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Small Technology Business (STB) Failure Prevention Strategies Using Potential Failure Modes

By
Krishnakumar Nair, University of South Florida

Small businesses are the backbones of both developed and developing economies of the world and play a vital role as drivers of growth and development (Blankson et al., 2018). According to the US Bureau of Labor Statistics (McIntyre, 2020; US-Labor, 2020), small businesses have an 80%, 70%, 50%, and 30% survival rate across one, two, five, and ten years in business. About 25% of new businesses cross the 15th year (Deane, 2022; US-Labor, 2020). This trend has remained the same for decades. Identifying the dominant causes of failures and using those key factors to create holistic, proactive failure prevention strategies reduces failure rates and improve business sustainability. Successful businesses contribute to sustained employment and advances in local, national, and global economies.

Proactive strategies to reduce small business failures improve their growth and sustainability. US Labor statistics show that small businesses faced a considerable decline in their survival and that statistics remained steady for decades, indicating the need for in-depth research to find the gap and address the survival of future businesses.

The scope of this research is on Small Technology Businesses (STBs) which are approximately 35% of small businesses. The question is, how can we address the short lives of the STBs and improve their sustainability? This article summarizes the failures in small technology businesses, categorizes them according to business functions, and proposes strategies to address them. Mapping failures to business function(s) allows for holistic and proactive solutions entrepreneurs could implement for growth and profitability. The literature survey analyzed the causes of failures, events that led up to failures, and the consequences of the failures. It also summarizes other studies investigating the failures and the proposed solutions, intervention trigger factors, actions, and gaps to address. Also presented is a brief analysis of the studies about the mistakes companies should avoid for continuous value creation and the steps that could prevent failures.

Keywords: Small technology, Business failures, Predominant causes, Proactive prevention strategies, Business growth, Sustainability

Small businesses are the backbones of both developed and developing economies of the world and play a vital role as drivers of growth and development (Blankson et al., 2018). According to the US Bureau of Labor Statistics (McIntyre, 2020; US-Labor, 2020), small businesses have an 80%, 70%, 50%, and 30% survival rate across one, two, five, and ten years in business. About 25% of new businesses cross the 15th year (Deane, 2022; US-Labor, 2020). Identifying the dominant causes of failures and using those key factors to create holistic, proactive failure prevention strategies reduces failure rates and improve business sustainability. Successful businesses contribute to sustained employment and advances in local, national, and global economies. The scope of this research is on Small Technology Businesses (STBs) which are approximately 35% of small businesses.

The researcher's experiences going through the drills of product failures and premature closures in innovative consumer products and healthcare solutions inspired him to investigate further the causes of business failures. Three decades of working for large, medium, and small technology companies have taught the researcher different types of cultures, business processes, and behavioral protocols. These include highly innovative, process-driven cultures like Motorola; Google's open, casual environments; and the overly hierarchical healthcare environment. Some companies had written rules to conduct and document failure analysis, postmortem, or lessons learned after the successful completion or failed closure of a project, product, or service. Accepting and learning from those failures provided a steppingstone to success for the next cycle of products. Also, business failures have an ecological ripple effect throughout the entire value chain, negatively impacting the economy (Quach et al., 2021). Hence another important obligation is to study business failures and help investors in the entrepreneurial transitions for sustainability. In the researcher's experience, most success stories led to growth and competitiveness. To summarize, the researcher's goal is to investigate *small businesses* to understand *why they are failing at the above rates*, *identify predominant factors* that caused such failures and study *proactive strategies that* could minimize their premature failures. Such strategies could improve the survival of businesses to generate sustained employment and economic growth.

Small technology businesses (STBs) are companies operating in the technology sector and are classified as small businesses based on their size, revenue, or number of employees. Such businesses primarily focus on developing, producing, or providing technology-related products, services, or solutions. STBs include companies involved in software development, hardware manufacturing, telecommunications, information technology (IT) services, e-commerce, biotechnology, and services, mostly leveraging technology to deliver innovative products or services.

Protocol

The Literature survey used keywords (ex: small technology business failures, business closures, strategies for small business success, and small business growth strategies) mainly on three databases - EbscoHost, ABI/Inform Global & JSTOR. Similar searches include Google Scholar, Quicksearch, and reputable online sites for relevant information.

The following sections discuss the literature survey and its summary. In the literature summary section, the researcher summarizes the business failure modes, as they are the initial signs business owners must look for and take action to prevent premature failures. The researcher abstracted the primary failure reasons and the literature on intervention strategies in the article's next section. The discussion section highlights propositions needed to enhance success rates, gaps to fill, and opportunities for further research. A high-level model proposed as a holistic solution to combat failures is a theoretical model that needs future in-depth work. The conclusion section highlights the current research's importance and proposes future opportunities.

Literature Summary

The researcher finds that business failures result from several reasons, including one or more of the following Failure Modes listed in Table 1 (note: this list includes the failure reasons the researcher observed during his career in different industries and from literature). It is crucial to study and understand the origins of failures as preventive actions regenerate businesses (Crutzen & Van Caillie, 2008; Ropega, 2011). These failure modes are also potential primary signs business owners must look for and take action to avoid failures. Failure modes are then abstracted as Failure Categories to propose proactive, holistic solutions for preventing failures. These failure categories are strongly related to the core business functions, and it is realistic to recommend comprehensive solutions involving one or more of these business units for failure. In a functional organizational structure, tasks and activities are grouped by business functions (Awa, 2016), encompassing their specialized talents or competencies. Examples include product management, finance/accounting, marketing, sales, operations, production/ manufacturing, research/innovation, human resources, information technology, and consumer experience. Mapping to business functions has several advantages, including the availability of expertise to support precise analysis of failure causes, business func-

Table 1: Business failure modes and their failure categories		
Failure Mode	**Failure Categories**	**Reference**
Lack of or a poor business plan or model	Business strategy shortfalls	(Cardon et al., 2011; DaSilva & Trkman, 2014; Nair & Blomquist, 2019)
Marketing failures (lack of marketing analysis, strategy, or plans)		(Yoder et al., 2016)
Enterprise business strategy		(Yoder et al., 2016)
Lack of business feasibility studies (analysis, business plan)		(Yoder et al., 2016)
Lack of vision, knowledge, and misjudgments by executives or major shareholders (Motorola Iridium, Java/ Lynx, UMTS market elimination)		(Cardon et al., 2011)
Competition outperforming or not researching the competition		(Amankwah-Amoah et al., 2018)
Lack of focus, spreading to multiple businesses before establishing one.		(Yoder et al., 2016)
Lack of flexibility to pivot		Observed by author
Lack of market demand for the product or service or lack of research on the purchasing characteristics of consumers	Customer dissatisfaction	(Cardon et al., 2011; Yoder et al., 2016)
Ignoring customer needs		Observed by author
Failure to meet the customer schedules or window of opportunity		Observed by author
Product or service affordability or price points		Observed by author
Customer acceptance or satisfaction (value creation)		(Naumzik et al., 2022)
Lack of revenue or running out of cash or insufficient capital	Financial crisis	(Shepherd & Wiklund, 2006; Shepherd et al., 2000)
Lack of loss absorption mechanisms or Financial planning		(Lussier, 1996)
Finance mismanagement		(Cardon et al., 2011)
Lack of checks & balances (ex: Theranos)		(Griffin III, 2022; Straker et al., 2021)
Bankruptcy - adverse economic conditions, bank failures		(Bhattacharjee et al., 2009; Garcia Martinez et al., 2019; Pearce & Michael, 2006; White, 2016)
Revenue reduction and increased expenses (Any company)		(Shepherd & Wiklund, 2006; Yoder et al., 2016)
Lack of retained earnings (profit) from previous years (small high-tech firms)		(Williams, 2016)

Table 1 (Continued): Business failure modes and their failure categories		
Failure Mode	**Failure Categories**	**Reference**
Technology implementation challenges – include hardware, software, and manufacturing.	**Innovation challenges**	**(Chen et al., 2009)**
Noncompliance with regulations, or laws (local, state, federal, or global), Intellectual property (IP) infringements	**Legal and regulatory**	**Observed by author**
Lack of understanding of management functions, management skills, and managerial training; poor decision making; cultural issues and unable to execute changes	**Management/leadership incompetence**	**(Alstete, 2008; Benson et al., 2011; Buchan, 2011; Cardon et al., 2011; McGrath, 2011; Philip, 2011)**
Scope issues (out of scope, scope creeps, feature over-packing)	**Technological gaps**	**(Chen et al., 2009)**
Lack of support tools, processes, or quality		**Observed by author**
Lack of product execution, control, and monitoring mechanisms		**(Chen et al., 2009)**
Lack of planning or vision (technology, process)		**(Cardon et al., 2011)**
Lack of plans for continuous improvements or evolution		**(Paipa-Galeano et al., 2020)**
Scaling or expansion without proper analysis or evaluation or too quickly		**(Yoder et al., 2016)**
Lack of technical research (incompatibilities)		**Observed by author**
Lack of technology validations/poorly executed product /unfeasible technology (ex: Theranos)		**(Griffin III, 2022; Straker et al., 2021)**
Delay in full technology knowledge transfer		**Observed by author**
Lack of continuous innovations.		**(Franco & Haase, 2010)**
Resource issues (lack of management support, lack of skilled resources, resource behaviors, direct project or program management failures, lack of cohesiveness in the team, burnout issues)	**Technological gaps (IT, Transformations)**	**(Chen et al., 2009)**

tion(s) providing precise financial impact caused by such failures, and in the case of actual failure occurrence, the team can address it faster due to accumulated domain knowledge. There is some literature on the taxonomy of IT project failures (Al-Ahmad et al., 2009). They do not directly refer to the STB failures, although a few IT functions have commonalities like technology, organization, management, and process. In order to design and implement effective interventions, failing businesses are categorized using metaphors to study leadership behaviors as a cause (Richardson et al., 1994). The reasons for business success are more well-documented than business failures (Bruno & Leidecker, 1988).

Table 2 explains the multiple core business functions conceived as Failure Categories and their relationships. The list also cites some specific examples from the literature. The advantages of mapping to Business Functions are described earlier in this section.

Appendix A describes a futuristic example of an STB – Electric Vehicle (EV) Charging Station – and

Table 2: Business functions abstracted as Failure Categories	
Failure Categories	**Core Business Functions**
Business strategy shortfalls **Technological gaps**	**Product Management, Strategy**
Customer dissatisfaction **Business strategy shortfalls**	**Consumer Experience**
Financial crisis	**Finance/Accounting**
Financial crisis **Business strategy shortfalls**	**Marketing & Sales**
Management/leadership incompetence **Business strategy shortfalls**	**Leadership, Operations & Analytics**
Innovation challenges	**Supply Chain**
Customer dissatisfaction	**Production/Manufacturing/Distribution**

demonstrates how to identify Failure Modes and Failure Categories and mapping to Business Functions. EV infrastructure is evolving. By 2030, half of the vehicles sold in the US will be EVs. EV owners continue to be satisfied with their vehicles while unsatisfied with the state of charging infrastructure. Hence in addition to public charging stations, we will need private charging stations to meet the demands of the vehicle owners.

Gaps and Opportunities

A current Business Plan template typically consists of a) a company overview, b) a business description, c) a market analysis, d) an operating plan, e) a marketing and sales plan, and f) a financial plan, which itself is inadequate to support a healthy startup. Many small technology businesses still need a Business Plan. Most companies do not even have a Growth and Sustainability Plan (GaSP), which lists the cost reduction plans (lean, staffing, scheduling, compliance, and employee satisfaction, to list a few), multiple ways to combat competition, opportunities to grow (technology, scaling, pivoting, hidden prospects), and sustainability (long term plans) activities. In a company, if a Business Plan exists, only a few make updates to the plan on a continuous cadence. These gaps in practice have raised interest in reinforcing business strategies for each STB with additional steps that would help them be successful and sustainable.

Most studies tried to address just one reason for the failures individually. That means the authors have researched in depth on just one specific reason. Examples are economic crisis, lack of leadership strategies, personal impact on the entrepreneur, or use of lessons learned from previous failures. That learning is insufficient as a business comprises several units (ex: development, manufacturing, customer experience, sales, marketing, business intelligence, and analytics), and adopting a holistic solution to address failures is more appropriate.

There are opportunities to increase success rates by introducing various concepts from the inception of a small technology business. As proposed, the executive team needs to increase domain business knowledge for entrepreneurs and decision-makers of the company. Promoting continuous innovation in every aspect of a business is critical to sustainability. Based on the studies, the financial crisis is a primary reason for failures. Creating a healthy and comprehensive financial strategy involving all business components (vs. individual financial strategy for just one business component) improves stability. Satisfying customer requirements and demand is critical, especially for technology companies. Incorporating analytics from customer surveys on product requirements and enabling them in their products and services will add enormous value to financial stability and business competitiveness. Creating long-term business plans and their continuous updates on a cadence will give entrepreneurs and decision-makers an overall vision for their business. This strategic planning will create opportunities to understand the pitfalls and take steps to avoid them. Creating and evolving a business culture of continuous improvements in every aspect of the business gives opportunities to implement innovative ideas for stability. This continuous improvement culture can evolve into the existing company culture. For all these to be a reality, the management/leadership needs to adequately buy into these ideas and prepare the organizations for change.

There are opportunities to translate cost-efficient, simple, and efficacious failure prevention tools in similar domains to the business domain. Such simple tools would help STB startups and entrepreneurs who are short on finances and looking for cost-effective mechanisms to proactively incorporate in the initial stages to prevent failures. This researcher has been working on translating a successful tool, Failure Mode Effects Analysis (FMEA), applied in products and processes to the business domain. Business Failure Mode Effects Analysis (BFMEA) (Nair & Mullarkey, 2023) is being designed and evaluated by academics and practitioners. Several traditional and software (Capterra, 2023), lean, and six sigma tools are available for STBs to avoid business failures; why are they not effectively using them? Some factors inhibit STB owners from using these vital tools that would help them succeed. The researcher is studying this phenomenon using a Qualitative Research Approach.

Many studies focus on successful startups and the determinants of success, but very few studies examine the stories of failed startups. Cantamessa et al. (2018) analyzed the unstructured 200+ post-mortem documents deriving startup failure patterns. They identified a lack of a structured business development strategy as a critical determinant of startup failures. They used the SHELL (Software, Hardware, Environment, Liveware People, and Liveware Environment) methodology, traditionally applied in the aviation sector, which was transformed to study the failures in the business environment. Target companies are organized into different sectors to study the failures. Also, the authors noted that companies fail for multiple reasons, and they built a statistical model using clustering methods to understand the chain of causes that resulted in a startup failure.

With the enormous amount of literature available in an area of research, the organization of the relevant literature and their analysis using bibliometric tools are becoming popular. Zambrano Farias et al. (2021) studied a bibliometric analysis of business failure literature using 500+ scientific journal papers in the Scopus database, published from 1954 to 2020, to identify the significant research trends and future challenges. They used bibliometric tools like VOSviewer (for constructing and visualizing bibliometric networks, such as citation networks or co-author networks) and SciMAT (Science Mapping Analysis Software Tool) to facilitate the literature review and elicit relevant knowledge. They carried out a bibliometric analysis to identify the prominent research authors and the main themes of current research. Such tools and literature analysis techniques are helpful to researchers.

This researcher proposes a model shown in Figure 1, an approach to creating a holistic solution to prevent business failures. Small technology businesses can a) create positive strategies to implement essential customer satisfaction feedback, b) propel innovation initiatives, c) improve domain business knowledge and d) create a culture of continuous improvement, to prevent failures. The predictability of failure categories can be determined using available literature and create a holistic solution incorporating the determinants of failure. Document all easily predictable failures into a Business Plan (BP) or to an extended Business Plan (eBP), depending on the complexity of the business. Proactive solutions for less predictable failures can be funneled into a "Growth and Sustainability Plan (GaSP)" with in-depth research to reduce complex failures and improve sustainability. GaSP will enable businesses to scale, pivot, or spinoff as needed, strengthening the business.

Reasons for Business Failures

'Failure rarely sneaks up on a founder, there are a series of signs and activities that happen prelude to a failure' (Eisenmann, 2021). Business failure occurs when a firm's revenue reduces drastically, and expenses rise such that the business becomes insolvent and unable to attract equity, resulting in either a change in management or exiting altogether (Shepherd & Wiklund, 2006; Shepherd et al., 2000). One of the top reasons for small enterprise (SME) failures is the lack of customer demand. For example, during the COVID-19 pandemic, health care, social assistance businesses, consumable food, and restaurant & food services businesses flourished. Many businesses that performed well before the pandemic slumped during the pandemic. Consumer demand is one of the primary indices determining a business's health. Recommendations to assess the different failure factors and strategize to pivot in trying times enable entrepreneurs to survive and continually make decisions for sustainability (Sohaib Shahid Bajwa, 2017).

Companies exit through bankruptcy or acquisition, and such studies contribute to understanding determinants and the macroeconomic instabilities' impact on such exits (Bhattacharjee et al., 2009). These researchers found a stronger relationship between bankruptcies and business instabilities. The risk of business failure can happen at any stage of a business channel. The connection between business failures and times of macroeconomic fluctuations is that business exit rates often rise during these crises and the periods of financial uncertainty that follow them (Garcia Martinez et al., 2019).

Theories for Business Failures

There is no list of variables or failure modes currently available that contribute to the prediction of the success or failure of small businesses (Lussier & Halabi, 2010). Also, there are no global prediction models that adequately theorize business success or failure

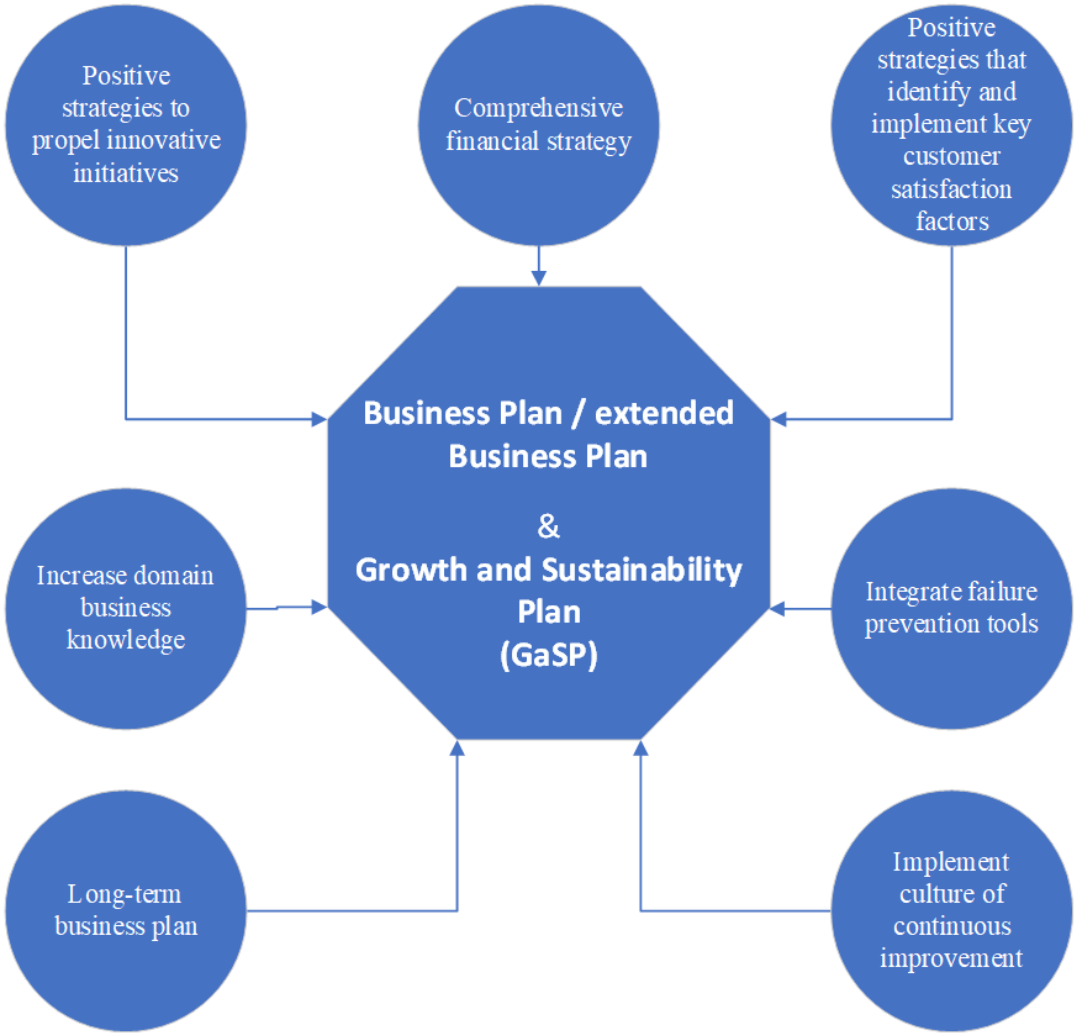

Figure 1: Proposed model to create an extended/Business Plan and a Growth & Sustainability Plan

(Guzmán & Lussier, 2015). A few theories could explain some parameters that contribute to success or failure. Theories that are applied to explain business failures are a) resource-based theory, b) decision theory, c) attribution theory, d) capital structure theory, and e) unifying theory. Resource-based theory (Gyimah et al., 2020; Lussier, 1995; Lussier & Halabi, 2010) can explain certain small business factors contributing to success or failure. This theory argues the need for specific resources to identify innovative opportunities and other business knowledge for businesses to succeed. Attribution theory helps understand the causal interpretation of events (attributions affect decisions; therefore, attributions should affect business decisions). In business failures, attribution theory was used to understand and interpret the relationship of failure to the outcomes of failure and then future entrepreneurial decisions (Askim-Lovseth & Feinberg, 2012). A study was carried out to predict business bankruptcy situations using variables related to capital structure theory and financial crisis (Lucanera et al., 2020). An attempt to identify which variables could explain and predict business success or failure using a unifying theory (Lussier & Halabi, 2010; Marom & Lussier, 2014) provides insights for a partial solution. A unifying theory of business failure is expected to provide a comprehensive understanding of the common underlying causes or patterns that lead to small business failures and a holistic solution for business success.

Research Findings on Failures and Intervention Strategies

Businesses could take course corrections when encountering challenges that prevent them from being profitable. Pivot is a change in the strategic direction of a business, product, or any element of a business model. The factors that lead to failures must be stud-

ied to understand the kind of pivots to be triggered (Sohaib Shahid Bajwa, 2017). This author studied the pivot trigger factors in software startups and the type of pivots. For their study, they collected data from 49 software startups like YouTube, Flickr, Pinterest, and Twitter. They gathered a list of factors that triggered such startups to pivot and identified significant types of pivots. They concluded that *customer needs* pivot is the most common type of pivot among all types. Results indicate that among the different pivot triggering factors they identified for software startups, adverse *customer reaction* was the most common reason to pivot, followed by their *flawed startup business model*. The learning that proceeds after a failure is critical for entrepreneurs to succeed. There are many advantages of entrepreneurs sharing business failure experiences. The experience triggers learning from failure, which encourages sharing resources, expertise, and ideas in the next entrepreneurial ventures, thus assisting entrepreneurs in succeeding in new ventures (Amankwah-Amoah et al., 2022).

A qualitative case study (Jackson, 2021) investigated successful leadership strategies in three small to medium urban enterprise owners. It resulted in recommendations for the owners to implement employee performance training and develop strategic planning. Successful leadership strategies are essential to facilitate success in any business and bring positive social change to urban communities. Social change brings about sustained job opportunities, increased local government tax revenues from sustained employment, reduced business failures, and improved community services and resources. Management/leadership incompetence leading to managerial deficiencies (lack of understanding of management functions, management skills, and managerial training; poor decision making; and cultural issues) are another reason for failures. Lack of education and business skills as the root cause of small business failure (Benson et al., 2011), poor leadership skills lose profits for the organization, which could result in business failure (Alstete, 2008), learning and adaptable leadership skills are essential for avoiding business failures (Buchan, 2011; McGrath, 2011; Philip, 2011).

A study (Mayr et al., 2021) evaluated businesses using a sample of 102 Austrian corporate bankruptcies in a year and logistic regression analyses to understand the relationship between entrepreneur characteristics (age, gender, education, and experience) and the probable causes of bankruptcy. They found that entrepreneur characteristics contributed significantly to the reasons for business failures (Mayr et al., 2021). Another research study compared the attitudes to business risks and failures among entrepreneurs having bankruptcy experience with those without such experiences. It showed statistically significant differences in the attitudes of entrepreneurs in evaluating the market, financial, personnel, operational, and legal risks (Dvorský et al., 2020). This study shows the need for domain business knowledge for success and sustainability.

Another research (Amankwah-Amoah et al., 2021) applied experiences of entrepreneurial business failures, a three-stage process of entrepreneurial engagement involving a) pre-founding, b) post-founding conditions, and c) the effects on future entrepreneurial ventures. These stages provided information on entrepreneurial fragility, resiliency, and the development of anti-fragility capabilities that benefit future ventures and their sustainability. Results of past failure analysis helped to adapt to future dynamic environments and hence can be applied to emerging-market businesses (Amankwah-Amoah et al., 2021). After studying sixteen emerging, failed, and successful platforms, the authors identified seven mistakes companies should avoid in creating and monetizing products, continuous value creation, and scaling. Avoiding these mistakes helps entrepreneurs develop digital platforms that generate and maintain value (Mancha et al., 2021). These seven mistakes are failing to a) create seamless digital experiences, b) create a vibrant ecosystem, c) protect monetization opportunities, d) identify strategic pivoting options, e) exploit crucial assets, f) innovate for growth, and g) maintain emerging strategies.

The seven mistakes identified in the literature were failing to a) create seamless digital experiences, b) create a vibrant ecosystem, c) protect monetization opportunities, d) identify strategic pivoting options, e) exploit crucial assets, f) innovate for growth, and g) maintain emerging strategies.

A study aimed at understanding the high failure rate among digital startup companies in Indonesia showed that the business model has a positive relationship with achieving sustainable performance (Danarahmanto et al., 2020). They analyzed the data using the structural equation model and contributed to understanding a business model based on *innovation* and *customer participation*. In another model, the authors studied the relationship between innovation, customer participation, business model, and sustainable performance (Danarahmanto et al., 2020). Customer participation enhances value in the company's business model (Prahalad & Ramaswamy, 2004), and it may lead to reinventing business models to improve profits (Merlo et al., 2014).

A study on the relationships between business failures and entrepreneurial decisions and behaviors revealed emotional issues. During business failures, entrepreneurs encounter financial, social, and emotional problems associated with them. The authors examined the relationships between the organization governing the rules of business failure and entrepreneurial decisions (Lee et al., 2021). The relationship between business failures and future opportunities is identified (Mueller & Shepherd, 2016). They investigated cognitive moderators of the relationship between failure experiences and a type of opportunity identification knowledge. Theories from cognitive psychology are used to develop and validate this business failure model focused on identifying opportunities. It empirically linked failures to structural alignment type of thinking. The study conducted in Australia to examine the impact of regret on personal well-being using attribution theory collected data from 319 failed entrepreneurs whose businesses failed in the past five years (Quach et al., 2021). Results provided information associated with entrepreneurial transitions and created a foundation for understanding the emotional responses of an entrepreneur. How company owners changed business behaviors following their business failures was studied to recommend how to bring success in their future endeavors (Dias, 2017). Like other similar studies, entrepreneurs change their business behaviors and practices based on their experiences from previous failures.

A study used the Lussier model (Lussier, 1995) in predicting the success or failure of small businesses in Ghana. They used logistic regression to analyze 101 failed and 107 successful small businesses (Gyimah et al., 2020). The variables of capital, economic environment, and marketing skills significantly predict a small business's success or failure. Authors claim the model accurately predicted 86.5% of the total business sampled as successful or failed. The retained earnings (profit) from past years could explain business failure among high-technology firms by indicating the available resources to respond to changing marketplace preventing failures. For small, high-technology firms, using neural network models, they analyzed the factors in determining business failures. This study is an addition to the literature on business failures. Authors consider the results robust because the neural networks tool can circumvent traditional regression models' strict assumptions (Williams, 2016).

Sujit and Tomas (Nair & Blomquist, 2019), based on case studies at nine Swedish business incubators, identified the need for an entrepreneur in the business model of failed startups. They propose that the 'matchmaking of the innovators with entrepreneurs' by the incubator is essential to prevent failures. The authors recommend that startups iterate their products with real-time feedback from customers and markets, thus validating the business model and the assumptions. Incubators play a vital role in the success of startups by managing the failures during business model validations and assisting them with necessary correction mechanisms or pivoting, thus uncovering a scalable business model.

Evaluation of the above literature revealed failure interventions, actions taken, and opportunities to pursue, and Table 3 summarizes those results.

Discussion

A comprehensive unifying theory of business failure does not exist, but understanding the common failure factors can provide valuable insights into mitigating risks and improving the chances of success in business endeavors. Researchers study and analyze failed businesses to identify trends and patterns that can identify best practices and provide entrepreneurs and managers with the tools to make informed decisions and avoid potential pitfalls. An integrated theoretical framework has been studied linking key business variables for implementing management standards (Ivanova et al., 2014). This research on one or more failure reason(s) has revealed the implicit relationship between business knowledge, management experience, and failures. Continuous customer participation on multiple fronts while initiating a product or service could enhance the value of the business. Innovations are critical to any business's success and sustainability. Several such concepts resulted from the literature review, industry experience, and interest in connecting practice to scholarly theories. It would be hard to translate many business concepts directly into a variable, but they can be defined as constructs because each encompasses various conceptual elements. This interpretation suggests the following propositions for future contributions to a holistic theoretical framework for business success.

P1 (***a***) A company increasing its domain business knowledge results in lower business failures.

Justifications: From the business failure literature, it is implicit that the company's decision-makers lacked comprehensive business knowledge. In a case study (Nair, 2022), the researcher worked with a small technology business to propose ways to double their profit in three years and study the impact of the spin-off of a product platform. That learning experience reaffirmed the researcher's understanding that small technology businesses lack business plans and complete knowledge of their business's environment, potential pitfalls, gaps, and opportunities. With assistance from multiple company members, the researcher documented a business plan, gathering business details. It is critical to continuously update, train decision-makers, and use business knowledge in each decision. Each business

Table 3: Intervention Trigger Factors, Actions, and Gaps/Opportunities

Triggering factor(s) for Intervention	Intervention Action	Gaps / Opportunity	References
Customer reaction, flawed startup business model	**Pivot**	**Business model validations – simple to complex validation methods**	**(Sohaib Shahid Bajwa, 2017)**
Steps to enhance employee morale, increase productivity, and achieve and maintain profit gains	**Employee training & strategic planning**	**Does positive social change contribute to the reduction in failures?**	**(Jackson, 2021)**
Failing entrepreneurship - bankruptcy, and lack of qualifications and knowledge of entrepreneurs	**Identify failure predictors and supplement them with knowledge and experience**	**Relationship between failures and business knowledge & management experience**	**(Mayr et al., 2021)**
Prior business failure experience in the process of subsequent venture formation	**Adapting to dynamic environmental changes**	**Continuous improvements (CI) in business entities social/professional mindset changes to build CI into the overall model.**	**(Amankwah-Amoah et al., 2021)**
Comparison of experience in bankruptcy to the attitudes to business risks and business failures; answers to risk statements that affect enterprise failure	**N/A**	**Domain business knowledge – more factors to consider. Analytics to create an overall risk index. A clear understanding of business issues/environment.**	**(Dvorský et al., 2020)**
Caused by the use of an inappropriate business model. Monitoring the effect of business model facilitation on innovation and customer participation against business performance	**Higher education and experience levels for leaders**	**Study a business model based on innovation and customer participation. Study the relationship between business model, innovation, and customer participation. Domain business knowledge.**	**(Danarahmanto et al., 2020; Nair & Blomquist, 2019; Prahalad & Ramaswamy, 2004)**
Relationships between governing rules of business failure vs. business decisions/behaviors	**N/A**	**Entrepreneur's knowledge, skills, and new solutions learned from failures**	**(Lee et al., 2021)**

has unique characteristics, and an in-depth understanding of the business and its environments provides an upper hand to be competitive and reduce potential pitfalls. Several factors contribute to the "business knowledge" database and the quality of its contents. Examples include – business information (environment, technology, process, manufacturing, marketing, sales, after-sales, customers, to name a few), decision maker's length of experience in the domain, number of current industry certification(s) possessed by that industry and its employees, the existence of a process for business knowledge documentation & continuous updates, cadence-based training opportunities for employees and metrics on company performance.

P1 (***b***) Identifying strategies to propel innovative initiatives in business reduce failures.

Justifications: Not many small technology companies have a business strategy organization or defined innovation initiatives. Driving continuous innovation in the technology of its products and the operations or execution of the business is critical to success. Intentional, continuous transformations, whether digital, agile, or infrastructural, add to sustainability. Encouraging innovation should be a function of company culture, and it is vital to accept failures as much as successes during these continuous innovation drives. The strategies involve exploitation (innovation due to reconfiguration of existing assets) and exploration (innovation of new markets, prod-

ucts, or business models). The buildup of intellectual property (IP) assets increases a company's evaluation and results in better financial stability.

P1 (***c***) A cumulative and lean financial strategy delivers positive business growth.

Justifications: Research indicates that the financial crisis is one of the prime reasons for business failures. Running out of capital, lack of checks and balances, financial mismanagement, and lack of loss absorption mechanisms are reasons for business failures. A financial strategy incorporating all aspects of the business – CapEx, OpEx, and innovation (R&D) budget with contingencies – and applying ***lean*** methods delivers positive business growth. Monitoring and altering the strategy based on profit margins create a healthy business environment.

P1 (***d***) Positive strategies that identify and implement key customer satisfaction factors increase product demand.

Justifications: Lack of customer demand, poor customer satisfaction, lower product quality, and the fact that it does not meet customer requirements are some of the top customer-related reasons for business failures. Successful technology businesses conduct customer satisfaction surveys on a cadence. Analytics identifies action items (requirement scope redefinitions, price restructuring, quality improvements, product redefinitions). Incorporating this feedback into a product or service improves the stability of the business. All these are possible only with supportive and innovative employees in the organization. Creating an employee culture that promotes these strategies are critical as well.

P2 (***a***) A long-term business plan increases business sustainability and competitive advantage.

Justifications: The focus of small enterprises is on making profits in the short term. Hence, they need to be made aware of the importance of strategic planning and defining strategic goals to achieve a competitive position in the market. Long-term and strategic planning (Stipic & Ruzic, 2021) helps make quality and effective decisions that deliver successful business results. In 2020, the researcher had an opportunity to work with the Brooksville-Tampa Bay Regional Airport at Brooksville, FL, to create short-term opportunities for business development due to the financial gap created by COVID. They had a fifteen-year Master Business Plan that was updated every five years. With significant capital investments from FAA and FDOT, it made sense to have such long-term planning. That accounted for the vision for the airport, the capital-acquiring process from government agencies, the development plan, and how to improve the local economy. For small technology businesses, a five to ten-year long-term business plan updated on a cadence (1 to 3 years) will provide opportunities to incorporate evolving technologies, processes, and changing market conditions to maximize growth and sustainability.

P2 (***b***) A culture of continuous business improvement creates stability.

Justifications: Organizations that value continuous improvement, waste reduction, problem-solving in managerial decisions related to people and processes, and crafting visionary ideas to achieve long-term success and effectiveness possess a culture of excellence (Provance et al., 2022). The success of a continuous improvement strategy depends on the individual strategies of all business units in a company. Each activity of the individual business unit will have a strategy, and all such strategies add up to create a continuous improvement framework for the company. It is a mindset change in a company's leadership and employees to continuously learn from experience and incorporate improvement factors in all their activities. Management trains employees on such frameworks and evaluates the outcomes using key performance indicators (KPIs).

Conclusions

A comprehensive list of all possible reasons for business failures is not currently available for small technology business failures. An across-the-board (covering all functional areas of the business) list would help entrepreneurs to view the type of failures they could face and take proactive actions to avoid them. A detailed review or meta-analysis of the causes of small technology failures will solidify the top reasons. This article is a first step in that direction. An integrated theoretical framework incorporating the propositions presented will contribute to a holistic framework for business success.

The consistent failure rates of small business enterprises indicate a need for in-depth research to fill the current gap and study proactive solutions to reduce them. The study's results will help alleviate current failures and provide a foundation for holistic solutions. The reason(s) for business failures and possible outcomes to improve success rates is the central theme of this article. A series of warnings and symptoms will occur before failure paralyzes a business. This article proposes methods to address these different failure modes or symptoms. They are categorized and mapped to business functions to apply solutions that could prevent failures effectively. Pre-accelerators, launchpads, seed programs, and business growth promotion centers could use this information to assist small business owners in preventing failures and becoming profitable. Such organizations could train business owners to look for such failure modes and proactively address them using available tools and techniques.

Several future research opportunities exist to continuously improve the ability of STB owners for growth

and sustainability. Grouping the failures using functional business categories and the possibility of their occurrence helps to address the potential solutions in two different approaches: a) an extended Business Plan and b) a Growth and Sustainability Plan (GaSP) for each business. Several modeling/simulation/ prediction studies are available addressing individual failure causes. These studies also contribute to the holistic prediction model connecting major functional areas of a business. Opportunities exist to translate cost-effective, simple, and proactive tools for STB owners and entrepreneurs. The researcher has proposed BFMEA, a solution that could proactively predict and prioritize failure modes in terms of financial benefit and business value.

There could be several reasons entrepreneurs neither create nor update their business plans. Launching the business takes so much effort, and they may not have the time to create or continuously update the business plan. When a small business starts, there may be a lack of resources to create and monitor a business plan. Also, when the business picks up with growing revenue, the business owner's concentration will be shifted to customer satisfaction factors, product improvements, scaling, supply chain, and manufacturing. The business plan may be completely ignored until the business owner hits a snag, and it will be too late to concentrate on creating a business plan. An artificial intelligence-based solution will help entrepreneurs and start-up owners incorporate Business, Growth, and Sustainability Plans into their swift routines.

Several traditional and software (Capterra, 2023), lean, and six sigma tools are available for entrepreneurs to avoid business failures; why are they not effectively using them? Several factors could inhibit business owners from using these vital tools, which would help them succeed. Examples include - lack of awareness of the existence of such tools, lack of knowledge of their usage, fear of the effects of using the tools, lack of training, inability to afford, the unfamiliarity of continuous improvements to tools, or technology evolutions. The researcher has proposed a Qualitative Research Methodology (QRM) to gather data through small business leadership and employee interviews. The results will present a set of tools to combat failures.

Research on the causes of small business failures and proposed actions to combat them has several limitations. Researchers have used different definitions for business failures, concentrating on prime reasons like bankruptcy or financial distress, thus narrowing the study to one or two causes. This approach makes it difficult for other entrepreneurs to apply these solutions to their businesses. To address this weakness, this author proposed a holistic solution to the failures using a unifying theory incorporating a set of primary failure reasons. Failure data reported are most often subjective and inconsistent. Small businesses often lack the resources for thorough reporting, leading to limited and sometimes unreliable data on failures. Researchers sometimes depend on this data to make their analysis and conclusions. External economic conditions, such as recessions or downturns, can significantly impact small businesses and may not be directly attributable to internal factors. Including primary internal and external factors in sustainability solutions is imperative. In this research, the author proposes a comprehensive solution, including factors for growth and sustainability. Small businesses or STBs consist of multiple types, like innovative technology implementations in electronic gadgets, mechanical assembly, or network services. Each faces unique challenges, and their failure factors can differ. Researchers need to be careful in generalizing findings and take steps to consider industry-specific subtleties. Business failure is often multifactorial, with multiple interconnected reasons. Because of this, comprehensive qualitative and quantitative research might provide more valuable information for the success of STBs. Most studies focus on successful startups and the determinants of success, but very few studies examine the stories of failed startups. Another critical limitation is the factor contributing to business failure across different cultures and regions. Studies need to capture these variations adequately. Combining multiple research methods and acknowledging the issue's complexity can contribute to a more comprehensive understanding of the reasons behind small business failures.

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Review

This article was accepted under the ***constructive peer review*** option. For futher details, see the descriptions at:

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Author

Krishnakumar Nair received his M.S. in Electrical Engineering and Computer Science from the University of Illinois at Chicago, IL, and an MBA from the University of South Florida, Tampa, FL. Nair is a doctoral candidate in the Doctor of Business Administration (DBA) Program at the University of South Florida and is expected to graduate in 2024. He has extensive technology industry experience for over 25 years working at Lucent Technologies, Motorola Inc., Motorola Mobility LLC (a Google company & a Lenovo company), University of South Florida Information Technology, and Humana Inc. Nair also has certifications as a Project Management Professional (PMP), Lean Six Sigma Green, Black and Master Black Belts, Manager of Quality and Organizational Excellence (CMQ/OE) and has several Agile and SAFe certifications. Mr. Nair is a Fellow of the Institution of Engineers (India), a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), a Senior Member of the American Society for Quality (ASQ), and a Member of the Project Management Institute (PMI).

Appendix A: STB Example

Electric Vehicle (EV) Charging Station is a futuristic example of an STB. This appendix identifies Failure Modes and Failure Categories and maps Failure Categories to Business Functions. EV infrastructure is evolving. By 2030, half of the vehicles sold in the US will be EVs. EV owners continue to be satisfied with their vehicles while unsatisfied with the charging infrastructure. Hence in addition to public charging stations, we will need private charging stations to meet the demands of future vehicle owners. Assume this researcher is an entrepreneur interested in an EV Charging Station startup.

Before starting an EV Charging Station franchise, identify all the Failure Modes and Failure Categories. To demonstrate their identification, three top issues are listed below. Issues that arise out of inner bullet points are failure modes. They include not supporting a level to multiple issues within each level. Categories such as "Charging Levels," "Charging Connector or Plugs," and "Paying for EV Charging" are failure categories. These Failure Categories are then mapped to related business functions.

- Charging Levels - There are three levels of EV charging, based on how much power they deliver. An EV Charging station should support multiple levels of power.
    - Level 1 uses a 120-volt outlet.
    - Level 2 charging provides 220 volts of power and charge from empty in about 4 - 10 hours.
    - Level 3 chargers (DC Fast Chargers) can charge the EV from empty in less than 20 minutes.
- Charging Connector or Plugs - are the interface between a charger and the vehicle. Incompatible connectors or plugs. EVs have distinct charging ports, and no universal charging connector is currently available. That means the shape of the plug that connects to your EV varies. Customers need to understand their vehicle's plug type. Not every charging station will be compatible with all different kinds of plugs.
    - Level 1 and Level 2 charging, most EVs use a J1772 plug (J-plug). Most common.
    - Level 3 DCFC, vehicles use CCS (combined charging system) or CHAdeMO plugs. CHAdeMO and SAE Combo CCS are not compatible with each other.
    - Tesla uses proprietary plugs for all levels of charging. J-plug can be used with an adapter.
- Paying for EV Charging
    - charging stations are only allowed to charge by the minute, not by the amount of electricity used

Business functions for Charging Levels & Charging Connectors or Plugs include Business Administration, Strategy, Purchase, Marketing, Manufacturing, Maintenance, Customer Experience, Operations & Analytics, Innovation, IT, Supply Chain, HR, and Finance. Whereas Paying for EV Charging involves Strategy, FinTech vendor interface, Purchase, Maintenance, Customer Experience, Operations & Analytics, Innovation, IT, Supply Chain, HR, and Finance. Mapping to business functions has several advantages, including the availability of expertise to support precise analysis of failure causes, business function(s) providing precise financial impact caused by such failures, and in the case of actual failure occurrence, the team can address it faster due to accumulated domain knowledge.

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