How to Craft Your Dream Final Year Project
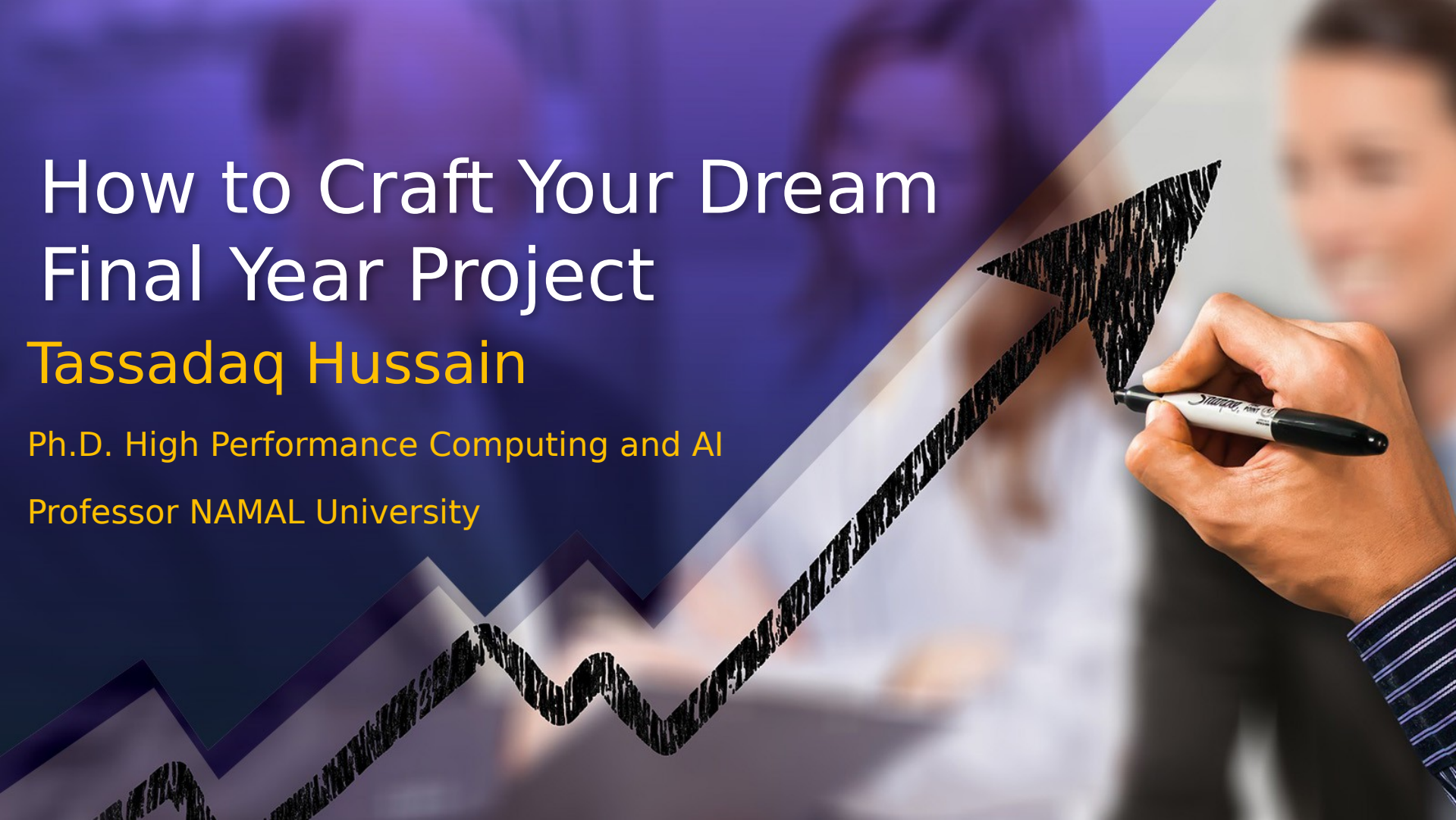
Tassadaq Hussain

Ph.D. High Performance Computing and AI

Professor NAMAL University

Introduction

Education:

PhD. Barcelona-Tech
Microsoft Research, Infineon Technologies France, Microsoft Research Cambridge, IBM

Suspenseful record of academic management as Professor and Dean

Enhanced Education Quality by Inculcating Outcome Based Education by Applied and Sustainable Projects

Experience:

19+ year's versatile experience in the area of Computing, Artificial Intelligence and IT.

Served National and International Academia, Industry and Government

- Barcelona Science Park Spain
- Cambridge Science Park UK
- Technopolis Of Sofia-Antipolis, France

Innovation, Research and Commercialization

- **Innovation and Research**
  - **80+ Million Pkr National and Int'l Funding.**
  - Supercomputing and Artificial Intelligence
  - Smart Electric Motor Controllers
  - Biomedical Applications
  - **80+ Publications**
  - **10 Patents**
  - **10 MVPs**
  - **5 Int'l Collaborations**

- **Development and Commercialization**
  60+ Million of Industrial Investments.
  Developed Digital Systems for Industry.
  Transform Idea into product.
  Innovation and Commercialization for Sustainable economic and industrial development.

- **Capacity Building:**
  Conducted more than **50 national and international workshops** and **training on Commercializable research, Writing successful grant proposal, and research and innovation.**

  Provides Consultancy and Support for Entrepreneurship, Start-ups, Business Innovation and Technology transfer.

Synergy: Science and Technologies

Agenda

- Personal Introduction
- **Final Year Project ?**
- Exploring Job Hunting Strategies
- Future Research Directions
- Analyzing the Viability of Start-up Business Models

Final Year Project

It provides Undergraduate students an opportunity to apply their theoretical knowledge to real-world problems or explore a specific area of interest within their chosen discipline.

It serve as an assessment of the student's proficiency, a means of showcasing their abilities to potential employers or graduate schools, or a platform for innovation and creativity.

Factors that Influence the FYP Selection

- **Long-standing motivation to solve a problem since childhood.**
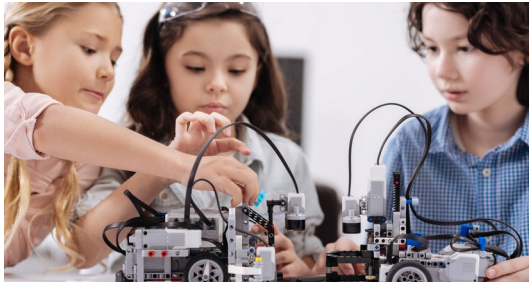
- **Recognition of social or industrial issues in surrounding.**

- **Aspiration to gain knowledge from the course.**

Factors that Influence the FYP Selection

- **Supervisor's Project: Idea, Processes, Methodology, Business Model, Financial Planning and Commercialization.**

Its never too late to START?

Vision
Mission
Targets

Having meaning not money

To improve quality of life

Title: Slogan: Mantra

- Wendy's   "Healthy fast food"
- FedEx   "Peace of mind"
- Nike   "Authentic athletic performance"

https://guykawasaki.com/speeches/

Mission

Job Hunt
- Technology
- Area
- Industry

Research
- Problem
- Impact
- Funding

Start-up
- Market
- Business Model
- Financial Planing

Higher Education, Industrial Development and Economic Growth
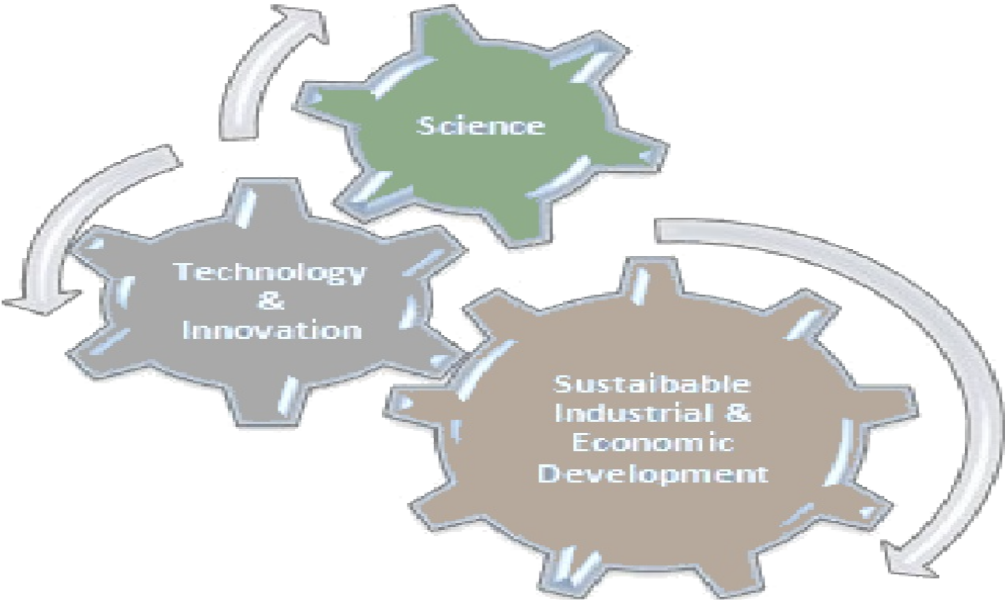
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Definition

Research: Creative and systematic work undertaken to increase the stock of knowledge.

Innovation: A new idea, method, or device.

Development: Implementation of research findings and innovative ideas to bring about practical and tangible outcomes.

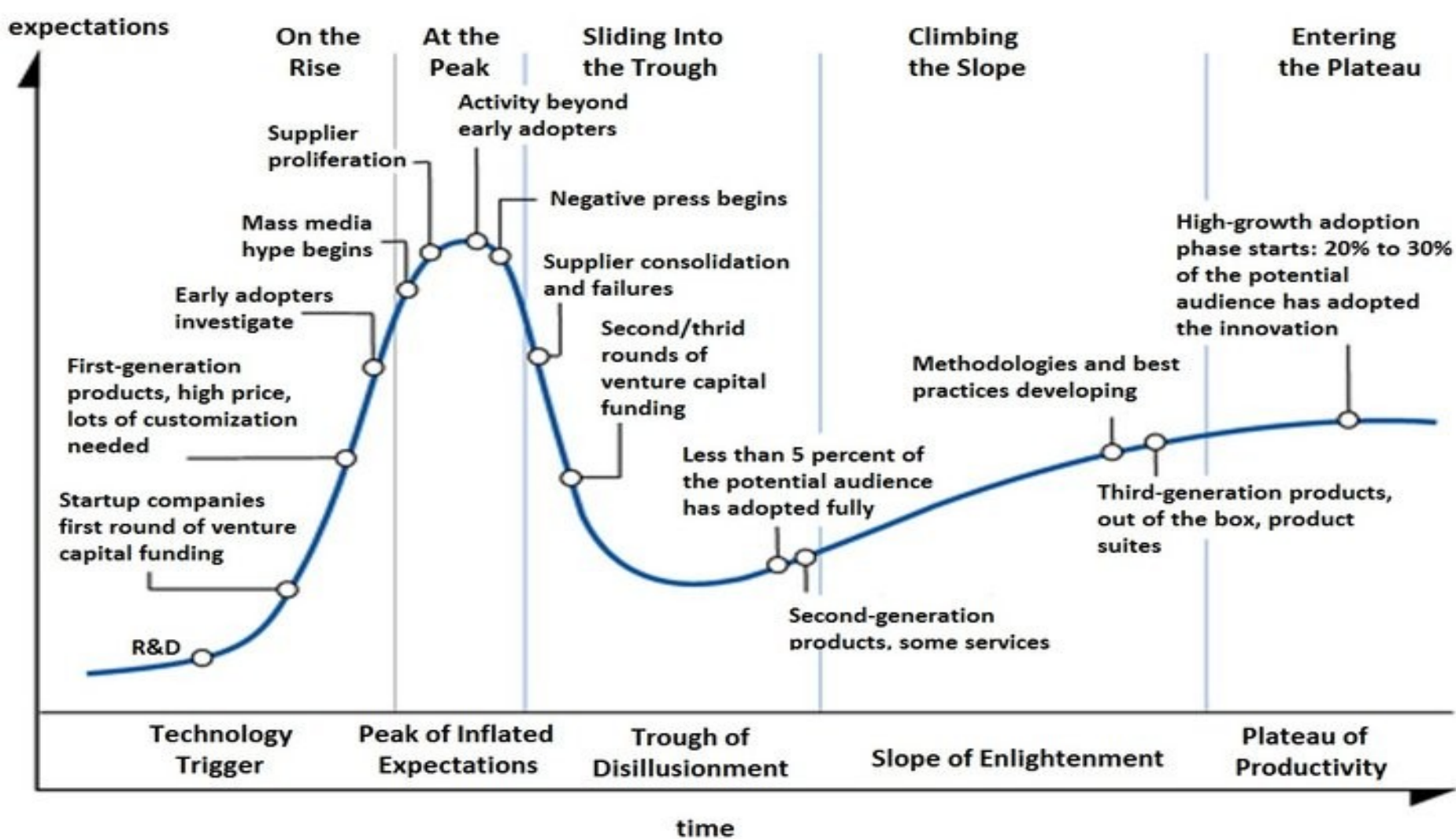| Research Area	Potential Funding Sources	Global Fund (Estimation)	Global Market Overview
Artificial Intelligence (AI)	Government grants, private foundations, industry funds	$15 billion - $20 billion annually	Rapid growth across industries, including healthcare, finance, and automation. Increasing demand for AI solutions and applications.
Biotechnology and Biomedical Sciences	National Institutes of Health (NIH), pharmaceutical companies, research grants	$100 billion+ annually	Expanding healthcare industry, advancements in genetics, personalized medicine, and drug development.
Climate Change and Environmental Sustainability	United Nations (UN) grants, environmental organizations, corporate sustainability funds	$20 billion+ annually	Increasing global concern for climate change, renewable energy, sustainable development, and environmental conservation.
Cybersecurity and Information Technology	Government cybersecurity programs, industry research grants	$10 billion - $15 billion annually	Growing importance of data protection, rising cybersecurity threats, and increased demand for secure IT systems and technologies.
Data Science and Big Data Analytics	Research councils, technology companies, data-driven organizations	$20 billion+ annually	Expanding need for data analysis, predictive modeling, and data-driven decision-making across various sectors, including finance, healthcare, and marketing.
Energy and Sustainable Technologies	Government energy programs, renewable energy funds, green technology investors	$50 billion+ annually	Growing emphasis on renewable energy sources, energy efficiency, and sustainable infrastructure development globally.
Neuroscience and Brain Research	National Institutes of Health (NIH), neuroscience foundations, academic grants	$10 billion - $15 billion annually	Increasing focus on understanding the brain, neurodegenerative diseases, mental health, and advancements in brain-machine interfaces.
Chip Design	Semiconductor companies, government research grants, industry collaborations	$20 billion - $25 billion	Growing demand for high-performance integrated circuits, advancements in semiconductor technology, and emerging applications in areas such as AI, IoT, and autonomous systems.
Space Science and Astronomy	National Aeronautics and Space Administration (NASA), space agencies, astronomy foundations	$10 billion - $15 billion annually	Advancements in space exploration, satellite technologies, astrophysics, and cosmology research.
Social Sciences and Public Policy	Social science research councils, policy institutes, non-governmental organizations (NGOs)	$10 billion+ annually	Addressing societal issues, policy analysis, public health, education, economics, and social behavior research.

Design and Development

- Hardware Design

- Software Application

- Data Sciences

- User Interactive Interface
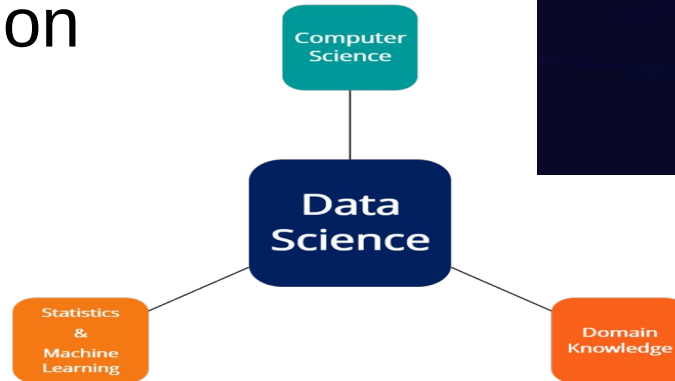
Tools and Tech

Local

- 2.5 Revolution
- Automation & Control
- Data Management and UI/UX Design

Int'l

- Hardware Technology
- Software Development

1750	1800	1850	1900	1950	2000

FIRST [1784]
Mechanical production, railroads, and steam power

SECOND [1870]
Mass production, electrical power, and the advent of the assembly line

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FOURTH [NOW]
Artificial intelligence, big data, robotics, and more to come
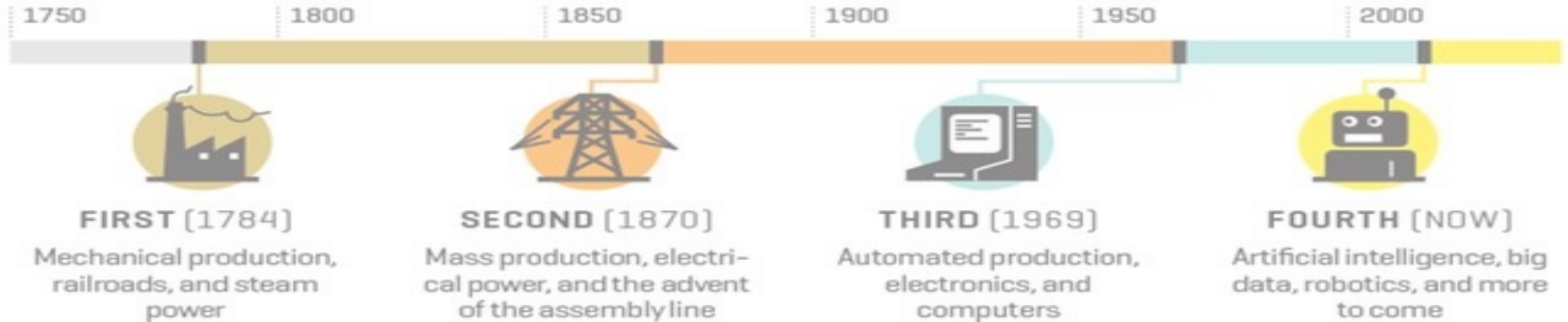
Types of Scholarship Grants and Funding

- Scholarships (Organizations and Government Grants)
    - }	Erasmus+ (Europe)
    - }	DAAD's scholarship
    - }	Eiffel Excellence Scholarship Programme (France) ...
    - }	Chevening Scholarships (UK) ...
    - }	(http://www.ucerd.com/Get_Funds_Pakistan.php)
- Research Projects
    - }	Professor of Universities
- Industrial Projects
    - }	IBM
    - }	Intel
    - }	 STMicroelectronics

Scholarships

- 100,000s of scholarships and financial support schemes available across Europe for international

- 1.7 million fellowships and private scholarships in the United States are awarded each year (Dickler, 2020).

- Around 1,581,000 scholarships are available to undergraduate and graduate students each year (Scholly, 2020).

- Germany. A particularly popular country for admission among students from all over the world. No wonder: In Germany almost all universities are free of charge and the country's largest scholarship fund — DAAD — provides a scholarship to cover living expenses.

Number of countries
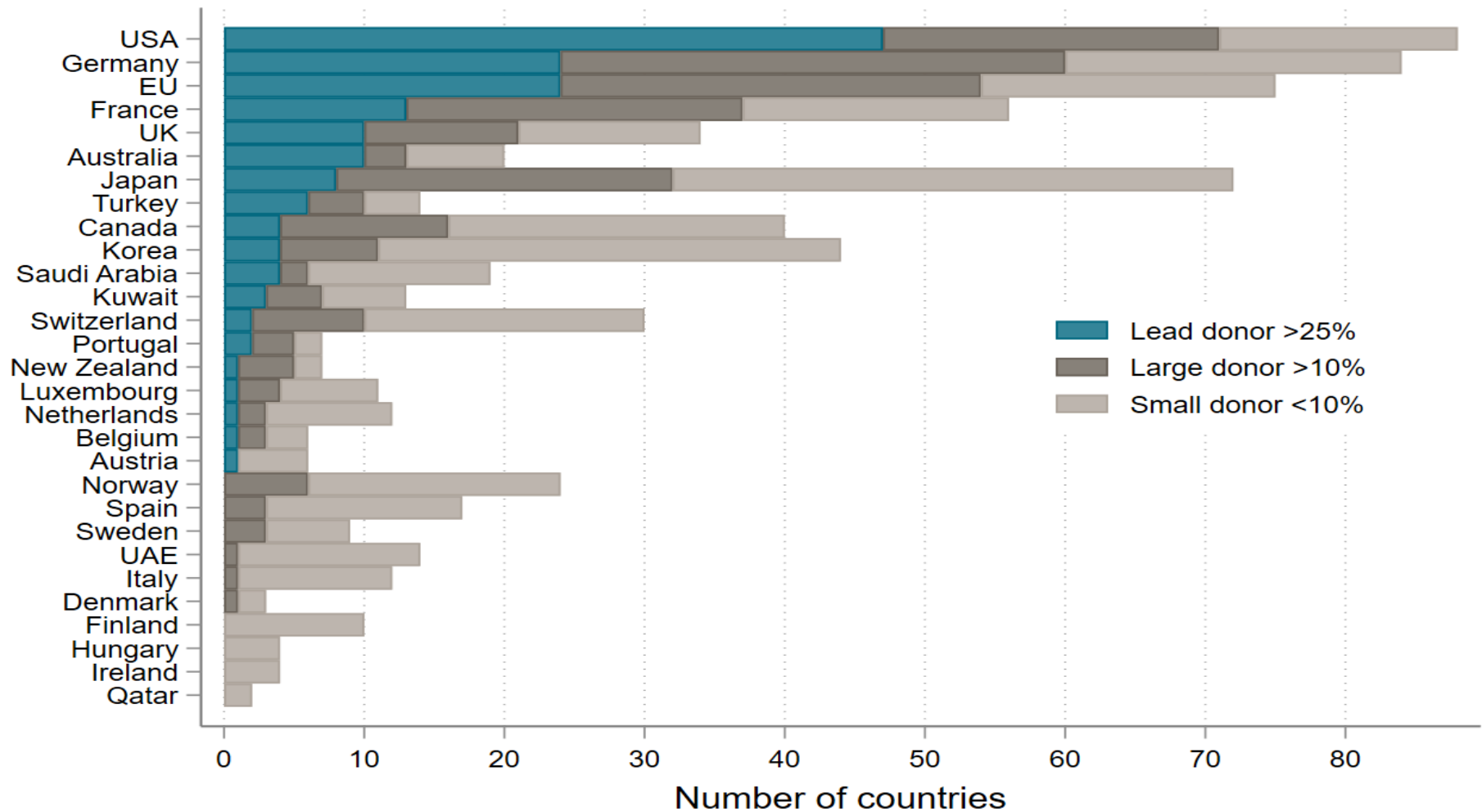
Top 10 Scholarships Programs

- Chevening Scholarship (UK)

- Fulbright Scholarships (USA)

- Endeavour Postgraduate Awards (Australia)

- Eiffel Excellence Scholarship Programme (France)

- GREAT Scholarships (UK)

- Rotary Foundation Global Study Grants (Global)

- Pierre Elliott Trudeau Foundation Scholarships (Canada)

- Commonwealth Scholarship

- Aga Khan Foundation International Scholarship Programme

- Joint Japan World Bank Graduate Scholarship Program (USA, Africa, and Japan)

UCERD
Gathering
Intellectuals
www.ucerd.com

For Pakistani Students

HEC Foreign Scholarships	**HEC National Scholarships**
NEST — National Environment & Education for Talent — **NEST Scholarships**	JICA — **Japan International Cooperation Agency Scholarships**
CHEVENING — **Chevening Scholarships**	**Fulbright Student Scholarships**
Australia Awards — **Ausaid Scholarships**	CAMPUS FRANCE — **France Scholarships**
World Bank Scholarships	IsDB — Islamic Development Bank — **Islamic Development Bank**
ADB — **Asian Development Bank Scolarships**	70 YEARS USEFP — **The United States Educational Foundation in Pakistan**

Our European Research Collaborators

- Barcelona Supercomputing Spain

  - Supercomputing and Artificial Intelligence

- Universite de Valenciennes France

  - Biomedical Signal Processing and Image Processing

  - Iridology

- CARE-Tech. TU-WIEN Austria

  - Secure Software, Hardware and Networking

- Institut supérieur d'électronique de Paris

  - VLSI, Digital System Design

HiPEAC

- High Performance and Embedded Architecture and Compilation

- HiPEAC is a European network of almost 2,000 world-class computing systems researchers, industry representatives and students.

European Research Funding Areas

Approximate computing

Compilation

Computer architecture

Cyber-Physical Systems

Data management

Design Space Exploration

Disruptive technologies

Embedded Systems

Energy efficiency / Low-power computing

GPUs / Heterogeneous systems

HPC / Exascale

Machine Learning / AI

Memory

Multicore / Manycore

Networking / Distributed computing

Parallel computing

Performance portability

Programming languages

Reconfigurable computing

Resource management / Scheduling

Robotics

Runtime performance / Optimization

Safety and Security

Simulation

Storage / IO

System Development

Usability

https://www.hipeac.net/jobs/#/

Title: Cool and Catchy Title with Key Words that Represent Scientific Innovation, Tool, Technology and Techniques used to solve the Problem

Abstract—

☐ Tell about key research problem in one sentence and why a novel solution is required

☐ State key scientific contributions, precisely and in the best

possible way that novelty is highlighted.

☐ Provide short implementation details and key results,

especially improvements over state of the art.

☐ Highlight if you are making some open-source contributions.

Q1: What is the key research problem that you are targeting in this paper and why is this an important problem? Explain the problem with solid references and (if possible) with real experimental evidence.

Q2: What are the major state-of-the-art works that target this problem. State their major pros and cons. Here state the related works in categorized form, in a succinct way, such that the discussion does not get long. Detailed related work will come in a separate section. In case of a 6-page paper, 1 paragraph of related work can be directly integrated in this introduction section, as space should be given to own work mostly.

Q3: What are the major limitations of the state-of-the-art, tell in discussion as well highlighted by your own experimental analysis. Put some short form here, and detailed in the motivational case study. If this can be done in 1-2 paragraphs, then the motivational study can be put inline here. The key goal should be coming quickly coming to major scientific challenges targeted in this paper, and the novel contributions that address these challenges.

Q4: What are your novel contributions, and how can they solve the above scientific challenges? State clearly, and highlight novel keywords. Justify why your novel contributions go beyond state-of-the-art and how!

Q5: What are your major results, and improvements over state-of-the-art? Is your experimental setup convincingly correct and reproducible? Can you ensure reproducible results, etc.? => Most of these parts should be justified in the detailed experimental setup and results sections, but here 1-2 sentences are important to convince or IMPRESS the reviewer that your evaluation is really thorough and he should believe your evaluation methodology and credibility of the results.

Agenda

- Personal Introduction
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- **Exploring Job Hunting Strategies**
- Viability of Start-up Business Models

Percentage of companies that have difficulty filling open positions by discipline

Discipline	Percentage
Electrical Engineering	60%
Computer Science / Software Engineering	35%
Mechanical Engineering	35%
Computer / Systems Engineering	30%
Materials Science / Chemical Engineering	30%
Operations	20%
Other*	15%
Industrial Engineering	10%
Physics	10%
Business (Finance, Accounting, Economics)	5%
Mathematics	5%

Hype Cycle for Artificial Intelligence, 2022

EXPECTATIONS / TIME

- Synthetic Data
- Smart Robots
- Foundation Models
- Edge AI
- Knowledge Graphs
- Responsible AI
- Generative AI
- Neuromorphic Computing
- ModelOps
- Operational AI Systems
- AI TRiSM
- Composite AI
- Natural Language Processing
- Decision Intelligence
- Digital Ethics
- AI Engineering
- AI Maker and Teaching Kits
- Data-Centric AI
- AI Cloud Services
- Causal AI
- Physics-Informed AI
- Deep Learning
- Computer Vision
- Data Labeling and Annotation
- Intelligent Applications
- Artificial General Intelligence
- Autonomous Vehicles

Innovation Trigger — Peak of Inflated Expectations — Trough of Disillusionment — Slope of Enlightenment — Plateau of Productivity

As of July 2022

Plateau will be reached: ○ <2 yrs. ○ 2–5 yrs. ● 5–10 yrs. ▲ >10 yrs. ⊗ Obsolete before plateau

Gartner.
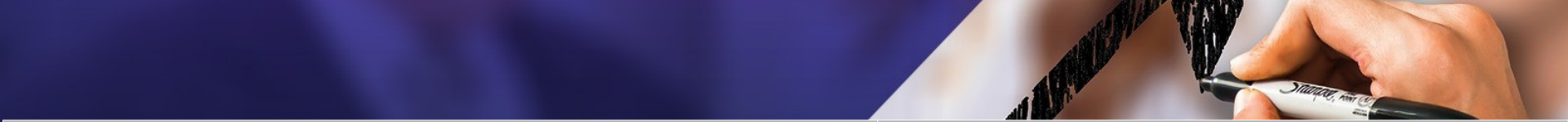
Future Job	Global Market Worth (Estimation)
Chip Designer	$500 billion by 2025
Artificial Intelligence (AI) Specialist	$190 billion by 2025
Data Scientist	$140 billion by 2025
Cybersecurity Analyst	$250 billion by 2026
Renewable Energy Engineer	$1.5 trillion by 2025
Biomedical Engineer	$9 billion by 2026
Sustainability Specialist	$18 billion by 2027
Blockchain Developer	$3.6 billion by 2025
Augmented Reality/Virtual Reality Developer	$61 billion by 2028
Robotics Engineer	$80 billion by 2025
Remote Work Facilitator	$218 billion by 2027

Industrial Tools and Tech

Local

- 2.5 Revolution
- Automation & Control
- Data Management and UI/UX Design

Int'l

- Hardware Technology
- Software Development

1750	1800	1850	1900	1950	2000

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Artificial intelligence, big data, robotics, and more to come
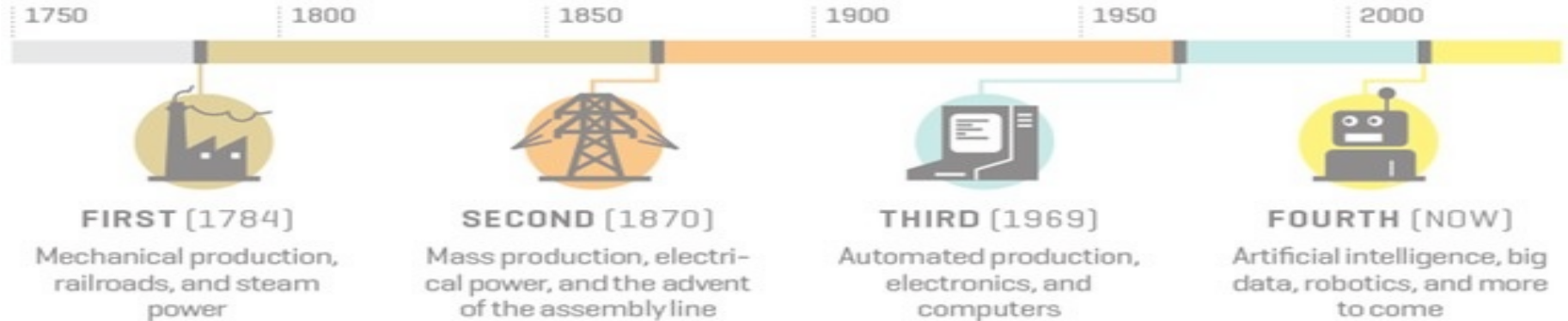
Industrial FYP

Local

- Commodity Commercial off-the-shelf (COTS) Hardware
- Data Management, classification, prediction using Application Dev Frameworks
- Software tools

Int'l

- Open Hardware Architecture
- Open-source software development environment
- Develop system/process based on a metathetical model

- VLSI Processor Design

- HPC System Development

- Real-time Signal Processing Application

- Health-care Application

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- Personal Introduction
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- **Viability of Start-up Business Models**

TOO LATE TO START?

by Anna Vital

quarter-life crisis   mid-life crisis

meanwhile elsewhere in the universe

25   35   4142   52   55   65

Jan Koum
founded WhatsApp

Michael Arrington
started TechCrunch

Mark Pincus
founded Zynga

Robin Chase
founded ZipCar

Craig Newmark
founded CraigsList

Tim Westergren
started Pandora

Jimmy Wales
founded Wikipedia

Robert Noyce
founded Intel

Ray Kroc
started McDonald's

Harland Sanders
started KFC

John Pemberton
invented Coca-Cola
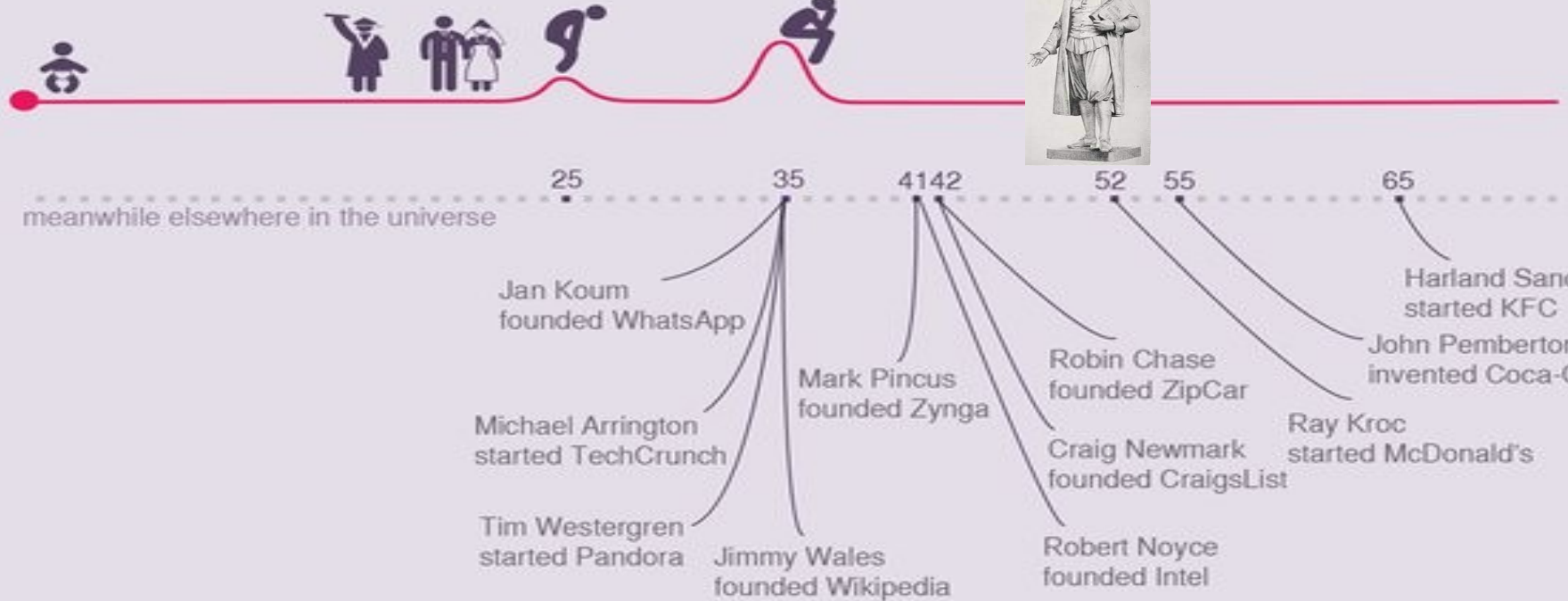
IT'S NEVER TOO LATE.

TOO LATE TO START?

by Anna Vital

quarter-life crisis   mid-life crisis

years of life

25   35   60

we live 78 years
(on average)
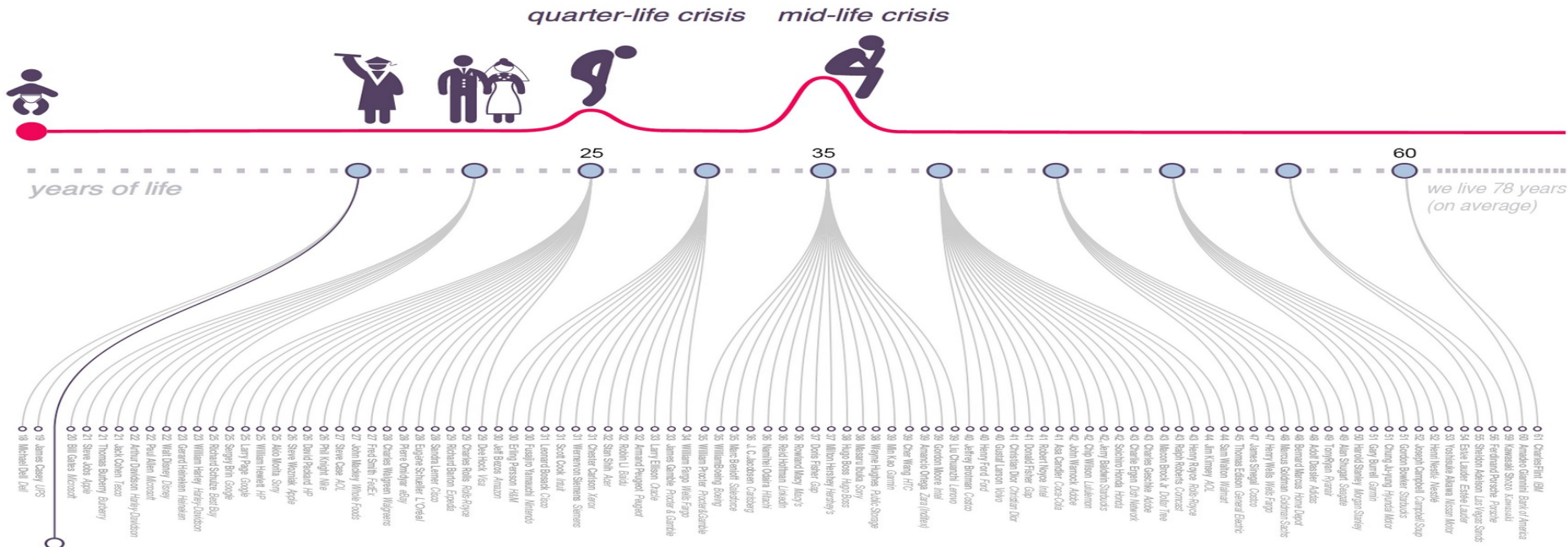
at 19
MARK ZUCKERBERG
started *Facebook*
launching the website at
his dorm room in Harvard

IT'S NEVER TOO LATE.

F&F Funders and Founders

based on world's top 2000 company CEOs according to Fobes Index (excluding government-related companies), numbers by Mark Vital

Uni-corns

- 1334 companies,

- 138 Uni-Corns

  - } 68 Local

  - } 23 IIT
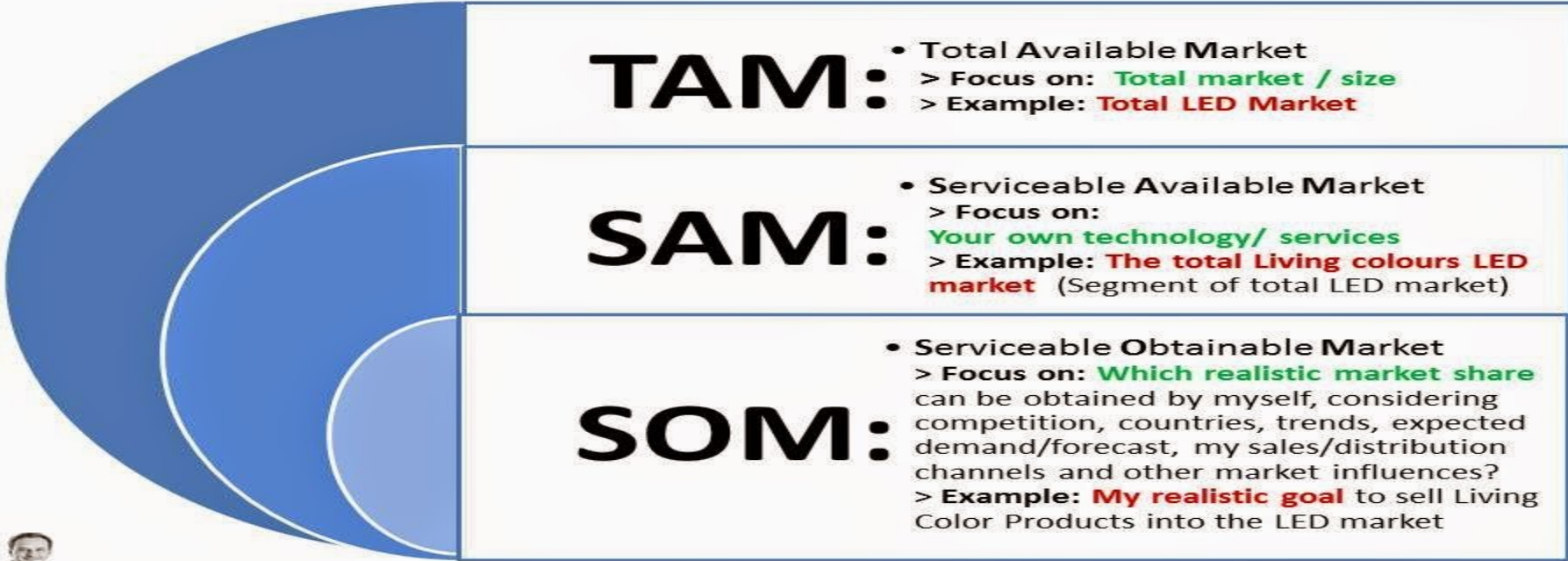
Startup Type

Identify Problem and Propose its solution.

Services

Commerce and Trading
Logistics, E-Commerce, Distributiors, Import-Export

Consultansy

Applicaiton Development
User Software or System Application.

Product

Support
Teaching, IT-Support, etc

Supplies

Independent Expert
Part-time, task based services, Data Scientintist, Marketing etc.

Process

Hardware Development
Technology and System Architecture, COTS, MOTS, GOTS

Market Analysis

TAM SAM SOM Market Evaluations – Easily Explained

TAM:
- Total Available Market
  > Focus on: Total market / size
  > Example: Total LED Market

SAM:
- Serviceable Available Market
  > Focus on:
  Your own technology/ services
  > Example: The total Living colours LED market (Segment of total LED market)

SOM:
- Serviceable Obtainable Market
  > Focus on: Which realistic market share can be obtained by myself, considering competition, countries, trends, expected demand/forecast, my sales/distribution channels and other market influences?
  > Example: My realistic goal to sell Living Color Products into the LED market

Explanation by Carsten Schade, Dipl./ B.A., Marketing Manager Europe, Middle East & Africa
Questions? Just contact me on: carstenschade@hotmail.com

Stages

1) Project Philosophy
2) Goals and Objectives (Commercial)
3) Anticipated Customer
4) Core Strength
5) Competitor Analysis
6) Go to Marketing
7) Financial Strategy
8) Commercialization

Requirement of Commertialization

Grading
Stable: Domestic
Industrial
Medical
Miltray

Agreements
NDA
LA
MTA
TTA

CopyRights
Patent, IP, TM,

Advertisement
Branding
Marketing
Publication

Production
MQO
Quality Assurance
Packaging

Sales
Dealers
Supplers
Customers

Example

Title: Development of High Performance Computing Machine for Big Data Application

Product Being Developed	Pakistan Custom Tarrif (PCT) No for product	World Market Size	Pakistan Market Size	Pakistan Import/Export Volume	No of industries engaged in this product/idea	Product Price	Business-Business or Business to Consumer
Supercomputing Platform for Data Sciences	8471.4120	81.43 Billion US$ 11.1% CAGR	76.3 Million US $	1.9 Billion US $	2	2.5 PKR Million	B2B and B2C

Problem Identification Table

	National / Int'l Market Size	Export, Import, Jobs, Usage etc.	Number of Manufacturing / Processing Industry	Product Price Market Sale Price, Manufacturing Price, R&D Cost
Name Types				
Numbers				
Impact				

To accelerate innovation, think big and start small

Challenge and ideate

Identify **challenges**; generate and prioritize **ideas**

Develop hypotheses to address **market** and **business opportunities**

Incorporate to work **across functional silos**

Cultivate **multi-functional and out-of-the-box thinking**

Prioritize

Define user **experience** and **value proposition**

Prioritize **highest value and impact** ideas

Prototype rapidly

Conduct experiments using hypothesis-led approach to develop **proof of concept**

Engage **ecosystem partners**

Start small and **be prepared to rapidly iterate**

Challenge and improve

Evaluate experiments **testing value proposition**

Identify and incorporate learnings to **improve solution benefit**

Scale appropriately

Industrialize proof of concept

Prepare **for deployment** at scale throughout the business and commercialization

Transition to business as usual

Source: A.T. Kearney analysis

Higher Education Commission, Pakistan

Call for Applications

Turn Your Entrepreneurial Idea into a Successful Enterprise

Innovator Seed Fund (ISF) – 2022

The Higher Education Commission (HEC) invites innovative startups owned by students, alumni, and/or faculty members/researchers (from Public & Private Sector Universities/Degree Awarding Institutions) to apply for Innovator Seed Fund (ISF) Grant.

⦿ KEY FEATURES

ISF, envisioned for development of innovation and startup ecosystem in Pakistan, is a flagship initiative of HEC under the Higher Education Development in Pakistan Project (HEDP). ISF is anticipated to support development of fledgling startups having innovative ideas through provision of seed funding grants, to transform them into successful and sustainable enterprises. The grant package includes up to USD 35,000 in seed funding, stretched over startups proposed budgetary requirements for activities including but not limiting to entrepreneurial training, legal / financial / marketing training and support, among other services.

☑ APPLICANT ELIGIBILITY

The lead applicant must:
- Either be a student, alumni and/or faculty member / researcher of the Higher Education Institutions (public and private).
- Have endorsement from one of the HEC Established 35 Business Incubation Centers across Pakistan.
- Have an SECP-registered business concern, ensuring legal status and promising potential of the startup.

📋 PRIORITY THEMES

The priority sectors for ISF support include:
1. Agriculture, Food Resources and Agri Tech
2. Housing, Construction and Manufacturing
3. Banking, Microfinance and FinTech
4. Health Care and Health Tech
5. Transportation and Logistics
6. Education and EdTech
7. E-commerce and Smart Retail
8. Sustainable Development, Climate and Energy
9. Emerging Technologies
10. Creative, Digital Media, Arts and Culture
11. Other sectors that have potential for growth and impact

Innovative Ideas / Concept Notes on prescribed application template must be submitted via HEC online portal.

https://www.rfi.hec.gov.pk

Deadline for Application Submission is January 6, 2023 – 11:59pm

For further information and application submission requirements please visit HEC website:

http://www.hec.gov.pk/site/isf

EMAIL

For queries, email at:
isf@hec.gov.pk

PID (I) 3522-D/22

f @HEC... @... hec_pk