VERİ MADENCİLİĞİ KULLANARAK KÜÇÜK İŞLETMELER İÇİN SÜRDÜRÜLEBİLİR BİR İŞ MODELİ GELİŞTİRME

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MAKALE BİLGİSİ

ÖZ

Küçük ve Orta Ölçekli Kuruluşlar (KOBİ'ler) Pakistan Ekonomisinin temel yapısıdır. Türlerine bakılmaksızın, dini temelli bir iş yapısına ait olsunlar veya olmasınlar, çoğu kendi etrafında sürdürülebilir bir model kuramıyor ve bu nedenle iflas ediyor. Yaygın nedenler, uzun ömürlü ve çok az parasal ödülü olan projeleri seçerken nakit girişi ve çıkışını dengeleyememeyi içerir. Belge, bu işletmelerin hangi alanları iyileştirmeleri gerektiğini anlamalarına yardımcı olmak için Veri Madenciliği tekniklerinden kavramların entegrasyonunu sunar. Makine öğrenimi algoritmalarıyla birlikte klasik karar ağaçları, kararlarının ve iş akışlarının sürdürülemez hale gelmesine neden olan yönlerini anlamak için KOBİ'lerden gelen verileri analiz etmek için kullanılabilir. Bu kararların dini düzenlemeler ve ilişkiler bağlamında bir analizi, inanca dayalı bir iş yapısının benimsenmesinin bir işletmeye yardımcı olup olamayacağını değerlendirmek için yapılacaktır. Makale ayrıca sürdürülebilirlik açısından seküler ve seküler olmayan iş yaklaşımları arasında bir karşılaştırma sunmakta ve bunu tüm dünyadaki KOBİ'lerin başarısı ve başarısızlığı ile ilişkilendirmektedir. Belgede seçilen kuruluşların kısa bir analizi de yer almaktadır.

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DEVELOPMENT OF A SUSTAINABLE BUSINESS MODEL FOR SMALL BUSINESSES USING DATA MINING

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ABSTRACT

Small and Medium-Sized Organizations (SMEs) are the foundational structure of the Pakistani Economy. Irrespective of their type, whether they belong to a religious-based business structure or not, many are unable to build a sustainable model around themselves and thereby go out of business. Common reasons include being unable to balance the cash inflow and outflow while choosing projects with a long lifespan and little monetary rewards. The paper presents the integration of concepts from Data Mining techniques to help these businesses understand which areas they need to improve. Classic decision trees along with machine learning algorithms can be used to analyze data from SMEs to understand the aspects of their decisions and workflow which leads them to become unsustainable. An analysis of these decisions in the context of religious regulations and dealings shall be done to assess whether the adoption of a faith-based business structure can help a business not. The paper also presents a comparison between secular and non-secular business approaches from the lens of sustainability and relating it to the success and the failure of SMEs all around the world. A brief analysis of the selected organizations is also included in the paper.

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INTRODUCTION

Throughout the world, small and medium-sized organizations (SMEs) are known for their growth, employment, economic stability as well as social development (Hyder & Lussier 2016). Successful entrepreneurial ventures result in the facilitation of economic growth which results in economic development and less wastage of valuable resources. The European Commission highlights SMEs as those organizations that have less than 250 employees. It also measures the gauges such as invested capital, labor force as well as annual turnovers (Raza, Minai, Zain, Tariq & Khuwaja 2018). In Pakistan however, there is no concrete definition of an SME. The government of Pakistan has implemented the enaction of SME policy through the creation of the Small and Medium Enterprises Development Authority (SMEDA). The CEO of SMEDA notes that every commercial body and trading associations in Pakistan have their definition of SME with its own needs. He further emphasizes that due to a visible lack of a concrete definition of SME, there is a critical obstacle for policymakers to develop policies and support programs for the growth of Pakistani SMEs (Nasir (2005) Source: Dawn.com Extraction date: 30.03.2020).

In Pakistan, SMEs contribute to various industries including but not limited to dairy, furniture, cotton weaving as well as food and jewelry (Ali 2018). The wholesale and retail business contribution of SMEs in Pakistan is about 18% with a total of 40% of the entire GDP of Pakistan. The annual growth rate is 5.8% (Government of Pakistan,2013). Therefore, the existence of SMEs is vital for the sustainability of employment, economical sustenance, and the nation's sociopolitical structure.

In countries such as Singapore, SMEs contribute to over 50% of the country's GDP showcasing its importance in the country's economy (Long, & Chan 2020). To further escalate the presence of such enterprises, over 99% of all businesses in Europe comprise SMEs (Battistella, Cagnina, Cicero & Preghenella 2018). This is indeed a vast number. In the United States, nearly 48% of private-sector employment comprises small businesses with 63% of private-sector jobs. The ratio of their survival is such that the new establishments have a 50% chance to survive their first five years with 33% being able to survive over ten years. Some businesses succeed while at the same time some fail (Hyder & Lussier 2016).

However, in Pakistan, many SMEs fail in a short time after their formation. These small businesses are critical to the survival of the economy that many policymakers have directed considerable efforts to enhance the development of new businesses while reducing their failure rates by predicting the variables that ultimately lead them to fail. Therefore, the analysis and prediction of success and failure rates of SMEs have become a critical area of research. This is because the research would benefit the entrepreneurs as well as the stakeholders and other parties involved and help them in making the right decisions at the right time. This is a challenging task since the data on Pakistani SMEs is not available as noted by the Pakistani Government (2013).

To avoid failures, there are comprehensive business performance variables that come into play. The common among them includes entrepreneurial mindset, leadership skills, utilization of an educated and talented workforce, etc. Kamarudin, Baharun, Abdullah & Liaw (2014) also state that religious faith and liberalism have an impact on the management and subsequent performance of SMEs. However, he also notes that research in the domain of religious influence on business is scarce. The implementation of religious values and beliefs within the operations of an SME as well as the belief of the management play a critical part in the overall success of the company as highlighted by Fernando & Jackson (2006). At the same time, this notion is supported by Martinez (2019) who state that belief in a higher power can allow for rational decision making and for the leader to exercise ethical principles in the SME. This aspect can reduce the failure rates of SMEs. To shed more light on this unique assumption, the paper aims to delve into the impact and effects of religious principles and guidelines and how they affect a business.

Research Gap

It can be observed that due to the scarcity of literature available that surrounds the impact of religious and ethical values on the success of an SME, a gap in the literature is present. Therefore, there exists a need to understand the effects of non-secular beliefs and the adoption of such beliefs especially among leaders and the management of small and medium-sized organizations. This knowledge will help to better gauge the theory that non-secular values can have benefits in the operational ability of the SME and prevent failures and closure.

Therefore, the paper undertakes a comprehensive analysis into understanding the factors that come into play in the success or failure of a Pakistani SME and how can this failure be avoided? The paper also isolates and extracts the variables that are critical for SMEs to avoid failure in the market. The research, therefore, tries to understand how the adoption of religious principles and values can enhance the sustainability of a Pakistani SME. Overall, the paper presents a sustainable business model for Pakistani SMEs with the incorporation of non-secular attributes.

The article is structured as follows. The section followed by the current one provides a brief background of the terminology used. This leads to the third section which is the analysis of contemporary literature to highlight the factors that contribute to SMEs' survival. The 'Literature Review' section, therefore, contains relevant data from both secular and non-secular perspectives to form an argument regarding SME sustainability. The fourth section, 'Methodology' highlights the procedure of the research briefly, including data collection and analysis, with the fifth section, 'Findings' providing a depiction of the SME sustainability model that was created using the data. The sections following this, provide a conclusion, to sum up, the paper and as well as layout a brief estimate of future research.

Research Question

Q: What is the effect of religious values on SME sustainability?

BACKGROUND

Why use Data Mining and Decision Trees?

To extract an answer for the reason question posed, data mining tools and technologies shall be used to gather the results and evaluate the impact of religious and ethical values on business sustainability. Decisions Trees in particular will be chosen to elaborate a hierarchy of sustainability factors that are vital for an organization. The reason why Decision trees were used is that not only Data mining can allow for robust results in terms of statistics and quantifications, but decision trees portray the output in a hierarchy. The tree of hierarchy is an elaborate form of visual depiction that showcases the level of importance and criticality of each factor. The factor with higher value and importance relative to the others is typically situated at the top, while others with lesser impact and value are towards

the bottom. This provides an easier understanding even for those who are not experts in Data mining techniques since visual depictions allow them to comprehend the relative importance and criticality of each sustainability factor.

Data Mining

Data Mining is the process that involves discovering knowledge and recurring patterns from large data sets through different means of analysis. Several data mining techniques are used for supervised and unsupervised data. The most prominent of these techniques are classification, association, and clustering. Through the application of these models on datasets, patterns can be formed allowing researchers to indulge in prediction and estimation by using the information they inference from the analysis (Tan, Steinbach & Kumar 2016).

KNIME

Konstanz Information Miner (KNIME) is an open-source and free data analytics tool that is used for data mining. It allows for the execution of various algorithms of data mining such as decision trees, random forest algorithms, and much more on the datasets that are fed into it. It makes use of a graphical user interface that allows for node assembly for combining different processes and data sources. It allows provides the facilities of Extraction, Transformation, and Loading (ETL).

Decision Tree

A decision tree is a structure similar to a flowchart where each node within the tree is an "attribute". The test performed on this attribute determines which branch would be followed which in turn represents the outcome. Every leaf node within the tree represents a class label. The tree following a top-down structure where the result is decided at the bottom, after traversing the tree.

Entropy and Information Gain

The algorithm that is used to create the tree is called ID3. The algorithm that was developed by J. R. Quinlan, creates a greedy, top-down search with multiple branches and no backtracking. The algorithm uses Entropy and Information gain to create a decision tree. Entropy enables the calculation of the homogeneity of the data sample. If the data sample is fully homogenous, then the entropy is zero. ID3 algorithm uses entropy to calculate the homogeneity of a sample. If the sample is completely homogeneous the entropy is zero and if the sample is equally divided then

it has an entropy of one. Entropy leads to the calculation of Information Gain. The Information Gain depends on the decrement of entropy after the dataset is divided on a particular attribute. The attribute that returns the highest information gain becomes the host for the split. The process is repeated until the decision tree is completely formed (Zhang et al. 2016).

Sustainability

A sustainability model is made up of multiple factors and attributes that are necessary for the sustainability of an entity. Sustainability is defined as the productivity of a set of activities that allow the entity to exist and flourish. For an organization or SME, a sustainability model defines the level of risk the company is at. If the model they incorporate is poor, then they are at a higher level of risk and business failure and vice versa (Geissdoerfer, Savaget, Bocken, & Hultink 2017).

LITERATUR REVIEW

The relative success of SMEs is highly dependent upon various reasons and factors apart from non-secular values. Success itself is defined as the ability of a business to survive and thrive in the market despite fierce competition and at the same time achieve growth and profitability which is required to expand business operations and increase clientele (Bose 2016). In Pakistan, there are numerous obstacles that an SME has to over-come to achieve success. These obstacles are higher in number as compared to SMEs in developed countries because Pakistan is still a developing nation that does not have considerable access to resources that are taken for granted in other nations.

Fundamental reasons for SME failures in Pakistan

SMEs all over the world are susceptible to business failure, and Pakistani SMEs are no exception. Different researches cite different variables and reasons as to why a considerable number of Pakistani SMEs are not able to achieve success. Dar, Ahmed, & Raziq, (2017) note that SME management falls victim to poor and substandard financial management. This combined with an apparent lack of industry experience makes it difficult for the SME to flourish. The research also suggests that due to a clear lack of vision, Pakistani businessmen are unable to formulate long-term plans for business sustainability. The reason for this is a clear lack of education. With a literacy rate of 62%, a sizeable number of businesses are being run by individuals who lack proper education. The statement is reiterated by

Raza et al. (2018) who identify different factors for SMEs' failure which not only include a lack of education observed on the management level, but also the workforce level. The hiring of unskilled and uneducated workers is cheap and a clear lack of long-term planning makes it look like a profitable business decision when in reality, it does more harm than good to the SMEs.

Khan & Khalique (2014) highlight the lack of technological advancements as one of the core reasons why Pakistani SMEs fail. They state that many SMEs in Pakistan are unable to upgrade from their outdated technological equipment due to the unavailability of resources and expertise. This becomes a factor in slowing down business. Furthermore, many SMEs do not provide initial training programs to their employees which leads to lesser productivity by the employees. All these factors, therefore, stunt the growth of business and lead the SME towards financial loss.

Khandker (2014) provides one crucial factor that has been reported in several other pieces of research which is an insufficient power supply for business operations. The research notes 67% of Pakistani respondents citing lack of electricity as the major cause of SME failure. Other reasons include poor financial access and relative political instability as major barriers to success. Haleem, Jehangir, & Ullah, (2019) also cite the shortage of electricity as one of the core issues that SMEs face in Pakistan regularly. The lack of a constant supply of electricity leads to the slowing of business operations resulting in SMEs not being able to make their deadlines and therefore receiving substantial losses. The lack of a concrete initial business investment/capital is also noted as a factor for subsequent failure for SMEs (Khan & Khalique (2014); Haleem et al. (2019); Jehangir, Fazal, Haleem, Jan & Haq, (2016)). It makes sense for SMEs to thrive only when the entrepreneur has sufficient capital to invest in the company as it takes a considerable amount of time to get a proper return on investment.

Ul Haq (2019) also emphasizes the lack of entrepreneurial education which translates to the lack of long-term planning and comprehension on the part of the entrepreneur, while Ali (2018) believes that while financial management is crucial for SME survival, the management of the SME requires competent advisors and partners to avoid failure. Without a network of expert advisors and access to their skills and knowledge, the SME is akin to a boat lost on the sea with no idea of the correct route to take and destined to fail.

Bilal, Khan & Akoorie (2016) only emphasize two factors that the researcher believes are crucial for SMEs to avoid failure, which are the expert handling and management of finances as well as access to a competent and skilled workforce. Raziq & Khair (2019), on the other hand, believe that along with expert financial management and entrepreneurial education, initial training programs for employees may result in the enhanced sustainability of the SME and helps to avoid failure. Many SMEs in Pakistan lack the resources or funds to develop comprehensive training programs for the new employees resulting in lower productivity and other obstacles.

It must be observed that each research undertaken to assess the reasons behind SME failure in Pakistan cite different factors behind these failures. While many of these factors coincide with each other, there are always some that do not. Therefore, there is no consensus on what obstacles undisputedly are responsible for the inability of many Pakistani SMEs to achieve success. However, what none of these researches provide, is an analysis of whether the application of religious principles has any part to play in the success or failure of an SME.

Impact of ethical and religious values for SME success

There is a considerable dearth of empirical research that examines the influence of religious principles and their application in the success and growth of a business. Pakistan is an Islamic country where Islamic values are often incorporated in business management. Yet some SMEs focus entirely on profit and finance rather than choosing to integrate non-secular practices in their work to benefit entities external to the company.

Edward Freeman in his stakeholder theory highlights that it is a company's intrinsic responsibility to satisfy anyone and everyone that is involved or impacted by the company. These stakeholders are vendors, employees, the environment, governmental agencies as well as others. The suggestion that the success of an organization is achieved only by satisfying all the stakeholders also implies that the company must not only prioritize those who profit from its rising stock. There is a religious element involved and this theory has roots in the observation of piousness and ethics when running a business, where the management should undertake ethical measures to ensure no harm comes to any stakeholders regardless of their involvement in profiting from company stocks (Freeman, Harrison, Wicks, Parmar., & De Colle, 2010).

Balog, Baker & Walker, (2014)'s research explicitly highlights that for ethical and religious entrepreneurs, financial motives are not the primary motivators for starting or sustaining a business. Many SMEs have found success when their business protocols involve giving back to the community, customers, and other low-level stakeholders. The owners of these SMEs believe that this success cannot be quantified rather it can be felt by sensing peace and tranquility in their businesses and social lives. Therefore, the values of a company and a concrete religious belief system can have a critical influence on the sustainability of the business as well as the decisions and culture within the company.

A connection can, therefore, be theorized between a Pakistani SME's integration of religious values into their practice and the chances of it succeeding despite not corresponding to the proper success variables as detailed in the last section. The utilization of ethical and religious practices can only be initiated by management. Idrus (2018) highlights, that entrepreneurs who undertake religious practices in their business see a higher degree of success for their organization. High religious values can help an SME sustain losses and still stay afloat as the management has a higher resilience to withstand obstacles due to their faith and belief (Idrus 2018).

Kamarudin et al. (2014) endorse Idrus' (2018) findings by highlighting the fact that the application of religiosity impacts a firm's performance and its degree of success. McCormick (1994) also acknowledges the existence of religious influence and spirituality in the behavior and work of many American managers and believes it to be a contributing variable through which these firms have achieved growth and development. Bellu and Fiume (2004) also put forth the statement that the pursuit of wealth while considering religiosity and ethical principles reduces the chance of dysfunctional outcomes in business, rather they aim to promote the success of the company.

In the book "Good to Great", Collins develops a framework of how a leader and their team can avoid failure by practicing value-based ethics. These ethics have their foundation set in many religions including Islam, Christianity, Buddhism, among others. Therefore, their application is directly akin to practicing religious beliefs. The act of helping others through their work, benefitting the society, and ensuring the benefit of entities external to the organization, can lead an SME to success even if they are lacking the success factors required for SMEs to succeed (Collins 2009). The notion is further expanded upon in "Built to Last" where the

author emphasizes that companies practicing and incorporating these values in their business operations are far likely to achieve sustainability and last longer (Collins., Collins, & Porras 2005).

The 'Tijarah' mindset is explored by Siti Anisah, Ahmad, Arif, Omar, & Rakiman (2017) where the research highlights that a business practices honesty, virtue, and morality in their trade dealings are less prone to business failures and more likely to recover from financial setbacks. Many Pakistani entrepreneurs have a strong faith in God which enables them to pursue ethical means of business conduct in their SMEs and as a result, see a higher degree of success. With this mindset, an SME provides a higher consideration to customer and stakeholder satisfaction, fairness in trade and agreements, and proper communication, all of which are vital factors for business success. The fifth habit mentioned in the book "7 Habits of Highly Effective People" by Stephen Covey utilizes ethos, pathos, and logos in business which provides a "wholesome" foundational structure and leads the organization to success (Covey 1989).

Ibrahim and Angelidis (2005) came up with the conclusion through their study that Christian-based companies or those that incorporate Christian beliefs and values in their business saw a higher rate of growth in their sales as well as higher productivity and return of investment. Similarly, Graafland et al (2006) found that practicing Islamic values internally in SMEs resulted in higher commitment and motivation thereby allowing SMEs to avoid business failures.

Therefore, it can be theorized that faith, religious beliefs, and ethical values indeed have a major effect on business performance, and while many pieces of research undertaken on SME success factors do not cite non-secular practices as a variable for success, this research endeavors to categorize religious and ethical beliefs as a core factor for success that can be utilized to avoid SMEs' failure.

Statistical presence of faith-based and religious values in business

The utilization of religious principles and values, as well as ethical and moral conduct, has always been present in business operations. Fernando & Jackson's (2006) research highlights that over 1/3 of a business comprises workers and managers who are driven by moral values and faith in religion. Whilst their religion and belief may differ from others, they still set store by the teachings of their adopted religion. The research notes that 30 to 35% of a business's success relative to their ongoing projects, comes from workers and leaders who use faith-based values in their day-

to–day operations. The statistic of 30-35% is quite significant within the context of business organizations which indicates if faith-based values are removed from the equation, the success rate of a business will fall to 65-70%.

Furthermore, the research conducted by Wong (2007) into the implementation of Christian values in Malaysian organizations, showcases that 97% of organizational workers and leaders are religious and attend their place of worship regularly. Out of this 97%, 74% regularly meet with fellow workers to discuss business operations, therefore hinting at the fact that convening for religious purposes allows the workers to work better on their organizational tasks as they communicate with each other more often. At the same time the research notes that over 50% of its sample size shows leaders and managers implementing religious and ethical values in their work and as they have seen continued success, parallels can be drawn which leads to results that showcase faith-based values contribute to an organization's success.

A similar conclusion is provided by Fernando et al. (2007) who note that Christian managers are 33% more idealistic than others. This idealism leads them to ensure that all tasks are worked upon, according to rules and protocol. This allows them to achieve a status of excellence and reliability in their deliverables. The statistical significance of religious leaders delivering higher quality work than others is a solid indicator that the implementation of faith-based and ethical values does indeed have a significant effect on the sustainability and survival of an SME. The study that was focused on Australians also states that religion and faith allow 64% of the sample population to have a strong belief in individuality which is then demonstrated through their organizational work.

METHODOLOGY

The contributing factors of SME sustainability that were identified during the literature review phase are provided in Table 1. Table 1 contains variables that are extracted from conventional and secular papers. While Table 2 holds factors that are extracted from faith-based papers that delve into ethical and religious principles. The qualitative analysis divides each factor into three categories based on their relative criticality highlighted in the researches, namely, "Not very important", "Important" and "Critical". The first category "Not very important", corresponds to those factors that the researchers chose not to include in their research, nor do they mention it. The second category "Important" corresponds to factors

that the researchers acknowledge as viable factors that impact SME sustainability but do not expand upon them nor provide recommendations on how they can be achieved. The third factor "Critical" highlights those factors that the researchers believe to have the utmost impact on SME sustainability and provide details and expand upon them while highlighting potential solutions and recommendations regarding their achievability.

Calculation of Entropy and Information Gain

The equation of Entropy is as provided (Boonchuay, Sinapiromsaran & Lursinsap (2017).

$$E(S) = \sum_{i=1}^{c} - p_i \log_2 p_i$$

Within Datamining, entropy can be considered as the relative value of how much variance the data possesses. The 'pi' is the overall probability of picking an element at random from the overall data set 'i' With the entropy calculated, the algorithm uses this entropy to produce the homogeneity of a sample. If the entropy is 0, then the element is completely homogenous and if it has an entropy of 1, then it is equally divided. A branch with the entropy of 0 is a leaf node.

To calculate the entropy of the target the dataset is divided into attributes. The entropy for each branch is calculated to get the total entropy for each split. The resulting entropy is subtracted from the value that was before the split. This results in 'Information Gain' or the reduction in Entropy. This process is then repeated for every branch This information gain is based on the reduction in entropy after a dataset is split on a particular attribute. The decision tree is created using the attribute with the highest information gain. Information Gain is calculated through the following equation to generate decision trees (Rai, Devi & Guleria (2016).

$$Gain(T, X) = Entropy(T) - Entropy(T, X)$$

Ultimately it is the value for Information gain at each attribute split, that is being measured. This value then helps create a decision tree using a top-down approach.

Secondary Data Collection and Analysis

While conducting data analysis, the most important task is to remove irrelevant or redundant attributes. The additional benefit that comes along with mining on a reduced set of attributes is the reduction of the number of attributes appearing in the discovered patterns, and making the patterns easier to understand. Now the question is "How can we find an 'appropriate' subset of the original attributes?" Assuming that the attributes are independent of one another aids in their classification as "best" (and "worst") by typically determined tests of statistical significance. This paper uses "information gain measure" for building decision trees for classification as an evaluation measurement tool. The next task is to select the split points to achieve a resulting partition that contains as many tuples of the same class as possible. Entropy is best suited for the given task. The variables extracted from the Literature studies were fed into KNIME to analyze the data from different dimensions. The 'Sustainability Factors' were considered as attributes. Entropy and Information Gain were used to create decision trees.

Showing every single calculation for the trees, however, is beyond the scope of this paper. Therefore, they are not included. The nodes within the trees are those that had the highest recurring count and allowed for data inference. [Appendix 3] showcases the decision trees that were created using KNIME while using different root columns to test the data to allow for a greater inference.

Table 1 was created using the variables extracted from conventional and secular business approaches found in the research.

Table 1: SME Sustainability Factors (Conventional Research)

Authors	Starting Capital	Fi-nance Man-age-ment	Indus-try Experi-ence	Long Term plans	Mana-gerial Educa-tion	Advi-sors	Hiring Skilled Work-force	Utiliza-tion of Tech-nology	Mar-keting Skills	Elec-tricity	No. of em-ployees	Train-ing Pro-grams
Dar et al. (2017)	N	C	C	I	C	N	C	N	I	I	N	N
Khan & Khalique (2014)	C	N	N	C	N	N	N	I	N	N	I	C
Raza et al. (2018)	N	C	I	N	I	N	I	C	N	C	N	I
Kazmi & Mäntymäki (2016)	N	N	N	N	C	N	C	C	N	N	N	N
Khandker (2014)	N	C	N	N	N	N	I	N	N	C	N	N
Ul Haq (2019)	N	C	N	I	C	N	N	N	N	N	N	N
Mahmood et al. (2017)	N	I	N	N	I	N	I	I	N	N	N	C
Ali (2018)	N	C	N	N	N	C	I	C	N	I	N	N
Jehangir et al. (2016)	C	I	I	N	C	N	N	I	I	N	N	N

Table 1 (Continued): *SME Sustainability Factors (Conventional Research)*

Haleem et al. (2019)	C	N	N	N	C	N	N	N	N	C	N	N
Naheed et al. (2019)	N	N	I	C	C	N	C	N	N	N	N	N
Bilal et al. (2016)	N	C	N	N	N	N	C	N	N	N	N	N
Raziq & Khair (2015)	N	I	N	N	C	N	N	N	N	N	N	C

Legends: **N**: not very important, **I**: important, **C**: critical

Table 1 showcases the most prominent recurring factors that researchers believe contribute to the success and failure of SMEs. There are twelve of them in total and all of them have been mentioned at least once by contemporary researchers about SME business sustainability. Their compilation into a table helps in their analysis and understand which factors are recurring at a higher rate than others. The table showcases all the secular attributes that research papers mentioned based on their relative level of importance.

Table 2 was created by extracting SME success indicators from nonsecular, faith-based research papers.

Table 2*: SME Sustainability Factors (Faith-Based Research)*

Authors	Incorpo-ration of Faith and CSR	Starting Capital	Long Term Vision	Market-ing Skills	Manage-rial Edu-cation	Finance Manage-ment
Almoharby (2011)	C	N	N	N	N	N
Martinez (2019)	C	N	N	I	I	N
Hui (2008)	C	N	I	N	I	N
Sobhani et al. (2011)	I	N	I	N	N	C
Doherty et al. (2006)	C	N	N	N	I	N
Anderson et al. 2019	C	N	N	N	C	N
Clarke (2008)	C	N	N	N	N	N
Moyer et al. (21014)	C	N	N	N	I	N

Legends: **N**: not very important, **I**: important, **C**: critical

Table 2 showcases SME sustainability factors that have roots in faith-based business approaches. These researches incorporate a spiritual element in their analysis of SMEs and as such provide a higher degree of importance to the incorporation of religious and ethical values in SMEs regarding their sustainability. As such, other contributing factors are scarcely mentioned.

Primary Data Collection

After the identification of these SME sustainability factors through literature analysis, the low priority factors were excluded and the remaining were used to develop a structured and close-ended questionnaire. The questionnaire is provided in [Appendix 1]. It utilizes Likert scale questions and is targeted towards Pakistani companies and their management to gain information regarding what they believe are critical factors for sustainability and survival for their organizations.

Twenty-Five local Pakistani companies that qualified as SMEs were scouted using a selection criterion. The criteria for choosing companies were (1) they had to be in operation for at least 3 years, (2) have at least 10 employees, and (3) have a monthly revenue of more than 1 million PKR. Out of these twenty-five companies, twenty agreed to take part in the research under the condition their identities and information remain anonymous. Therefore, all details regarding the companies have been omitted to comply with ethical directives. Table 3 provides a brief highlight of the organizations that took part in the research.

Table 3: Organizations Details with Criteria

Cases	Location	Firm Size	Main Activities
Organization 1	Pakistan	Small (20-49)	Software Development
Organization 2	Pakistan	Micro (<20)	Software Development
Organization 3	Pakistan	Small (20-49)	Oil Distribution
Organization 4	Pakistan	Small (20-49)	Import/Export
Organization 5	Pakistan	Small (20-49)	Software Development
Organization 6	Pakistan	Small (20-49)	Software Development
Organization 7	Pakistan	Small (20-49)	Textile Operations
Organization 8	Pakistan	Micro (<20)	Import/Export
Organization 9	Pakistan	Small (20-49)	Software Development
Organization 10	Pakistan	Micro (<20)	Import/Export
Organization 11	Pakistan	Small (20-49)	Education
Organization 12	Pakistan	Micro (<20)	Retail
Organization 13	Pakistan	Small (20-49)	Software Development
Organization 14	Pakistan	Small (20-49)	Import/Export
Organization 15	Pakistan	Micro (<20)	Manufacturing
Organization 16	Pakistan	Micro (<20)	Retail
Organization 17	Pakistan	Micro (<20)	Retail
Organization 18	Pakistan	Micro (<20)	Manufacturing
Organization 19	Pakistan	Small (20-49)	Education
Organization 20	Pakistan	Small (20-49)	Retail

All the organizations selected for the data collection are from Pakistan. We have categorized them into two: micro and small. Micro size companies are those companies that have less than twenty employees whereas small companies have employees between the range of twenty and forty-nine. Six companies belong to the software industry whereas the rest belong to the Oil industry, Import/Export, Retail, Manufacturing, Education, and Textile industry. The questionnaire responses collected from these organizations are provided in [Appendix 2].

FINDINGS

Comparison between Secular and Non-Secular Business Approaches

Certain comparisons can be made between the variables recorded in Table 1 and Table 2. It can be seen that conventional and secular business approaches hardly mention the concept of religious or ethical values in a business. Most of them highlight factors that have proven track records of being vital to the success of an SME. Such as starting capital, finance management, long-term vision, expert marketing skills, and so on. These approaches in business, hardly delve into the unknown, the non-secular domain, where it is difficult to prove that religious or ethical values also contribute to the success of SMEs.

However, non-secular business approaches that specifically talk about the value of religious principles and ethics in the sustainability of SMEs, reiterate and highlight the criticality of this factor in the success of SMEs again and again. They hardly delve into non-secular factors that contribute to SME success. These researches assume that faith, religious beliefs, and principles are the only critical factor of SMEs that aid in their sustainability. Therefore, this showcases a dramatic research gap where secular business approaches tend to avoid spiritual and religious factors whereas faith-based researches are biased towards nothing but religious values.

Hence, Table 1 and Table 2 are showing the business approaches of the two extremes. To fill the gap between the two approaches, a survey has been conducted with twenty companies operating in Pakistan. After conducting this survey, a middle ground was found which suggests a hybrid business model for sustainability. This paper presents that hybrid business model, which is the combination of the best of these two businesses' approaches backed up by real-life data. By putting both the business approaches together, this research can get greater clarity and a wider and

complete picture of all the variables that contribute to SME success, secular as well as non-secular.

Sustainability Model (developed from existing variables from the literature)

The sustainability model provided in Figure 1 is created from the data held in Table 1 which provides the analysis of SME sustainability factors mentioned in conventional and secular researches. According to the decision tree presented in Figure 1, Initial Capital funding is the key element for any business for sustainability. It does not support ethical values as a key element behind the sustainability of any business. As mentioned in the introductory section, in the United States, the new establishments have a 50% chance to survive their first five years with 33% being able to survive over ten years. The model presented in Figure 1 also endorsed the core reason behind the failure of many SMEs around the world. This is because they prioritize funding and capital and the pursuit of profit as compared to sustainability which is achieved through the implementation of core values, beliefs, ethics, and religious principles. Though a considerable amount of these companies manages to avoid failure by using a combination of strong capital, marketing skills, technology, and other aspects, conventional researches, however, they do not believe religious beliefs and principles to be a strong enough contributing factor for SME sustainability.

Collin's work suggests that building a company does not revolve around profit but a vision, a mission that far exceeds the individual's lifespan. His analysis of companies that have achieved sustainability and have been in operation for over a hundred years showcases that having a well-balanced management experience and a clear vision and motivation far exceeds the hunt for financial gain and profit. Companies that opt for the former and far likely to be sustainable than those who opt for the latter. The ideology that a lasting organization goes beyond just making money is reiterated in "Good to Great" and "Built to Last" where Collins believes that sustainability comes from informed decision making, preservation of core values, constant innovation rather than trying to exploit customers using contemporary marketing and business strategies. (Collins 2009). It must be noted that this decision tree does not have attributes of religious and ethical values because this was created using data extracted from secular researches. The reason why it is included in this paper is that it acts as a stepping stone for the proposed sustainability model in the next section.

Figure 1: *Sustainability Model Decision Tree created from secular values (Obtained through secondary data)*
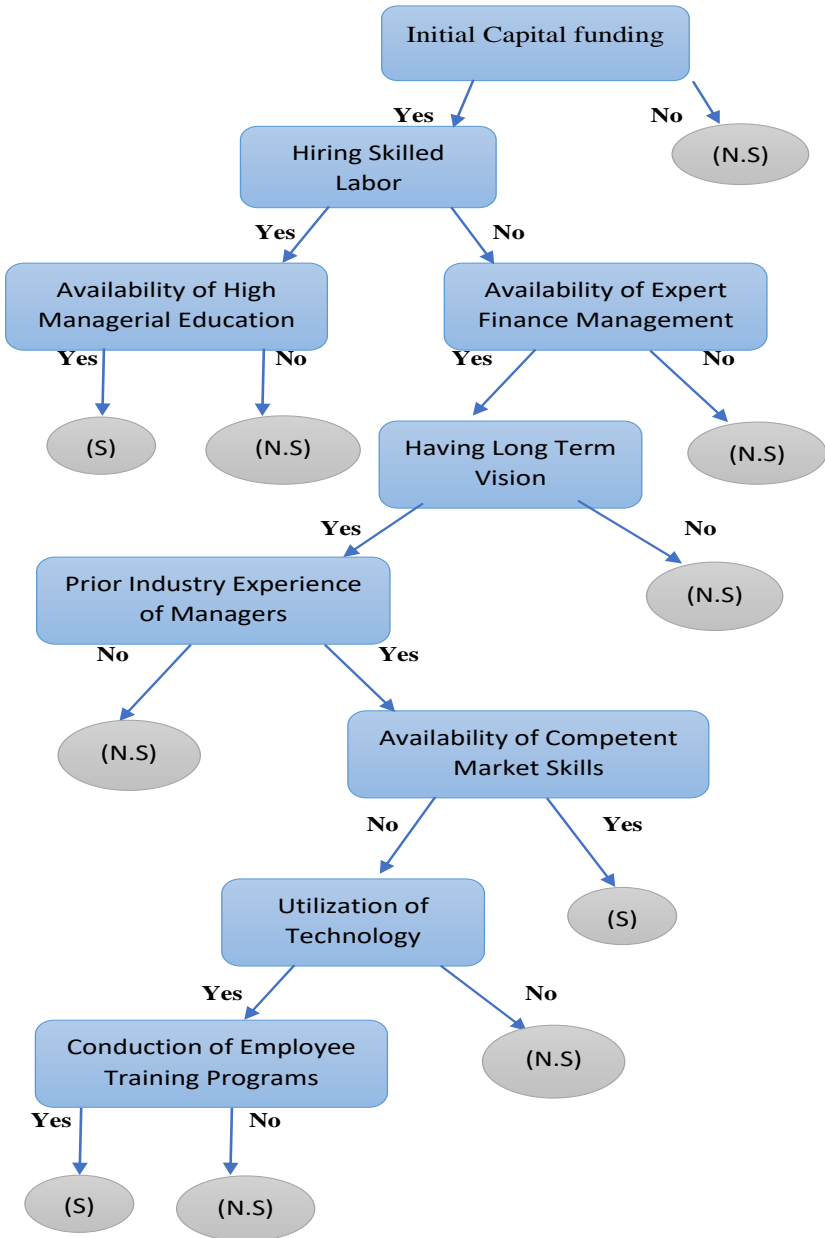
Key (S): Sustainable (N.S): Not Sustainable

Proposed Sustainability Model

The proposed model is derived from the first-hand data collected from the twenty companies operating in Pakistan. After modeling the collected data using the Decision Tree algorithm which is one of the classification algorithms used in Data mining, it has been noticed that the decision tree supports the faith-based business approaches. In the beginning, multiple decision trees were created using all the classes as a core splitting class. Some of the trees are shown in Appendix 3. After applying the Random Forest Algorithm technique, which is one of the Ensemble methods for classification, to all of these generated decision trees, a more powerful decision tree is generated which is shown in Figure 2. It is evident from the decision tree presented in Figure 2 that Religious and ethical values are indeed the most vital aspect in business. The decision tree itself was created by calculating the information gain at each node split. Table 4 shows the Entropy and information gain at the root level. The same process was followed at subsequent levels to create the tree.

Table 4: Entropy and Information Gain at Root Level

Variable	Entropy	Information Gain
Long Term Vision	0.614	0.081
Technology	0.684	0.043
Religious and ethical values	0.150	0.587
Marketing skills	0.432	0.269
Finance Management	0.662	0.041
Skilled workforce	0.453	0.273
Training programs	0.453	0.273
Higher education of managers	0.451	0.240
Starting capital	0.653	0.074
Managerial experience	0.653	0.074

The table above portrays the entropy levels and information gain of each attribute at the root level. The root level is the very first level of the decision tree, usually situated at the top. It is where the decision tree starts. For an attribute to classify as a root node they need to have the highest information gain value and the lowest entropy. For each node,

these two values were calculated. The table depicts 'Religious and Ethical values' at the highest information gain with 0.587 and the lowest entropy with 0.150. The rest of the values of the remaining attributes is ignored. This, therefore, allows it to become the root node which is why in the sustainability diagram shown below, the node 'Religious and Ethical Values' is situated at the top.

For every level, the entropy and information gain are calculated all over again and the same process is followed to isolate the node with the highest information gain and the lowest entropy. This node then becomes the second node in the decision tree, which in this case is 'Finance Management'. The process is then continued until the decision tree is filled with all the nodes.

Within a decision tree, the root node holds the most value and importance since that is where the decision tree starts and the path to the endpoint is charted from the root node. This allows the root node to be included in every path that is taken to reach the end of the tree, therefore its rate of inclusion is high, making it the most critical part of the decision tree. The tree highlights that the attribute 'Religious and Ethical Values' is the most important node due to it being placed at the top of the tree with the rest of the attributes following after it.

It can be observed that the model shown in Figure 2 is very different from the model in Figure 1. Based on this model, an analysis can be made that Pakistani SMEs value the concept of incorporation of religious and ethical values highly and believe it to be the core behind sustainability. Therefore, other aspects that are also critical for SMEs ' survival such as funding, experience, education, and technological integration are given relatively lower priority, nevertheless, they are incorporated within their sustainability model. However, it can be theorized that the lack of prioritizing them can be a cause of failure for many of them.

Figure 2: *Sustainability Model (developed through Questionnaire)*
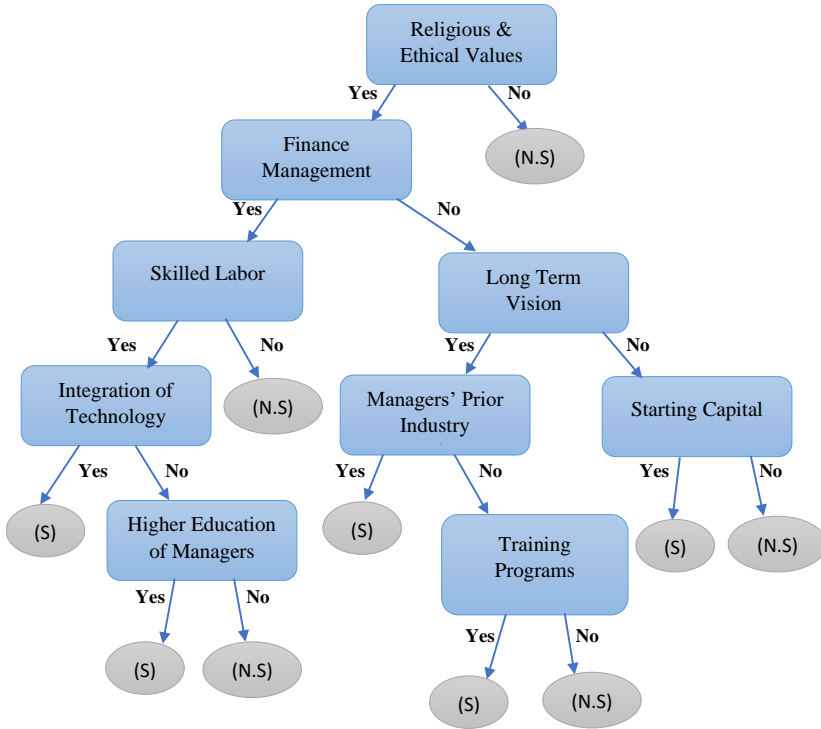
Key (S): Sustainable (N.S): Not Sustainable

Discussion

Aligning all the decision trees together, it can be observed that the emphasis Collins and Hess put on a clear vision and the preservation of ethics and values do have a considerable impact on SME sustainability. Many organizations, particularly in Pakistan understand this and can conduct their business according to sharia law. However, despite this many SMEs both within Pakistan and in other countries put financial profit as their foremost priority. By putting all their efforts into securing funding, hiring a competent team, utilizing expert market skills, they aim to prioritize secular factors over non-secular ones. Such companies need to keep a healthy balance of both factors to achieve optimum sustainability. By solely focusing on a select few, they neglect the other and make themselves vulnerable to unsustainability.

These results are supported by Azmat et al. (2019) who claim that faith and belief can enhance decision-making skills and allows the leaders and

managers to demonstrate calmness and rationality during key impactful moments. The research also notes that ethical and religious values allow for leaders to take losses at face value and instead of letting hirer physical and mental health get impacted, they frequently move on to the next venture. The faith allows them to justify their failure as something that was beyond their control and as such, they do not need to wallow in it. This leads them to bounce back faster and find successful opportunities elsewhere.

Mbugua (2019) also supports the findings by noting that leaders and managers who demonstrate faith-based values in their business operations do not solely rely on their faith. They understand the mutually exclusive aspect of working within the boundaries of faith and as such, they also employ other secular business tactics to achieve success. Therefore, it stands to reason that faith is not enough to carry a business towards success, rather it provides the added advantage of peace and steadfastness in the leader's life and is demonstrated through their actions and decisions in the organization. This supports the findings and results that the demission tree provides where the success of an SME comes with the implementation of both secular and non-secular values however the non-secular values have a greater degree of importance.

 It is thereby recommended for SME owners to develop an entrepreneurial mindset that stems from adopting religious values and beliefs, as well as doing good in the world and giving back to society. By pursuing aspects other than financial gain, the companies can embark on a spiritual journey where the inner peace and satisfaction of the employees are prioritized through ethical beliefs and principles over monetary gain. This is ultimately how SMEs will achieve sustainability.

CONCLUSION

The implementation of ethical and core religious beliefs indeed plays a vital part in the overall sustainability and success of the business. Sustainability also has several other contributing factors and thus it is impossible to suggest a universal sustainability model due to various extrinsic factors that impact organizations. While some are more critical than others and vary depending on factors such as business location, it can be stated that a greater understanding of these factors both secular and non-secular alike, can help business owners avoid business failure. Contemporary researches that aim to highlight these factors often miss some of the factors and either analyze secular factors or non-secular ones, yet hardly both. It is critical

to understand both these domains to get a complete picture of a business's structural foundation and its relative strength.

The observation that the attribute of religious and ethical values was not only present in the decisions tree but was also the root node, highlights that this is an aspect that is indeed worth researching more. The secondary data, particularly secular research papers neglect to mention this attribute and pride it no merit or importance at all. Yet the primary research portrays a very different picture and exemplifies the value of this attribute and makes it a core foundation and necessity for the survival of SMEs.

The sustainability models that were developed, come off as a result of the analysis of both secular and non-secular factors that were amassed through primary data collection and literature review. It is dependent on the number of times a factor is highlighted by contemporary researches. Furthermore, it must be noted that even though a firm can be considered unsustainable upon the models' application, it does not mean that the firm cannot make a profit or that it is a complete failure. Rather it is an indication that the organization is associated with a higher level of risk.

FUTURE RESEARCH

While the sustainability models have been proposed, it remains to be seen how they hold up in the long term, therefore, the researchers shall be checking up on the companies that agreed to participate in this research, after 6 months or 12 months to evaluate their progress and to assess how they are faring in regards to their sustainability. Furthermore, the research shall be continued and more companies and organizations shall be scouted and requested to participate in the research to refine the sustainability model. The proposed sustainability model can be further strengthened by adding more data from companies from other parts of the world. Every country has its own cultural and religious values. This would be an interesting task to evaluate how different cultural and religious values affect the sustainability of any company. In this way, a global sustainability model can potentially be developed which may help SMEs all around the world.

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Appendix 1: Questionnaire

Q1 Do you think, having a long-term vision complements the sustainability of your business?

Q2 Have you integrated technology into your venture?

Q3 Do you believe the incorporation of Islamic practices helps a business in success?

Q4 Have you incorporated religious and ethical values in your business?

Q5 Are expert marketing skills necessary for the survival of your business?

Q6 Do you believe you have achieved sustainability in your business?

Q7 On a scale of 1-10 how important is expert finance management for the success of your business?

Q8 On a scale of 1-10 how crucial is management's prior industry experience for your business' sustainability?

Q9 On a scale of 1-10 highlight how important is the aspect of hiring a skilled workforce towards your organizational success.

Q10 On a scale of 1-10 how important is conducting employee training programs for the survival of your company?

Q11 On a scale of 1–10 how critical is a higher education of the management team, for the success of your company?

Q12 On a scale of 1–10 how vital is a large pool of starting capital (initial funding) necessary for your company's sustainability?

Appendix 2: Questionnaire Responses

Table 5: *Questionnaire Responses*

Case	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Organization 1	Yes	Yes	Yes	No	Yes	No	8	9	7	6	4	4
Organization 2	No	Yes	Yes	Yes	No	No	6	8	5	8	3	3
Organization 3	Yes	Yes	Yes	Yes	No	Yes	7	8	9	8	6	6
Organization 4	No	Yes	Yes	Yes	No	Yes	9	10	6	10	5	4
Organization 5	Yes	Yes	Yes	Yes	Yes	Yes	10	8	10	10	5	3
Organization 6	Yes	Yes	Yes	Yes	Yes	Yes	7	7	8	8	8	5
Organization 7	Yes	No	Yes	Yes	No	Yes	8	7	7	8	9	3
Organization 8	Yes	Yes	Yes	Yes	No	Yes	9	6	8	7	9	5
Organization 9	Yes	Yes	Yes	Yes	No	Yes	4	4	9	9	3	9
Organization 10	Yes	Yes	No	Yes	Yes	Yes	10	5	10	6	7	4
Organization 11	Yes	Yes	No	Yes	Yes	No	6	7	10	6	8	3
Organization 12	No	No	Yes	Yes	No	No	8	8	10	9	5	4
Organization 13	Yes	Yes	Yes	No	No	Yes	7	9	7	8	5	6
Organization 14	Yes	Yes	Yes	Yes	Yes	Yes	8	4	7	7	7	4
Organization 15	Yes	Yes	Yes	Yes	No	Yes	9	8	8	10	6	5
Organization 16	Yes	Yes	Yes	Yes	No	Yes	10	6	5	8	9	3
Organization 17	Yes	Yes	Yes	Yes	Yes	Yes	4	8	9	8	3	5
Organization 18	No	Yes	Yes	Yes	No	Yes	6	7	9	8	9	9
Organization 19	Yes	Yes	Yes	Yes	No	Yes	8	10	8	6	3	4
Organization 20	Yes	Yes	Yes	Yes	Yes	Yes	8	5	6	10	4	3

Likert Scale Rating Score Equivalent: 1 to 5: No 6 to 10: Yes

Appendix 3: Test Decision Tree Models

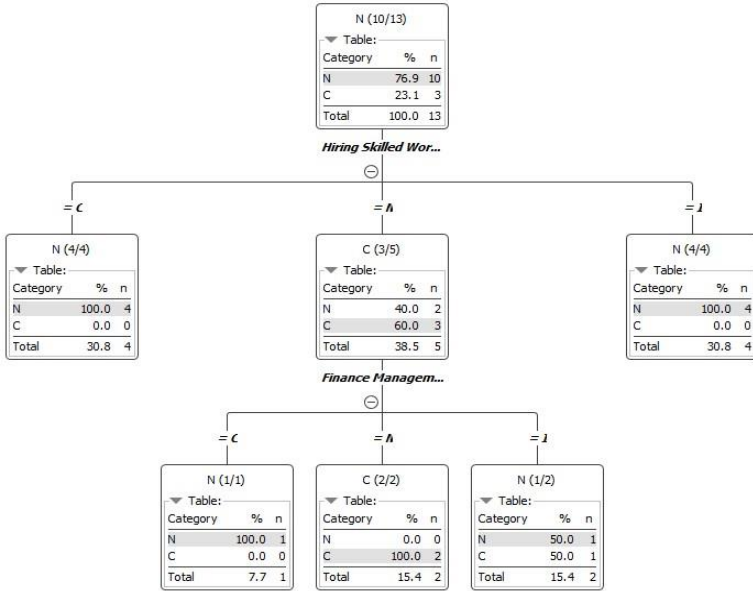**Figure 3**: *Initial Capital as Root Node*

Figure 4: *Finance Management as Root Node*
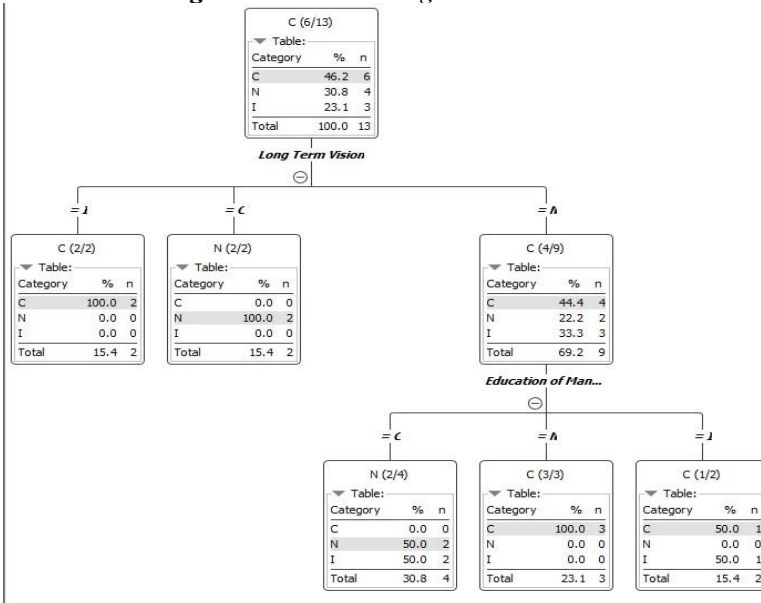
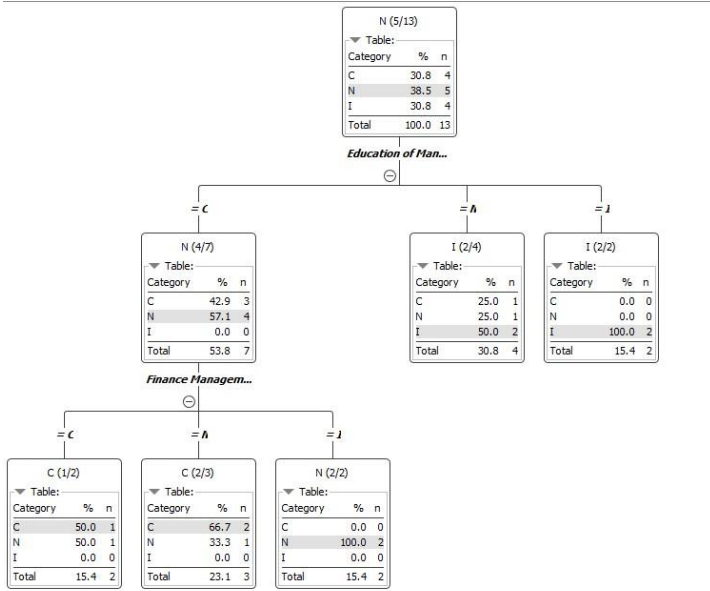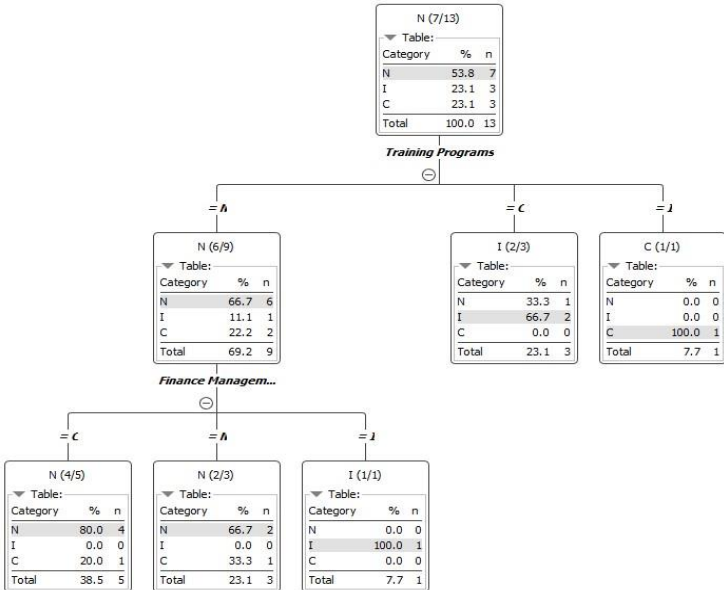**Figure 5:** *Hiring Skilled Workforce as Root Node*

Figure 6: *Technological Utilization as Root Node*

AUTHORS' PERCENTAGE-BASED CONTRIBUTION

The contributions of each author to the study by percentages are as follows:
The percentage-based contributions of the 1st author and 2nd author are 50% and 50%, respectively.
1st Author: Literature review, Data Collection, Data Analysis, Model Creation, writing.
2nd Author: Evaluation of Research Significance, Research design, writing.

DECLARATION OF CONFLICTING INTERESTS

There is no financial or individual relationship with a person or an institution in the context of the study. Also, conflicting interests do not exist.

ETHICAL APPROVAL OF THE STUDY

All rules within the scope of "Instruction on Research and Publication Ethics for the Higher Education Institutions" were observed throughout the study. No actions mentioned in the Instruction's second chapter titled "Actions Against to Scientific Research and Publication Ethics" were taken in the study.