**A Qualitative Research Study of the Tech Startup Journey**

**through Entrepreneurial Pivoting**

Pavan Kumar Sala, Simon Philbin & Safia Barikzai

Nathu Puri Institute for Engineering and Enterprise, School of Engineering, London South Bank University, 103 Borough Road, London SE1 0AA, United Kingdom

**Abstract**

**Purpose** – As part of the entrepreneurial journey, high-tech entrepreneurs are faced with the need to develop a competitive value proposition and leverage emerging technology to strengthen the value proposition. Entrepreneurial pivoting can be adopted to address this requirement since it enables the startup to validate and refine the company’s strategy and business model. Therefore, this research study provides an empirical investigation of the pivoting concept explained in the context of the lean startup approach (LSA) to improve our understanding of the entrepreneurial journey for high-tech entrepreneurs.

**Methodology** – A qualitative research method was conducted by interviewing thirty high-tech entrepreneurs across the United Kingdom to validate the theories behind the LSA and identify new insights on entrepreneurial pivoting.

**Findings** – The research study has validated the existing types of pivots and identified two new pivots (giving 16 in total). The study validated the existing factors that trigger a tech startup to change its direction and identified three new factors (giving 14 in total). The research also determined that there can be a domino effect in pivoting and the value proposition can be created and sustained through pivoting.

**Originality** – This study provides empirical evidence on pivots and the factors associated with pivots. Furthermore, it helps in understanding the influence of the phases of technology entrepreneurship on pivoting. The study also discusses the challenges faced by tech startups while pursuing pivots, the domino effects in pivoting and has found evidence that pivoting eventually leads to achieving the desired results.

# **Keywords**

*Lean Startup approach, Technology entrepreneurship, Pivots, Factors associated with pivots.*

# **Introduction**

The most widely adopted definition for entrepreneurship is the *“creation of new enterprise”* (Low and MacMillan, 1988). Entrepreneurs can be regarded as business actors who build companies on morals, which not only benefits themselves but also the economy as well as consumers who use their products or services (Fadlia and Ramadani, 2020). In this era of innovation and digitalization, technology can play a vital role that is harnessed by tech startups to be sustainable and contribute towards economic growth. In this regard, a high-tech entrepreneur is successful when technology is commercialized (Litan and Song, 2008). Technology entrepreneurship is often described as gathering resources and technical systems and developing strategies to pursue an opportunity (Spiegel and Marxt, 2011).

In the context of technology entrepreneurship, the question arises: How does an entrepreneur create value? Indeed, do they know how they create value? (Frederiksen and Brem, 2017). In order to address these questions, we could either ask successful entrepreneurs or we could search in the literature about the methods and the practices they follow. One of the most popular practitioner-oriented methods of entrepreneurship is the LSA, although there of course other approaches such as corporate entrepreneurship (Yunis *et al.,* 2018). However, Shepherd and Gruber (2020) have pointed out that there remains a gap between academic researchers and practitioners in entrepreneurship. Therefore, this study focuses on reducing this gap by investigating in detail the phenomenon of entrepreneurship pivoting, which is a key part of the LSA. Moreover, Flechas Chaparro and de Vasconcelos Gomes (2021) identified that decisions behind entrepreneurial pivoting are currently poorly understood, which further undercovers the pressing need for empirical research in this area.

This empirical research study helps to improve our understanding of entrepreneurial pivoting by tech startups and the influence of technology entrepreneurship on pivoting, while also validating the different types of pivots and the factors associated with pivoting. In order to achieve this objective, the study developed four research questions, which are as follows:

RQ-1: How can a tech startup change its direction through pivoting?

RQ-2: What are the factors that cause a tech startup to change direction and pivot?

RQ-3: Does the phase of technology entrepreneurship influence pivoting?

RQ-4: Can a tech startup create and sustain its value proposition through pivoting?

The structure of this article is as follows: Section 2 provides the literature review on technology entrepreneurship, the LSA, entrepreneurial pivoting, the factors that trigger pivots and a conceptual framework. Section 3 discusses the methodology, data collection and data analysis. Section 4 includes the results of data analysis and discussion. Section 5 comprises the limitations, future work and conclusions of this research study.

**Literature review**

*Technology Entrepreneurship*

Technology entrepreneurship (TE) is defined as a process in which an entrepreneur is assembling organizational resources, technical systems and develops strategies to pursue the opportunities (Shane and Venkataraman, 2003). TE is regarded as exploring and exploiting new technology-based solutions for creating and achieving economic value (Son *et al.*, 2019). However, technology entrepreneurship does not mean adopting digital technologies by technology startups. TE acts as an interface between innovation and entrepreneurship. Urbano *et al.* (2019) explained that innovation is a degree of newness by generating ideas, processes, products, or services that are breakthrough. The domain of TE can be characterised as consisting of the following: a) science and technology policies b) exploration and fostering of new technologies across various industries c) government support to science and technology to stimulate new technologies and d) market regulations that govern the entrepreneurial initiatives.

Technology entrepreneurship has gained interest from both researchers and policymakers in the last two decades. Researchers such as Sobel and Clark (2017) argue that even though TE is widely recognised, it still lacks a unified framework (Rakićević *et al.*, 2018). Indeed, Spiegel and Marxt (2011) developed a framework based on the three phases of TE which are formation (i.e., looking for opportunities), exploitation (i.e., developing strategies to commercialise an idea) and renewal (i.e., changing according to customer requirements). From a regional economies’ perspective, TE provides significant advantages and spill-over effects that have economic and social impacts since bringing highly innovative ideas to the market contribute to more agile economic growth (Cunningham and Menter, 2021).

## *The Lean Startup Approach*

The primary goal of a startup is to find a viable business model that can create value for its customers, and the Lean startup approach is a process to validate business models according to being agile and iterative. Similar to the case of entrepreneurship, the startup does not have a universally accepted definition. Ries (2011) identified a startup as an institution, which operates under highly uncertain conditions to develop new products or services. On the other hand, Blank (2020) explained that a startup’s primary goal should be to find a scalable business model that can be used repeatedly. A business model relates to how a firm is economically and financially sustainable while creating and delivering value to its customers. Many scholars believe that startups do not have a feasible business model in the early phases to achieve the company’s long-term objectives and it is rare for startups to develop an ideal business model at the early stages (Bortolini *et al.*, 2018).

According to Ghezzi and Cavallo (2020), the five principles of lean are identifying value, creating a process flow, eliminating excess engineering hours, producing a high-quality product, and creating value for customers. The Lean Startup approach is an opportunity exploration method, and entrepreneurs use it to develop a validated business model to sustain and scale up their business. This approach emphasises how entrepreneurs achieve deeper customer needs and design new hypotheses to develop a market-fit product (Harms and Schwery, 2020). Although the LSA includes supporting concepts, such as the minimum viable product (MVP), build, measure and learn principle (BML), as well as pivoting, this article focuses on entrepreneurial pivoting. This allows an exploration of the types of pivots and the factors that trigger pivoting as well as other aspects of entrepreneurial pivoting.

## *Entrepreneurial pivoting*

Due to resource scarcity or market conditions, in the early phases of a tech startup, such as the inception phase, startup phase or survival phase, they may undergo frequent changes in their business model and value capturing technique by applying the LSA. In such a case, the entrepreneur would choose a new path, i.e., pivot for creating value. Those decisions turn into key juncture points, where companies or startups change their strategy or product or indeed the whole company. Continuous innovation develops new ideas, products and helps to renew organizational structures, which is acknowledged as long-term growth. Most startups decide to pivot because the idea is not practical, or customers are not scaling up. Some classic examples of pivoting were carried out by Nokia, Facebook, and Twitter as they changed business models over time (Hirvikoski, 2014). The decision to pivot involves uncertainty as it may jeopardise the firm’s survivability. Due to this uncertainty, it is challenging to determine what, when and how to pursue a pivot (Flechas Chaparro and de Vasconcelos Gomes, 2021).

Researchers such as Brenk *et al.* (2019) identified that a pivot means a change in strategy by a startup. Moreover, Axelson and Bjurström (2019) explained the pivot as a change in approach towards an idea. Teece (2018) defined the pivot as a substitution of the existing business model, whereas Shepherd and Gruber (2020) called it an organised way of rectification to test new hypotheses. However, the pivot was defined initially by Ries (2011) in his book The Lean Startup as a “*structured course correction designed to test a new fundamental hypothesis about the product, strategy, and engine of growth*.” The concept of pivoting (change in direction) has gained the attention of many practitioners and tech startups, but the conceptualisation of different types of pivots and factors associated with it still requires further empirical investigation and validation (Bohn and Kundisch (2020), Hampel *et al.*, 2020).

In recent years, researchers such as Hampel *et al.* (2020) and Sherperd and Gruber (2020) identified entrepreneurial pivoting as a change in firm strategy or as testing new hypotheses. These studies defined pivoting and discussed how widely it is encouraged among practitioners involved in entrepreneurship. At the same time, they pointed out that the concept of entrepreneurial pivoting has not gained much attention among researchers. Whereas Flechas Chaparro and de Vasconcelos Gomes (2021) conducted a systematic literature review (SLR) on pivoting decision in startups. This study provided a comprehensive review on the pivot decision in startups, including discussion of prior definitions as well as proposing a refined definition of entrepreneurial decision making. The study also proposed a theoretical framework explaining the necessity of pivoting, the process of the pivot and its outcome. Similarly, the research study conducted by Kirtley and O’Mahony (2020) described the pivot as a change in strategy by restructuring or reallocating the resources and activities. The study was based on an investigation of seven firms from the energy and cleantech sectors, out of which only three of the firms pivoted during the study. The researchers have explained that a pivot is not achieved by a single decision but by incrementally withdrawing or adding strategy elements over time.

In other work, the study by Grimes (2018) explained why incorporating external feedback is essential to increase the viability of ideas and how entrepreneurs’ psychological ownership towards ideas can trigger resistance for the revision of ideas. On the other hand, the study by Bajwa *et al.* (2017) identified the types of pivots and factors that trigger pivots in software startups from conducting a study based on secondary data. The study mentioned that since it is an emerging topic, the existing research and knowledge on the pivots of software startups is minimal.

Ries (2011), Hirvikoski (2014) and Bajwa *et al.* (2017) identified different types of pivots to test the new hypothesis of a company. In this research, the pivots are grouped into the following categories: a) product; b) market; c) strategy; and d) team level pivots. In this context, terms like startups, entrepreneurs or companies are used interchangeably.

### *Product level pivots:*

Zoom-in pivot (Pvt-1): A single feature of the product that attracts the most customer base and the feature itself becomes the product.

Zoom-out pivot (Pvt-2): This type of pivot is the *vice versa* of the zoom-in pivot, where the entire product becomes a single feature of a much broader product.

Technology pivot (Pvt-3): Every company will try to optimize their resources and provide the best possible solution for customers. This can be done by using different technologies to address the same solution.

Platform pivot (Pvt-4): One of the most used pivots in software industries is the platform pivot. Companies develop applications for their platforms, but sometimes the platform itself becomes a product for customers or clients.

### *Market level pivots:*

Customer segment pivot (Pvt-5): A startup develops a product or a service targeting a customer segment. However, when they evaluate their product performance in terms of reaching out to the target customer base, the startup may find that although the product is attracting the customer, they are not the actual targeted customer. This means the startup needs to reposition its product or service and optimize according to that segment of the market.

Customer need pivot (Pvt-6): A startup tries to commercialize an idea by addressing customer needs. However, the product or service idea may not necessarily be the most critical need of the customer. The startup will, therefore, pivot in order to meet an essential need of the customers.

Channel pivot (Pvt-7): Every company will have a channel with which they reach out to customers. Sometimes companies try to sell products directly to customers and sometimes they may choose other channels as the route to market. A channel pivot is a basic solution for any company to reach out to customers in an effective way.

Market segment pivot (Pvt-8): Rather than focus on entering the whole market, a startup may concentrate on entering a particular market segment because they see the potential for the business to grow.

### *Strategy level pivots:*

Value capture pivot (Pvt-9): Companies will use this pivot to change the way they monetize their product. This change will impact the value captured by the product, business, and the engine of growth.

Engine of pivot (Pvt-10): Companies try to speed up their growth rate, profitability, and customer base through changing the business model. There are three primary engines of growth which are viral, sticky, and paid growth models. The primary motivation for companies changing the engines of growth model is to grow at a faster rate.

Business architecture pivot (Pvt-11): Moore (2007), an organizational theorist, defined two major business architectures, which are the high margin and low volume model and low margin and high-volume model (i.e., volume-based operations). The company that wants to pivot to any of the above business architectures can adopt any one of them at a given time.

Complete pivot (Pvt-12): A pivot can be used to change a product, strategy, or the market for the company. When a team decides to change in all three areas as well as the business model, it is called a complete pivot.

Side project pivot (Pvt-13): Many companies may commence a parallel project alongside the main project. However, sometimes the side project becomes the main project for the company and this type of pivot is called the side project pivot.

### *Team level pivots:*

Social pivot (Pvt-14):Social factors play a significant role in pivoting. These factors can be due to changes in people or the environment, such as working on existing idea by partnering with an entirely new team.

## *Factors that trigger pivoting*

In order to understand more about the process of pivoting, we have reviewed the eleven factors that trigger pivoting identified by Bajwa *et al.* (2017), and they have been divided into external and internal factors (see Table I). External factors are those that are beyond the control of the startup, whereas internal factors are those triggered due to internal activities/operations of the startup.

Insert Table I. Factors that trigger pivots.

An entrepreneur is committed to exploring new opportunities. They face challenges in transforming those opportunities into a successful business. However, too much commitment towards their initial ideas may hamper pursuing new opportunities. Duringthecommercialization of opportunities, entrepreneurs essentially become an expert in the process associated with the company’s technology, operations, and markets. High expertise in one segment may make it difficult for entrepreneurs to shift in another direction. Furthermore, with a high level of commitment and expertise, an entrepreneur may fail to recognize the new opportunity or show resistance towards a new opportunity because of product orientation or market orientation (Crilly, 2018).

This empirical study recognises the contribution of the aforementioned studies through seeking to enrich our understanding of entrepreneurial pivoting by describing the experience of high-tech entrepreneurs. When compared to other studies this study has conducted empirical research by collecting primary data from interviews with thirty entrepreneurs from across the United Kingdom (UK). The objective is to understand what type of pivot a tech startup can pursue, the factors that trigger a tech startup to change direction, and whether pivoting helps high-tech entrepreneurs to achieve the desired results. At the same time, the article focuses on understanding the influence of the phases of technology entrepreneurship phases on pivoting.

Figure 1 illustrates the conceptual framework of the research study, which includes the depiction of the research questions. An entrepreneur commercialises an idea/opportunity with the help of technical systems and resources. However, a tech startup may need to change direction to address the factors it encounters. Therefore, a high-tech entrepreneur will develop a new hypothesis and test it by pursuing pivots to address those factors. Once the new hypothesis is successful, the startup creates and sustain its value proposition. At the same time, a startup’s decision to pivot may be influenced by the phase of TE it is going through.

Insert Figure 1. Conceptual framework and research questions.

# **Methodology**

This research study adopted the qualitative method for data capture and analysis. After data was collected through interviews, the research process involved transcribing, coding, categorising themes, and interpreting the findings. During the transcription of interviews, data were cross verified with field notes. The data was then manually coded (i.e., initial coding). Once initial coding was completed, NVivo software was used for the final coding where the cases were defined by assigning attributes and values which led to identifying the themes and patterns. The NVivo software offers matrix coding, crosstab coding, and comparison diagrams to gain in-depth knowledge from the data. Finally, data was interpreted to understand the phenomenon of entrepreneurial pivoting and related aspects.

Semi-structured interviews were carried with the thirty high-tech entrepreneurs to understand their experience of entrepreneurial pivoting, as well as factors associated with pivots, and the influence of the TE phase on pivoting. The interviews were conducted virtually. During the interviews, written field notes were taken and later those notes were cross verified with the transcriptions to ensure every detail was captured. The field notes proved very useful as they helped to understand participant’s experience on pivoting. In this regard Braun and Clarke (2006) mentioned that there is no fixed set of rules on naming, identifying, or defining how many times a pattern needs to appear to recognise it as a theme in qualitative research (Mattimoe *et al.*, 2021). The reason for using both the manual and technical approach for coding in the qualitative analysis was to make sure the underlying essence of the data is retained. NVivo software is an effective tool to code and analyse qualitative data that can generate charts, tables, and comparison diagrams to measure the number of times a code was referred. The software helps in capturing a comprehensive overview of data. However, there is the possibility of becoming distracted while looking at the broad overview. Therefore, the manual approach was initially employed before the technical (software-based) approach in order to familiarise data, identify initial codes, search for patterns, define themes, and most importantly understand the tech entrepreneur’s experience of pivoting. Appendix I illustrates the 10 nodes and 46 sub-nodes that were used in the qualitative analysis using NVivo software.

The data has been analysed in two stages. In the first stage, manual coding was adapted, where the open coding technique was used. Open coding is an interpretive process where the researcher identifies insights by understanding the phenomena revealed in the data. For example, identified themes in the initial coding were the experience of tech entrepreneurs; the number of times a tech startup has pivoted; what type of pivots were pursued; and the factors that triggered pivoting. These themes were identified once the interviews were converted into transcripts. After initial coding, the research study applied the technological approach (i.e., using the NVivo 12 software). For this step, axial coding according to the grounded theory approach was used. The themes developed in the first coding stage helped develop further the categories and subcategories in the second stage. In this stage, identified themes were pivots and their respective factors; the possibility of a domino effect; challenges faced by the tech entrepreneurs while pursuing pivots; and the influence of technology entrepreneurship on pivoting. Figure 2 illustrates the process followed for this research study.

Insert Figure 2. Methodology and process stage

## *Data Collection*

In this study, we used the purposeful sampling technique, where participants were approached who possessed certain qualities or traits that provide a wide range of potential perspectives within the specified subject (Koerber and McMichael, 2008). We selected thirty high-tech entrepreneurs who agreed to be interviewed. All the thirty participants are from tech startups that fall under one of the British Venture Capital Association (BVCA) categories of technology sectors. According to the BVCA definition, technologies can be categorised according to the following high-tech sectors: communication systems; software technology; internet technology; semiconductor technology; and biotechnology, medical, instrumentation and medical pharmaceutical (Vohora et al., 2004). Before starting the interview, each participant was made familiar with the concept of entrepreneurial pivoting. The research used the work of Eric Ries (2011), Bajwa *et al.* (2017) and Hirvikoski (2014) studies to explain the definition of a pivot, different types of pivots and the factors that trigger pivots.

The participants either hold the position of CEO or CTO of the tech startup, except participants 13 and 28 (these participants work as advisors for the tech startups, although they were involved in pivoting activities). The participants had a range of experience from one year of being a tech entrepreneur to 30 years plus. Out of the thirty participants, there were 6 female (20%) and 24 male (80%) high-tech entrepreneurs; and 8 (27%) high-tech entrepreneurs were PhD degree holders. Out of the thirty, 10 (34%) tech startups are in the software technology category; 7 (23%) tech startups are in the internet technology category; 5 (17%) tech startups are in the other electronic related technology category; 4 (13%) tech startups are in the biotechnology, medical, instrumentation and medical pharmaceutical technology category; and 4 (13%) tech startups are in the communication systems category. The study observed that not all of the interviewed participants followed the LSA in their respective startups. Nevertheless, 29 of the 30 tech startups pursued pivots to respond to the factors encountered. Table II represents the profiles of the participants.

Insert Table II. Participants details.

# **Results**

## *Types of entrepreneurial pivots*

First and foremost, through our analysis, we validated all fourteen types of pivots that were identified in the literature review by Ries (2011), Bajwa *et al.* (2017) and Hirvikoski (2014). Appendix II provides details on the pivots pursued by the tech startups and the factors associated with the corresponding pivots. Figure 3 identifies the number of times each pivot was pursued, and we can observe that the top five most pursued pivots are ‘customer segment pivot’ (N=20), ‘customer need pivot’ (N=14), ‘channel pivot’ (N=13), ‘side project pivot’ (N=11), and ‘technology pivot’ (N=10). Three out of those five pivots fall under the market-level pivot category.

Insert Figure 3. Number of times each pivot was mentioned by participants.

Participants 19, 24, 11 and 13 are the four high-tech entrepreneurs with the most pivoting experience out of the thirty interviewees. Participant 19 pursued twelve different pivots, whereas participant 24 pursued nine pivots. On the other hand, participants 11 and 13 pursued eight pivots each. Many participants were involved in multiple tech startups, but they explained their pivoting experience with respect to one of their companies. However, participants 18 and 28 explained their pivoting experience across all the companies they were involved. Participant 18 was involved in three tech startups, and the same is described in Appendix III as Tech startup 1, 2 and 3. Similarly, participant 28 was also associated with multiple tech companies. The participant holds thirty plus years of experience in the tech industry in which they worked with two tech startups and one large corporate from the tech industry. The same is represented as Tech startup 1, 2 and Company A.

We used matrix coding to analyse the dataset with respect to the attributes we defined while coding our data. We conduct matrix coding to determine which technology sector pivoted most and what type of pivot(s) was pursued from our dataset. Appendix IV illustrates the number of times a pivot was used in a particular technology sector. The tech startups under the internet technology sector are the ones that pivoted the most (N=41). The following two technology sectors are software technology (N=33) and communication systems (N=21). We did not have a single tech entrepreneur from the semiconductor technology sector. The highest pursed pivots among these sectors are customer segment pivot (N=20), customer need pivot (N=14), channel pivot (N=13) and side project pivot (N=11). During the interview, participants were asked to share their experience on pivoting. The following are selected participant quotations on pivoting:

* Participant-1: “*Pivoting is a funnelling effect, and it is a process which is very iterative* [*sic*].”
* Participant-15: *“At the end of the day, growth is what startup needs. Pivoting is an ongoing process* [*sic*].*”*
* Participant-25: *“Pivoting is a function of a turnaround activity and putting strategies in places while rethinking the direction of travel* [*sic*].*”*

Participant 13, who has more than thirty years of experience in the tech industry, mentioned that apart from fourteen pivots listed in the literature, he has pursued two new types of pivots. He identified them as ‘business ecosystem pivot’ and ‘brand pivot’. A business ecosystem pivot is defined as a strategic alliance/partnership between two startups to gain more customers and enter new market segments. On the other hand, when startups remove their multiple products from different brand categories and rebrand them into one brand and one domain, it is known as a brand pivot. This helps in creating a clear image for customers. These two pivots can be categorised into strategy level pivots as these are strategic decisions taken by a company to expand the business. The study has validated all 14 types of pivots from the literature and identified 2 new pivots giving a new total of 16 pivots.

## *Factors that cause entrepreneurial pivots*

The qualitative data analysis validated the eleven factors mentioned by Bajwa *et al.* (2017) and identified three new factors that trigger a tech startup to pivot. While discussing factors that trigger pivots, high-tech entrepreneurs mentioned terms such as ‘demand and supply’, ‘strategic longevity’, ‘substituted by a new entrant’, ‘for business expansion’, ‘adding value’, ‘geopolitical issues’ and ‘market opportunity’ as further reasons behind their tech startup’s pivoting. Upon further discussion, we understood that some of these terms can be interlinked with existing factors. For example, earlier market conditions was defined as a narrow market that may become saturated quickly. However, we have redefined ‘market conditions’ as a combination of the change in demand and supply with a narrow market where a startup cannot sustain or thrive in the future. Similarly, ‘strategic longevity’ and ‘market opportunity’ can be grouped together. Therefore, the new definition of ‘strategic longevity’ is the advantage a startup acquires after broadening its solution in its operating sector. This also helps to eliminate competition and creates a deeper relationship with customers by providing additional value. ‘Substituted by a new entrant’ and ‘geopolitical issues’ are factors that is faced by almost every startup that conduct its business globally. Hence the three new factors are ‘geopolitical issues’, ‘substituted by a new entrant’ and ‘strategic longevity’. The first two factors can be classified under external factors, whereas the third factor can be classified under internal factors.

The following are selected participant quotations on the factors that cause entrepreneurial pivots:

* Participant 3: *“Yeah, customer feedback definitely. We worked hard to make sure we had customer feedback all the time and all of our projects. We had that you had to talk to us a lot and that’s what drove it in a very Eric Ries kind of way* [*sic*]*.”*
* Participant 28: *“In the case of Tech startup 1 which we touched on which was a side project pivot. I think that was a combination of technology challenges and side project success* [*sic*].*”*
* Participant 28: *“In the case of Company A, which re-engineered its business a business architecture pivot again, that was the influence of an investor, promoter or founder* [*sic*]*.”*

The bar chart depicts the number of times each factor was mentioned by the participants and subsequently coded (see Figure 4). From the chart, we can observe that the top five most coded factors were ‘customer feedback’ (N=19), ‘technology challenges’ (N=15), ‘competition’ (N=12), market conditions (N=12) and ‘influence of investor, partner, or founder’ (N=11). The least discussed factor was ‘legal issues’ (N=3). The research study has validated all the 11 factors from the literature and identified 3 new factors giving a new total of 14 factors that can lead to entrepreneurial pivots.

Insert Figure 4. Number of times each factor was mentioned by participants.

*Understanding the impact of the phase of TE*

This research study included a focus on identifying the influence of the phase of TE (i.e., formation, exploitation and renewal) on pivoting. Seventeen participants (57%) agreed that, yes, technology entrepreneurship influences pivoting, and nine (30%) disagreed with it. Meanwhile, four participants (13%) were not sure whether TE influences pivoting. However, ten high-tech entrepreneurs (34%) felt that the simple linear process of formation, exploitation and renewal did not fully capture the complex nature of TE. They believed that the TE phase needs to have a feedback loop because it is not always a simple linear process and relates to a more complex phenomenon.

The following are selected participant quotations on the influence of the TE phase on pivoting:

* Participant 8: *“I think second, and third phases definitely have an impact. First phase I'm not very sure, but I think all of them have at some level* [*sic*]*.”*
* Participant 30: *“A pivot could happen to any one of these phases for different reasons* [*sic*]*.”*
* Participant 3: *“I don’t recognize this phased structure. It's not a structure that I've that I really recognize, and the reason is if you think about growth this is this kind of assume steady state and if you’re growing as a business, then you’re always in formation and exploitation and renewal. So, like you’re in all three phases continually* [*sic*]*.”*

*Realising the value proposition through pivoting*

One of the motivations behind investigating entrepreneurial pivoting is understanding whether pivoting helps to create and sustain the venture’s value proposition. Twenty-four participants (80%) (23 CEO’s and one advisor) agreed that yes, pivoting helps in creating and sustaining a value proposition. On the other hand, six participants (20%) could not confirm the same. However, they did not deny that pivoting helps in creating a value proposition. The participants explained that business plans often encounter difficulties, and it becomes essential to pivot. The qualitative analysis found substantial evidence to support the fourth proposition that pivoting can create and sustain a value proposition, which is illustrated through the following participant quotations:

* Participant-2: *“Yes, on numerous grounds because the first business plan usually wrong and even after pivot basically know that there's so much additional thing. So yeah, absolutely. It's a continuous progress and any startup that hasn't pivoted I'm very suspicious so that's my sort of experience* [*sic*].*”*
* Participant-20: *“I haven’t been in a business yet where we haven’t had to make minor or major pivots and you know, I’ve been in three companies and each of them has had to pay because things change, you know, technology changes, customer needs change, competition changes you need be tuned in and listening to what’s happening* [*sic*].*”*

## *Emerging pivoting phenomena*

While researching entrepreneurial pivoting, we identified three aspects related to pivoting. They are: (a) the domino effect; (b) pivoting leading to the achievement of the desired results; and (c) the challenges faced by startups while pursuing pivots. In regard to point (a), we found that there can often be a domino effect in pivoting. Twenty high-tech entrepreneurs (67%) confirmed the domino effect, and twelve interviewees shared exactly which pivot triggered another pivot. The remaining ten participants (33%) did not experience the domino effect in their entrepreneurial pivoting journey. Figure 5 illustrates the list of pivots pursued by twelve participants due to the domino effect. Out of 12 participants, three interviewees shared two cases of the domino effect. Four participants pursued triple pivots due to the domino effect, and the rest of them pursued double pivots.

Insert Figure 5 Domino effect in pivoting.

The following are selected participant quotations related to the domino effect in pivoting:

* Participant 11: *“Absolutely. I mean when you change from hardware to software the whole market changes you know your approach to market changes that there’s a whole bunch your whole business model changes effectively when you move hardware to software* [*sic*]*.”*
* Participant 12: *“I think every pivot has sort of been related because it's been the evolution of the company and the product. Yeah, that's definitely say every pivot is related is a domino effect, and it's been the evolution of products* [sic]*.”*
* Participant 16: *“Platform pivot actually let us to Customer segment pivot and Technology pivot, and I think Customer need pivot led us to Zoom-in pivot* [*sic*]*.”*

During the interviews and in regard to point (b), we asked participants whether they achieved the desired results. 87% of the participants agreed that yes, they achieved desired results after pivoting. Three participants mentioned that they are yet to achieve the desired results, but the preliminary results were positive. This substantiates that pivoting eventually enables high-tech entrepreneurs to find the right direction for their tech startups.

A tech startup drives forward to develop a product-market fit for its customers and will often pivot to achieve this goal. However, it is not easy to change the direction of a tech startup. Upon discussion with the interviewees, we identified the challenges faced by tech startups and classified them into three groups i) persuading customers; ii) pursuing stakeholders, partners, or suppliers; and iii) onboarding resources. The study found that the high-tech entrepreneurs faced at least one of the above three challenges. Firstly, the challenge they often face is the need to explain to people (mainly customers) that they are doing something new or different and rebrand their product or service. Secondly, seeking approval from investors, partners, or suppliers is as important as assuring customers of changes, since pivots lead to drastic changes and tech startups need the support of suppliers. Thirdly, early-stage startups have a relatively small team; one of the biggest challenges for the entrepreneurs can be coping with the workload, training the team members, and recruiting more employees, which all have a big impact on the level of cash flow. The following quotations provides representative illustrations on the challenges experienced by tech startups.

* Participant-17: *“Absolutely pivots are really hard. One of the first challenges is you have to explain to people (customers) that you are now doing something different.* [*sic*].*”*
* Participant-22: *“I think the challenge is always how to listen with the minimal changes. So, you know, we all want to listen to our customers, but you automatically divide whatever they say into unrealistic, too expensive to do or let's try to think of an out-of-the-box solution* [*sic*].*”*
* Particiapnt-24: *“Some challenges are other suppliers or partners were not able to accommodate the pivot that we were making therefore we had made much more drastic changes. Some of the pivots necessitated changes to technology or people or process that made them quite challenging to do. It took a little bit of time for some of the pivots for the rest of the company to get on board and understand why you were doing it* [*sic*].*”*

# **Discussion**

The quantitative research study evaluates the concept of entrepreneurial pivoting through validating the different types of pivots and the factors that trigger pivots. In addition, the study has identified the phenomenon of the domino effect in pivoting as well as the challenges that a tech startup faces while implementing pivots.

The study’s first research question (RQ-1) is: How can a tech startup change direction through pivoting? During their entrepreneurial journey, high-tech entrepreneurs may face a challenge that leads to a pivot from the original strategy (Ries, 2011). Pivoting means selecting a new path for creating value. The concept of pivoting leads to a new direction of research on entrepreneurship; it involves understanding the types of pivots pursued by high-tech entrepreneurs during their entrepreneurial journey. The qualitative research has sought to reveal new insights into the characteristics of pivots and the rationale behind pivoting as a core strategy to underpin startup survivability. Moreover, the study has examined the consequences of pivoting in terms of how pivoting leads to the desired outcome for the startup as well as the challenges faced by startups while pursuing pivots. Also, two new pivots, namely ‘business ecosystem pivot’ and ‘brand pivot’, are identified as both strategic level pivots. Consequently, the study identified that the process of entrepreneurial pivoting can be characterised through sixteen pivots.

The study’s second research question (RQ-2) is: What are the factors that cause a tech startup to change direction and pivot? The qualitative data analysis has validated the eleven factors mentioned by Bajwa *et al.*(2017) and identified three new factors that trigger a tech startup to pivot, thereby giving a new total of 14 factors that lead to entrepreneurial pivots. The new factors are: ‘geopolitical issues’ and ‘substituted by a new entrant’ (which are both external factors), ‘strategic longevity’ (which is an internal factor).

The third research question (RQ-3) is: Does the phase of technology entrepreneurship influence pivoting? The research relates to understanding the influence of the phase of TE (i.e., formation, exploitation, and renewal) on pivoting. It was found that over half of the high-tech entrepreneurs (57%) believe that the phase of TE influences pivoting. However, ten high-tech entrepreneurs (34%) also felt that the existing linear process of formation, exploitation and renewal did not adequately capture the complexity and realities of TE. These high-tech entrepreneurs did not agree with the framework of technology entrepreneurship by Spiegel and Marxt (2011). Hence, they could not confirm the influence of the phase of TE on pivoting. The empirical study has shown that further research needs to be carried out to understand the different phases of TE and the complexities of a tech startup's journey.

The study’s final research question (RQ-4) is: Can a tech startup create and sustain its value proposition through pivoting? The study found that 80% of the participants agreed that pivoting helps create and sustain the value proposition of the startup. This study established firm evidence that pivots build an improved relationship between customers and tech startups through helping to create and sustain the value proposition.

The study gives rise to a number of implications for practitioners (i.e., tech entrepreneurs), which are as follows:

1. Entrepreneurial pivoting is a value adding process and key part of the LSA, where a startup can potentially pursue 16 different types of pivots that are caused by 14 different factors.
2. Pivots help in creating and sustaining the value proposition. Therefore, a high-tech entrepreneur needs to be careful not to be become overly emotionally connected to their original idea, which may inhibit the decision to pivot. Instead, they can be prepared to test new hypotheses in order to achieve the desired results after pivoting.
3. The empirical study has confirmed the domino effect in pivoting, which means one pivot can often lead to multiple pivots. For example, if a tech startup changes its customer segment, the startup may need to change its channel to reach the new customer segment.
4. There are three challenges that tech startups often face while attempting pivots: persuading customers; pursuing stakeholders, partners, or investors; and onboarding resources. Entrepreneurs can be cognisant of such challenges when pivoting.

The study gives rise to implications for policymakers, which are summarised as follows:

1. Organisations involved in providing support and training to tech startups (such as tech transfer officers, accelerators, and government-backed initiatives) can benefit from the improved understanding of the types of pivots and factors that cause pivots developed by this study, which can be incorporated into the knowledge base and training provision of such organisations.
2. Mentors, coaches, advisors as well as non-executive directors who all provide some form of support and advice provision for tech startups are able to incorporate the evidence-based findings of this study into their support frameworks so that the survivability of tech startups in enhanced.
3. The financial investment community for startups, such as venture capitalists and angel investors, are able to consider the impact of entrepreneurial pivoting on the investment proposition, i.e., considering when to invest in the context of whether or not the startup has pivoted, or is just about to pivot.
4. Events and conferences organised towards improving our understanding of technology entrepreneurship may seek to increase the level of focus on empirical studies related to entrepreneurial pivoting as well as the other aspects of the LSA, such as the MVP and BML.

# **Conclusion**

In the era of continuous innovation and digitalisation, a high-tech entrepreneur explores opportunities by harnessing technological innovation and the required resources to create and sustain a value proposition. During their entrepreneurial journey, high-tech entrepreneurs may face a challenge that leads to a pivot from the original strategy (Ries, 2011). Pivoting means selecting a new path for creating value. The concept of entrepreneurial pivoting leads to a new direction of research on entrepreneurship; it involves understanding the types of pivots and factors that trigger the pivot in an entrepreneurial journey. Simultaneously, this research opens the door to compare different entrepreneurship theories and systematise the corresponding knowledge. Pivots are categorised into four levels product, market, strategy, and team level. The research study validated all the existing 14 types of pivots from the literature review and identified two new pivots, namely ‘business ecosystem pivot’ and ‘brand pivot’, thereby resulting in a total of 16 types of pivots that are available to high-tech entrepreneurs. The study validated the 11 factors from the literature that trigger pivoting and identified three new factors that give rise to pivoting, namely ‘geopolitical issues’, ‘substituted by a new entrant’ and ‘strategic longevity’ thereby resulting in a total of 14 factors that cause pivoting. Furthermore, the study found supporting evidence to address three of the four research questions that were synthesized from the literature, i.e., the pivots available to a startup were validated along with the factors that cause pivoting, and the linkage of pivoting to a startup creating and sustaining its value proposition was validated. Partial support was found for the research question on whether the phase of technology entrepreneurship influences the process of pivoting. The empirical study has provided evidence to substantiate the emerging phenomenon of the domino effect in pivoting, where one pivot leads to further pivot(s). The study also discusses three significant challenges i.e., persuading customers; pursuing stakeholders, partners, or suppliers; and onboarding resources the tech startups face while pursuing pivots.

One of the limitations of this research study is that even though the purposive sampling technique was used to identify relevant tech startups, not all tech startups followed the LSA, although 29 out of the 30 tech startups conducted pivots. The second limitation is that the study did not identify any correlation between the type of pivot and the factors that cause entrepreneurial pivoting. Future research is proposed to ascertain whether such a correlation exists using an appropriate survey instrument with tech startups and corresponding statistical analysis. Further research is also proposed on understanding the non-linearity of the TE process and why specific factors triggered more than other factors.

# **Acknowledgements**

The authors gratefully acknowledge the useful feedback and insights provided by the editor and anonymous reviewers that has helped to significantly enhance the quality of this article.

# **References**

Axelson, M. and Bjurström, E. (2019), “The Role of Timing in the Business Model Evolution of Spinoffs”, *Research-Technology Management*, Vol. 62 No. 4, pp.19-26.

Bajwa, S., Wang, X., Nguyen Duc, A. and Abrahamsson, P. (2017), “Failures to be celebrated: an analysis of major pivots of software startups”, *Empirical Software Engineering*, Vol. 22 No. 5, pp.2373-2408.

Blank, S. (2020), *The four steps to the epiphany*, John Wiley & Sons, Hoboken, New Jersey.

Bohn, N. and Kundisch, D. (2020), “What Are We Talking About When We Talk About Technology Pivots? – A Delphi Study”, *Information & Management*, Vol. 57 No. 6, 103319.

Bortolini, R.F., Nogueira Cortimiglia, M., Danilevicz, A.d.M.F. and Ghezzi, A. (2018), “Lean Startup: a comprehensive historical review”, *Management Decision*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/MD-07-2017-0663>

Braun, V. and Clarke, V. (2006), “Using thematic analysis in psychology”, *Qualitative Research in Psychology*,Vol. 3 No. 2, pp.77-101.

Brenk, S., Lüttgens, D., Diener, K. and Piller, F. (2019), “Learning from failures in business model innovation: solving decision-making logic conflicts through intrapreneurial effectuation”, *Journal of Business Economics*, Vol. 89 No. 8-9, pp.1097-1147.

Crilly, N. (2018), “‘Fixation’ and ‘the pivot’: balancing persistence with flexibility in design and entrepreneurship”, *International Journal of Design Creativity and Innovation*, Vol. 6 No. 1-2, pp.52-65.

Cunningham, J. and Menter, M. (2020), “Transformative change in higher education: entrepreneurial universities and high-technology entrepreneurship”, *Industry and Innovation*, Vol. 28 No. 3, pp. 343-364.

Fadlia, F. and Ramadani, I. (2020), “Are You Entrepreneur or Just an Opportunist? An Analysis on Neo Liberal Theory”, in: *TICASH 2019: Tarumanagara International Conference on the Applications of Social Sciences and Humanities,*Atlantis Press, pp.649-654.

Flechas Chaparro, X. and de Vasconcelos Gomes, L. (2021), “Pivot decisions in startups: a systematic literature review”, *International Journal of Entrepreneurial Behavior & Research*, Vol. 27 No. 4, pp.884-910.

Frederiksen, D. and Brem, A. (2017), “How do entrepreneurs think they create value? A scientific reflection of Eric Ries’ Lean Startup approach”, *International Entrepreneurship and Management Journal*, Vol. 13 No. 1, pp.169-189.

Ghezzi, A. and Cavallo, A. (2020), “Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches”, *Journal of Business Research*, Vol. 110, pp.519-537.

Grimes, M.G. (2018), “The pivot: How founders respond to feedback through idea and identity work”, *Academy of Management Journal*, Vol. 61 No. 5, pp.1692-1717.

Hampel, C.E., Tracey, P. and Weber, K. (2020), “The art of the pivot: How new ventures manage identification relationships with stakeholders as they change direction”, *Academy of Management Journal*, Vol 63 No. 2, pp.440-471.

Harms, R. and Schwery, M. (2020), “Lean Startup: Operationalizing Lean Startup Capability and testing its performance implications”, *Journal of Small Business Management*, Vol. 58 No. 1, pp.200-223.

Hirvikoski, K. (2014), “Startups pivoting towards value” *Data and value-driven software engineering with deep customer insight*, In Proceedings of the seminar (No. 58314308, pp. 1-7).

Kirtley, J. and O’Machony, S. (2020), “What is a pivot? Explaining when and how entrepreneurial firms decide to make strategic change and pivot”, *Strategic Management Journal*, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1002/smj.3131

Koerber, A. and McMichael, L. (2008), “Qualitative sampling methods: A primer for technical communicators”, *Journal of Business and Technical Communication,* Vol. 22No. 4, pp.454-473.

Litan, R. and Song, M. (2008), “From the Special Issue Editors: Technology Commercialization and Entrepreneurship”, *Journal of Product Innovation Management*, Vol. 25 No. 2, pp.112-113.

Low, M. B. and MacMillan, I. C. (1988), “Entrepreneurship: Past research and future challenges”, *Journal of Management,*Vol. 14 No. 2, pp.139-161.

Mattimoe, R., Hayden, M. T., Murphy, B., & Ballantine, J. (2021), “Approaches to Analysis of Qualitative Research Data: A Reflection on the Manual and Technological Approaches”, *Accounting, Finance, & Governance Review*, Vol. 27 No. 1.

Moore, G. A. (2007), “Dealing with Darwin: How Great Companies Innovate at Every Phase of their Evolution”, *Strategic Direction*, Vol. 23 No. 9. https://doi.org/10.1108/sd.2007.05623iae.001

Rakicevic, J., Levi Jaksic, M., & Jovanovic, M. (2018), “Measuring the Potential for Technology Entrepreneurship Development: Serbian Case”, *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies,* Vol. 23 No. 2, pp.13-25.

Ries, E. (2011), *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*, Penguin Group, London, UK.

Shane, S. and Venkataraman, S. (2003), “Guest editors’ introduction to the special issue on technology entrepreneurship”, *Research policy*, Vol. 32 No. 2, pp.181-184.

Shepherd, D.A. & Gruber, M. (2020), “The lean startup framework: Closing the academic-practitioner divide”, *Entrepreneurship Theory and Practice*. Advance Online Publication. DOI: 10.1177/1042258719899415

Sobel, R.S. and Clark, J.R. (2018), “The use of knowledge in technology entrepreneurship: A theoretical foundation”, *The Review of Austrian Economics*, Vol. 31 No. 2, pp.195-207.

Son, H., Chung, Y. and Hwang, H. (2019), “Do technology entrepreneurship and external relationships always promote technology transfer? evidence from Korean public research organizations”, *Technovation,*Vol. 82, pp.01-15.

Spiegel, M. and Marxt, C. (2011) “Defining Technology Entrepreneurship”, in: *IEEE: International Conference on Industrial Engineering and Engineering Management*, Singapore, 06-09 December. Institute of Electrical and Electronics Engineers (IEEE), pp.1623-1627.

Urbano, D., Guerrero, M., Ferreira, J. J. and Fernandes, C. I. (2019), “New technology entrepreneurship initiatives: Which strategic orientations and environmental conditions matter in the new socio-economic landscape?”, *The Journal of Technology Transfer,*Vol. 44 No. 5, pp.1577-1602.

Vohora, A., Wright, M. and Lockett, A. (2004), “Critical junctures in the development of university high-tech spinout companies”, *Research policy*, Vol. 33No. 1, pp.147-175.

Yunis, M., Tarhini, A., and Kassar, A. (2018), “The role of ICT and innovation in enhancing organizational performance: The catalysing effect of corporate entrepreneurship”, *Journal of Business Research*, Vol. 88, pp.344-356.

**Appendix I: Nodes and sub-nodes**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Name of nodes and sub-nodes** | **Description of node/sub-node** |
| 1 | Achieved desire results | Whether tech startups achieved desire results after pivoting |
| 1.1 | No | The tech startup did not achieve desire results after pivoting |
| 1.2 | Not sure | The participant could not confirm about achieving desire results |
| 1.3 | Yes | Yes, the tech entrepreneur achieved desired result |
| 2 | Challenges faced with pivots | Whether the tech startup had any issues with pursuing pivots |
| 2.1 | No | No, the tech startup did not face any challenges while pivoting |
| 2.2 | Yes | Yes, the tech startup faced challenges while pursuing pivoting |
| 3 | Change in technology after pivoting | Whether there was change in the technology used by tech startup to develop its product or service after pivoting |
| 3.1 | No | No, the tech startup did not change the technology after pivoting |
| 3.2 | Yes | Yes, the tech startup changed the technology after pivoting |
| 4 | Domino effect | Did one pivot lead to another pivot |
| 4.1 | No | There was no domino effect |
| 4.2 | Yes | Yes, there was a domino effect |
| 5 | Factor(s) associated to pivot(s) | Which factor led to which pivot |
| 6 | Factors | This code consists of factors that trigger tech startups to pivot. There are two categories external and internal factors |
| 6.1 | External factors | Factors that are in control of tech startups |
| 6.1.1 | Competition | Multiple startups/companies offering same/similar products |
| 6.1.2 | Customer feedback | Feedback from customers  |
| 6.1.3 | Market conditions | Better opportunities or no longevity |
| 6.1.4 | Technology challenges | Limitations of technology |
| 6.1.5 | Unscalable business | Unable to grow |
| 6.1.6 | Wrong timing | Ahead of market  |
| 6.2 | Internal factors | Factors that triggered due to startup actions |
| 6.2.1 | Business financials | Cash and financial issues |
| 6.2.2 | Flawed business model | Not generating enough revenues |
| 6.2.3 | Influence of investor, partner, or founder | Call of founder or investor |
| 6.2.4 | Legal issues | Patent or copyright issues |
| 6.2.5 | Side project success | Successful than main project |
| 7 | Influence of Technology Entrepreneurship | Whether there is an influence of TE on pivoting |
| 7.1 | No | No there is no influence of technology entrepreneurship on pivoting |
| 7.2 | Not Sure | The participant is not sure whether there is an influence of technology entrepreneurship on pivoting |
| 7.3 | Yes | Yes, there is an influence of technology entrepreneurship on pivoting |
| 8 | Type of Pivot | There are a total of 14 pivots. They are categorised at 4 level product, market, strategy, and team level |
| 8.1 | Market level pivots | Change at customers level |
| 8.1.2 | Channel pivot | Another effective way of reaching customers |
| 8.1.3 | Customer need pivot | A problem identified by the startup is not crucial for the customer  |
| 8.1.4 | Customer segment pivot | A change in the target customer segment  |
| 8.1.5 | Market segment pivot | A segment of the entire market |
| 8.2 | No pivot | The tech entrepreneur did not pivot |
| 8.3 | Product level pivots | Change in products |
| 8.3.1 | Platform pivot | A platform itself turns into product or vice versa |
| 8.3.2 | Technology pivot | Same solution but using different solution |
| 8.3.3 | Zoom-in pivot | A single feature becomes an entirely new product |
| 8.3.4 | Zoom-out pivot | A product becomes a feature of a larger product  |
| 8.4 | Strategy level pivots | Change at strategy level |
| 8.4.1 | Business architecture pivot | Low volume-high margin or Low margin-high volume |
| 8.4.2 | Complete pivot | Starting new business |
| 8.4.3 | Engine of growth pivot | A change in strategy for rapid growth |
| 8.4.4 | Side project pivot | Side business more successful than main business |
| 8.4.5 | Value capture pivot | A change in the method of capturing value (money) |
| 8.5 | Team level pivots | Change in startup team |
| 8.5.1 | Social pivot | New team on the same idea |
| 9 | Useful to check | The purpose of the code is to understand the text that has inner meaning related to pivoting, factors, and TE |
| 10 | Value proposition | Pivoting helps tech startups to create and sustain value proposition |
| 10.1 | No | No pivoting does not help in creating and sustaining value proposition |
| 10.2 | Not sure | The participant is not sure whether pivoting helps in creating and sustaining value proposition |
| 10.3 | Yes | Yes, pivoting helps in creating and sustaining value proposition |

# **Appendix II: Factors and Pivots**

|  |  |  |
| --- | --- | --- |
| **Participant ID** | **Type of pivot** | **Factors** |
| Participant-1 | 1. Complete pivot (pursued 3 times) | 1. Competition and market conditions  |
| Participant-2 | 2a. Market segment pivot2b. Customer segment pivot2c. Customer need pivot 2d. Side project pivot | 2a. Influence of investor, partner or founder and legal issues 2b. Customer feedback, technology challenges and unscalable business2c. Influence of investor, partner or founder, technology challenges and market conditions 2d. Side project success and customer feedback |
| Participant-3 | 3a. Zoom-in pivot 3b. Zoom-out pivot 3c. Customer segment pivot3d. Customer need pivot 3e. Channel pivot 3f. Engine of growth pivot 3g. Side project pivot | 3a. Competition3b. Competition3c. Unscalable business 3d. Customer feedback 3e. Unscalable business 3f. Flawed business model3g. Influence of investor, partner or founder, market conditions and side project success |
| Participant-4 | 4a. Market segment pivot 4b. Customer segment pivot 4c. Customer need pivot4d. Value capture pivot4e. Side project pivot4f. Channel pivot | 4a. Wrong timing4b. Competition4c. Customer feedback4d. Competition4e. Side project success and technology challenges4f. Side project success |
| Participant-5 | 5a. Zoom-in pivot5b. Technology pivot5c. Customer segment pivot5d. Business architecture pivot | 5a. Customer feedback5b. Technology challenges5c. Competition5d. Competition |
| Participant-6 | Did not pursue any pivot | N.A. |
| Participant-7 | 7a. Customer need pivot7b. Customer segment pivot7c. Technology pivot | 7a. Customer feedback7b. Flawed business model, Wrong timing, and market conditions7c. Unscalable business, wrong timing, technology challenges and market conditions |
| Participant-8 | 8a. Customer segment pivot8b. Zoom-out pivot8c. Platform pivot8d. Channel pivot | 8a. Competition, customer feedback and market conditions8b. Competition and customer feedback8c. Customer feedback 8d. Customer feedback |
| Participant-9 | 9a. Side project pivot9b. Customer segment pivot | 9a. Side project success9b. Market conditions |
| Participant-10 | 10a. Customer segment pivot10b. Market segment pivot | 10a. Customer feedback, influence of investor, partner or founder and technology challenges 10b. Influence of investor, partner, or founder |
| Participant-11 | 11a. Technology pivot11b. Platform pivot11c. Customer segment pivot11d. Customer need pivot11e. Channel pivot11f. Market segment pivot11g. Engine of growth pivot11h. Side project pivot | 11a. Technology challenges and competition11b. Customer feedback, influence of investor, partner or founder, market condition and competition11c. Customer feedback, competition, Wrong timing and influence of investor, partner, or founder11d. Customer feedback, competition, wrong timing, influence of investor, partner or founder and market conditions11e. Influence of investor, partner, or founder, unscalable business and competition11f. Market conditions, competition, unscalable business and technology challenges11g. Market conditions, influence of investor, partner or founder, technology challenges and unscalable business11h. Customer feedback, technology challenges, competition, unscalable business, wrong timing, market conditions and influence of investor, partner, or founder |
| Participant-12 | 12a. Zoom-out pivot 12b. Customer segment pivot12c. Channel pivot12d. Business architecture pivot | 12a. Customer feedback and flawed business model12b. Flawed business model12c. Customer feedback and unscalable business12d. Business financials |
| Participant-13 | 13a. Zoom-in pivot13b. Customer segment pivot13c. Customer need pivot13d. Channel pivot13e. Market segment pivot13f. Value capture pivot13g. Business ecosystem pivot13h. Brand pivot | 13a. Customer feedback and competition13b. Competition and market conditions13c. Market conditions13d. Market conditions13e. Market conditions13f. Market conditions and competition13g. Market conditions13h. Customer feedback |
|  |
| Participant-14 | 14a. Side project pivot14b. Customer segment pivot14c. Business architecture pivot14d. Social pivot14e. Technology pivot | 14a. Side project success14b. Customer feedback14c. Customer feedback14d. Legal issues14e. Technology challenges and influence of investor, partner, or founder |  |
| Participant-15 | 15a. Customer segment pivot 15b. Channel pivot15c. Value capture pivot | 15a. Competition, market conditions and geopolitical issues15b. Competition, market conditions and geopolitical issues15c. Strategic longevity and side project success |  |
|  |
| Participant-16 | 16a. Zoom-in pivot16b. Technology pivot16c. Platform pivot16d. Customer segment pivot16e. Customer need pivot | 16a. Legal issues16b. Technology challenges16c. Legal issues16d. Legal issues16e. Customer feedback |  |
| Participant-17 | 17a. Side project pivot17b. Technology pivot17c. Zoom-out pivot17d. Customer need pivot | 17a. Side project success and customer feedback17b. Technology challenges and side project success17c. Side project success and customer feedback17d. Customer feedback and competition |  |
| Participant-18 | Tech Startup-1: Customer need pivot Tech startup-2: Customer segment pivotTech startup-3 Platform pivot | Tech Startup-1: Customer feedback Tech Startup-2: Influence of investor, partner, or founder Tech Startup-3: Flawed business model |  |
| Participant-19 | 19a. Zoom-in pivot 19b. Zoom-out pivot 19c. Platform pivot19d. Customer segment pivot19e. Channel pivot19f. Market segment pivot19g. Value capture pivot19h. Engine of growth pivot19i. Business architecture pivot19j. Complete pivot19k. Side project pivot19l. Social pivot | 19a. Customer feedback, competition, and market conditions 19b. Customer feedback, competition, and market conditions19c. Customer feedback, competition, and market conditions19d. Customer feedback and wrong timing19e. Customer feedback and competition19f. Competition19g. Competition19h. Customer feedback19i. Customer feedback19j. Customer feedback, influence of investor, partner, or founder, legal issues, side project success and business financials19k. Customer feedback, wrong timing, and market conditions 19l. Influence of investor, partner, or founder, legal issues, side project success and business financials |  |
| Participant-20 | 20a. Zoom-in pivot20b. Zoom-out pivot20c. Platform pivot20d. Customer segment pivot20e. Customer need pivot20f. Side project pivot | 20a. Technology challenges20b. Competition20c. Flawed business model20d. Side project success20e. Customer feedback and flawed business model20f. Competition |  |
| Participant-21 | 21a. Channel pivot21b. Side project pivot | 21a. Wrong timing21b. Wrong timing |  |
| Participant-22 | 22a. Customer need pivot22b. Value capture pivot | 22a. Customer feedback and wrong timing22b. Customer feedback and wrong timing |  |
| Participant-23 | 23. Technology pivot | 23. Wrong timing and influence of investor, partner, or founder |  |
| Participant-24 | 24a. Zoom-out pivot24b. Technology pivot24c. Platform pivot24d. Channel pivot24e. Market segment pivot24f. Value capture pivot24g. Engine of growth pivot 24h. Business architecture pivot24i. Side project pivot | 24a. Customer feedback24b. Strategic longevity24c. Strategic longevity and unscalable business 24d. Influence of investor, partner, or founder24e. Market conditions24f. Influence of investor, partner, or founder24g. Influence of investor, partner, or founder24h. Customer feedback24i. Influence of investor, partner or founder, side project success and strategic longevity |  |
|  |
| Participant-25 | 25a. Platform pivot25b. Channel pivot25c. Value capture pivot25d. Engine of growth pivot25e. Side project pivot25f. Social pivot25g. Technology pivot | 25a. Technology challenges25b. Unscalable business and flawed business model25c. Flawed business model25d. Business financials25e. Business financials25f. Flawed business model25g. Technology challenges and unscalable business |  |
|  |
| Participant-26 | 26a. Business architecture pivot26b. Customer segment pivot | 26a. Technology challenges and business financials26b. Business architecture pivot led to pursue this pivot |  |
| Participant-27 | 27a. Customer segment pivot27b. Channel pivot27c. Engine of growth27d. Business architecture pivot | 27a. Market conditions and influence of investor, partner, or founder 27b. Business financials and customer feedback27c. Competition, business financials and customer feedback 27d. Competition and business financials |  |
| Participant-28 | Tech Startup-1: Customer segment pivot Tech Startup-2: Side project pivotCompany-A: Business architecture pivot | Tech startup-1: Influence of investor, partner, or founder Tech Startup-2: Technology challenges, side project success and business financialsCompany-A: Influence of investor, partner, or founder |  |
|  |
|  |
| Participant-29 | 29a. Zoom-out pivot29b. Channel pivot | 29a. Strategic longevity 29b. Competition |  |
| Participant-30 | 30. Customer need pivot (pursued this pivot twice) | 30. Technology challenges, Unscalable business, wrong timing, market conditions, customer feedback and influence of investor, partner, or founder |  |

**Appendix III:** **Number of times a pivot pursued in a technology sector**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type of pivot** | **Communication system** | **Software technology** | **Internet technology**  | **Semiconductor technology**  | **Biotechnology, medical, instrumentation and medical pharmaceutical technology**  | **Other electronics related technology** |
| Channel pivot | 2 | 4 | 5 | 0 | 1 | 1 |
| Customer need pivot | 0 | 4 | 5 | 0 | 2 | 2 |
| Customer segment pivot | 1 | 8 | 6 | 0 | 2 | 3 |
| Market segment pivot | 2 | 3 | 1 | 0 | 0 | 0 |
| No pivot | 0 | 0 | 4 | 0 | 0 | 0 |
| Platform pivot | 2 | 1 | 4 | 0 | 1 | 1 |
| Technology pivot | 1 | 3 | 2 | 0 | 2 | 2 |
| Zoom-in pivot | 1 | 0 | 3 | 0 | 1 | 1 |
| Zoom-out pivot | 2 | 1 | 4 | 0 | 0 | 1 |
| Business architecture pivot | 2 | 2 | 0 | 0 | 2 | 1 |
| Complete pivot | 1 | 0 | 0 | 0 | 0 | 0 |
| Engine of growth pivot | 2 | 1 | 2 | 0 | 1 | 1 |
| Side project pivot | 2 | 4 | 2 | 0 | 1 | 2 |
| Value capture pivot | 2 | 1 | 3 | 0 | 1 | 0 |
| Social pivot | 1 | 1 | 0 | 0 | 1 | 0 |