Microorganisms for Sustainability 39
Series Editor: Naveen Kumar Arora

Natarajan Amaresan
Dhanasekaran Dharumadurai
Olubukola Oluranti Babalola *Editors*

Agricultural Microbiology Based Entrepreneurship

Making Money from Microbes

Springer

Microorganisms for Sustainability

Volume 39

Series Editor

Naveen Kumar Arora, Environmental Microbiology, School for Environmental Science, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India

Microorganisms perform diverse roles on our planet most of which are important to make earth a habitable and sustainable ecosystem. Many properties of microorganisms are being utilized as low input biotechnology to solve various problems related to the environment, food security, nutrition, biodegradation, bioremediation, sustainable agriculture, bioenergy and biofuel, bio-based industries including microbial enzymes/ extremozymes, probiotics etc. The book series covers all the wider aspects and unravels the role of microbes towards achieving a sustainable world. It focuses on various microbial technologies related to sustenance of ecosystems and achieving targets of Sustainable Development Goals. Series brings together content on microbe based technologies for replacing harmful chemicals in agriculture, green alternatives to fossil fuels, use of microorganisms for reclamation of wastelands/ stress affected regions, bioremediation of contaminated habitats, biodegradation purposes. Volumes in the series also focus on the use of microbes for various industrial purposes including enzymes, extremophilic microbes and enzymes, effluent treatment, food products.

The book series is a peer reviewed compendium focused on bringing up contemporary themes related to microbial technology from all parts of the world, at one place for its readers, thereby ascertaining the crucial role of microbes in sustaining the ecosystems.

Natarajan Amaresan •
Dhanasekaran Dharumadurai •
Olubukola Oluranti Babalola
Editors

Agricultural Microbiology Based Entrepreneurship

Making Money from Microbes

Springer

Editors
Natarajan Amaresan
C.G. Bhakta Institute of Biotechnology
Uka Tarsadia University
Surat, Gujarat, India

Dhanasekaran Dharumadurai
Department of Microbiology
Bharathidasan University
Tiruchirappalli, Tamil Nadu, India

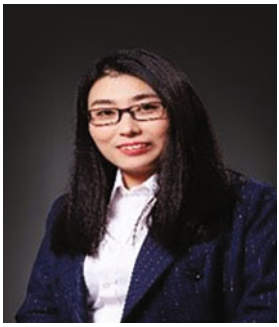
Olubukola Oluranti Babalola
Faculty of Natural and Agricultural Sciences
North-West University
Mmabatho, South Africa

ISSN 2512-1901 ISSN 2512-1898 (electronic)
Microorganisms for Sustainability
ISBN 978-981-19-5746-8 ISBN 978-981-19-5747-5 (eBook)
https://doi.org/10.1007/978-981-19-5747-5

© Springer Nature Singapore Pte Ltd. 2023
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Foreword



Agricultural microbiology based on entrepreneurship is also referred to as science entrepreneurship or bioscience enterprise in agriculture, life science entrepreneurship, entrepreneurship in microbiology, or agriculture microbiology enterprise. It is the entrepreneurship of microorganisms which acts as a bridge of innovation connecting academia and industry. It is the business of utilizing ideas and innovations of microorganisms and products obtained from bacteria, fungi, actinomycetes, and protozoa to gain profit and serve the society. Therefore, bioentrepreneurship encloses an understanding of an idea, invents something, and brings about the sum of all activities to create an environment and infrastructure for well-trained professionals to build research-based projects and their commercialization. Bioentrepreneurship is manifested as the key driver of the new bioeconomy. For a person to be a bioentrepreneur, few skills are prerequisite like positive energy, leadership qualities, appropriate track record, technical knowledge of the field, articulating and managerial skills. Agricultural microbiology is a branch of science that studies different microorganisms that are associated with plants, soil fertility, and even animal diseases. The microorganisms associated with plants include organisms of different groups like bacteria, fungi, actinomycetes, and protozoa. Agricultural microbiology has been extensively studied for the decade as it

helps to understand the importance of relevant microbial strains to agricultural applications to minimize agricultural loss and increase soil fertility and harvest. There is a symbiotic relationship between plants and the associated microorganisms where both benefit from each other. Besides, different topics within agricultural microbiology help in the diagnosis and prevention of plant diseases that might result from plant pathogens. Agricultural microbiology helps in the understanding of the specific plant requirements that include soil texture, soil nutrients, water content, and associated microorganisms. Based on the studies made in agricultural microbiology, different microorganisms can be used for different purposes, all ultimately leading to minimizing loss of plant and plant products and increasing fertility and harvest. The dominant group of microorganisms found in the soil and plants is bacteria. These bacteria are present in a symbiotic relationship with the plants to help in processes like nitrogen fixation and mineral supply. Bacteria are followed by actinobacteria, as the second most dominant group. Actinobacteria are also studied in agricultural microbiology as they produce different groups of antibiotics and also help in increasing the fertility of the soil.

Agricultural microbiology based on entrepreneurship allows for the exploration of new and advanced techniques that can be used in agricultural practices to make the practices safer and reliable business model of biofertilizers, plant growth promoters, biopesticides, and biocompost production. This book comprises 20 chapters from contributors across the world. The book content has divisions as entrepreneurship, business plan, biofertilizer, and compost production. It outlines the concept of entrepreneur and entrepreneurship, government schemes for entrepreneurship programs, skills for entrepreneurs, ethical and legal issues in microbial products in India, and intellectual property principles in microbial technologies.

The second part of the book summarizes mass multiplication, production cost analysis, and marketing of *Rhizobium*, *Azotobacter*, *Azospirillum,* cyanobacterial, VAM, and *Frankia* biofertilizers. It also describes the production cost analysis and marketing of phosphate solubilizers and *Bacillus thuringiensis, Trichoderma, Metarhizium,* and *Beauveria* bioinsecticide. A special chapter on vermicomposting is also included in this book to create a centre of attention for readers in microbiology, biotechnology, agriculture, and business management.

I appreciate and congratulate the book editors Dr. Natarajan Amaresan, Assistant Professor, C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, India, Dr. Dharumadurai Dhanasekaran, Associate Professor, Department of Microbiology, Bharathidasan University, Tiruchirappalli, India, and Prof. Olubukola Oluranti Babalola, Faculty of Natural & Agricultural Sciences, North-West University, South Africa, for bringing the book on *Agricultural Microbiology-Based Entrepreneurship: Making Money from Microbes* as immense volume to the entrepreneur to open innovative entrepreneurship.

School of Life Sciences and Biotechnology, Shanghai Jiao Tong University, Shanghai, China

Fengli Zhang

Preface

Entrepreneurship is currently a hot topic in policy circles all around the world. Poverty, income inequality, and unemployment are rising, and strong entrepreneurship, shown in part through the formation and expansion of small and medium businesses, is vital for economic development. Therefore, it is critical to turn research findings into money-making initiatives that the unemployed may participate in. The book focuses on developing entrepreneurial capabilities to create a source of income using microbiological products.

Agricultural Microbiology-Based Entrepreneurship: Making Money from Microbes advocates a paradigm shift in research-related investigations toward microbial product technology transfer and commercialization. The book helps prospective entrepreneurs improve their knowledge and skills to commercialize items for broad usage. The book highlights the concept of entrepreneurship, skills for entrepreneurs and intellectual property principles, and ethical and legal issues frameworks of microbial products in the agricultural sector. Biofertilizers and composting are the major microbiological products required to increase crop yield and ensure sustainable food production. In-depth knowledge about different microbial-based fertilizers, multiplication, production costs and analysis, and marketing are discussed in the book.

This book is for everyone who has an inkling of wanting to make a fortune through microbiological research products. The book encourages academics, graduate students, and the unemployed to develop entrepreneurial skills to create a source of income. They can profit from the research presented in this book.

Surat, Gujarat, India — Natarajan Amaresan
Tiruchirappalli, Tamil Nadu, India — Dhanasekaran Dharumadurai
Mmabatho, South Africa — Olubukola Oluranti Babalola

Contents

Part I Entrepreneurship and Business Plan

1 Concept of Entrepreneur and Entrepreneurship 3
Swapnil Chaurasia

2 Government Schemes for Entrepreneurship Programs 25
Ami Naik and Pooja Patel

3 Skills for Entrepreneurs 41
Swapnil Chaurasia

4 Intellectual Property Principles in Microbial Technologies 63
R. Pathirajan, S. Gomathi, V. Ambikapathy, A. Panneerselvam, G. Gayathri, and A. Anbukumaran

5 Ethical and Legal Issues in Microbial Products in India 81
Pooja Patel and Ami Naik

Part II Biofertilizer and Compost Production

6 Mass Multiplication, Production Cost Analysis, and Marketing of Cyanobacterial Biofertilizers 103
V. T. Anju, Siddhardha Busi, and Madhu Dyavaiah

7 *Rhizobium* Biofertilizers: Mass Production Process and Cost-Benefit Ratio Analysis 125
Komal A. Chandarana and Natarajan Amaresan

8 Mass Multiplication, Production Cost Analysis, and Marketing of VAM Fungal Biofertilizer 133
Komal A. Chandarana, Harshida A. Gamit, Sapna Chandwani, Hetvi Y. Naik, and Natarajan Amaresan

9 Mass Multiplication and Cost Analysis of *Frankia* Biofertilizer 155
Thirumagal Thirugnanam and Dhanasekaran Dharumadurai

10 Mass Multiplication, Production Cost Analysis and Marketing of *Azospirillum* 169
S. Gomathi, V. Ambikapathy, and A. Panneerselvam

11 Mass Multiplication, Production Cost Analysis, and Marketing of *Azotobacter* 185
Prittesh Patel, Sajjan Grover, and Pushpendra Singh Chauhan

12 Mass Multiplication, Production Cost Analysis, and Marketing of *Pseudomonas* 195
Komal A. Chandarana, Harshida A. Gamit, Hetvi Y. Naik, Sapna Chandwani, and Natarajan Amaresan

13 Mass Production, Formulation, and Cost-Benefit Ratio Analysis of *Bacillus thuringiensis* Bioinsecticide 209
Komal A. Chandarana, Harshida A. Gamit, Hetvi Y. Naik, Sapna Chandwani, and Natarajan Amaresan

14 Mass Multiplication, Production Cost Analysis, and Marketing of *Trichoderma* 223
Dhruti Amin

15 Mass Multiplication, Production Cost Analysis, and Marketing of *Metarhizium* 237
Sapna Chandwani, Hetvi Y. Naik, Harshida A. Gamit, Komal A. Chandarana, and Natarajan Amaresan

16 Mass Multiplication, Production Cost Analysis, and Marketing of *Beauveria* 251
Sapna Chandwani, Hetvi Y. Naik, Harshida A. Gamit, Komal A. Chandarana, and Natarajan Amaresan

17 *Chaetomium* sp.: An Insight into its Antagonistic Mechanisms, Mass Multiplication, and Production Cost Analysis 267
Parthasarathy Seethapathy, Harish Sankarasubramanian, Rajendran Lingan, and Raguchander Thiruvengadam

18 Vermicomposting: A Leading Feasible Entrepreneurship 289
P. Kavitha

19 Mass Production and Marketing of Microbial Compost 307
Swati Patel and Urjita Sheth

20 Cost-Benefit Assessment of Solid-Based Biofertilizer Production . . . 329
R. Kannan and T. Seenivasa Moorthy

Series Editor, Editors and Contributors

About the Series Editor

Naveen Kumar Arora, **Fellow of International Society of Environmental Botanists (FISEB), PhD in Microbiology**, is Professor and Head of the Department of Environmental Science at Babasaheb Bhimrao Ambedkar University (A Central University), Lucknow, Uttar Pradesh, India. He is a renowned researcher in the field of environmental microbiology and biotechnology. His specific area of research is plant-microbe interactions, particularly plant growth-promoting rhizobacteria. He has more than 75 research articles published in premium international journals and several articles published in magazines and dailies. He is an editor of 25 books, published by Springer. He is a member of several national and international societies, Secretary General of Society for Environmental Sustainability, serves on the editorial board of four journals, and a reviewer of several international journals. He is also the editor in chief of the journal *Environmental Sustainability* published by Springer Nature. He has delivered lectures at conferences and seminars around the globe. He has a long-standing interest in teaching at the PG level and is involved in taking courses in bacteriology, microbial physiology, environmental microbiology, agriculture microbiology, and industrial microbiology. He has been advisor to 134 postgraduate and 11 doctoral students. He has been awarded for excellence in research by several societies and national and international bodies/organizations. Although an academician and researcher by profession, he has a huge obsession for the wildlife and its conservation and has authored a book, *Splendid Wilds*. He is the President of Society for Conservation of Wildlife and has a dedicated website www.naveenarora.co.in for the cause of wildlife and environment conservation.

About the Editors

Natarajan Amaresan is an Assistant Professor at C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Gujarat. He has received his undergraduate, postgraduate, and doctorate degrees in Microbiology. Dr. N. Amaresan has over 16 years of experience in teaching and research in various allied fields of microbiology, mainly microbial ecology, plant-microbe interactions, and others. He has been awarded young scientist awards by Association of Microbiologists of India, National Academy of Biological Sciences, and recipient of visiting scientist fellowship from National Academy of India. He has published more than 60 research articles, 13 books, and 45 book chapters of national and international repute. He has handled various projects sponsored by DBT, DST, GEMI, etc., and guided students for their doctoral and master's degrees.

Dhanasekaran Dharumadurai is working as an Associate Professor, Department of Microbiology, Bharathidasan University, Tiruchirappalli, India. He was awarded UGC-Raman Post-Doctoral Fellowship and worked in the University of New Hampshire, USA. He was awarded Fellow of Linnean Society, London, UK, and INSA Visiting Scientist Fellowship by the National Science Academy. He has graduated 12 PhDs and 76 MScs with over 106 research publications, 49 book chapters, and an H-index of 30 and citations of 2850. He filed two Indian Patents and organized 8 national level seminar, conference, and workshop programs. He has edited 11 books and authored 4 laboratory manuals. His research focus is microbiome profiling of actinorhizal root nodules, lichen, poultry gut, and cattle's reproductive system.

Olubukola Oluranti Babalola (Pr.Sci.Nat, MASSAF, FASLP, FTWAS, FAS), the Vice President of the Organization for Women in Science, is an NRF-rated scientist with over 20 years of experience in rhizosphere metagenomics and has an MBA. She has experience from the International Institute of Tropical Agricult^10,200 citations. Olubukola is #1 in Africa for Soil Science and Plant Nutrition. Her international experience spans the Americas, Asia, Europe, and Oceania.

Contributors

Natarajan Amaresan C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

V. Ambikapathy Department of Botany, A.V.V.M Sri Pushpam College (Autonomous) (Affiliated to Bharathidasan University, Trichy) Poondi, Thanjavur, Tamil Nadu, India

Dhruti Amin C. G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

A. Anbukumaran Department of Microbiology, Urumu Dhanalakshmi College, Tiruchirappalli, Tamil Nadu, India

V. T. Anju Department of Biochemistry and Molecular Biology, School of Life Sciences, Pondicherry University, Pondicherry, India

Komal A. Chandarana C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

Sapna Chandwani C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

Pushpendra Singh Chauhan Crop Life Science Ltd, Ankleshwar, Gujarat, India

Swapnil Chaurasia Shrimad Rajchandra Institute of Management and Computer Application (SRIMCA-MBA), Uka Tarsadia University, Surat, Gujarat, India

Dhanasekaran Dharumadurai Department of Microbiology, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

Madhu Dyavaiah Department of Biochemistry and Molecular Biology, School of Life Sciences, Pondicherry University, Pondicherry, India

Harshida A. Gamit C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

G. Gayathri Department of Botany, A.V.V.M Sri Pushpam College (Autonomous) (Affiliated to Bharathidasan University, Trichy) Poondi, Thanjavur, Tamil Nadu, India

S. Gomathi Department of Botany, A.V.V.M Sri Pushpam College (Autonomous) (Affiliated to Bharathidasan University, Trichy) Poondi, Thanjavur, Tamil Nadu, India

Sajjan Grover Department of Entomology, University of Nebraska-Lincoln, Lincoln, NE, USA

R. Kannan Kalasalingam School of Agriculture and Horticulture (KSAH), Kalasalingam Academy of Research and Education (KARE), Krishnankoil, Tamil Nadu, India

P. Kavitha Department of Microbiology, Srimad Andavan Arts and Science College (Autonomous), Tiruchirappalli, Tamil Nadu, India

Rajendran Lingan Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

T. Seenivasa Moorthy Kalasalingam School of Agriculture and Horticulture (KSAH), Kalasalingam Academy of Research and Education (KARE), Krishnankoil, Tamil Nadu, India

Ami Naik C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Bardoli, Gujarat, India

Hetvi Y. Naik C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

A. Panneerselvam Department of Botany, A.V.V.M Sri Pushpam College (Autonomous) (Affiliated to Bharathidasan University, Trichy) Poondi, Thanjavur, Tamil Nadu, India

Pooja Patel Government Medical College, Surat, Gujarat, India

Prittesh Patel C.G. Bhakta Institute of Biotechnology, Uka Tarsadia University, Surat, Gujarat, India

Swati Patel ASPEE SHAKILAM Biotechnology Institute, Navsari Agricultural University, Surat, Gujarat, India

R. Pathirajan Department of Botany, A.V.V.M Sri Pushpam College (Autonomous) (Affiliated to Bharathidasan University, Trichy) Poondi, Thanjavur, Tamil Nadu, India

Harish Sankarasubramanian Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Parthasarathy Seethapathy Department of Plant Pathology, Amrita School of Agricultural Sciences, Amrita Vishwa Vidyapeetham, Coimbatore, India

Urjita Sheth Department of Biotechnology, School of Science and Technology, Vanita Vishram Women's University, Surat, Gujarat, India

Busi Siddhardha Department of Microbiology, School of Life Sciences, Pondicherry University, Pondicherry, India

Thirumagal Thirugnanam Department of Microbiology, School of Life Sciences, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India

Raguchander Thiruvengadam Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Part I
Entrepreneurship and Business Plan

Chapter 1
Concept of Entrepreneur and Entrepreneurship

Swapnil Chaurasia

Abstract Through the passage of time, mankind has witnessed evolution of business structures. Right from sharp edged stones to forged metal swords and today laser sharpened sophisticated blades used for grooming purposes. All this transformation has not only been experienced through the products that we use and the businesses that we see today but also the concepts and methodology that gave rise to such transformations. One of this is entrepreneurship, a term that embraces everything that is new, everything that is useful and everything that has the potential to change the future course of action and the way we look at the world. Entrepreneurship can be considered as a natural phenomenon of every business. It is the integral nature that provides the element of an enterprise to a business moving beyond production, distribution, and exchange. The chapter aims at providing in-depth insights about various concepts pertaining to entrepreneurs and entrepreneurship through extensive review of literature covering broad dimensions of entrepreneurship. The chapter incorporates highlights from different pertinent theories related to entrepreneurship and tries to present an elaborated description of the concept and critical aspects associated with the same. As entrepreneurship is defined, understood, and percolated variously in different parts of the world, a model for entrepreneurship is also established using insights from various literatures. The last section of the chapter discusses the recent scenario of entrepreneurship in India and its accomplishments in recent times.

Keywords Entrepreneurship · Characteristics of an entrepreneur · Theories of entrepreneurship · Entrepreneurship in India

S. Chaurasia (✉)
Shrimad Rajchandra Institute of Management and Computer Application (SRIMCA-MBA), Uka Tarsadia University, Surat, Gujarat, India
e-mail: swapnil.chaurasia@utu.ac.in

© The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2023

N. Amaresan et al. (eds.), *Agricultural Microbiology Based Entrepreneurship*, Microorganisms for Sustainability 39,
https://doi.org/10.1007/978-981-19-5747-5_1

1.1 Introduction

Every company is driven through its vision and mission statements. Entrepreneurship is an integral element of any business life that adds to the accomplishments of the company. The people who are directly involved in company activities like the owners, management, directors, and the like are the ones who are most responsible for the realization of the vision that the company has set for itself. However, people come from a variety of backgrounds and have varied levels of education, which presents the diverse talent pool formed by entrepreneurship. This is inescapable and becomes a part of the entrepreneurial process. Furthermore, as economy and technology evolve, entrepreneurship becomes more diverse while also increasing its competitiveness. Innovation becomes the focal point from this perspective. However, overcoming the difficulties of entrepreneurship becomes a task. However, it is critical for us to recognize that not all entrepreneurship activity is beneficial to a corporate organization unless and until entrepreneurial skills and management practices are implemented within the firm to allow for change and learning. Every organization strives to understand and implement elements of entrepreneurship. Thus a close and critical look into the talents is needed. Meanwhile, a thorough understanding of the definition of entrepreneurship is required.

1.2 Defining Entrepreneurship

Since entrepreneurship is considered to be a natural phenomenon in the inception and the journey of a business that can affect the company's performance and its impact on its important stakeholders, it becomes imperative for any business enterprise or entrepreneur to first understand the definition of entrepreneurship before attempting to resolve business challenges and issues (Table 1.1).

Business historians and eminent researchers pioneered the very reservoir of information and knowledge pertaining entrepreneurship in the 1940s and 1950s. Significant institutional drivers of the research agenda in light of entrepreneurship conducted under the aegis of Harvard Business School-based Interdisciplinary Center for Study on Entrepreneurial History, through its extensive and quality-driven publications that focused on emergence and evolution of the concept of entrepreneurship. These works and areas were extensively explored by Alfred Chandler and Joseph Schumpeter and stand significant till date. However, entrepreneurship research hit certain notable methodological barriers, and attention turned to the corporation, leaving entrepreneurship research fragmented and marginalized. Thus, the world has witnessed many notions and angles through which the concept of entrepreneurship was studied and defined. The majority of the definitions of entrepreneurship emphasized on the aspects of the characteristics of an entrepreneur or the result expected out of the process of entrepreneurship (Naser et al. 2011). The

Table 1.1 Definitions of entrepreneurship

Sr. No.	Author(s)	Year	Highlights
1	Frank H. Knight	1921	Established relationship between entrepreneurship and risk taking
2	Schumpeter	1965	Exploitation of market opportunities through innovation
3	Peter Drucker	1970	Entrepreneurship is drive through challenges and risks
4	Hisrich	1990	Highlighting initial characteristics and creative mindset of an entrepreneur
5	Gartner	1990	Inclusion of innovation as one of the personality traits of an entrepreneur out of 90 attributes
6	Thomas and Mueller	2000	Stressed upon the fact that cultural value dominate the characteristics of entrepreneurship
7	Onuoha	2007	Described the concept as building and reshaping of enterprises and businesses
8	Zimmerer	2008	Entrepreneurship is about creating a new business
9	Kuratko	2009	Focused upon making a change through creation and application of ideas
10	Brooks	2009	Described entrepreneurship as the process of pursuing lucrative opportunities

following table summarizes the key highlights of different definition pertaining to entrepreneurship as it evolved over the time.

"The technique of forming new organisations or rejuvenating mature organisations, notably new enterprises often in response to identified possibilities," says Onuoha (2007). "Entrepreneurs," according to Schumpeter (1965), are "individuals who seize market opportunity through technological and/or organisational innovation." "Entrepreneurship is about taking risks," according to Frank H. Knight (1921) and Peter Drucker (1970). An entrepreneur, according to Bolton and Thompson (2000), is "a person who routinely develops and innovates to build something of recognised value around anticipated opportunities." "Someone who exhibits initiative and creative thinking, is able to organise social and economic systems to convert resources and situations into practical account, and embraces risk and failure," according to Hisrich (1990) and Ali et al. (2019). According to Thomas and Mueller (2000), entrepreneurship research should be broadened to worldwide markets in order to understand the conditions and qualities that encourage entrepreneurial activity in different countries and areas. From the above table it is evident that the definition of entrepreneurship had been shaped through various attributes expected out of an entrepreneur or the result desired from the enterprise. It is an amalgamation of various traits and characteristics of an individual taking up an entrepreneurial venture.

There have been various eras and each era highlights different sets of expected behavioral and inherent traits relished to be of critical importance for entrepreneurship (Baum and Locke 2004). Majority of such definitions of entrepreneurship focused upon the ends while some saw entrepreneurship as a well-thought process

to develop a successful organization or a business. Many definitions focused upon the skillsets and the viewpoints of entrepreneurs that shape up a business enterprise (Casper 2000). The economy looks up to entrepreneurship as job generating phenomenon that results in the creation of working avenues and opportunities that would lead to economic prosperity of any country. This definition and notion of entrepreneurship formed the basis for differentiating an entrepreneur from a manager as the end results, or the desired output from both the entities is poles apart (Aulet and Murray 2013). Nonetheless, entrepreneurship is a disciplined and self-sufficient activity that has converted old behaviors into new ones. Entrepreneurship is a kind of expression (Chang and Wyszomirski 2015). According to another study, entrepreneurship "begins with action and the formation of a new organization." According to Barot (2015), entrepreneurship is a key to success, and everybody who starts a new company organization is entering a new paradigm of entrepreneurship. "Art entrepreneurship is a relatively new field of research," Chang and Wyszomirski (2015) said, "and the focus area is exploring the management process of entrepreneurship such as creativity and autonomy, adaptation, and creating artistic as well as economic and social value." Entrepreneurship necessitates dedication. Entrepreneurship is a different discipline in and of itself. Croci (2016) also characterized entrepreneurship as an autonomous and interdisciplinary discipline that may work independently.

1.3 Entrepreneurs Versus Managers

There has been a long debate since the emergence of the concept of entrepreneurship and management. Though both the terms are interrelated in more than one way, there exist distinct differences between these terms. Without a second thought there is a clear distinction between a manager and an entrepreneur, as these two entities have different roles and responsibilities and what is expected of them. The manager's foremost responsibility is to oversee the resource pooling process and effectively manage the firm's business portfolio (Baumol 1988). They play an important role when, as is often the case, businesses do not perform efficiently and fall far short of their production limits. A second, but equally important, role of the manager is to establish a reputation and foster an atmosphere of trust, which turns a conflictive system (individuals with competing goals) into a cooperative one. Managers should foster a culture of trust so that employees are less likely to engage in opportunistic behavior, even when it serves their short-term interests, while also increasing efficiency by lowering supervision and agency costs (Acemoglu et al. 2001). On the other hand entrepreneurs are resource providers. They are the ones who walk the extra mile for furnishing best of the resources that can be optimally utilized by the firm (Eisenmann and Eisenmann 2013). Entrepreneurs are not limited to the constraints of scope of functioning as with the case of managers.

The entrepreneurial function entails the identification, evaluation, and exploitation of opportunities, such as new products, services, or manufacturing processes; new strategies and organizational structures; and new markets for previously

unavailable products and inputs (Shane and Venkataraman 2000). The entrepreneurial opportunity is a previously untapped and undervalued economic resource. Because various actors have different notions about the relative value of resources or when resources are transformed from inputs to outputs, entrepreneurial opportunities abound (Brown and Eisenhardt 1995). The entrepreneur's theory focuses on the diversity of opinions regarding the worth of resources. The entrepreneurial function can be defined as the identification of new economic opportunities and the subsequent production of new economic activity, frequently through the formation of a new company. As there is no market for opportunities, an entrepreneur leaves no stone unturned when it comes to utilization of available resources. Right from the stage of procurement to the last stage of conversion process the entrepreneur makes sure that the best possible resources are obtained. Thus the transformation process of input into output solely rests on the shoulders of an entrepreneur (Amit et al. 2003). The difficulty in protecting ownership rights of ideas that are not associated with patents or copyrights, as well as the different expectations held by entrepreneurs and investors on the economic value of ideas and business opportunities, and the entrepreneur's need to withhold information that may affect the project's value, are all disadvantages to the market for "opportunities" that are also viewed by many academicians as a set of probabilities with numerous determinants (Sexton and Bowman 1985). The entrepreneurial component, entrepreneurial function, entrepreneurial initiative, and entrepreneurial behavior are few terms used to describe entrepreneurship, and it is also referred to as the entrepreneurial "spirit," which is purely subjective and has been an area of study in the domain of entrepreneurship since quite some time. The entrepreneurial component is regarded to be a new factor in production that differs from the traditional conceptions of earth, work, and capital, and must be explained by the entrepreneur's remuneration in the form of money, as well as a scarcity of people with entrepreneurial qualities (Stewart and Roth 2001, 2007). Thus, entrepreneurship appropriately justifies the reason to be one of the factors of production.

The discovery and exploitation of opportunities, as well as the establishment of a business, are both considered entrepreneurial functions unlike managerial responsibilities, which are limited to administration. Entrepreneurial behavior is defined as behavior that combines creativity, risk-taking, and foresight. In other words, it includes famous theories of the innovative entrepreneur proposed by Schumpeter, the risk-taking entrepreneur who operates in an uncertain environment, and the entrepreneur with initiative and imagination who generates new chances whereas managers are acquainted with controlled atmosphere and less volatile variables pertaining to business. The importance of accurately anticipating market flaws or the ability to innovate in order to develop new and innovative combinations of strategies and resources which is highlighted by entrepreneurial "initiative." Inside or outside of an established company, entrepreneurial initiative encompasses the notions of creation, risk-taking, renewal, and innovation (Ahuja and Lampert 2001). Finally, the entrepreneurial spirit prioritizes exploration, search, and creativity over the exploitation of managerial business prospects. All of these help to explain why entrepreneurship is described in so many ways (Table 1.2).

Table 1.2 Difference between entrepreneur and manager

Entrepreneur vs. Manager	
Entrepreneur	Manager
Explores resources	Manages resources
Creates and enterprise	Administers an enterprise
Exploits opportunities	Utilizes inputs provided
Self-driven	Driven by management
Have a risk appetite	Usually risk averse
Can be intuitive and irrational	Tries to be logical and rational
Self-controlled	Requires supervision and monitoring
Opportunity driven	Data/analysis driven

Entrepreneurial functions differ from managerial functions, having said that it does not mean in any sense that an entrepreneur is not expected to perform major managerial functions like planning, organizing, directing, controlling and coordinating. The studies along with factual data analyze various behavioral and psychological variables that can be used to study entrepreneurial responses to business situations and complex problems. Recent studies along with foundation researched support the fact that various intrinsic factors act as a trigger and motivate behaviors of an entrepreneur including the need for achievement, which is posed to be greater in entrepreneurs than in managers. The tendency and nature to exercise control over opportunities and resources are also found to be greater in entrepreneurs than in managers. Thus, it can be inferred that despite the similar functions of an entrepreneur and a manager, the end outcomes and desired results of present actions differentiates the said two.

1.4 Entrepreneurial Process

The entrepreneurial process has been proposed in different ways, as the process of business development is not strictly based on science of sequence. Thus, one universal process will not suffice the need. Theories on entrepreneurship try to provide insights on broad areas that can act as a consideration for creating and nurturing an enterprise. Business processes include identifying and assessing opportunities, deciding to use or sell opportunities, procuring resources, and developing strategies and organizations for new business projects. Entrepreneurship is the "process of an individual seizing an opportunity alone or within an organization". Recently, when many business owners and businessmen have shown entrepreneurship in strategy development, it has been suggested that companies have a much brighter future than current perceptions suggest. The core activity of an entrepreneur is the establishment of a company (Mack and Pützschel 2014). The concept of entrepreneurship played a pivotal position in the emergence of any business enterprise. Since the mid-nineteenth century, various economists had critiqued the static

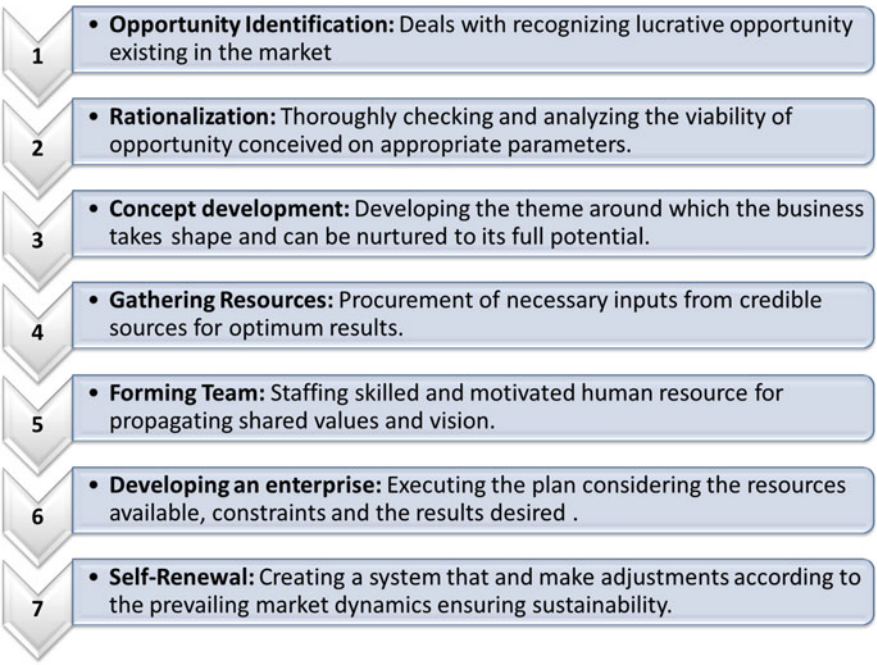


Fig. 1.1 Entrepreneurial process

theories of classical and neoclassical economic thought documenting the methods wherein the shape of economies had modified over a period of time. Many factors and determinants came into picture during the early twentieth century barring the classical notion of establishment of company and enterprise as an institution and accepting the agency of the humanistic characteristic with that of the creation nurtured under the embrace of economic conditions majorly. The changes in economic conditions led to the restructuring of the economy making the conditions conducive for entrepreneurs to incubate and nurture the business venture, thus, motivating the risk bearers in the form of entrepreneurs toward such rapid change and transformation.

Even though the entrepreneurial process for business development may take any course subjected to environmental and personal needs of an entrepreneur, a basic course of action can still be crafted so as to broadly characterize phases that would require different approaches coupled with varied skillset of an entrepreneur. The entrepreneurial process includes the following steps (Fig. 1.1).

1. Opportunity identification
2. Rationalization
3. Concept development
4. Gathering resources
5. Forming team

6. Developing an enterprise
7. Self-renewal

To develop substanc from analysis of aspects like the economic, social, and cultural environment. Efforts are being made to understand different environmental variables that include social, cultural and common values, institutions related to legal frameworks, variables of economic environment (demand) and financial environment (risk capital and cost), and spatial environment (cluster and cohesive economy) (Abbey 2002). Therefore, three basic ideas are considered that explain the emergence of entrepreneurial activity. Initially focused on the individual, entrepreneurship is understood as a human attribute such as willingness to change, risk acceptance, performance needs, and the like. The other basic idea motivates entrepreneurial behavior, such as market dimensions, dynamics of technological change. The third assumption is the idea that is related to the function, culture, and social values of the institution. These approaches are not exclusive, as entrepreneurial activity is also a human activity and does not occur spontaneously solely due to economic environment, technical, normative, and demographic.

1.5 Factors Affecting Entrepreneurship

Abundance of literature, bearing factors affecting entrepreneurship, has been made available through various credible sources realizing the criticality of aspects pertaining to entrepreneurship. These factors include national culture, education, experience, family background, need for achievement, internal locus of control, attitude, government policies, and the like (Kogut and Singh 1988). These factors act as triggers and catalysts for entrepreneurial activities and in many ways affect the entrepreneurial mindset of an individual embarking on an entrepreneurial venture.

1.5.1 National Culture

Entrepreneurs in different countries have some universal characteristics, but there may also be other characteristics that are unique to their culture (Welter et al. 2016). Entrepreneurial behavior is always associated with cultural values, which are based on the framework of the cultural aspects of Hofstede. Studies show that national culture has a great impact on entrepreneurship. This study focuses on the relationship between Turkish culture and its entrepreneurial spirit and is based on how national culture relates to the level of entrepreneurship. National culture was previously defined by many scholars. Culture is defined as a set of shared beliefs, values, and expected behaviors (Hofstede 1980a). Deeply rooted, unconscious, and even irrational shared values shape political institutions and social and technological systems, all of which simultaneously reflect and reinforce values and beliefs.

National culture has been described in various ways by scholars. Culture is described as shared beliefs, values, and predicted behaviors (Hofstede 1980b). Deeply embedded, unconscious, or even irrational shared values form political establishments in addition to social and technical systems, all of which concurrently mirror and improve values and beliefs (McCloskey and Sandberg 1971). These values form a part of many theories related to entrepreneurship and the manner in which entrepreneurship takes up a shape in different nations.

1.5.2 Education

Education is one of the important elements of human capital. It is a source of knowledge, skills, discipline, motivation, and self-confidence (Cooper et al. 1994). A significant amount of research has been done on the basis of human capital theory to investigate the impact of education on the performance of entrepreneurs and their businesses. Highly educated people are expected to run their businesses better than less educated people. Though education as an element alone does not guarantee success, it actually helps in enriching and enhancing the impact of the efforts that an entrepreneur puts into the business venture. Empirical evidence from education and entrepreneurship shows a mixed relationship (Foreman-Peck 2006; Lekoko et al. 2012). They have been positive, neutral, and, in some cases, negative correlation. They were obtained through analysis of real time data. For example, the research conducted by Stewart, Watson, and Barnir in 2003 and Neubaum in 2005 showed positive relationship between success and education of entrepreneur, whereas, the study by Bukvii in 2012 showed negative relationship.

It is not easy to discuss the importance of education to the success of an entrepreneur, as it depends on different aspects, such as the industry to which the company belongs. The role of education differs from sector to sector and from one industry to another (Fayolle and Gailly 2008). For example, education is more important to manufacturing entrepreneurs and is more obvious than entrepreneurs in other industries. A particular type of education is a more accurate prediction of a particular type of business and its performance (Jenkins and Griffith 2004). Education has different implications when measured by indicators (Hattab 2015). For example, the impact of education on entrepreneurs differs between when measured in terms of profitability and sales and when measured in terms of employment. In many countries one of the major parameters to measure the impact of education over entrepreneurial success is through the market capitalization of the venture. This assessment does neglect the qualitative aspect of the impact and measure only the quantitative impact of education. Thus, in order to measure the impact of education on entrepreneurial success both aspects should be given equal weightage.

1.5.3 Experience

Another most sought after element that affects entrepreneurship is experience. Experience provides an edge to an individual especially in critical circumstances. Through experience, people collect useful information and develop skills in different professions. So far, various aspects of previous experience have been discovered in the literature. However, the most commonly cited types of experience are entrepreneurship, management, and industry experience. Entrepreneurship experience refers to the number of previous startups and the role they play in those ventures. Industry experience refers to the experience in the industry to which the current company belongs. Management experience refers to management experience regardless of industry. As discussed earlier in the chapter, entrepreneurs have to perform all the functions of a manager to increase the sustenance of the venture. Studies on human capital confirm the importance of experience to be a successful entrepreneur. They claim that previous experience improves the company's economic performance (Judge et al. 2007). From an industrial experience perspective, researchers suggest that individuals entering areas they are familiar with are more likely to succeed in their business as they tend to make less errors and the amount of rework is reduced by a margin. They understand better than others how to meet the demands of this market and the volatility in it. As a result, these individuals are more likely to gain information that the outsiders and new comers cannot collect nor have easy access to. This experience helps build an entrepreneurial knowledge base, improve access to market information and corporate networks, and improve management skills. They may also have useful contacts and sufficient experience to understand the types of products in demand in their business context. Thus, experience acts as an equity that is reaped in critical and demanding situations.

1.5.4 Family Background

Family background acts as a backbone for entrepreneurial behavior as it shapes the responses of an individual to a great extent. It is possible to acquire the knowledge necessary to start one's own business through family background, especially when it comes to countries in which majority of the businesses in key sectors belongs to the category of family owned enterprise, like India to be precise. There are several reasons why entrepreneurial children also known as the second-generation entrepreneurs are likely to be self-employed. These factors generally derive from the mechanism of exposure and obstruction. The exposure mechanism focuses on how the parent's social position exposes the child to experiences and expectations that have a significant impact on career choices. Scientists argue that children of self-employed parents are more likely to see self-employment as a viable career choice than their peers. Independent parents can act as role models for their children. This role-modeling feature not only means that children value independence more than

other forms of employment, but it can also encourage entrepreneurial behavior like risk taking ability. Another reason in support of the concept is availability of the resources in the form of privileges. Easy and instant access to capital and crucial infrastructure provide self-confidence to the individual looking to take up risky but lucrative ventures. It argues that entrepreneurial children can successfully enter self-employment because they have better access to knowledge about entrepreneurial opportunities Thus, it is a clear explanation of how the family background influences an entrepreneur and entrepreneurship as a whole.

1.5.5 Need for Achievement

Need for achievement is one the important psychological aspect that affects entrepreneurship. The need for achievement was introduced in a motivational theory by McClelland in 1961 along with two other important needs that lead to a certain kind of behavior. It was proposed that people in need of high achievement prefer to solve problems as their need for high performance is directly linked to their need for achievement. These individual set high goals, and strive to achieve those goals themselves (Kirby 2003). Certain advance theory assumes that people with high performance needs are more entrepreneurial and often perform better than those with low performance needs (Collins et al. 2004). They spend their time thinking about how to make their job better and how to achieve something that matters to them, thus enhancing their productivity through channelized efforts, which are lead to high reward achievement (McClelland 1961a, b, 1965, 1987).

1.5.6 Innovativeness

In the modern times, innovation is considered as a refined meaning of "change." Innovativeness is an integral element of entrepreneurial persona, which allows the entrepreneur foster accomplishments of their enterprise. This element emphasizes on a real time and active methodology in regard to innovation, which includes a gradual day by day attempt to enhance one's activities, work processes, and procedures. Schumpeter (1934) turned into one of the first authors to introduce the function of innovation into the entrepreneurial process. He perceived innovation as a scientific look for changes, possibilities for brand new markets, merchandise, or thoughts. Numerous articles and literature have described the potential of entrepreneurship in bringing radical as well as incremental innovation not only in markets but in the economy as a whole. As proposed by him dynamic entrepreneurship is a phenomenon in which an individual is an entrepreneur who innovates and who makes new combinations (Graham and Shuldiner 2001). These combinations of various resources, coupled with innovative capabilities of an entrepreneur, provide astonishing results in the form of new products, new markets, new methods of production,

and new capabilities. Innovativeness is an aspect that provides scope and pathway for development and evolution as per the requirements of the dynamic market place.

1.5.7 Locus of Control

Locus of control is ability, a required skill, and one of the most important factors that can affect entrepreneurship in more than one ways. It refers to an individual's potential of perceiving things to persuade activities, which are of prime significance. It primarily is concerned with external and internal forces that determine the consequences and results of the behaviors and actions taken by an entrepreneur throughout his/her entrepreneurial journey. The notion that outside or external drivers determine the results forms one end of the ideology while the ones with conviction that inner and intrinsic drivers determine the ends forms the other ideology of this factor. The former is called as externals and the latter is termed as internals. Both these aspects of one's persona greatly affect the destination and the end results. The variables like randomness, chances, and the like are not appreciated by the internals and thus, they develop stronger and advanced level of need for achievement, performance, and reward.

1.5.8 Attitude

Attitude is the most important factor affecting entrepreneurship at a level, which is beyond measurement. Almost all the psychological and behavioral aspects in the form of variables some way or the other are interlinked with attitude of the entrepreneur. It is said that enterprise is shaped in the vessel of attitude. Attitude is reflected through qualitative and subjective aspects like optimism, pessimism, and realism. Entrepreneurs with optimistic approach are the ones with great intuitiveness driving their actions whereas an entrepreneur with pessimist approach is more cautious and analysis driven to avoid worst case scenarios. Realist entrepreneurs are the ones who explore all the possible opportunities to convert into profitable ventures. Whatever the mindset is, an entrepreneurial venture is impacted by the attitude an entrepreneur reflects (Fig. 1.2).

1.6 Theories of Entrepreneurship

Entrepreneurship theories and research will continue to be vital in the field's development. Scholars have proposed several hypotheses to explain the topic of entrepreneurship. Economics, psychology, sociology, anthropology, and management all have roots in these theories. Entrepreneurship theories cover a wide range of

Fig. 1.2 Factors affecting entrepreneurship

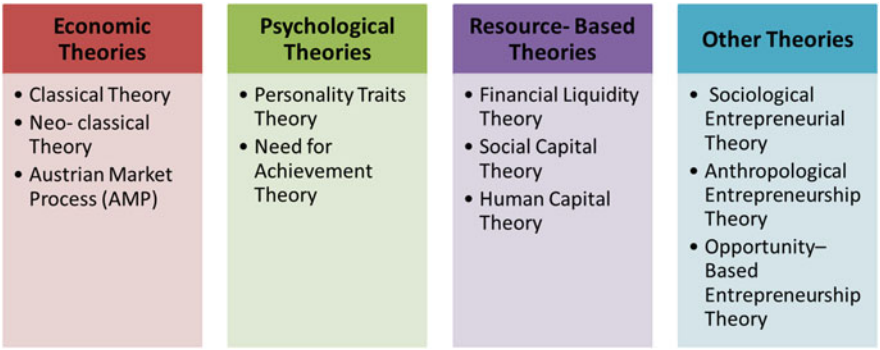


Fig. 1.3 Theories of entrepreneurship

aspects that are critically important for development of entrepreneurship and entrepreneurial traits. These theories lay emphasis on various dimensions, personality traits, situational factors, and the like, which have an effect on entrepreneurs and sometimes paves the basis for measurement of an entrepreneur's effectiveness and efficiency. These theories are broadly categorized as follows (Fig. 1.3).

1.6.1 Economic Theories of Entrepreneurship

These theories that deal with virtues of free commerce, specialization, and competition were lauded in classical theory. In a competitive marketplace, the classical theory proposed and reflected the entrepreneur's directing role in the creation and distribution of goods and services (Weber 1930, 1956). Though the hypothesis has had its own critique on the grounds that it was not able to provide explanation to the dynamic transformation brought about by the entrepreneurs of the industrial-era, the correction to this model was brought by Neoclassical theories claiming that economic phenomena could be reduced to instances of pure trade, reflect an optimal ratio, and occur in an essentially closed economic system. Even though the theory did come up as advancement over classical theory, lacuna in terms of entrepreneurship at an individual tier was still missing as the theory concentrated mainly on the macro factors like aggregate supply and demand. The setback of this theory was addressed by AMP, which is the Austrian Market Process that deliberately focused on human actions and behavior pertaining to their knowledge and its impact on an economy (Austin et al. 2006). The AMP highlighted the innovativeness of an entrepreneur in an economy and his/her capability of creating something "NEW," which in turn is regarded as the founding stone of enterprising. The stepping stone of creating something new sets the economy in a cyclical motion of production, distribution, and exchange.

1.6.2 Psychological Entrepreneurship Theories

Psychology is the scientific study of mind and behavior. Psychology includes the study of conscious and unconscious phenomena, including feelings and thoughts. It is an academic discipline of immense scope, crossing the boundaries between the natural and social sciences. Psychological theories of entrepreneurship view entrepreneurship from that of personal characteristics of human, highlighting the behavioral and attitudinal dimensions (Krauss et al. 2005). Many theories have been incorporated providing massive literature that focused on personality of an entrepreneur. It has been found that the personality of an entrepreneur shapes the entrepreneurial venture taken up by the entrepreneur. A hefty list is of such personality traits that are available in the literature, which reflects distinct behavior of an entrepreneur and supports that these traits impact the overall molding and functioning of an enterprise (Zhao et al. 2010). Traits such as risk bearing capability, taking initiatives, composure, aggressiveness, and ambitious and the like are some widely witnessed and supported traits of an entrepreneur. These traits are demonstrated by majority of entrepreneurs across the globe and thus have deep rooted establishment in the development of personality theories of entrepreneurships (Lent et al. 2000). These traits are patterns of behaviors that entrepreneurs show during their entrepreneurial journey. These traits can be inherited and are acquired too. The origin of psychological or behavioral traits is yet a debatable topic but the fact of the matter is