement items with the sources

Construct	Source(s)	Items	Statement
Growth Hacking (GH)	Abraham and Pasaribu (2022); Troisi et al. (2020)	GH1	Our firm conducts rapid experimentation across the customer journey to accelerate customer growth.
		GH2	Our firm focuses on technology-based solutions for continuous improvement.
		GH3	Our firm follows a data-driven approach to marketing decision-making.
		GH4	Our firm follows a data-driven approach to innovation.
		GH5	Our firm follows an open innovation model through distributed decision-making.

(*continued on next page*)

(*continued*)

Construct	Source(s)	Items	Statement
Firm Performance (FP)	Bai et al. (2023)	FP1	Our firm quickly introduces products in the market.
		FP2	Our firm offers dependable delivery to our customers.
		FP3	Our firm offers high quality products to our customers.
		FP4	Our firm can meet the special needs of key customers.
		FP5	Our firm provides the required quantity according to the key customer's order requirements.
		FP6	Our firm can get information in advance of out-of-stock or delayed delivery.
Marketing Capability (MC)	Mu et al. (2018)	MC1	Our firm can continuously scan and sense emerging market trends and events.
		MC2	Our firm is quite alert to changing market conditions.
		MC3	Everyone in our firm is sensitized to listen to latent problems and opportunities in the market.
		MC4	Our firm can anticipate market trends and events accurately before they are fully apparent.
		MC5	Our firm can effectively listen to, understand, and rapidly respond to relevant marketplace conversations.
Disruptive Innovation (DI)	Govindarajan and Kopalle (2006)	DI1	In your opinion, how do you rate your firm to be disruptive in introducing new products during the past five years.
		DI2	Our firm rarely introduces products that are disruptive in nature. (Reversed)
		DI3	Our firm lags behind in introducing disruptive product innovations. (Reversed)
		DI4	During the past five years, the new products that were introduced by this firm were very attractive to a different customer segment at the time of product introduction.
		DI5	During the past five years, the new products that were introduced by your firm were those where the mainstream customers found the innovations attractive over time as the new products were able to satisfy the requirements of the mainstream customers.
Technological Turbulence (TT)	Danneels and Sethi (2011)	TT1	The technology is changing rapidly.
		TT2	Technological changes provide big opportunities.
		TT3	A large number of new products have been made possible through technological breakthroughs.
		TT4	Technological developments are rather minor. (Reversed)
Market Turbulence (MT)	Wang et al. (2022)	MT1	It was very difficult to forecast market developments in our industry.
		MT2	Customer needs and product preferences changed quite rapidly.
		MT3	It was difficult to predict changes in customer needs and preferences.
		MT4	Market competitive conditions were highly unpredictable.

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