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Optimizing Government Grants for Startups: Encouraging Growth of Technology Startups Within the U.S. Entrepreneurial Ecosystem

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ABSTRACT

The entrepreneurial landscape in the United States thrives on innovation, with tech startups playing a pivotal role in driving change and economic expansion. This article explores the symbiotic relationship between government grants and technology startups, examining the impact, challenges, and evolution of grant programs in fostering innovation. Beginning with a historical overview, it traces the trajectory of government support, highlighting milestones such as the Small Business Innovation Research (SBIR) program and legislative reforms. Through a comprehensive literature review, it evaluates the multifaceted impact of government grants on startup ecosystems, encompassing economic effects, innovation output, and spillover impacts. Moreover, it delves into the challenges faced by startups, including funding constraints, regulatory complexities, and market entry barriers, emphasizing the need for sector-specific tailoring of grant programs. The article concludes with an evaluation framework that scrutinizes procedural efficacy, outcome metrics, sector-specificity, and long-term sustainability, providing insights into enhancing the effectiveness of government grant initiatives for fostering technological innovation.

KEYWORDS: *Entrepreneurship, Innovation, Tech Startups, Government Grants, United States, SBIR, STTR, Economic Impact, Regulatory Challenges, Market Entry, Sector-Specific Support, Evaluation Framework, Long-Term Sustainability, Innovation Ecosystems, Funding Constraints, Policy Reforms.*

1. INTRODUCTION

An extensive web of pioneers, risk-takers, and game-changers who are always trying new things is at the core of this entrepreneurial spirit. From the behemoths of Silicon Valley to the fledgling startups in developing tech

centers, the United States has a long history of being an innovation powerhouse (Khandelwau & Asthana, 2023). Academic institutions, venture capital firms, corporations, and government agencies all work together to foster an ecosystem where ideas can grow into successful businesses. Looking around at this thriving entrepreneurial scene, it could be perceived that tech startups are driving change by bringing new ideas and approaches to old businesses (Badzinska, 2016). Their capacity to quickly adjust to changing market conditions and implement innovative technology makes them indispensable to economic expansion. Thus, the entrepreneurial ecosystem in the United States provides the ideal setting for planting, tending to, and eventually harvesting innovative ideas (Qoriawan & Apriliyanti, 2022).

It is not without its difficulties, nevertheless, to traverse this competitive landscape. Startups in the technology industry confront several challenges, such as a lack of funding, difficulty breaking into new markets, and the ongoing need to innovate in order to remain competitive (Angadi & Patil, 2014). It is critical to evaluate existing support mechanisms, especially the function of government subsidies, in helping startups achieve sustainable growth, because of the crucial role entrepreneurs play in generating economic success (Sykora, 2019). Government grants play a pivotal role by offering essential funding and guidance throughout the most important phases of growth. In order to help startups turn their creative ideas into real goods and scalable businesses, these grants provide much-needed funding. Government grants give more than just cash; they also bring mentorship, networking, and access to tools that are crucial for startups to succeed in the competitive startup world (Girma, Gorg, Strobi, & Hanley, 2010).

Startups typically face a lack of resources as they navigate the turbulent path from ideation to market viability (Khandelwau & Asthana, 2023). Grants from the government are crucial in easing this load, so entrepreneurs can concentrate on developing and implementing their ideas without worrying about money. For tech firms, this funding is especially important because of the high costs of R&D, prototyping, and early-stage market testing (Grimm, Soubeiga, & Weber, 2021). Government grants also serve as a validation mechanism, showing private investors and the market at large that the ideas put out by a company have the backing of established authorities. In addition to attracting more investment, this confirmation boosts the startup's reputation, creating an atmosphere that is ideal for teamwork, alliances, and expansion (Badzinska, 2016).

In addition to providing financial backing, government grants frequently include mentorship programs that link startups with experienced individuals and specialists in their field (Crivelli, 2017). Beyond basic direction, this mentorship provides insightful critique, strategic counsel, and a road map for negotiating the complex terrain of technological advancement and market penetration. Government grant programs provide an environment where mentors and businesses work hand in hand, which is crucial for success since it encourages a mindset of constant learning and adaptation (Vildo & Masso, 2013). Government funds help companies grow holistically by providing access to pooled resources, infrastructure, and collaborative spaces. Startups are free to concentrate on making their products and services better thanks to these tools that take care of logistical issues. Government funds essentially act as catalysts, helping firms proceed from ideation to invention (Girma, Gorg, & Strobi, 2007).

Startups in the tech industry are at the forefront of innovation in the United States' entrepreneurial environment, but their mettle are tested along the way, together with creativity, and ability to plan ahead (Badzinska, 2016). To put government funds, which try to be a supporting force in overcoming the obstacles that typically characterize the early phases of startup development, in context, it is crucial to understand these issues. Limited access to capital is an ongoing problem that technology entrepreneurs must constantly contend with (Girma, Gorg, Strobi, & Hanley, 2010). Startups, in contrast to more established businesses, typically do not have the capital reserves to cover the expenses of R&D, product prototyping, and first market penetration. Startups face the double whammy of slow innovation due to a lack of capital and the possibility of being surpassed by more established businesses with deeper pockets (Angadi & Patil, 2014).

Another enormous obstacle that tech firms face is market access limitations. It takes more than just a compelling value proposition and a well-planned strategy to break into crowded marketplaces and become a recognized player (Sulillari, 2023). Adding another layer of complexity to the startup landscape is the struggle for recognition and customer acquisition, which frequently necessitates extensive marketing and outreach activities. The United States' long history of mutually beneficial partnerships between the government and innovators can be traced back to the very beginning of the country (Khuan, Andriani, & Rukmana, 2023). Governments have long been crucial in encouraging innovation by creating the enabling environments for the expansion of businesses and the development of ground-breaking concepts. To understand how the government has changed its position in the entrepreneurial scene, especially when it comes to digital firms, It is necessary to know this heritage (Doblinger, Surana, & Anadon, 2019).

Research and development programs spearheaded by the federal government in the US surged following WWII. Huge sums of money were poured into scientific research and technical development during the Cold War because of the increased demand for new technologies (Adawiyah, 2021). The government's efforts to position itself as a catalyst for technological growth were demonstrated by initiatives like the founding of the National Science Foundation (NSF) in 1950 and the Defense Advanced Research Projects Agency (DARPA) in 1958. A prime example of the revolutionary potential of government-led programs is the creation of the internet, which was initially financed by the United States Department of Defense (Yunus & Abdulrazaq, 2023). This is a perfect example of how the government can foster innovation by providing financial support and by establishing norms that reward teamwork, curiosity, and taking calculated risks.

The 1982 launch of the Small Business Innovation Research (SBIR) program was a turning point in the history of entrepreneurship (Patanakul & Pinto, 2014). Small enterprises were given the chance to participate in research and development projects that may be later turned into a product through this initiative, which required federal agencies to set aside a portion of their funds for them (Adawiyah, 2021). One way the government encourages innovation is through the Small Business Innovation Research (SBIR) program, which gives businesses the tools they need to go from idea to market-ready product. In addition to providing direct finance, the government plays a crucial role in setting rules and regulatory frameworks, which in turn affect the entrepreneurial landscape (Nel & Thomas, 2022). There is now a more favorable climate for startups to get investment because to legislation that has simplified fundraising requirements, such as the JOBS Act of 2012. Government officials have shown their dedication to fostering innovation by taking the initiative to adjust policies in response to the changing startup ecosystem (Anulika, 2021).

The present state of government funding for digital startups is reflective of the entrepreneurial ecosystem's triumphs and its inherent difficulties in the United States (Adawiyah, 2021). It is crucial to do a detailed analysis of current grant programs to determine their effect on startup growth and to spot any gaps that may need strategic intervention. There is no denying the critical role that government incentives, like SBIR and STTR, have played in the acceleration of innovation. In order to encourage a spirit of innovation and experimentation, these initiatives provide financial support to small enterprises that are involved in innovative research and development (Qoriawan & Apriliyanti, 2022).

On the other hand, flaws can be found and fixed by critical analysis. Challenges for businesses trying to obtain these resources include complicated procedures, excessive bureaucracy, and restricted availability (Ogunsanwo & Kazeem, 2022). Startups are notoriously quick to innovate and enter new markets, but they sometimes find their speed stifled by bureaucratic red tape. Additionally, entrepreneurs in fast-growing industries like clean energy, biotechnology, or artificial intelligence may not have all of their demands met by the existing grant landscape (Crivelli, 2017). To meet the varied needs of startups in various technology fields, it is critical that grant programs be both inclusive and flexible. This stud’s primary objective is to investigate the entrepreneurial ecosystem in the United States as it pertains to government funding for technology businesses.

2. LITERATURE REVIEW

Historical Evolution of Government Grant

In the United States, government grants have a complex history that is characterized by important efforts and variations in strategy that have all worked to encourage innovation and help companies thrive (Crivelli, 2017). Along the course of history, significant events have taken place that have shaped the way the government supports entrepreneurial activities. A revolutionary surge occurred in the decades following WWII, when the United States government saw the critical importance of innovation in increasing the country's competitiveness (Nel & Thomas, 2022). There was an effort to formally promote scientific research and development with the founding of organizations like the National Science Foundation (NSF) in 1950. At the time, the government's main priority was funding more academic research; this would pave the way for later programs to encourage applied research and entrepreneurship (Doblinger, Surana, & Anadon, 2019).

Launched in the 1980s, the Small Business Innovation Research (SBIR) initiative was a major turning point. Businesses involved in innovative research and development were able to receive funding thanks to this legal obligation, which mandated federal agencies with large research budgets to set aside a portion for small businesses (Acharya & Dixit, 2019). Two programs that stood out as important players in the ecosystem were the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs. Both programs helped businesses get off the ground and encouraged innovation (Khandelwau & Asthana, 2023).
Government support was amplified around the turn of the century, especially in reaction to the ever-changing tech startup scene. Reforms like 2012's Jumpstart Our Business Startups (JOBS) Act attempted to loosen restrictions on fundraising, making it easier for startups to get funding (Whitbeck, 2012). This legislative action aimed to

bring rules in line with the changing needs of the entrepreneurial landscape by acknowledging the shifting dynamics of startup finance. The historical account also reveals the government's indirect but no less important role in encouraging innovation. An ecosystem that is friendly to the growth of startups can be achieved by policies that encourage intellectual property protection, simplify regulatory frameworks, and tax credits for research and development (Salamzadeh & Kawamorita, 2015).

A proactive reaction to the changing dynamics of innovation is essentially what the historical development of government grants in the US represents (Whitbeck, 2012). With a focus on helping small enterprises and basic investments in university research, the trajectory demonstrates a dedication to creating an environment where startups can flourish (Garg & Gupta, 2021). The current scenario can be better understood against this historical backdrop, and the stage can be set for assessing the efficacy and influence of government incentives on tech businesses.

Impact Assessment of Government Grants

Evaluating the effect of startup funding on innovation and entrepreneurial growth is an important part of the conversation about government subsidies for startups. To determine whether government funding is helping startups achieve long-term success, the vast amount of literature in this field analyses different aspects using different approaches (Angadi & Patil, 2014).

Economic effects of government grants on new businesses have been the subject of a great deal of research, with many studies using quantitative measures to draw conclusions (Badzinska, 2016). Among the most obvious indicators of success are increases in revenue, new jobs, and the size of the market. It is common practice for researchers to do regression analysis when tying governmental funding to these indicators; this helps to uncover cause-and-effect linkages and isolate the variables with the greatest impact on the final product (Qoriawan & Apriliyanti, 2022). The innovation output made possible by government grants is the subject of a considerable portion of the research. This covers examinations of newly-filed patents, innovations in existing products, and technical breakthroughs linked to the injection of funding (Sykora, 2019). Researchers use qualitative evaluations to delve into the specifics of the innovations that emerge from grant-supported projects, illuminating the qualitative aspects of effect in a more nuanced way.

In addition, academics frequently investigate the knock-on impacts of government handouts, looking at how the money makes its way through the economy as a whole. Connecting supply chains, forming partnerships, and igniting innovation ecosystems at the regional level are all part of this (Badzinska, 2016; Anulika, 2021). Government assistance for startups shapes the innovation ecosystem as a whole through these spillover effects, which go beyond particular firms. However, researchers pointed out some of the difficulties that could arise during an impact assessment. Problems with attribution arise when trying to determine the exact impact of government funding among other variables. Strong causal links are a challenge for researchers, who need complex approaches and large data sets to tackle the problem (Doblinger, Surana, & Anadon, 2019).

Challenges Faced by Startups in the United States

To provide a more detailed picture of the framework in which government grants function, the literature on the topic of government support for startups delves deeply into the myriad difficulties encountered by these young businesses. Startups face a myriad of obstacles on their path to success, including those connected to money, regulations, and the market (Garg & Gupta, 2021).

Constraints on available funds surface again and again throughout the discussion. Startups frequently face the challenge of obtaining additional cash to continue operations and support expansion after government incentives have ended. According to the research, this problem is recursive, and a comprehensive ecosystem is necessary to aid beyond just financial backing (Crivelli, 2017).

Startups have additional difficulties due to the complexity of regulations. Startups need to be agile to overcome bureaucratic roadblocks, comply with regulations, and adjust to changing regulatory frameworks. Through empirical analysis and case studies, researchers illuminate the unique regulatory hurdles encountered by entrepreneurs across industries and the ways in which these obstacles impact their development (Anulika, 2021). Another major obstacle for startups is breaking into new markets. Research delves at the challenges faced by entrepreneurs, especially when supported by government grants: long-standing rivals, skepticism from consumers, and the necessity to distinguish oneself in oversaturated marketplaces. Any politician serious about making government assistance programs more effective must have a firm grasp of the complexities of market entry, such as customer behavior and industry-specific obstacles (Ogunsanwo & Kazeem, 2022).

To further recognize the unique difficulties encountered by startups in various technology fields, the literature stresses the significance of sector-specific tailoring. The challenges that a biotech startup has are very different from those that a financial business face. In keeping with the demand for a more sophisticated and individualized strategy to encourage innovation, the idea of adjusting governmental assistance to meet the unique requirements of various industries arises as a recurring issue in the discussion. (Crivelli, 2017; Qoriawan & Apriliyanti, 2022)

Evaluation of Grant Programs
The efficacy and overall influence of government grant programs for startups can be viewed from the perspective of literature on the subject dives into a critical analysis of individual projects. By using this evaluation lens, it could be seen that grant programs need improvement by analyzing their results, procedures, and overall effectiveness (Doblinger, Surana, & Anadon, 2019).

Procedural Efficacy
The procedural aspects of grant programs to determine the efficacy of these programs' administration has been assessed. This necessitates investigating application procedures, review periods, and the precision of standards. Researchers hope to find bureaucratic roadblocks and bottlenecks in the process of providing startup funding by analyzing the complexities of relevant procedures (Khuan, Andriani, & Rukmana, 2023).

Outcome Metrics and Quantifiable Effect
One of the main focuses in evaluating grant programs is the quantitative impact they generate, which is measured by outcome metrics. From quantitative markers like income growth and employment creation to qualitative ones like the generation of innovative technology or patents, researchers use a wide range of measurements (Doblinger, Surana, & Anadon, 2019).

Sector-Specific Assessment
Recognizing that many industries and technical domains have distinct requirements and obstacles, the literature stresses the significance of sector-specific evaluations. Grant programs' ability to meet the unique needs of entrepreneurs in industries like biotech, AI, or renewable energy might be better understood by analyzing their effects inside those specialized domains (Angadi & Patil, 2014).

Innovation and Long-Term Sustainability
Researchers investigate the long-term effects of grant programs beyond the short-term results. In order to track the long-term consequences on the trajectory of startups, longitudinal research and time-series analytics are crucial. For the purpose of guiding future policy decisions, it is crucial to comprehend the role that grants play in ensuring the continued innovation, market presence, and sustainability of startups (Qoriawan & Apriliyanti, 2022).

Identification of Best Practices
The literature frequently looks for examples of effective grant programs in an effort to find best practices. By looking at cases from throughout the world, comparative analysis can identify programs that have encouraged innovation and entrepreneurialism. Improving grant programs by incorporating components that have worked elsewhere is possible with the help of lessons learned from successful models.

Empirical Review
Wasnik & Jain (2023) examined the pivotal role of government initiatives in fostering startup ecosystems, with a focus on India. The study identifies and analyzes nearly 50 diverse startup schemes through systematic reviews of government sources. Noteworthy efforts by dedicated divisions and ministries, such as Atal Innovation Mission and DPIIT, showcase India's commitment to supporting new enterprises. The establishment of quality incubators nationwide fosters collaboration and innovation. The research highlights the instrumental role of government funding in surmounting financial hurdles, contributing to India's notable ascent in the Global Innovation Index.

Qoriawan & Apriliyanti (2022) delved into the dynamics of an entrepreneurial ecosystem within an emerging economy, employing a micro and meso-level social network approach. Using multi-layered social network analysis, the research unveils unique characteristics, such as sparse networks, resource scarcities, and weak institutional policies. The study underscores the inadequacy of grants alone, advocating for strategic networks and robust institutional policies to foster successful entrepreneurial ecosystem functioning. It emphasizes the importance of collaboration, shedding light on the governance of entrepreneurial ecosystem and adding valuable insights to the literature.

Ogunsanwo & A (2022) evaluated the impact of government incentives on the expansion of small and medium-sized enterprises (SMEs). Utilizing a descriptive survey research design and a structured questionnaire, the study examines the effects of government grant availability, accessibility, and sufficiency on SME expansion. The sample includes 177 SME owners, analyzed through SPSS multiple regression analysis. Results indicate a positive association between government grant factors and SME expansion in Nigeria, signified by statistically significant p-values. The study recommends enhancing government grants and resources for SMEs, fostering a more supportive environment for Nigerian business owners.

Srhoj, Lapinski, & Waide (2021) conducted an assessment of the economic impact of a business development grant scheme, aiming to refine such policies for increased effectiveness. The study investigates whether firms' performance measures improve after receiving grants. Using a two-way fixed effects regression and matching grant recipients with non-recipients, the research finds a positive effect, especially pronounced for smaller firms. Dose-response functions indicate that the share of the grant amount in firm profits is a critical factor for effectiveness. Back-of-the-envelope analysis suggests that the benefits outweigh the direct costs of the grant scheme.

Acharya & Dixit (2019) explored the shift from traditional market-driven entrepreneurship to technology-driven entrepreneurship in response to rapid technological changes. It emphasizes the significance of a supportive ecosystem, including institutional setups, in fostering technology entrepreneurship. The study employs regional innovation surveys to investigate the impact of nodal institutions on the growth of incubatee ventures. It also assesses the need for support and government policy initiatives promoting technology business development. The researchers aim to validate performance indicators derived from the literature for the Indian scenario.

3. METHODOLOGY

This study examines the several funding and investment programs put in place by the United States government to support and encourage the development of the country's startup scene. The results will be backed by a strong methodology that employs a secondary research technique, guaranteeing their authenticity and dependability. Finding and cataloguing funding opportunities—such as grants, subsidies, incubators, accelerators, seed capital, unsecured credit, and financial assistance programs—that are uniquely suited to startups is the major goal of the study. In order to collect reliable information, the research meticulously examined official government documents and websites, paying special attention to funding options that the government offered. The study guarantees the accuracy and reliability of the data by only using official government sources.

The study employs a model to represent effect of government grants on technology startups in the United States. Data will be collected on indicators including government grant, recipient name, grant objective, and business types description. The model is specified as follows;

$GRT = f(REN, GRO, BTD)$

Linearly, the model is presented as;

$GRT = \beta_0 + \beta_1 REN_t + \beta_2 GRO_t + \beta_3 BTD_t + \mu_t$

where;

GRT = government grant.
REN = recipient name.
GRO= grant objective.
BTD= business type.
β_0 = Intercept.
β_1 to β_4 = Slope of the variables.
μ = Error term.

The study employed Linear Regression, specifically Ridge Regression. The decision to use this regularized linear regression model is dictated by the need to add a penalty term to the linear regression objective function, which discourages the model from fitting the noise in the training dataset. Additionally, Ridge Regression is effective in handling multicollinearity, which occurs when independent variables in a regression model are highly correlated. A machine learning algorithm will be employed for this process.

4. RESULT AND DISCUSSION

The data utilized covers grants given to small businesses and individuals in the United States.

Exploratory Data Analysis


```
#Load the Government Grant Data
grant_df = pd.read_csv("Grant New Data.csv")
display(grant_df.info())
grant_df.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6351 entries, 0 to 6350
Data columns (total 5 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   year                          6351 non-null   object
 1   grant                         6351 non-null   float64
 2   recipient_name                6351 non-null   object
 3   grant_objective               6351 non-null   object
 4   business_types_description    6351 non-null   object
dtypes: float64(1), object(4)
memory usage: 248.2+ KB

None
```

Descriptive Analysis of Government Grant

```
In [196]:  df_new.describe().round(2)
```

Out[196]:

	grant
count	2369.00
mean	1187184.25
std	842044.37
min	243455.00
25%	350000.00
50%	1101380.00
75%	1813184.00
max	3352543.00

The average value of government grants to startups is $1,187,184.25 with a standard deviation of $842,044. The minimum value of government's grant is $243,455, while the maximum value of government's grant is $3,352,543. The study employs histogram to visualize the distribution of government grants within the considered period.

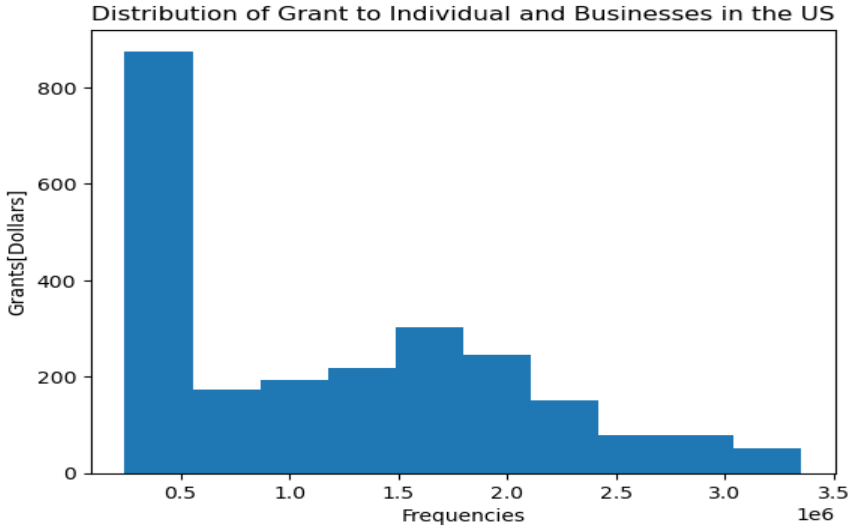


Figure 1: Distribution of Government Grants

The chart in Figure 1 shows that the data is rightly skewed, indicating that government grant distribution is not normally distributed. The diagram suggests that about 75 percent of the beneficiaries received over $800,000 in grant.

Distribution of Grant Objective

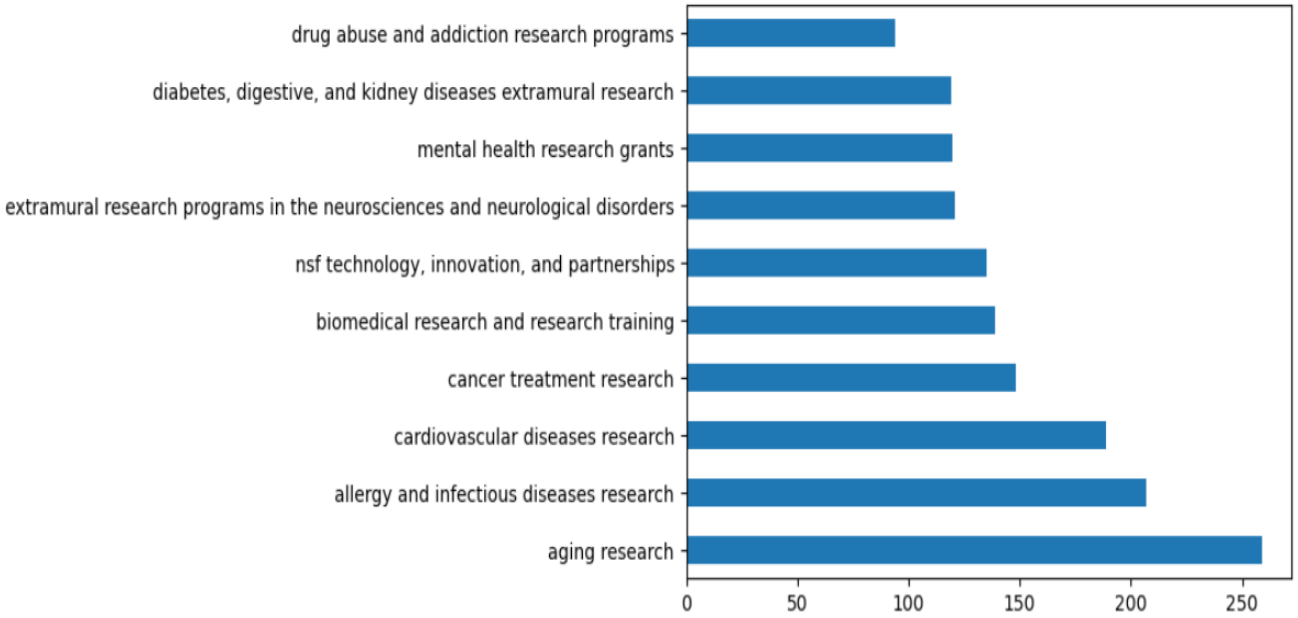


Figure 2: Purpose for seeking Grants.

The above figure presents the top ten reasons why startups in the United States seek for grant. It can be seen that most of the grants given to small business are for research purposes. Most of this is centered around the healthcare industry.

Distribution of Startups

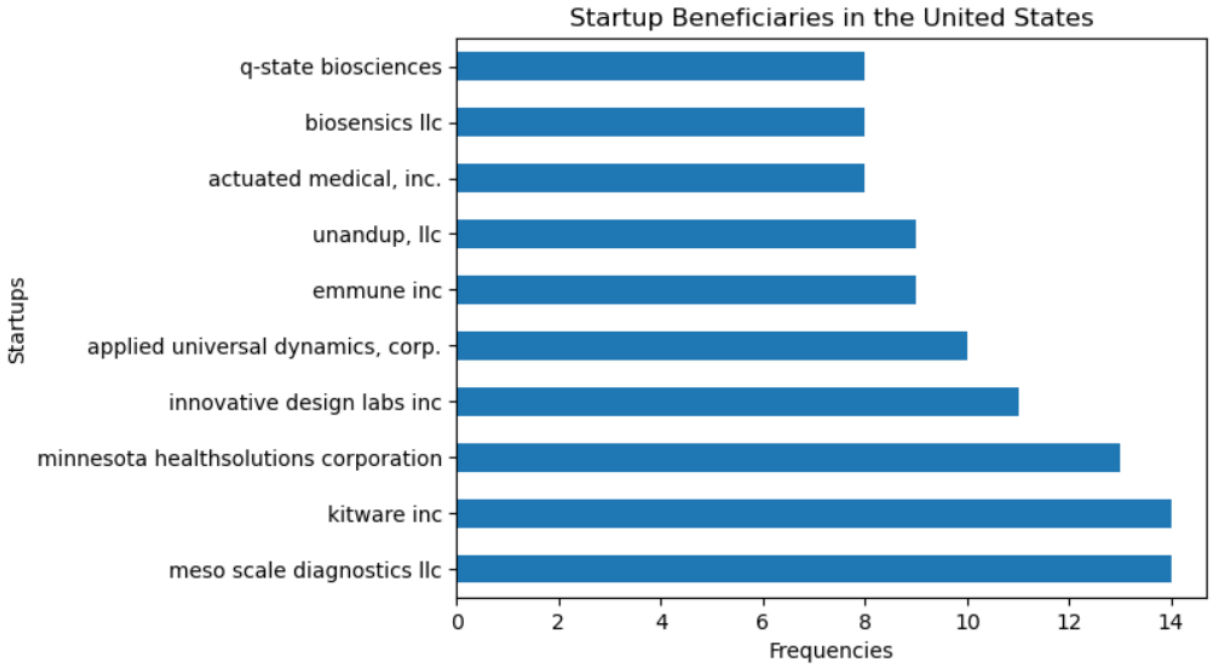


Figure 3: Startups with the most grants in the United States

The figure above indicates that meso scale diagnostic LLC and Kitware Inc. have benefitted from government grants than any other startups, this was followed by Minnesota Health Solutions Corporation. This also indicate that healthcare startups are the highest beneficiary of government grants in the United States.

To optimize government grants for startups, the study creates and analyzes a model. The dataset was split into train and test sets. It was also divided into target vector and feature matrix (y and X)

```
#Split data into features and target
y = df_new["grant"]
X = df_new.drop(columns=["grant", "year"])


#Horizontal Splitting of data into training and test sets.
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
print(len(X_train))
print(len(X_test))
```

```
1895
474
```

Setting the Baseline

```
#Set the Baseline for performance evaluation
y_mean = y.mean()
y_baseline = [y_mean] * len(y_train)
mae = mean_absolute_error(y_train, y_baseline)
print(round(mae,2))
round(y_mean,2)
```

```
728348.31

]: 1187184.25
```

The mean absolute error was employed to set the baseline to evaluate the accuracy of the model. The mean absolute error of 728348.31 implies that on the average, prediction of grants will be off by 728348.31. The closer the value to zero, the higher the predictive power of a model.

Building and Training of the Model

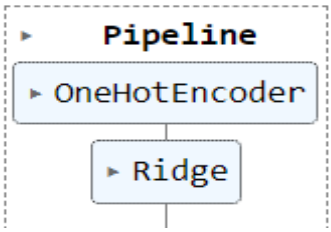
Given that the features included in the model are categorical variables, the study utilized OneHotEncoder to convert categorical data, represented as integer labels into a binary matrix, as they cannot be directly used in machine learning models.

```
#Instatiate
ohe = OneHotEncoder(use_cat_names=True)

#Train the data
ohe.fit(X_train)

#Transform the data
XT_train = ohe.transform(X_train)
print(XT_train.shape)
XT_train.head()
```

```
(1895, 1378)
```

Using pipeline, the model was built, containing the OneHotEncoder and Ridge Regression.


```
#Build the Pipeline using Make_Pipeline
model = make_pipeline(
    OneHotEncoder(use_cat_names=True),
    Ridge()
)
model.fit(X_train, y_train)
```



The model was fitted and trained. Based on the trained data, the study proceeds to make prediction. The predicted values were then utilized to calculate the mean absolute error for the trained data.

```
#Make prediction using the trained data
y_pred_training = model.predict(X_train)
mae_training = mean_absolute_error(y_train, y_pred_training)
print("Training MAE:", round(mae_training, 2))
```

```
Training MAE: 374530.86
```

The mean absolute error for the trained data is 374530.86, which is smaller than the baseline mean absolute error. This indicates that the model performs better on the trained dataset. Hence, it can be utilized for prediction.

Model Interpretation

```
intercept = model.named_steps["ridge"].intercept_
coefficients = model.named_steps["ridge"].coef_
print("coefficients len:", len(coefficients))
print(coefficients[:5])  # First five coefficients
```

```
coefficients len: 1378
[ 222267.73148711 -414070.82325864  669174.24597479  157785.357386
63
 -391710.5382518 ]
```

```
feature_names = model.named_steps["onehotencoder"].get_feature_name
print("features len:", len(feature_names))
print(feature_names[:5])  # First five feature names
```

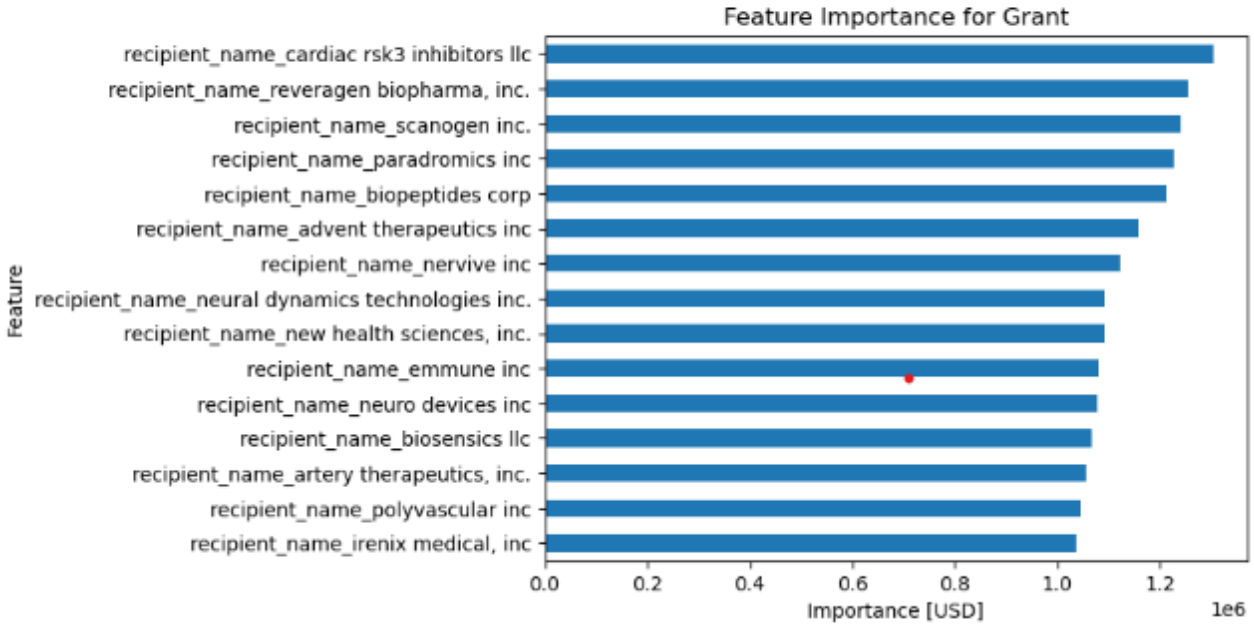
```
features len: 1378
['recipient_name_profusa, inc.' 'recipient_name_stealth biologics,
llc'
 'recipient_name_rendever, inc.' 'recipient_name_posit science cor
p'
 'recipient_name_cfd research corporation']
```



```
feat_imp = pd.Series(coefficients, index=feature_names)
feat_imp.head()
```

```
recipient_name_profusa, inc.                222267.731487
recipient_name_stealth biologics, llc      -414070.823259
recipient_name_rendever, inc.               669174.245975
recipient_name_posit science corp           157785.357387
recipient_name_cfd research corporation    -391710.538252
dtype: float64
```

```
feat_imp.sort_values(key=abs).tail(15).plot(kind="barh")
plt.xlabel("Importance [USD]")
plt.ylabel("Feature")
plt.title("Feature Importance for Grant");
```



Looking at the bar chart, it could be seen that cardiac risks3 inhibitors is the startups that received the highest grant, this was followed by Reveragen Biopharma Inc., and Scanogen Inc. The important features extracted from the model indicated that startups in the healthcare industry are mostly considered for grants. This is to support their activities relating to research and development of new health products that can contribute to improved healthcare for the citizens and increased life expectancy.

5. SUMMARY OF FINDINGS AND CONCLUSION

The findings of the study indicate that healthcare startups are the highest beneficiaries of government grants in the United State. This Suggests that priority is given to startups in the healthcare industry. More specifically, healthcare startups whose activities are centered around research and development are considered for funding than other small businesses in other sectors. This is based on the perception that the United States is witnessing a remarkable surge in investment in healthcare startups, reflecting a robust trend of innovation and technological advancements in the sector. High-profile investments from grants are fueling the growth of startups focused on digital health, telemedicine, and biotechnology. This influx of funding is fostering groundbreaking solutions, reshaping the healthcare landscape, addressing emerging challenges, emphasizing the industry's strategic importance and potential for transformative change.

The findings highlight the necessity for intentional interventions by U.S. policy makers to promote the growth of healthcare startups. It is crucial to tackle limited availability of resources, and ineffective institutional policies to support the growth of these startups, as it could be seen that they are contributing to research and development of health product and services that can have positive influence on the quality of life. Policymakers should prioritize the development of cooperative networks, rather than solely relying on financial subsidies, in order to strengthen the entrepreneurial environment. It is essential to acknowledge the unique patterns in developing countries, highlighting the significance of customized strategies. To drive the progress of the entrepreneurial scene in the United States, it is crucial to foster robust institutional backing and seamless policy integration. This will guarantee sustained expansion, the generation of employment opportunities, and enhanced global competitiveness in the quickly changing technological industry.

It is recommended that there should be regular monitoring of the entrepreneurial ecosystem's dynamic, adapting policies to reflect emerging trends and challenges, ensuring sustained support for technology startup development. Beyond grants, there should be the introduction of diverse support mechanisms, such as mentorship programs and access to specialized resources, fostering a holistic approach to startup development. In addition to this, startups should be encouraged to collaborate, build networks with support organizations, and government agencies to bridge structural gaps and alleviate resource scarcities.

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