Data analytics for finding emerging entrepreneur’s success factors
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ABSTRACT
Professional business incubation refers to the process by which a person or institution helps a startup develop and grow. Before sponsoring or channelling funding for startups, incubators recognise the potential for growth and weigh the opportunity. Before deciding to support or fund a startup, it is necessary to conduct extensive research into available resources. With the help of industries, developing countries have made rapid progress toward the goals of macro-stability, inclusive and sustainable growth in recent years. Incubators, while a powerful tool for promoting new ventures, have some limitations. Customers can sometimes develop overly dependent tendencies, rendering them unable to adapt to real economic influences. At the same time, it has been noted that the majority of them work in isolation and with a limited spectrum, which prevents them from reaching potential people and results in a shortfall of the centre, facilities, and resources. At the same time, companies are quick to adapt and change due to dynamic changes in technology and market demand as the variable phases survive the growth trend.

Keywords: data analytics; principal component analysis; common factor analysis; business intelligence; incubation

1. Introduction
An incubator is a facility designed to lessen the likelihood that an early-stage start-up will fail by giving it the assistance and access to resources it needs to become financially and economically viable. Therefore, the business model of an incubator depends on how well it can create a reliable and relevant support framework to meet these essential demands of these early-stage businesses.

Offering fundamental business services and resources, developing a system for choosing the top new startups and entrepreneurs for mentoring, and developing an adequate and diversified network of mentors and investors are all essential components of success in the tech incubation sector.

A small but diversified set of indicators, including the number of start-ups incubated, the percentage of successful exits, the financial sustainability of the incubator, involvement with mentors, faculty, and investors, finance support, infrastructural support, and the creation of jobs, determine an incubator’s success[1].

The new business incubator is a cutting-edge system that offers entrepreneurs a range of assistance programs to accelerate the creation of new businesses, the commercialization of technologies, and
economic expansion. Since no two incubators are the same, they should be grouped according to their purposes. The distinct characteristics of each incubator may be identified through categorization, and the success factors for each incubator model can then be used to establish a standard for successful models that are suitable for various situations. Randomly comparing incubator results without understanding the motivation frequently results in unfair and unrealistic comparisons. An entrepreneur needs different things depending on the industry they are in. For instance, an IT and software start-up would have quite different needs than a manufacturing or healthcare start-up. In addition, the perspectives of entrepreneurs and incubator staff regarding the value of the services offered by the incubator are divergent. While the incubator staff believes that networking, mentoring, and training are extremely important to the start-ups it houses, entrepreneurs appear to disagree. The outcome of the incubator will be greatly affected by this variation in perception. For the incubator to highlight some success stories, it is crucial to consider the demands of the start-ups it has been developing[2].

India and other Asian nations have a propensity to adapt Western business models to suit local market demands. The follower markets of developing nations like China and India, two of the world’s most prosperous countries, are generally where you may find this duplication of such successful worldwide firms. As a result, despite having the market potential, a sizable talent pool, and a culture that values frugal innovation, there were no Indian pioneers in the field of developing start-ups. Most startups also find it difficult to understand the possible client segments.

Start-ups in their early stages of development benefit from synergies created between well-established industries, renowned specialists, consultants, and start-ups. Collaboration between SMEs (small and medium-sized firms), government, quasi-government organisations, and other organisations that do research and offer financial expert advice allows the area to take advantage of its innovation assets, which contribute to its ability to deliver, learn, adapt, and grow. Even for small firms, networking makes it easier to find possibilities and connections.

Businesses frequently fail to turn because they have a strong attachment to their ideas despite knowing that they are creating a faulty product or a product for which there is no market. As a result, priceless time, talent, assets, and financial resources are wasted.

The failure of an entrepreneur’s new business ventures may be caused by a lack of business management and administrative abilities, despite the fact that they may have wonderful ideas and desires. Management gets overly complicated when there is a wide range of duties at the top, such as planning, strategizing, staffing, organising, and leading. Most founders also don’t have traditional management education or training. Opportunities vanish as a result of making poor judgments or delaying making them. Businesses are vulnerable to failure due to poor hiring procedures, ineffective organisational structures, and a lack of market and customer research. Poor management, not the usually mentioned shortage of capital, is to blame for the closure of a number of start-ups in the Indian economy. Bad administrative decisions cause products to be released either too early or too late in the market, despite intense competition[3].

Many business to customer (B2C) and diversified inventory start-ups with potential suffer in fundraising rounds in India as a result of the better performance and faster growth of business to business (B2B) over B2C. Researchers and experts agree that there need to be frequent adjustments made to financing plans to account for increased investment returns and risk diversification while accelerating the overall funding trend. In order to determine whether an idea has already been proposed or is currently being used, a deep analysis of the global market must be performed in the early stages of an emerging start-up, particularly in the technology sector.

According to the National Association of Software and Service Companies (NASSCOM2017) research, a lack of cash is not the main cause of start-up failure. According to the survey, startups have gotten 55% of their capital from investors, but they haven’t made any headway in the corporate world[4].

Due to poor timing, Cardback, a fin-tech startup payment recommendation platform started back in 2012,
was forced to cease operations. Being a growing market economy, India was not yet developed enough to accept a technology that required numerous trades.

The founder of the 2005-launched hotel aggregator Stayzilla blamed the failure on a lack of local networking, an inability to scale the business model, and poor revenues.

Since Tinder, Bumble, and other well-funded start-up players like Woo and Vee and TrulyMadly had already entered the Indian market and had already seized the market, Cogxio, a unique platform for online matchmaking to tie consumer internet businesses to provide dating choices like places to dine and vacation for the matched pair using Artificial Intelligence and geographical intelligence, was forced out of the country.

The failure of the firm management, which was caused by a lack of market research, a lack of competitor analysis, and inadequate marketing, led to the closure of FabFurnish, an online furniture venture that was first launched back in 2011. Its major rival Pepperfry, led by leaders with much more experience, had already taken root in the market and was expanding due to outstanding achievements in online retailing and effective marketing tactics[^5].

Due to a lack of market research into Indian customs, Klozee, an online store where customers could borrow worn clothing, failed. Capitalists claimed that Indians would not follow customs like borrowing clothing even to flaunt high fashion out of fear and cleanliness concerns.

Such instances highlight the adverse repercussions on startups caused by inadequate marketing, analysis, and decision-making, which have their roots in the founders’ lack of managerial and administrative decision-making abilities.

In conclusion, there are many other factors that contribute to the high failure rates of small enterprises, including limited finance, poor management, outdated technology, competitive pressure, immigration issues, a lack of intellectual capital, inadequate consultants and expert remedies, with hardly any networking. To create a successful start-up ecosystem, there is a critical need for streamlined through to the alignment of strategies and resources. The necessity of the hour is for pragmatic investments and a focus on creating successful locally owned and sourced enterprises in different major cities, all of which work together to address problems peculiar to India. In order to help businesses address these many different reasons for survival, a number of organisations play a critical role in providing support.

### 2. Success factors for business incubation

Success factors are actions that a person or organisational structure should be obediently required to take in order to carry out its objective. It is possible to define critical success factors as those operational components that require management’s immediate attention if the organisation is to maintain a competitive advantage. According to Wagner, a feasibility study often entails the following, making it essential toward an incubator’s success.

- Market research;
- an objective statement;
- financing, capitalization, short- and long-term investments, and debt plan;
- timeline and standards for the project;
- entry and exit standards for startups businesses.

To comprehend the viability of the overall operation, the organisation must carefully examine and scrutinise the desired outcome, create a timeline with milestones, and establish the current condition.

Feasibility studies are crucial because they force you to think top-down and in the big picture in order to create a workable programme. According to Hasan a feasibility study enables sponsors to test the waters before
going into a company and identifies necessary resources and the commitments required to create a sustainable enterprise.

The success of an incubator is influenced by the availability of cash for firms in any form, including government grants, loans, equity and debt financing agreements, or the participation of venture capitalists or investment firms. Without seed money or early-stage finance, no company would ever have the chance to turn their idea into a reality. Incubators thus provide grants, loans, equity and debt financing solutions, company and tax planning, and risk management. Without enough early-stage seed capital, even the most sought-after technology start-ups are unable to take off[6].

According to Barrow, comparing the number of successful enterprises in the portfolios has been the primary criteria used to assess the performance of incubators for the longest time. As a result, the incubator’s and the tenant companies’ results are mutually reinforcing, or linked. This aspect alone should motivate incubators to work hard to give their tenants the best services possible. To attract venture capitalists and keep them from defecting to initiatives outside the incubator, incubators also need to make contributions to the firms within their portfolio.

The impetus to initiate successful entrepreneurship starts from promotion and consensus on economic and industrial policies. The innovative framework of business incubators can only be truly admired if the association between entrepreneurship and economic impact is addressed. This can be viable only if the projects the incubators are in pursuit of are in line with the economic goals and strategies and with the socio-cultural environment the government is in pursuit of. Developing countries like India, China and other South-African nations might follow foreign incubator business models adopted during their growing stages which attribute to a facilitative entrepreneurial environment, government policies and supportive grants.

A management team is crucial to any business in order to continuously develop the capabilities of the organisation. Management teams must work to make tiny, incremental improvements to the business processes in order to increase productivity. Over the years, a number of management procedures have been developed, which support the company’s basic principles and overall performance. Some of the common and well-liked management tools used by effective and accomplished management teams are Lean management and Six Sigma[7].

3. Conceptual framework and research methodology

This work focuses on various business incubators and their success factors such as technical and management disposition, revenue collection, individual value addition capabilities.

The primary focus of an incubator should be on the developing companies. All other objectives such as job creation and economic impact would automatically follow. This can be explained by the principle of causality where successful free standing graduate companies result in job creation and a change in the existing economy.

Never forget that the incubator is still a venture by itself, and one that must be handled as such if it is to fulfil its goal of helping start-up firms prosper. The incubator’s business itself passes through a number of trying times[8].

Programs and services provided by the incubator should be developed taking into account the differing needs of firms with different requirements and specialised in various verticals. Management’s “One size fits all” strategy will result in ineffective grooming and evidence-based strategies.

3.1. Identification of data and correlation

For a technical business incubator to operate at its best in developing nations, there are distinguishable personal characteristics. During the early phases, certain stakeholders, seed investors, and government
functions are more valuable than the others. Performance of the incubator is enhanced by hiring and keeping a competent board, staff, and management team. The success of incubators indicated in Table 1 is increased when there are more options for networking and mentoring. The likelihood that the incubator will succeed is increased by more clients. The incubator’s emphasis on shared services for its tenants’ entrepreneurs contributes to its success. The success of the incubator is influenced by its location. The rate at which tenant companies’ intellectual capital grows during incubation directly relates to the success of the incubator.

Table 1. Identification of factors.

<table>
<thead>
<tr>
<th>Management</th>
<th>Communication</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Entrepreneurial individuals</td>
<td>● Shared services</td>
<td>● Value creation</td>
</tr>
<tr>
<td>● An organisational context</td>
<td>● Physical resources</td>
<td>● New products and services</td>
</tr>
<tr>
<td>● Business concepts</td>
<td>● Financial legal assistants</td>
<td>● Job creation</td>
</tr>
<tr>
<td>● Opportunities for innovation</td>
<td>● Networking</td>
<td>● Asset and revenue growth</td>
</tr>
<tr>
<td>● Technological and capital resources opportunities</td>
<td></td>
<td>● Economic diversity/growth</td>
</tr>
</tbody>
</table>

Two important applications of factor analysis include:

- Minimising the number of variables
- Discovering structures in the relationships between the variables[9].

The two primary varieties of factor analysis consist of:

- Using PCA (principal component analysis), which offers distinctive answers, it is possible to rebuild the original data using the obtained findings. Only a small number of elements are kept after meeting the criteria, but the overall variation among the variables under consideration is examined.
- The term “CFA” (common factor analysis) refers to a group of methods that use the shared variance of the original variables to produce factor solutions, resulting in a less number of factors than the variables originally entered. This characteristic of the common factor analysis is what makes it desirable for the thesis to identify the number of connected variables and afterward classify them under the heading of recognised factors.

The scree plots were used to calculate how many variables needed to be taken into account. Given that the computed Eigenvalues represent the entire amount of variance explained by a principal component, the Scree Plots of Eigenvalues aid in deciding the number of dimensions to be taken into account for factors. By multiplying the squares of each factor’s variable loading, Eigenvalues are calculated. According to the Kaiser Rule, factors are often regarded as stable if their Eigenvalues are greater than 1.0. The effectiveness of sampling is assessed using this Kaiser-Meyer-Olkin (KMO) index. To ensure the accuracy of the data for each area at hand, the KMO table was created. The KMO number needed to be higher than 0.5 since a KMO value below 0.5 denotes low importance. The KMO index is used to evaluate how well samples were chosen. It aids in figuring out whether common variance influences hidden variables and their variance. It aids in figuring out whether common variance influences hidden variables and their variance. Additionally, Bartlett’s test was carried out. It was anticipated that Bartlett’s value would be below 0.05. In essence, the correlation matrix is an identity matrix unit, according to the Bartlett test’s null hypothesis. In addition to examining the scree plots to confirm the presence of components Bi-Plots were used as a visual representation of the components’ presence[10].

3.2. Factor analysis procedure

The factor loadings’ orthogonal rotations, which preserved the correlation matrix (standardised covariance matrix), residual matrix, and communalities, made it simpler to read the factor loadings. The easy placement of the axes and the assignment of a factor to each set of variables allowed for rotation. A factorial load is transformed orthogonally by an orthogonal rotation, which enables a more straightforward understanding of the factorial loads. The rotated positions maintain the correlation of the covariance matrix,
the residual matrix, the specific variances and the commonalities. The covariance matrix, residual matrix, particular variances, and commonalities are all maintained by the rotated positions. The rotation that is done neatly sets the axes close to as many points as possible and gives each set of variables a factor. Occasionally, though, a variable will have a tendency to be close to more than one axis, designating it to more than one component. The following rotation techniques are available\[11\].

Equimax makes it possible to maximise the variation of squared loadings inside factors and variables.

The load matrix’s columns are made simpler by Varimax, which enables a maximum variation of the squared loads inside the components. The most popular rotation method among those that are accessible is this one because it aims to make loads significantly small or large for easy interpretation.

Quartimax: By simplifying the rows of the charge matrix, this approach maximises the variances of the charges squared inside the variables.

Depending on the value of the parameter gamma, the orthomax rotation is made up of the aforementioned three rotations. It results in a flawlessly basic structure.

4. Collection of data and summarization

Since most entrepreneurs lack business, administrative, and management abilities, a solid, accountable management team that can oversee and direct daily operations frees up the entrepreneurial team to concentrate on what they do best—innovating and developing—rather than managing and funnelling daily operations. Before entering a market segment, management teams can make adjustments to business plans and strategies since they are far more responsive to market trends and demands. Strong management teams boost output and make sure that all available efforts are focused on a single goal, exponentially increasing output and productivity\[12\]. The incubator’s commitment to the interests of the shareholder would be maintained by a professional board. The following factors are considered for factor analysis and are listed in Table 2.

Category 1: Determine the types of board members.
Category 2: Selection criteria for management teams.
Does the management team undergo any training? Categorization 3.0.
If so, which initiatives fall under Category 3.1? (Check all that apply).
What criteria for client admittance fall under Category 4 in your opinion?

<table>
<thead>
<tr>
<th>Table 2. Criterion for factor analysis.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Various types of board members</strong></td>
</tr>
<tr>
<td>Members of the tertiary industry, the government, the private sector, and academic university staff</td>
</tr>
<tr>
<td><strong>Criteria for choosing the management team</strong></td>
</tr>
<tr>
<td>Experiences with entrepreneurship, education level, prior relevant experience, and technical expertise</td>
</tr>
<tr>
<td><strong>The management team’s training phase</strong></td>
</tr>
<tr>
<td>Project management, Management in Business and Entrepreneurship</td>
</tr>
<tr>
<td><strong>Important customer admission criteria</strong></td>
</tr>
<tr>
<td>Product viability, core team proficiency, technology focus, educational attainment, and completion of a particular course</td>
</tr>
</tbody>
</table>

Table 3 tests speak about the quality of the data. KMO value should be more than 0.5 and Bartlett’s value should be less than 0.05.

<table>
<thead>
<tr>
<th>Table 3. KMO and Barlett’s test for identified factors.</th>
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</thead>
<tbody>
<tr>
<td><strong>KMO and Bartlett’s Test</strong></td>
</tr>
<tr>
<td>Kaiser-Meyer-Olkin measure of sampling adequacy</td>
</tr>
<tr>
<td>Bartlett’s test of sphericity</td>
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<td></td>
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</tbody>
</table>
Biplot Figure 1 indicates a graph. It shows the presence of factors.

![PCA graph of variables](image)

**Figure 1.** Biplot of identified factors.

The scree plot Figure 2 clearly verifies the existence of correlations between the factors D4, D3, D2 and D1.

![Scree plot](image)

**Figure 2.** Scree plot of individual variances of dimensions for factors 1 to 4.

Scree plot Figure 3 clearly indicates the Eigenvalues of dimensions.

![Scree plot](image)

**Figure 3.** Scree plot of Eigenvalues of dimensions for factor identified.

This work was able to deduce that the first two principal components have Eigenvalues larger than 1 using the Scree plots of individual variance of dimensions and the Scree plot of Eigenvalues of Dimensions (1.8 and 1.1 respectively). These two factors account for about 71% of the volatility in the data. The scree plot also shows that the Eigenvalues start to form a straight line after the third dimension. The three components have been chosen for the study because the amount of variance in the data can be adequately explained by 71% of the factors [13].

Correlation plot Figure 4 displays the dimensions or factors’ weights.

The Pearson correlation heatmap creates a matrix of the results. The existence of dimensions and the correlation value, denoted by the coloured circles, is confirmed using correlation coefficients. The correlation
is between +1 and −1. White areas indicate a lack of correlation between the dimensions and the variables, while dark blue rings indicate a strong linear association\[14\].

Figure 4. Correlation plot for factors D1 to D4.

Table 4 for managers based on factor D for factor loading, Eigenvalue, and percentage of extraction using principal component method.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Points</th>
<th>Factor loading</th>
<th>Eigenvalues</th>
<th>% of variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>0.802187362</td>
<td>1.771069996</td>
<td>44.27674991</td>
<td>44.27674991</td>
</tr>
<tr>
<td>3</td>
<td>0.739356772</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.72681461</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0.9100300</td>
<td>1.070467716</td>
<td>26.7616929</td>
<td>71.03844281</td>
</tr>
</tbody>
</table>

The table reveals the degree to which each variable’s relationship to the underlying component is strong. The table clearly shows that the majority of the variables have substantial factor loadings for the component to which they are associated, which is a sign of a robust association for factor analysis. The section’s listed contributing factors include:
1) responsible board members;
2) strong management team.

A capable management team is essential to streamlining daily business operations. Technical entrepreneurs frequently lack the administrative, management, and business abilities necessary to handle the vast variety of tasks associated with directing, staffing, and strategizing. Sustainable growth is ensured by a competent, committed management team, which is crucial for these young businesses. In contrast to having to worry about the administration, obtaining financing, inspiring trust in the investors, and other obligations, having a management team enables the entrepreneur to devote all of their attention and energy to what they are truly strong at technical product creation. Management teams play a key role in identifying operational weaknesses and providing support until they are fixed\[15\]. Incubators and customers can make adjustments to business plans and strategies before entering a market sector due to management teams’ increased responsiveness to industry trends and requests. Strong management teams improve productivity and make sure that all available efforts are focused on a single goal, dramatically enhancing production and the results of efforts. Dynamic business owners frequently exhibit this problem, where their organisations rely too heavily on them for development inspiration and ideas, making them less noticeable when they are absent. Incubator management teams who are proactive and responsible predict problems like this and implement key strategies, such as promoting client company founders’ independence, to prevent them\[16\]. As opposed to the daily duties of the technical business incubators, a board of directors assumes the distinctive set of rigorous obligations. They may be the largest shareholders and contribute significantly to finance themselves, or they may act on behalf of the shareholders and make broad policy decisions. The board members’ role of the board ensures that the technical business incubator is operating successfully as a whole.
The study moved forward under the assumption that start-up requirements or the factors influencing incubator success are universal. However, a thorough study addressing and identifying the critical factors specifically in the Indian context without filtering through international literature might produce unexpected results because, while it is important to learn from international models, it is also crucial to assess the local circumstances before putting any model into practice. A study into the models of such incubators may be interesting to examine given identification of the numerous extraneous elements and collaborations with particular organisations which might leverage other aspects, not just monetary profits to benefit the incubator. It has been noted from the current study that Incubators linked with universities or located within universities have great privileges in contrast to others. Since an online survey was provided to participants and information was collected from those participants alone, skewed data might be inferred, raising doubts about the validity of the respondents’ responses and their genuine opinions. A one-on-one interview with a diverse group of participants might produce more fruitful findings. It may be helpful to identify criteria after classifying incubators according to data and affiliation with universities.

5. Conclusion

Considering that most entrepreneurs lack business, administrative, and management abilities, a strong, responsible management team that can oversee and direct daily operations frees up the entrepreneurial team to concentrate on what they do best—innovating and creating. Management teams are far more receptive to market trends and demands, which aids incubators and customers in fine-tuning business plans and strategies before entering a market segment. Strong management teams boost output and make sure that all available resources are directed toward a single goal, exponentially enhancing output and productivity. A responsible board would guarantee that the incubator is dedicated to the interests of the stakeholders. Factors like business process and transformation, human resources, branding and promotion, and logistic consultancy under managerial services have been notably evaluated highly since they relieve the team of these obligations, allowing them to fully concentrate on the project alone. The establishment that serves as a business incubator here is crucial.

Author contributions

Conceptualization, NS and SS; methodology, NS; software, NS; validation, NS, SS and DDP; formal analysis, DDP; investigation, DDP; resources, NS; data curation, NS; writing—original draft preparation, SS; writing—review and editing, SS; visualisation, SS; supervision, DDP; project administration, NS and SS; funding acquisition, NS and SS. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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