Methodology for Assessing Skill Shortages and Gaps

Kaushal Manthan

Bornali Bhandari
Professor
NCAER

June 16, 2025

Outline

- Objectives
- What are Skills?
- Broad Framework of Assessing and Anticipating Skills Shortage
- Sector-wise Analysis
- Policy Recommendations

Objectives

- Create a dynamic framework for skill gap assessment that can be regularly updated to predict skill requirements in line with the evolving economic landscape.

- Develop a uniform and standardised methodology for conducting demand assessments at both sectoral and state levels has been developed.
  - Analysis of 7 high growth sectors based on the methodology

What are Skills?

Definition and Typology of Skills

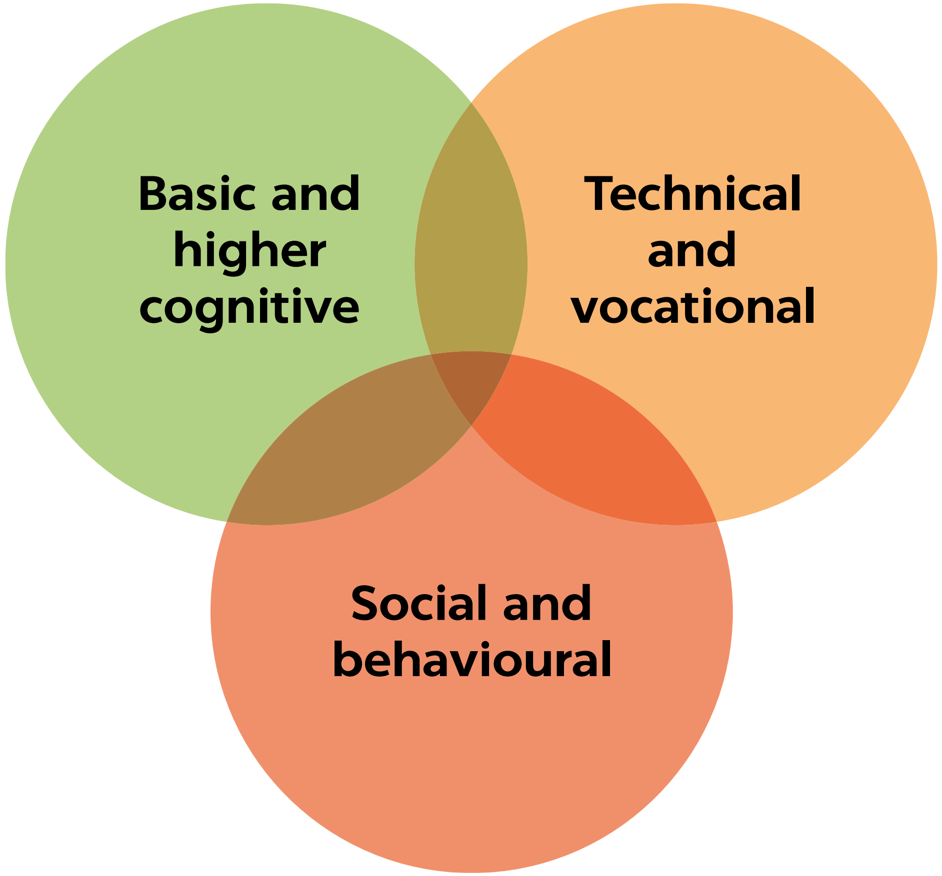
4

What are Skills?

Cognitive skills are *basic skills* of literacy and numeracy, applied knowledge and problem- solving aptitudes and *higher-order skills* such as experimentation, reasoning and creativity

Technical and vocational skills (TVET) are the physical and mental ability to perform specific tasks using tools and methods in any occupation

Social and behavioural skills include working well with others, communicating and listening well, and being agreeable and outgoing



Note: [Detailed list of Skills]
Source: National Council of Applied Economic Research (NCAER). (2018). Skilling India: No time to lose. http://www.ncaer.org/publication_details.php?pID=300

Skills Shortage & Skill Gap

- The study develops methodology to
  - Assess & anticipate skills shortage at sectoral level and
  - skill gap at the worker level in a particular sector

- **Skills Shortage** describes the situation where a job vacancy is hard to fill because of a lack of applications with the needed skills.
  - For example, you need 20 plumbers but you are only able to find 2 plumbers.

- **A skill gap** occurs where an employee's competence to do the job is called into question (typically by his/her manager). One can apply this concept to prospective employees. Employers find that the prospective employees have the appropriate qualifications but not the desired skill sets.
  - For example, you need 20 plumbers and you are able to find all 20 with appropriate qualifications but,
  - They do not have the appropriate skills set that you need for the job

Source: Green, F. 2013. Skills and Skilled Work: An Economic and Social Analysis. Oxford University Press, United Kingdom.

Broad Framework of Assessing and Anticipating Skills Shortage

Broad Framework of Assessing and Anticipating Skills Shortage

7 Components

1. Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics

2. Simulations of anticipated growth over the medium run using input-output analysis

3. Occupational-wage employment survey of non-agricultural enterprises (proposed)

4. Survey of non-agricultural enterprises for vacancies and skills (proposed)

5. Big Data Analysis of Non-agriculture sectors (proposed)

6. District-level analysis of jobs in the agriculture & allied sectors (proposed)

7. Stakeholder Interactions

Component 1
Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics-I

A. Identification of Sectors (Industries)

- Identify sectors at the desired level of aggregation that will be used for analysis
- Map NIC sectors to sectoral sub-sectors
    - NIC code 35106 captures electric power generation using other non-conventional sources and the wind energy sector is subsumed under this.
    - The Information Technology (IT) sector has only NIC code, 6201, for 'computer programming activities.
        - 62011 Writing , modifying, testing of computer program to meet the needs of a particular client excluding web-page designing; 62012 Web-page designing 62013; Providing software support and maintenance to the clients
        - But IT has several sub-sectors—IT Services (ITS), Business Process Management (BPM), Engineering and Research & Development (Er&D), Software Products (SPD), Future Skills, etc.
- Data Source: MoSPI NIC Classifications
- Centre and Sector Skill Councils
- Frequency: Once in 3 years

Component 1
Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics-II

B. Identification of Occupations

- Update mapping of NCO 2015 job roles with job roles identified by the Sector Skill Councils
  - 731 is the NCO code for handicraft workers.
  - Code for a power loom weaver is 7318.5500 and that for a
  - Handloom weaver is 7318.5800.
  - The power loom weaver code captures four different types of technologies (plain loom, semi-automatic loom, automatic loom and shuttle-less loom)

- Out of the 3,600+ occupations identified in the NCO-2015, select occupations will be used for analysis for all the components of assessing skills shortages and gaps
- PLFS only captures NCO-3 digit codes
- Data Source: MoLE NCO-2015 Classifications
- Centre and Sector Skill Councils
- Frequency: Once in 3 years

Component 1
Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics-III

C. Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics

- **Selection of sectors & sub sectors**
  - I/O analysis, Income & emp. Multipliers, %GVA & workers; ranking of sectors, sunrise sectors
  - Analysis of value-chain
  - Data sources: PLFS, National Accounts Statistics (NAS)
- **Identification of Geographical Clusters**
  - Agglomerations of units, institutions etc.
    - ✓ Data Sources: Various Data Sources
  - Workforce
    - Data Sources: PLFS, ASI and ASUSE
  - State-wise Mapping of Geographical Clusters along with Share of Labour Force

Component 1
Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics-IV

C. Macro-analysis of sectoral shares & workforce, identification of geographical clusters and sectoral workforce characteristics (contd.)

- **Sectoral Workforce Characteristics**
  - Educational qualifications (general, technical & vocational education), Engagement, Occupation (NCO 3-digit) and Gender of workers
  - Data Source: PLFS
- **Roles**
  - Centre: State-level analysis
  - States: District level analysis
- **Frequency: Annual**

D. Occupational Mapping

Component II
Simulations for forecasting jobs and occupations

Simulations for forecasting jobs and occupations

- Using I-O Analysis
- Data sources: NAS, PLFS and IMF
- Roles- Centre, States
- Frequency: Once in 3 years

Component III
Demand projections using Occupation-Wage-Employment Survey for Non-agricultural Enterprises (proposed)

- Re-design the existing Occupation-Wage Survey to capture, wages at all geographies, employment (number), qualifications and skills
- Select specified number of occupations across firms
- Survey of enterprises
- Starting point- Economic Census/Ministry of Corporate Affairs database/Goods & Services Tax Network
- Centre-State collaboration
- Data representative at the district level
- Roles: Centre is designing, Centre-States-Districts collaboration required in collecting data

Component IV
Assess skill shortages and gaps in non-agriculture sectors using vacancy data for non-agricultural enterprises (proposed)

- This is for non-agricultural sectors that can collect the data on vacancies and skills.
  - Firms should be sampled across size, ownership, regions and sub-sectors that have been identified previously.
  - Vacancy data may be analysed in the short-run.
  - The MCA maybe used as the universe.
  - The occupations list should be the same as identified in the beginning.
  - The Centre should define a skill shortage. If vacancies last for more than three months, then it should be defined as a skill shortage.
  - Using this definition, SSCs can use a common assessment framework to feed into MSDE policymaking
  - Role: Centre is designing and State Sector Councils are implementing
  - Frequency: Quarterly/Annual

Component V
Big Data Analysis of Non-agricultural Enterprises (proposed)

- Industry-wise
- Select occupations
- Identify new occupations
- Spatial variations
- Role: Sector Skill Councils
- Frequency: Quarterly/Annual

Component V
District-level Analysis of Jobs in Agriculture & Allied Sectors (proposed)

- Secondary Data
  - Agriculture Census
  - Situation Analysis of Farmers
  - States data etc.

- Primary Data
  - Survey
  - Stakeholder Interactions

- Role: Design by Centre but key role is of States and Districts

- Frequency: Annual

Component VI
Stakeholder Interactions

- Identify across the value chain
- FGDs, Structured questionnaires
- Roles: Centre designing and State Sector Councils implementing
- Frequency: Annual

Analysis of 7 High Growth Sectors

Selected Sectors and Sub-sectors

- I/O analysis, Income & emp. Multipliers, %GVA & workers; ranking of sectors, sunrise sectors
- Data sources: PLFS, National Accounts Statistics (NAS)

S.No.	Sector	Sub-sector	Sub-Sectors
1	Primary	Agriculture	Growing of Cereals, Leguminous Crops and Oilseeds
2	Primary	Livestock	Raising of Cattle and Buffaloes
3	Tertiary	Trade	Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenance & repair of MVs
4	Tertiary	Computer related services	Computer Programming Activities
5	Secondary	Manufacturing of Textiles plus cotton ginning	Weaving of textiles
6	Secondary	Manufacture of Transport	Manufacturing of motor vehicles, parts & accessories of motor vehicles
7	Secondary	Electricity	Electric Power Generation using solar energy and other non-conventional sources

Back

Data Sources: NAS and PLFS

Agriculture: Growing Cereals (including rice), Leguminous Crops and Oilseeds

Top 5 Geographical Clusters in 'Growing Cereals (including Rice), Leguminous Crops and Oilseeds'

S.No.	*Geographical Clusters**	*Share of Workers (PLFS)*
1.	Uttar Pradesh	Uttar Pradesh
2.	Maharashtra	Madhya Pradesh
3.	Rajasthan	Bihar
4.	Madhya Pradesh	Maharashtra
5.	Gujarat	Chhattisgarh

Notes: *Based on four parameters- institutional, business infrastructure, human resources and government support
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-II

Growing of Cereals, Leguminous Crops and Oilseeds

NCO 2015 Code	Name	Description	PLFS (2022-23)		Projections (2026-27)	
			Share in Total Jobs (%)	Total Jobs (lakhs)	Scenario 1 Projections (lakhs)	Scenario 2 Projections (lakhs)
611	Market Gardeners & Crop Growers	Cultivator, Tree and Shrub Crop Growers, Gardeners, Mixed Crop Growers, Agriculture Information Management	69.4	1,116.6	1,433.3	1,496.6
921	Agricultural, Forestry and Fishery labourers	Crop Farm Labourers, Livestock Farm Labourers, Garden and Horticultural Labourers,	19.6	315.9	406.0	423.9
631	Subsistence Crop Farmers	Tree Trimmer and Pruner	8.9	143.4	184.3	192.4
613	Mixed Crop and Animal Workers	Seed Grower/Quality Seed Grower, Seed Processing Worker	1.0	15.4	19.L8	20.7
633	Subsistence Mixed Crop and Livestock Farmers		0.4	6.9	8.9	9.3

Stakeholders Survey: Job Roles that are facing and will face demand shortage in the Agriculture Value Chain

- Drone Operator
- Agriculture Advisor/Crop Advisor (Agri-tech)
- IT-GIS Specialist (Agri-tech)
- Metal Inert Gas (MIG)-Welding Operator
- Farm -Machinery Service Technician

Note: Detailed Description

Livestock: Raising Cattles and Buffaloes

Top 5 Geographical Clusters in 'Raising Cattle and Buffaloes'

S.No.	Geographical Clusters*	Share of Workers (PLFS)
1.	Karnataka	Uttar Pradesh
2.	Maharashtra	Gujarat
3.	Rajasthan	Bihar
4.	Gujarat	Tamil Nadu
5.	Bihar	Madhya Pradesh

Notes: *Based on four parameters- institutional, business infrastructure, human resources and government support
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-III

Raising of Cattle and Buffaloes

NCO 2015 Code	Name	Description	PLFS (2022-23) Share in Total Jobs (%)	PLFS (2022-23) Total Jobs (lakhs)	Projections (2026-27) Scenario 1 Projections (lakhs)	Projections (2026-27) Scenario 2 Projections (lakhs)
612	Animal Producers	Livestock and Dairy Producers, Animal Producers Not Elsewhere Classified	87.3	209.1	226.4	211.2
521	Street and Market Salespersons	Stall and Market Salespersons, Street Food Salespersons (Milkman)	4.0	9.7	10.5	9.8
632	Subsistence Livestock Farmers		3.8	9.2	10.0	9.3
613	Mixed Crop and Animal Workers	Artificial Breeding Technician, Mixed Crop and Animal Workers, Other	2.8	6.7	7.2	6.7
611	Market Gardeners & Crop Growers	Mixed Crop Growers, Agriculture Information Management	0.6	1.5	1.6	1.5

Stakeholders Survey: Job Roles that are facing and will face demand shortage in the 'Raising of cattle and buffaloes' sub-sector

- Veterinary Technician/Assistant
- Mechanic-Refrigeration and Air Conditioning
- Dairy Technologist
- Manager-Dairy Farm

Note: Detailed Description

Weaving of Textiles

Top 5 Geographical Clusters in 'Weaving of Textiles'

S.No.	Geographical Clusters*	Share of Workers (PLFS)
1.	Tamil Nadu	Tamil Nadu
2.	Uttar Pradesh	Assam
3.	West Bengal	Gujarat
4.	Andhra Pradesh	Andhra Pradesh
5.	Gujarat	West Bengal

Notes: *Based on locations.
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-IV

Weaving of Textiles

NCO 2015 Code	Name	Description	PLFS (2022-23) Share in Total Jobs (%)	PLFS (2022-23) Total Jobs (lakhs)	Projections (2026-27) Scenario 1 Projections (lakhs)	Projections (2026-27) Scenario 2 Projections (lakhs)
731	Handicraft Workers	Handicraft Workers in Textiles, Leather and Related Materials	66.8	13.3	17.7	15.5
815	Textile, Fur and Leather Products Machine	Fibre Preparing, Spinning and Winding Machine Operators, Weaving and Knitting Machine Operators, Sewing Machine Operators, Bleaching, Dyeing and Cleaning Machine Operators	12.4	2.5	3.3	2.9
753	Garment and Related Trades Workers	Garment and Related Pattern Makers and Cutters, Sewing, Embroiderers and Related Workers,	8.0	1.6	2.1	1.9
112	Managing Directors and Chief Executives	Director Manufacturing	3.6	0.7	1.0	0.8
632	Manufacturing Labourers		2.0	0.4	0.5	0.5

Stakeholders Survey: Job Roles that are facing and will face demand shortage in the 'Weaving of textiles' sub-sector

- Weaver-Handloom
- (Jacquard/ Loin loom)
- Weaver- Power loom
- Weaving Assistant (Handloom)

Note: Detailed Description

Manufacturing of motor vehicles (MVs), parts & accessories of motor vehicles and repair & maintenance of motor vehicles

Top 5 Geographical Clusters in 'Manufacturing of MVs, Parts & Accessories of MVs and Repair & Maintenance of MVs'

S.No.	Geographical Clusters*			Share of Workers (PLFS)		
	Manufacture of Motor Vehicles (MVs)	*Manufacture of Parts & Accessories of MVs*	*Repair and Maintenance of MVs*	*Manufacture of Motor Vehicles (MVs)*	*Manufacture of Parts & Accessories of MVs*	*Repair and Maintenance of MVs*
1.	Maharashtra	Maharashtra	Maharashtra	Maharashtra	Gujarat	Tamil Nadu
2.	Haryana	Tamil Nadu	Tamil Nadu	Tamil Nadu	Maharashtra	Maharashtra
3.	Karnataka	Uttar Pradesh	Uttar Pradesh	Madhya Pradesh	Tamil Nadu	Gujarat
4.	Tamil Nadu	Haryana	Kerala	Rajasthan	Haryana	Karnataka
5.	West Bengal	Gujarat	Gujarat	Andhra Pradesh	Karnataka	Uttar Pradesh

Notes: *Based on locations.
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-V

Manufacturing of MVs, Parts & Accessories of MVs and Repair & Maintenance of MVs

NCO 2015 Code	Name	Description	PLFS (2022-23)		Projections (2026-27)	
			Share in Total Jobs (%)	Total Jobs (lakhs)	Scenario 1 Projections (lakhs)	Scenario 2 Projections (lakhs)
723	Machinery Mechanics and Repairers	Motor Vehicle Mechanics and Repairers	58.5	18.3	26.0	30.8
932	Manufacturing Labourers		6.9	2.2	3.1	3.6
112	Managing Director and Chief Executive		4.2	1.3	1.9	2.2
821	Assemblers	Mechanical Machinery Assemblers, Electrical and Electronic Equipment Assemblers	3.5	1.1	1.6	1.9
312	Mining, Manufacturing and Construction Supervisors	Manufacturing Supervisors	2.7	0.9	1.2	1.4
311	Physical and Engineering Science Technicians	Electrical Engineering Technicians, Electronics Engineering Technicians, Mechanical Engineering Technicians	2.4	0.8	1.1	1.3

Note: Projections was done for the whole sector namely, 'Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenance & repair of MVs' but occupation-wise projections for maintenance & repair of motor vehicles are added here.

Stakeholders Survey: Job Roles that are facing and will face demand shortage in the 'Manufacturing of MVs, Parts & Accessories of MVs and Repair & Maintenance of MVs'

- Machine/CNC operator; Turner; Grinder; Tool and die maker
- Technician / Mechanic; Motor mechanic
- Power / Micro electronics engineers; AI/ML expert
- Embedded Software Engineers; Vehicle Software Developer
- AI Data Science Engineers; Automotive Cybersecurity Specialist

Note: Detailed Description

Electric Power Generation using solar energy and other non-conventional sources

Top 5 Geographical Clusters in 'Electric Power Generation using Solar Energy and Other Non-conventional Sources'

S.No.	Geographical Clusters*		Share of Workers (PLFS)	
	Generation of Solar Energy	*Generation of Wind Energy*	*Generation of Solar Energy*	*Generation of Wind Energy*
1.	Gujarat	Gujarat	Maharashtra	Maharashtra
2.	Karnataka	Tamil Nadu	Tamil Nadu	Tamil Nadu
3.	Rajasthan	Karnataka	Karnataka	Gujarat
4.	Tamil Nadu	Maharashtra	Delhi	Lakshadweep
5.	Andhra Pradesh	Rajasthan	Gujarat	

Notes: *Based on locations.
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-VI

Electric Power Generation using solar energy and other non-conventional sources

NCO 2015 Code	Name	Description	PLFS (2022-23)		Projections (2026-27)	
			Share in Total Jobs (%)	*Total Jobs (lakhs)*	*Scenario 1 Projections (lakhs)*	*Scenario 2 Projections (lakhs)*
541	Protective Service Workers	Fire Fighters, Security Guards	25.4	0.2	0.3	0.4
413	Keyboard Operators	Typists and Word Processing Operators, Data Entry Clerks,	10.1	0.1	0.1	0.1
741	Electrical Equipment Installers and Repairers	Electrical Mechanics and Fitters, Electrical Line Installers and Repairers	9.7	0.1	0.1	0.1
932	Manufacturing Labourers		9.5	0.1	0.1	0.1
411	General Office Clerks		7.8	0.1	0.1	0.1

Stakeholders Survey: Job Roles that are facing and will face demand shortage in 'electric power generation using solar energy and other non-conventional sources'

- Solar Project Manager; Solar Installer; Solar PV Installer and O&M Technician (Surya Mitra)
- O&M Technicians- Mechanical and Electrical
- Engineers; Electrical engineers- Power Systems Design; Civil and Electrical Engineers; Project Engineers
- Resource Assessment; Site Surveyor; Resource Analysis
- Site Managers / in-charge /supervisor; Construction / Project Managers
- Asset Management; Quality & Vendor Management Engineers

Note: Detailed Description

Retail sale of food, clothing, footwear and leather articles in specialised stores

Top 5 Geographical Clusters in 'Retail Sale of Food, Clothing, Footwear and Leather Articles in Specialised Stores'

S.No.	Geographical Clusters*	Share of Workers (PLFS)
1.	Maharashtra	Uttar Pradesh
2.	Karnataka	Bihar
3.	Uttar Pradesh	West Bengal
4.	West Bengal	Maharashtra
5.	Tamil Nadu	Tamil Nadu

Notes: *Based on locations.
Source: NCAER Analysis from Various Sources.

Projected jobs (in lakh) across top NCO codes-VII

Retail sale of Food, Clothing, Footwear and Leather Articles in Specialised stores

NCO 2015 Code	Name	Description	PLFS (2022-23)		Projections (2026-27)	
			Share in Total Jobs (%)	*Total Jobs (lakhs)*	*Scenario 1 Projections (lakhs)*	*Scenario 2 Projections (lakhs)*
522	Shop Salespersons	Shopkeepers, Shop Supervisors, Shop Sales Assistants,	76.5	173.6	281.2	291.6
521	Street and Market Salespersons	Stall and Market Salespersons, Street Food Salespersons,	8.3	18.9	30.5	31.7
112	Managing Directors and Chief Executives	Director, Retail Trade, Working Proprietor, Retail Trade/Proprietor, Retail Trade	7.2	16.3	26.4	27.4
952	Street Vendors (Excluding Food)	Hawker, Street Vendors, Non-Food Products, Other	2.3	5.1	8.3	8.6
524	Other Sales Workers		2.0	4.6	7.4	7.7

Note: Projections was done for the whole sector namely, 'Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenance & repair of MVs' but occupation-wise projections are only shown for retail sale in this slide. In 2022-23, 8% of total jobs in this sector belonged to repair and maintenance of motor vehicles. Occupation-wise projections are done based on 92% of the total sector's jobs.

Back

Stakeholders Survey: Job Roles that are facing and will face demand shortage in 'retail sale of food, clothing, footwear and leather articles in specialised stores'

- Customer service representative/Sales Associate/Sales person/e-Commerce Marketing Assistant/Manager
- Merchandising Manager/ Associate
- Logistics manager/ Associate
- ICT Personnel/ Computer operator

Note: Detailed Description

Computer Programming Activities

Top 5 Geographical Clusters in 'Computer Programming Activities'

S.No.	Geographical Clusters*	Share of Workers (PLFS)
1.	Maharashtra	Telangana
2.	Tamil Nadu	Tamil Nadu
3.	Karnataka	Maharashtra
4.	Uttar Pradesh	Karnataka
5.	Gujarat	Andhra Pradesh

Notes: *Based on four parameters- institutional, business infrastructure, human resources and government support.
Source: NCAER Analysis from Various Sources.

Step 5: Projected jobs (in lakh) across top NCO codes-VIII

Computer Programming Activities

NCO 2015 Code	*Name*	*Description*	PLFS (2022-23)		Projections (2026-27)	
			Share in Total Jobs (%)	*Total Jobs (lakhs)*	*Scenario 1 Projections (lakhs)*	*Scenario 2 Projections (lakhs)*
251	Software and Application Developers, and Analysts	System Analysts, Software Developers, Web and Multimedia Developers, Applications Programmers	77.4	19.6	33.8	32.6
133	Information and Communications Technology Services Manager	Information and Communication Technology Services,	5.0	1.3	2.2	2.1
112	Managing Directors and Chief Executives		2.1	0.5	0.9	0.9
216	Architects, Planners, Surveyors and Designers	Graphic and Multimedia Designers,	2.1	0.5	0.9	0.9
413	Keyboard Operators	Typists and Word Processing Operators, Data Entry Clerks,	2.0	0.5	0.9	0.8

Back

Stakeholders Survey: Job Roles that are facing and will face demand shortage in ‘Computer Programming Activities’

- Data Engineering
- Business Analyst- Technical
- Data Security
- Functional/ Domain Analyst

Note: Detailed Description

Comparison of Methodologies

Comparison of Methodologies-I

	NCAER	NASSCOM	RASCI	World Bank	States
Key Objective	Assess skill shortage of 7 high growth sectors	Mapping of employment scope and skills gap in retail	Mapping of employment scope and skills gap in retail	Local skill gaps at the district level	Assess skill shortages in States/Districts
Multiple objectives	Jobs Forecasting both using macro methods and sectorally; Skills gap – medium or hard to fill both now and in the future; skills gap-extensive or intensive in nature	Estimate talent skills gap Talent Supply refers to the installed tech talent for the given year. Talent Demand is defined as "Fulfilled Demand (Installed Talent) + Unmet Demand (Open Job Postings)"; only includes unfilled jobs at present and excludes met job postings over the previous 12-month period.	Jobs forecasting; incremental job requirements, identification of growing job roles & spatially too and Intensive skills gap	Assessed skills gaps in terms of differences between local opportunities and local skilling capacity	Jobs forecasting

Comparison of Methodologies-II

	NCAER	NASSCOM	RASCI	World Bank	States
Methodology Used	Input-output analysis; Primary Assessment, estimate demand at sectoral level	Used proprietary database; AI/ML data used and CAGR technique for forecasting	Survey-based method but sampling size not statistically significant	Economic mapping and stakeholder consultations-Survey	Secondary data analysis, survey and stakeholders analysis
Sectors covered	7 sectors	IT	Retail and Allied sectors	Not applicable	All districts
Locations covered	All-India	All-India	All-India	1 district per state across 6 States	Districts
Job Projections	Yes (I-O analysis) gives quantitative forecasts about jobs	No; gives projections about workers across broad categories	No; gives projections about workers across broad categories	No	Gives projections for NSQF job roles

Comparison of Methodologies-II

	NCAER	NASSCOM	RASCI	World Bank	States
Skill Shortage	Yes; Stakeholder consultations (can be scaled up if national survey done)	Yes	No	No	Yes but only for youth but the definition of youth differs
Skill Gap		Yes	No	No	No
Advantages	Simultaneous forecast of jobs for all sectors using IO; direct plus indirect job creation using IO	Closest to identifying gaps	De-compose retail sector and identify growing jobs; identify high growth cities	Good bottom-up approach; can be scaled up at the State-level	Good bottom-up approach; compute shortage
Disadvantages	Will not be able to capture changes within jobs; mismatch in wages not estimated	Cannot be applied to other sectors especially the traditional ones; only captures technical skills; mismatch in wages not estimated	Not statistically significant; should have had a sample size of at least 1,600; extensive skills gap assessment missing; mismatch in wages not estimated	But it is not assessing skills gaps in terms of jobs in demand and number in supply; Skilling capacity does not translate to number of people available because aspirations change; mismatch in wages not estimated; labour stock	Hard to compare across the country Focussed on one demography may result in missing systemic issues

Comparison of Methodologies-Key Take-aways

- I-O analysis.
  - I-O analysis is a simultaneous approach across sectors.
  - It projects both direct and indirect jobs
  - This can be complemented by survey
  - Limited to NCO-3 digit codes; same code for two different types of workers
  - Sometimes misses new and emerging job roles
    - Suryamitras and Vayumitras are not captured by the PLFS on a consistent basis
  - Constant technology assumed

- Implement an occupation-wage-employment survey of firms for all sectors on an annual basis
  - This is a robust method because it will give us both job projections and occupations that face skills shortage and gap

Policy Recommendations

Policy Recommendations

- Improve methodology to assess skills shortages and skill gaps
  - Improve current statistics –PLFS, ASI and ASUSE
  - Design Occupation-wage-employment survey

- Strengthen supply side
  - Improve quality of ITIs
  - Upgrade teachers, curriculum and books
  - Learning of traditional job roles are not happening through family. Other alternative learning modes need to be created
  - Learning TVET is a necessary condition but not a sufficient condition for landing a job and career progression
  - Provide hostels for females
  - Hands-on-training and practical curriculum
  - Strengthen academia-industry collaboration at the skilling eco-system
  - Avenues for upskilling and re-skilling

- Demand-side
  - Counselling and guidance for addressing aspirations
  - Wages mismatch
  - Encourage female labour force participation by providing transport; having role models etc.
  - Change work conditions

Thank You!

Study Team

- **Project Leader:** Bornali Bhandari
- **Senior Advisor**: Aradhna Aggarwal, Shish Pal Bansal, Shashanka Bhide, Sonalde Desai, GC Manna, Sudipto Mundle and Sanjib Pohit
- **Core Team Members:** Saurabh Bandyopadhyay, Isha Dayal, Ashish Desai, Charu Jain, Laxmi Joshi, Ajaya K Sahu and KS Urs
- **Research Analysts/Associates:** Cheruvu Satya Subrahmanya Bharadwaja, Somdev Singh Deora, Kenneth Gomes, Denipreet Kaur, Falak Naz, Nishika Pal, Karan Raj and Sharon Thomas
- **Interns:** R. Abhiram (External), Tarun Agrawal (External), Ahan Bansal, Somdyuti Gupta, Gaurav Mahalingam, Shruthi Muruganandam (External), Ayushman Rathore, Jigisha Sharma and Kushagra Thagral
- **Research Support Team**: Shalini Aggarwal, Poonam Dhawan and Praveen Sachdeva

Types of Skills

Foundational Cognitive Skills	*Advanced Cognitive Skills*	*Foundational socio-emotional Skills*	*Advanced socio-emotional skills*	*Knowledge*	*Sector/Job-specific Skills*
Reading Literacy	Learning Strategies	Civic and Digital Citizenship	Instructing	General	Occupational
	Critical Thinking	Seek and Value Diversity	Negotiation	Sectoral	Technical
Writing	Creativity	Conscientiousness (including attitude towards work)	Persuasion		Innovation
Speaking	Independent research	Openness to Experiences			Physical
Communication	Judgement and Decision-making	Extraversion			
Language Skills 1	Systems Analysis	Agreeableness			
Language Skills 2	Systems Evaluation	Neuroticism/Emotional stability			
Numeracy/Mathematics	Financial Resources	Social Skills at Work			
ICT Literacy to Skills	Material Resources				
Self-learning to Active (Independent) Learning	Personnel Resources				
Active Listening	Time Management				
Science					
Problem Solving					

Source: Bhandari, B. 2021. "Policy for the Full Range of Employability Skills". *NCAER Working Paper No. 123*. https://www.ncaer.org/wp-content/uploads/2022/09/1623156388WP-123_NCAER_Skill_Working_Paper.pdf. NCAER, New Delhi, India.

Back

Step 1: Sectors that appear in both the top 25 lists of shares of GVA and jobs

Sector	Sub-Sector	Share of sectoral GVA (%)	Share of sectoral jobs(%)
Tertiary	Trade	10.6	9.4
Primary	Agriculture	8.3	39.2
Secondary	Construction	8.1	14.8
Tertiary	Computer related services	6.1	0.8
Tertiary	Public administration. & defence	5.7	1.3
Tertiary	Financial Services	5.4	0.8
Primary	Livestock	4.7	7.1
Tertiary	Education & Research	4.6	2.9
Tertiary	Other Business services#	3.6	0.7
Tertiary	Land Transport	3.1	3.4
Secondary	Manufacture of textiles + cotton ginning	2.0	1.2
Tertiary	Medical and Health	1.6	1.1
Secondary	Manufacture of other non-metallic mineral products	1.3	0.8

Sources: National Accounts Statistics (NAS) and Periodic Labour Force Survey (PLFS)

Back

Step 2: Choose sectors that appear in both the top 25 lists of *GVA and employment multipliers*

- We use a national input-output model for 64 sectors to estimate output, income and employment multipliers for 2021-22.
- We use the income and employment multipliers and rank them.
- We choose those sectors that appear in both the top 25 lists of GVA and employment multipliers.

S.No.	Sector	Sub-sector
1	Primary	Livestock
2	Tertiary	Trade
3	Tertiary	Community, Social and Personal Services
4	Primary	Agriculture
5	Secondary	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material

Back

Step 3: Choose sectors that appear in the top 25 lists of shares of *GVA, jobs, employment and output multipliers*

Sector	No. of top 25 lists that the sector appears in (Max=4)
Trade	4
Agriculture	4
Livestock	4
Community, Social & personal services	4
Construction	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Education & Research	3 (Share of GVA, Share of Jobs & GVA Multiplier)
Other Business services#	3 (Share of GVA, Share of Jobs & GVA Multiplier)
Land Transport	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Manufacture of textiles+cotton ginning	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Computer related services	2 (Share of GVA & Share of Jobs)
Public administration & defence	2 (Share of GVA & Share of Jobs)
Ownership of dwellings	2 (Share of GVA & GVA Multiplier)
Financial Services	2 (Share of GVA & Share of Jobs)
Manufacture of Basic Iron and Steel + Casting of iron and steel	2 (Share of GVA & GVA Multiplier)
Communication	2 (Share of GVA & GVA Multiplier)
Electricity	2 (Share of GVA & GVA Multiplier)
Medical and Health	2 (Share of GVA & Share of Jobs)
Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	2 (Share of GVA & GVA Multiplier)
Forestry and Logging	2 (Share of GVA & GVA Multiplier)
Manufacture of other non-metallic mineral products	2 (Share of GVA & Share of Jobs)
Manufacture of coke and refined petroleum products	2 (Share of GVA & GVA Multiplier)
Fishing & Aquaculture	2 (Share of GVA & GVA Multiplier)
Manufacture of Transport	1 (Share of GVA)
Manufacture of machinery and equipments n.e.c.	1 (Share of GVA)
Manufacture of pharmaceutical; medicinal chemicals and botanical products	1 (Share of GVA)

Back

Step 4: Sunrise sectors from Budget 2022-23 are mapped to the 64 sectors

S.No.	Sunrise Sector (mentioned in Union Budget 2022-23)	Sector	Sub-sector	Ranks
1	Agri-tech	Primary	Agriculture	Top 25 GVA and Employment Multiplier
2	Artificial Intelligence, Deep tech and Digital Economy	Tertiary	Computer related services	GVA Multiplier Rank28
3	Geospatial Systems and Drones	Secondary	Manufacture of computer, electronic and optical products	GVA Multiplier Rank 63
4	Semiconductor and its eco-system	Secondary	Manufacture of communication equipment	GVA Multiplier Rank 62
5	Space Economy	Tertiary	Air Transport	GVA Multiplier Rank 30
6	Genomics and Pharmaceuticals, pharma	Secondary	Manufacture of pharmaceutical; medicinal chemicals and botanical products	GVA Multiplier Rank 55
7	Green Energy	Secondary	Electricity	Top 25 GVA
8	Clean Mobility Systems	Secondary	Manufacture of Transport	GVA Multiplier Rank 59
9	Climate Action			

Back

Step 5: Integrate sectors from Step 3 and Step 4 to select sectors

S.No.	***Sector***	***Sub-sector***	***Appears in all 4 top 25 lists of Multipliers and Shares***	***Sunrise Sector (mentioned in Union Budget 2022-23)***	***Sector Skill Council***
1	Primary	Agriculture	4	Agri-tech	ASCI
2	Primary	Livestock	4		ASCI
3	Tertiary	Trade	4		Retailers' Association Skill Council of India
4	Tertiary	Computer related services	2	Artificial Intelligence, Deep tech and Digital Economy	IT-ITeS Sector Skill Council-NASSCOM
5	Secondary	Construction	3		Construction Sector Skill Council
6	Secondary	Electricity	2	Green Energy	Skill Council for Green Jobs

Notes: Orange shaded cells indicate sunrise sectors.

Back

Alternative Sectors-I

S.No.	Sector	Sub-sector	Appears in all 4 top 25 lists of Multipliers and Shares	Sunrise Sector (mentioned in Union Budget 2022-23)	Sector Skill Council
1	Tertiary	Community, Social and Personal Services	4		
2	Tertiary	Education & Research	3		
	Tertiary	Other Business Services	3		
3	Tertiary	Land Transport	3		
4	Secondary	Manufacture of textiles + cotton ginning	3		Textile Sector Skill Council
5	Tertiary	Public Administration and Defence	2		
6	Tertiary	Ownership of dwellings	2		
7	Tertiary	Financial Services	2		BFSI
8	Secondary	Manufacture of Basic Iron and Steel + Casting of iron and steel	2		Indian Iron and Steel Sector Skill Council
9	Tertiary	Communication	4		Telecom Sector Skill Council
10	Tertiary	Medical and Health	3		Healthcare Sector Skill Council
11	Secondary	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	3		

Back

Alternative Sectors-II

S.No.	Sector	Sub-sector	Appears in all 4 top 25 lists of Multipliers and Shares	Sunrise Sector (mentioned in Union Budget 2022-23)	Sector Skill Council
12	Primary	Forestry and Logging	3		
13	Secondary	Manufacture of other non-metallic mineral products	2		
14	Secondary	Manufacture of coke and refined petroleum products	2		
15	Primary	Fishing & Aquaculture	2		ASCI
16	Secondary	Manufacture of Transport	1	Clean Mobility Systems	Automotive Skills Development Council
17	Secondary	Manufacture of machinery and equipments n.e.c.	1		
18	Secondary	Manufacture of pharmaceutical; medicinal chemicals and botanical products	1	Genomics and Pharmaceuticals, pharma	Life Sciences Sector Skill Development Council
19	Secondary	Manufacture of computer, electronic and optical products		Geospatial Systems and Drones	Electronics Sector Skill Council of India
20	Secondary	Manufacture of communication equipment		Semiconductor and its eco-system	Telecom Sector Skill Council
21	Tertiary	Air Transport		Space Economy	Aerospace and Aviation Sector Skill Council

Back

Step 6: Policy Direction

Replace Construction with Manufacturing Sectors

S.No.	***Sector***	***Sub-sector***	***Appears in all 4 top 25 lists of Multipliers and Shares***	***Sunrise Sector (mentioned in Union Budget 2022-23)***	***Sector Skill Council***
1	Primary	Agriculture	4	Agri-tech	ASCI
2	Primary	Livestock	4		ASCI
3	Tertiary	Trade	4		Retailers' Association Skill Council of India
4	Tertiary	Computer related services	2 (Share of GVA & Share of Jobs)	Artificial Intelligence, Deep tech and Digital Economy	IT-ITeS Sector Skill Council-NASSCOM
5	Secondary	Manufacturing of Textiles plus cotton ginning	3 (Share of GVA, Share of Jobs & Employment Multiplier)		Textiles Sector Skill Council
6	Secondary	Manufacture of Transport	1 (Share of GVA)	Clean Mobility Systems	Automotive Sector Skill Council
7	Secondary	Electricity	2 (Share of GVA and GVA Multiplier)	Green Energy	Skill Council for Green Jobs

Notes: Orange shaded cells indicate sunrise sectors.

Back

Step 7: Choosing Sub-sectors at the NIC 4-digit level-I

S.No.	Sector	Sub-sector	Sub-Sector (Share of Jobs within the sector)
1	Primary	Agriculture	1. Growing of cereals (except rice), leguminous crops and oil seeds (39%)
			2. Growing of rice (33%)
			3. Growing of fibre crops (6.6%)
2	Primary	Livestock	1. Raising of cattle and buffaloes (46%)
			2. Raising of sheep and goats (8.1%)
			3. Raising of poultry (3.15%)
3	Tertiary	Trade	1. Retail sale of food in specialized stores (33.9%)
			2. Retail sale of clothing, footwear and leather articles in specialized stores (8.4%)
			3. Maintenance and repair of motor vehicles (3.7%)
4	Tertiary	Computer related services	1. Computer programming activities (49.7%)
			2. Other information technology and computer service activities (34.3%)
			3. Computer consultancy and computer facilities management activities (9.1%)

Back

Step 7: Choosing Sub-sectors at the NIC 4-digit level-II

S.No.	*Sector*	*Sub-sector*	*Sub-Sector (Share of Jobs)*
5	Secondary	Manufacturing of Textiles plus cotton ginning	1. Manufacture of other textiles n.e.c. (34.2%)
			2. Weaving of textiles (32.3%)
			3. Finishing of textiles (9.5%)
6	Secondary	Manufacture of Transport	1. Manufacture of parts and accessories for motor vehicles (49%)
			2. Manufacture of motor vehicles (18.7%)
			3. Manufacture of motorcycles (15.5%)
7	Secondary	Electricity (focus on sunrise sector)	1. Electric power generation by coal based thermal power plants (22%)
			3. Electric power generation using solar energy (6%)
			4. Electric power generation using other non conventional sources (1.2%)

Back

Selected Sectors and Sub-sectors

- I/O analysis, Income & emp. Multipliers, %GVA & workers; ranking of sectors, sunrise sectors
- Data sources: PLFS, National Accounts Statistics (NAS)

S.No.	Sector	Sub-sector	Sub-Sectors
1	Primary	Agriculture	Growing of Cereals, Leguminous Crops and Oilseeds
2	Primary	Livestock	Raising of Cattle and Buffaloes
3	Tertiary	Trade	Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenance & repair of MVs
4	Tertiary	Computer related services	Computer Programming Activities
5	Secondary	Manufacturing of Textiles plus cotton ginning	Weaving of textiles
6	Secondary	Manufacture of Transport	Manufacturing of motor vehicles, parts & accessories of motor vehicles
7	Secondary	Electricity	Electric Power Generation using solar energy and other non-conventional sources

Back

Data Sources: NAS and PLFS

Value Chains

Steps	*Agriculture*	*Livestock*	*Weaving of Textiles*	*Motor Vehicles*	*Green Electricity*	*Retail*	*IT*
1.	Crop Planning	Input – collection of feed and fodder	Inputs+Ginning	Design and R&D	Manufacturing of Components	Selection of locations/platfor m	Industry 4.0
2.	Cultivation (Input & Production)	Milk Production	Spinning	Manufacturing	Planning	Selecting type of shop/platform	Cloud Infrastructure
3.	Harvesting	Collection of Milk	Weaving & Finishing	Sales	Engineering, Procurement & Construction	Products finalisation	Software Product
4.	Supply Chain (Storage and Transport)	Transport	Marketing	After Sales Service	Operation & Maintenance	Procurement	IT Integration/ System Integration
5.	Marketing	Bulk Chilling Centres/ Households		Support Services	Transmission	Storage and warehousing	End-User Computing
6.						Store management	
7.						Customer satisfaction	

Back

Defining Geographical Clusters

- Porter (1990) defined an industry cluster as a geographically proximate group of firms and associated institutions in related industries, linked by economic and social interdependencies.
- Delgado et al. (2014) defined clusters as "geographic concentrations of industries related by knowledge, skills, inputs, demand, and/or other linkages.
- Methodology: used step-wise ranking method to compile indicators

Back

Sources:
1. Porter, M. E. 1990. Competitive advantage of nations. New York: Free Press.
2. Delgado, M., Porter, M. E., & Stern, S. 2014. "Defining clusters of related industries". *NBER Working Paper No. w20375*. https://www.nber.org/system/files/working_papers/w20375/w20375.pdf. Boston: MA: National Bureau of Economic Research.

Methodology for Computing Geographical Clusters-I

Delgado et al. (2014) in agriculture and livestock

Identification of Clusters	Institutional	Social Capital
		Network & Partnership
		Leadership & Vision
		Entrpreneurship & Culture
	Business Infrastructure	Access to Information
		Market
		Specialist Service
		Financial Access
	Human Resources	Competence
		Expertise
		Innovations
	Government Support	Infrastructure
		Policies

Source: Adapted framework from Sutawi et al. (2022)

Back

Indicators for Computing Geographical Clusters for Growing Cereals (including rice), Leguminous Crops and Oilseeds

Pillars	*Sub-Pillars*	*Indicators*
Institutional	Social Capital	Primary Agricultural Societies
		% of farm households where any of the household member is a member of registered farmer's organization
	Network & Partnership	FPOs
	Leadership and Vision	State Agricultural Marketing Boards/Directorates
		National Agricultural Federation
	Entrepreneurship and Culture	No. of agri tech-start-ups
	Competition	Not relevant in Indian Agricultural Scenario
Business Infrastructure	Information Access	% of crop growers who are accessing technical advise
	Market Access	Access to market sources for selling their produce
		Market information System: Number of APMC Market registered in e-NAM portal/000 farmers
	Specialist Service	Soil Testing Laboratories
		Custom Hiring Centres Established
		State-wise Storage capacity:
		State-wise list of the Warehouses Registered with the WDRA
		State -wise seed Testing Laboratories
		State Seed Corporations
		Seed Certification Agencies
		State-wise number of Fertilizer sale points
	Specialist Service	State-wise number of fertilizer quality control Laboratories
	Financial Access	State wise number of operative KCC

Back
Back to Sectoral Analysis

Indicators for Computing Geographical Clusters for Growing Cereals (including rice), Leguminous Crops and Oilseeds

Pillars	***Sub-Pillars***	***Indicators***
Human Resources	Competence & Expertise	% of workers who are employed in growing of cereals, pulses and oilseeds industry
	Innovation	Training Institutes
		Seeds: National Seed Research and Training Centre, Varanasi
		No. of Farm Machinery training institutes
		National Centre for Organic and Natural Farming (Regional Training Stations)
		R &D Investment in Agriculture (Crops)
		% of ICAR institutes and State Agricultural Universities devoted to crop sciences
		Agri-clinics And Agri-business Centers
Government Support	Infrastructure	No. of PACS by State
		% of (Agriculture) capital expenditure to total government expenditure
		Agri-tech
	Policies	State Agriculture Infrastructure Development Plan (SAIDP)
		State Agriculture Plan (SAP)
		District Agriculture Plan (DAP)
		National Agriculture Infra Financing Facility
		State Extension Programmes for Extension Reforms (ATMA)

Back
Back to Sectoral Analysis

Agricultural Geographical Clusters-I

***Agricultural Geographical Clusters* for Growing Cereals (including rice), Leguminous Crops and Oilseeds**

State	*Institutional*	*Infrastructure*	*Government Support*	*Human Resource*	*Average of all the Rankings*
Uttar Pradesh	2	3	3	1	2
Maharashtra	1	2	14	2	5
Rajasthan	8	4	2	5	5
Madhya Pradesh	6	1	10	4	5
Gujarat	5	8	6	6	6
Bihar	10	13	4	3	8
Odisha	12	9	7	11	10
Tamil Nadu	9	7	5	20	10
Karnataka	7	10	12	14	11
Telangana	4	11	20	8	11
West Bengal	18	21	1	7	12
Haryana	14	6	21	10	13
Andhra Pradesh	11	5	23	15	14
Assam	23	20	8	9	15
Punjab	13	14	17	16	15
Kerala	3	19	19	21	16
Himachal Pradesh	21	16	11	17	16

Back
Back to Sectoral Analysis

Agricultural Geographical Clusters for Growing Cereals (including rice), Leguminous Crops and Oilseeds-II

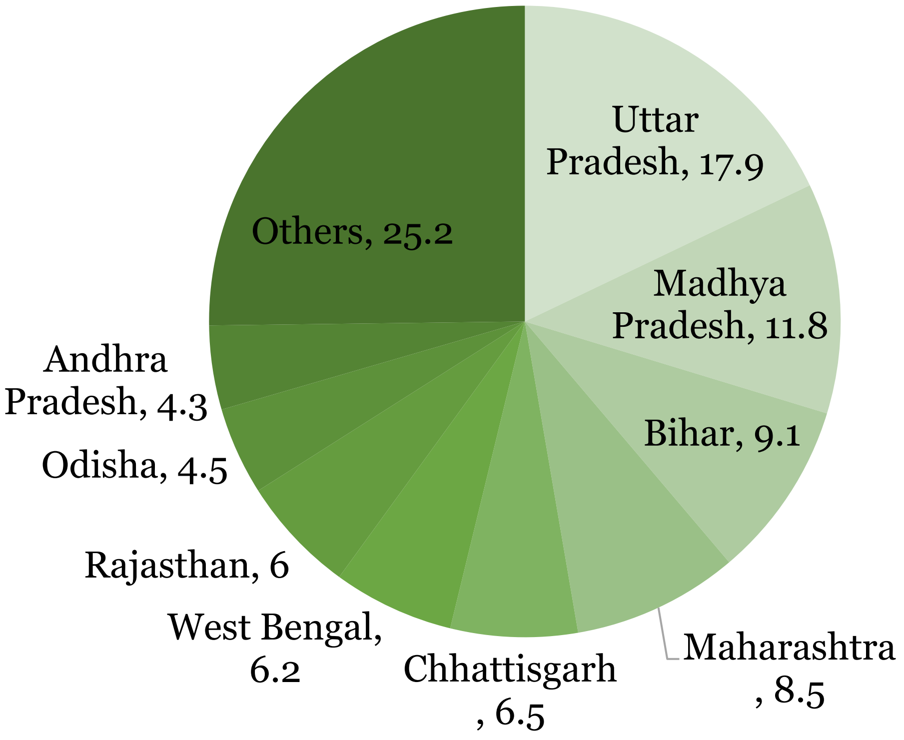
State	*Institutional*	*Infrastructure*	*Government Support*	*Human Resource*	*Average of all the Rankings*
Jammu & Kashmir	22	17	9	18	17
Chhattisgarh	20	12	24	13	17
Uttarakhand	17	15	18	19	17
Jharkhand	19	18	25	12	19
Nagaland	15	22	16	25	20
Mizoram	16	25	15	32	22
Tripura	26	23	13	30	23
Manipur	24	29	27	22	26
Delhi	25	24	30	24	26
Meghalaya	28	30	29	23	28
Arunachal Pradesh	31	32	22	28	28
Sikkim	27	28	32	26	28
Goa	29	31	28	27	29
Puducherry	30	26	31	29	29
Lakshadweep	32	27	34	36	32
Chandigarh	37	34	26	34	33
Dadra & Nagar Haveli	35	33	35	31	34
Ladakh	34			33	34
Daman & Diu	33	36			35
Andaman & Nicobar Islands	36	35	33	35	35

Back
Back to Sectoral Analysis

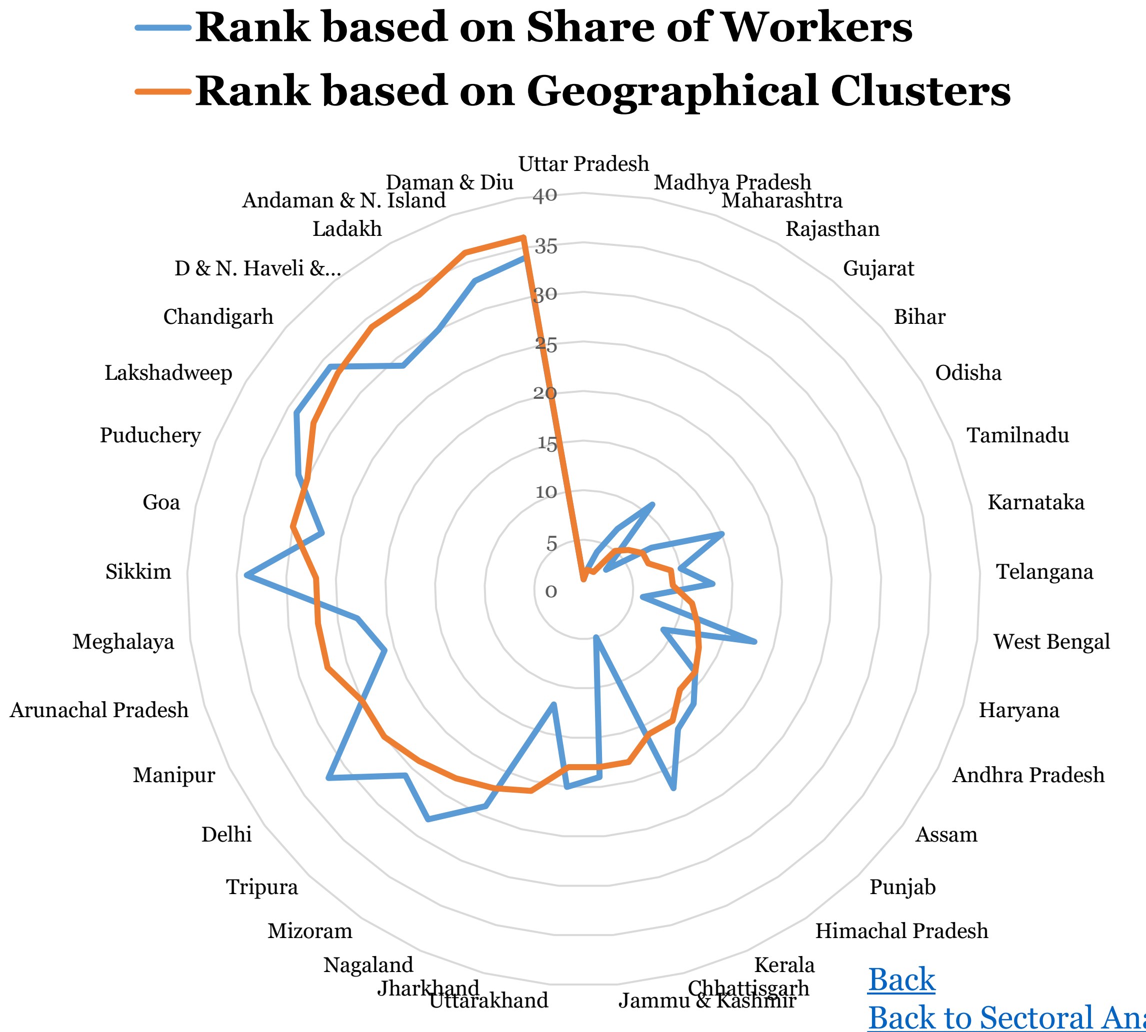
State Variations in Workers and Correlation of Clusters

The correlation between rankings of geographical clusters and share of workers is 0.9 for 'growing of cereals, leguminous crops and oilseeds'

Percentage Share of Workers (age 15+) Engaged in Growing Cereals (including rice), leguminous crops and oilseeds, 2022-23



Source: NCAER Analysis from PLFS 2022-23



[Back](#)
[Back to Sectoral Analysis](#)

Indicators for Computing Geographical Clusters for ‘Raising Cattle and Buffaloes’

Pillars	*Sub-Pillars*	*Indicators*
Institutional	Social Capital	Affiliated Dairy Cooperative Societies (DCS)
		FPOs
	Network & Partnership	Membership of Dairy Cooperatives
		No. of private dairy farms
	Leadership and Vision	Dairy Federations
	Entrepreneurship and Culture	Dairy Cooperative Brands
		Percentage of employers in the specific NIC code
	Competition	No. of private dairy farms (data not available)
Business Infrastructure	Information Access	% of dairy farmers who are accessing technical advice
	Market Access	Procurement volume of milk across India -% of dairy farm households who are selling to the market
	Specialist Service	Artificial insemination centres
		No. of Artificial inseminations done
		Fodder farms
	Bulk Cooling Units	Bulk cooling units
		Liquid Milk Plants
	Milk Processing Centre (No.)	Capacity of milk processed (TLPD)
	Financial Access	% of dairy farm households who have a bank account
		% of dairy farm households who have accessed institutional credit
		% of dairy farm households who accessed credit for capital expenditure in farm business

Indicators for Computing Geographical Clusters for 'Raising Cattle and Buffaloes'		
Pillars	***Sub-Pillars***	***Indicators***
Human Resources	Competence & Expertise	% of workers who are employed in dairy industry and who have technical/vocational education
		No. of training institutes
	Innovation	State-wise no. of patents in dairy industry
		% of ICAR institutes and State Agricultural Universities devoted to dairy or veterinary
Government Support	Infrastructure	No. of PACS by State
		No. of Gram Panchayats covered by Dairy Cooperatives
		% of (dairy development plus animal husbandry) capital expenditure to total government expenditure or total agriculture
	Policies	Dairy Progeny Programme

Back
Back to Sectoral Analysis

Dairy Clusters in India-I

S.No.	***State Name***	***Institutional***	***Business Infrastructure***	***Human Resources***	***Government Support***	***Average Ranking***
1	Karnataka	1	6	4	6	4.3
2	Maharashtra	6	1	2	15	6
3	Rajasthan	4	4	6	10	6
4	Gujarat	2	2	10	14	7
5	Bihar	7	3	3	26	9.8
6	Kerala	10	23	11	1	11.3
7	Odisha	14	16	9	7	11.5
8	Tamil Nadu	5	9	7	25	11.5
9	Uttar Pradesh	3	7	1	35	11.5
10	West Bengal	15	10	8	17	12.5
11	Madhya Pradesh	8	11	5	31	13.8
12	Chhattisgarh	17	21	18	2	14.5
13	Himachal Pradesh	20	12	15	11	14.5
14	Andhra Pradesh	16	8	17	18	14.8
15	Haryana	9	18	14	23	16
16	Assam	19	17	13	19	17
17	Jharkhand	26	13	12	20	17.8

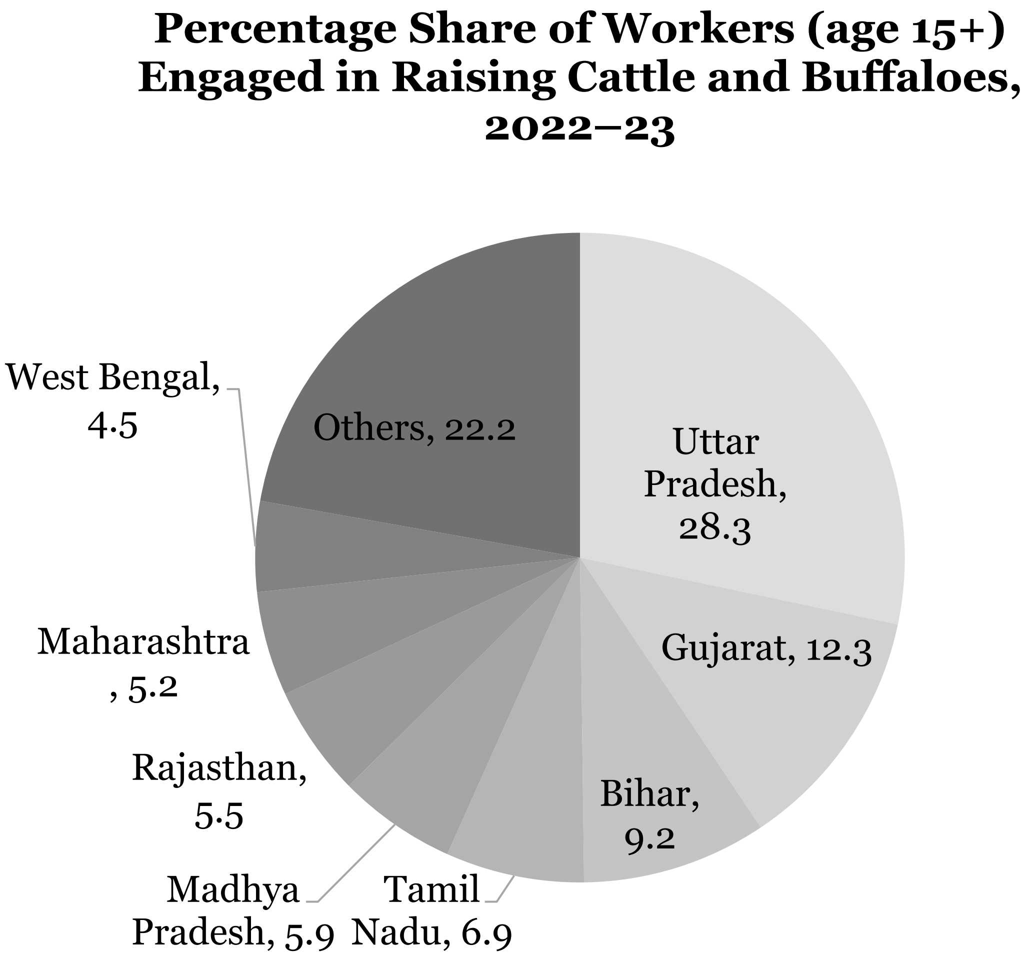
Back
Back to Sectoral Analysis

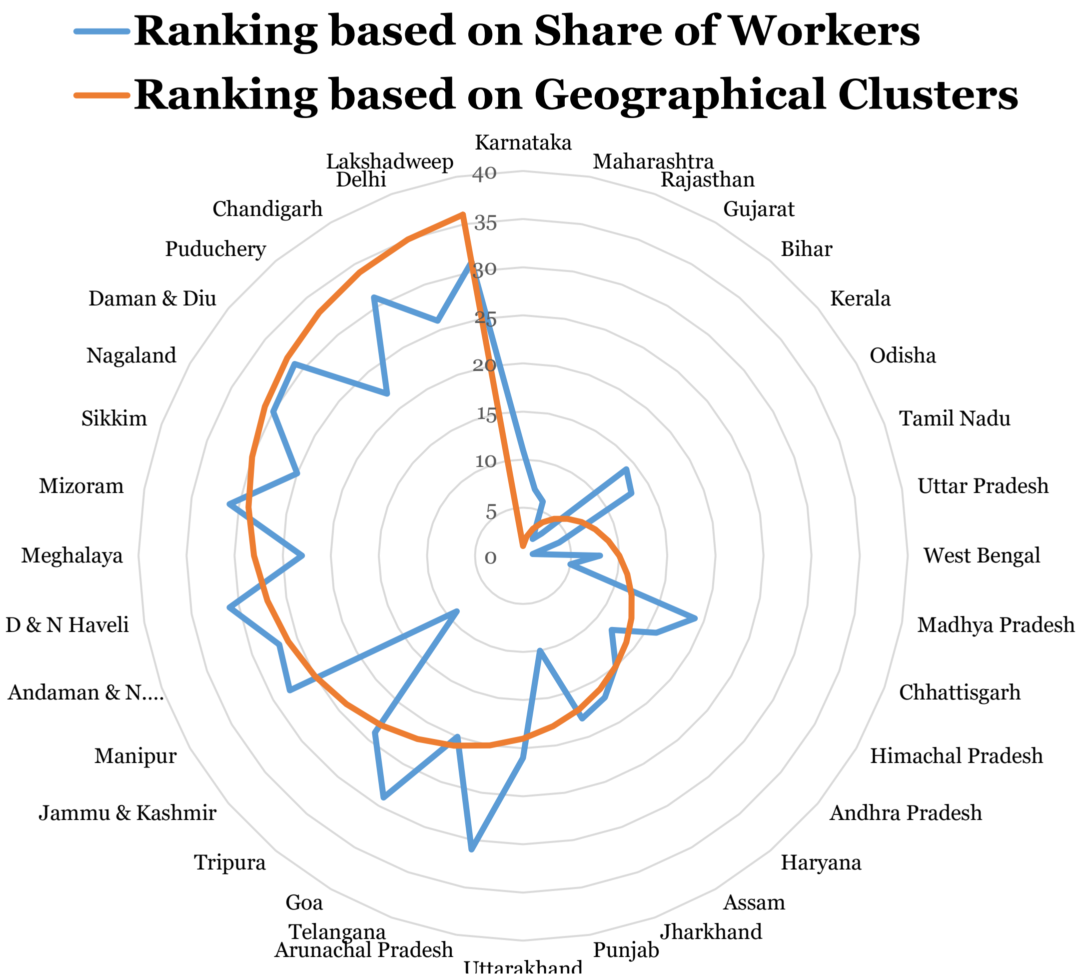
Dairy Clusters in India-II

S.No.	*State Name*	*Institutional*	*Business Infrastructure*	*Human Resources*	*Government Support*	*Average Ranking*
18	Punjab	11	14	16	32	18.3
19	Uttaranchal	12	19	20	24	18.8
20	Arunachal Pradesh	33	20	23	5	20.3
21	Telangana	13	15	19	36	20.8
22	Goa	24	5	30	27	21.5
23	Tripura	25	28	22	13	22
24	Jammu & Kashmir	18	22	21	28	22.3
25	Manipur	21	24	24	22	22.8
26	A & N Islands	31	30	29	4	23.5
27	D & N Haveli	32	31	33	3	24.8
28	Meghalaya	29	35	31	8	25.8
29	Mizoram	30	34	27	12	25.8
30	Sikkim	22	27	25	29	25.8
31	Nagaland	27	36	28	16	26.8
32	Daman & Diu	36	29	35	9	27.3
33	Puducherry	23	33	26	30	28
34	Chandigarh	34	25	34	21	28.5
35	Delhi	35	26	32	34	31.8
36	Lakshadweep	28	32	36	33	32.3

Back
Back to Sectoral Analysis

The correlation between rankings of geographical clusters and share of workers is 0.8 for 'raising cattle and buffaloes'





Notes: 1. Lower ranking means higher concentrations.
Sources: NCAER Computations from Geographical Cluster Computations and PLFS 2022-23.

Back
Back to Sectoral Analysis

Methodology for Computing Geographical Clusters-II

Sector	*Definition*	*Indicator*	*Sources of Data*
Weaving of Textiles	Porter (1990)	Number of manufacturing units	1. Annual Survey of Industries (ASI) 2. Annual Survey of Unincorporated Sector Enterprises 3. Ministry of Textiles
Manufacturing of Motor Vehicles (MVs), Parts & Accessories of MVs and Repair & Maintenance of MVs	Porter (1990)	Number of units/ No. of workshops	ASI and ASUSE

Back
Back to Textiles Sectoral Analysis
Back to Auto Sectoral Analysis

Geographical Clusters of Weaving for Textiles

	Rank using ASI 2021-22	*Rank using ASUSE 2021-22*	*Ranking using no. of Power loom units from the MoT, 2022*	*Ranking using Number of Handloom Units from the MoT, 2022*	*Average*
Tamil Nadu	2	1	2	5	2.5
Uttar Pradesh	8	5	3	7	5.8
West Bengal	12	3	9	2	6.5
Andhra Pradesh	10	4	6	9	7.3
Gujarat	1	10	4	22	9.3
Maharashtra	3	9	1	26	9.8
Karnataka	11	8	5	16	10.0
Assam	16	6	20	1	10.8
Manipur	20	2	21	3	11.5
Kerala	9	11	16	15	12.8
Madhya Pradesh	14	13	7	20	13.5
Odisha	18	7	18	11	13.5
Haryana	5	24	10	21	15.0
Jammu & Kashmir	20	17	11	12	15.0
Telangana	13	12	21	18	16.0
Rajasthan	4	19	17	25	16.3
Tripura	25	16	21	6	17.0

Back
Back to Sectoral Analysis

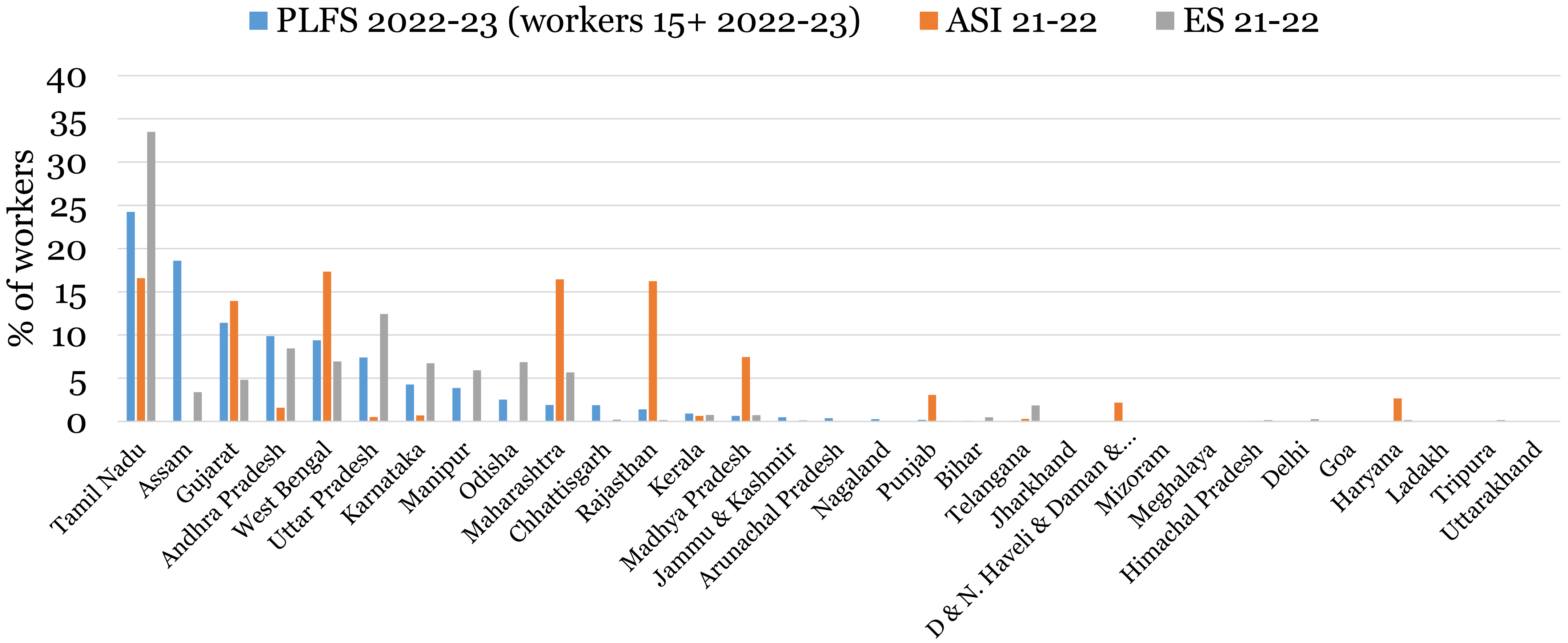
Geographical Clusters of Weaving for Textiles

	Rank using ASI 2021-22	*Rank using ASUSE 2021-22*	*Ranking using no. of Power loom units from the MoT, 2022*	*Ranking using Number of Handloom Units from the MoT, 2022*	*Average*
Bihar	23	14	8	24	17.3
Punjab	7	22	11	31	17.8
Arunachal Pradesh	25	26	11	12	18.5
Chhattisgarh	19	18	19	19	18.8
Meghalaya	25	27	21	3	19.0
Nagaland	25	21	21	10	19.3
Mizoram	15	27	21	17	20.0
D & N. Haveli & Daman & Diu	6	27	21	31	21.3
Arunachal Pradesh	31	27	21	8	21.8
Delhi	20	20	21	27	22.0
Uttarakhand	23	25	11	31	22.5
Jharkhand	25	27	21	23	24.0
Goa	25	27	21	30	25.8
Ladakh	31	23	21	31	26.5
Puducherry	31	27	21	28	26.8
Chandigarh	31	27	21	31	27.5
Lakshadweep	31	27	21	31	27.5
Sikkim	32	28	21	29	27.5

Back
Back to Sectoral Analysis

State Variations in 'Weaving of Textiles

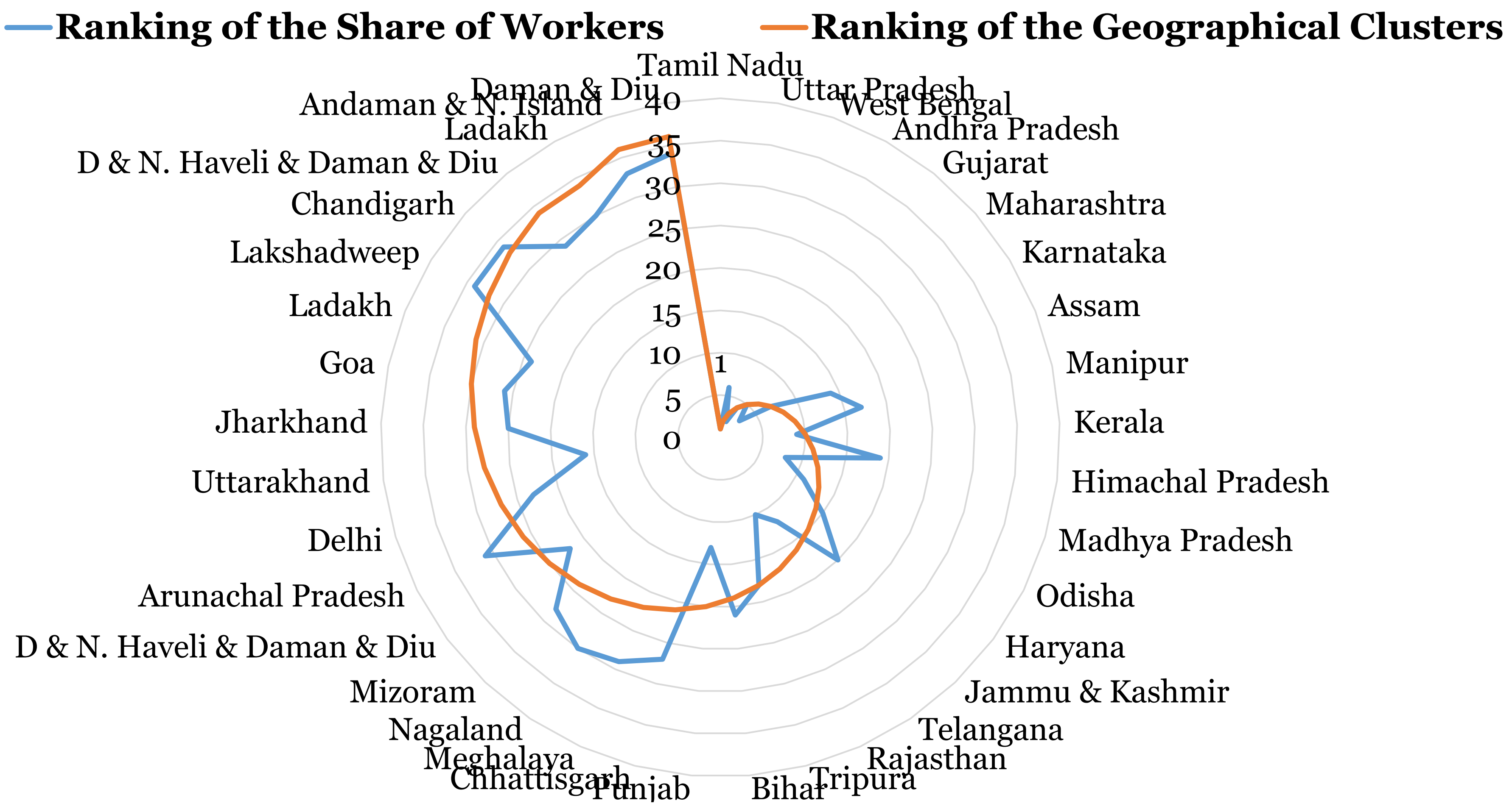
All three sources of employment data conform to the broad trends that a large share of workers are engaged in weaving of textiles in Tamil Nadu, Gujarat, Assam, AP and West Bengal but ASI and ASUSE show that Maharashtra, Rajasthan, MP, Punjab and Haryana also employ workers in this sector



Sources: NCAER Analysis from PLFS 2022-23, ASI 2021-22 and ASUSE 2021-22

[Back]
[Back to Sectoral Analysis]

The correlation between rankings of geographical clusters and share of labour force is 0.8 for 'weaving of textiles'



Note: Lower ranking means higher concentrations.
Sources: NCAER Computations from Geographical Cluster Computations and PLFS 2022-23.

Back
Back to Sectoral Analysis

Parts and Accessories of Motor Vehicles				Motor Vehicles				Repair and Maintenance of Motor Vehicles			
State/UT	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***	***State/UT***	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***	***State/UT***	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***
Maharashtra	2	2	2	Maharashtra	1	7	4	Maharashtra	3	2	2.5
Tamil Nadu	1	3	2	Haryana	2	7	4.5	Tamil Nadu	1	4	2.5
Uttar Pradesh	5	1	3	Karnataka	4	5	4.5	Uttar Pradesh	5	1	3
Haryana	3	5	4	Tamil Nadu	3	7	5	Kerala	2	6	4
Gujarat	7	4	5.5	West Bengal	10	1	5.5	Gujarat	6	5	5.5
Karnataka	4	8	6	Gujarat	4	7	5.5	Karnataka	4	7	5.5
Punjab	8	7	7.5	Uttar Pradesh	8	4	6	Rajasthan	11	3	7
Rajasthan	11	10	10.5	Madhya Pradesh	6	7	6.5	Andhra Pradesh	7	12	9.5
Jharkhand	10	12	11	Jharkhand	7	7	7	Telangana	8	11	9.5
Kerala	20	6	13	Rajasthan	12	3	7.5	Madhya Pradesh	14	8	11
Uttarakhand	6	22	14	Punjab	14	2	8	Punjab	10	13	11.5
Madhya Pradesh	9	19	14	Uttarakhand	10	6	8	West Bengal	13	10	11.5
Delhi	12	16	14	Telangana	9	7	8	Jharkhand	15	9	12
West Bengal	15	15	15	Andhra Pradesh	12	7	9.5	Haryana	12	17	14.5
Odisha	20	11	15.5	Odisha	15	7	11	Delhi	9	23	16
Andhra Pradesh	14	18	16	Kerala	15	7	11	Odisha	19	14	16.5
Jammu & Kashmir	25	9	17	Jammu & Kashmir	17	7	12	Bihar	18	16	17

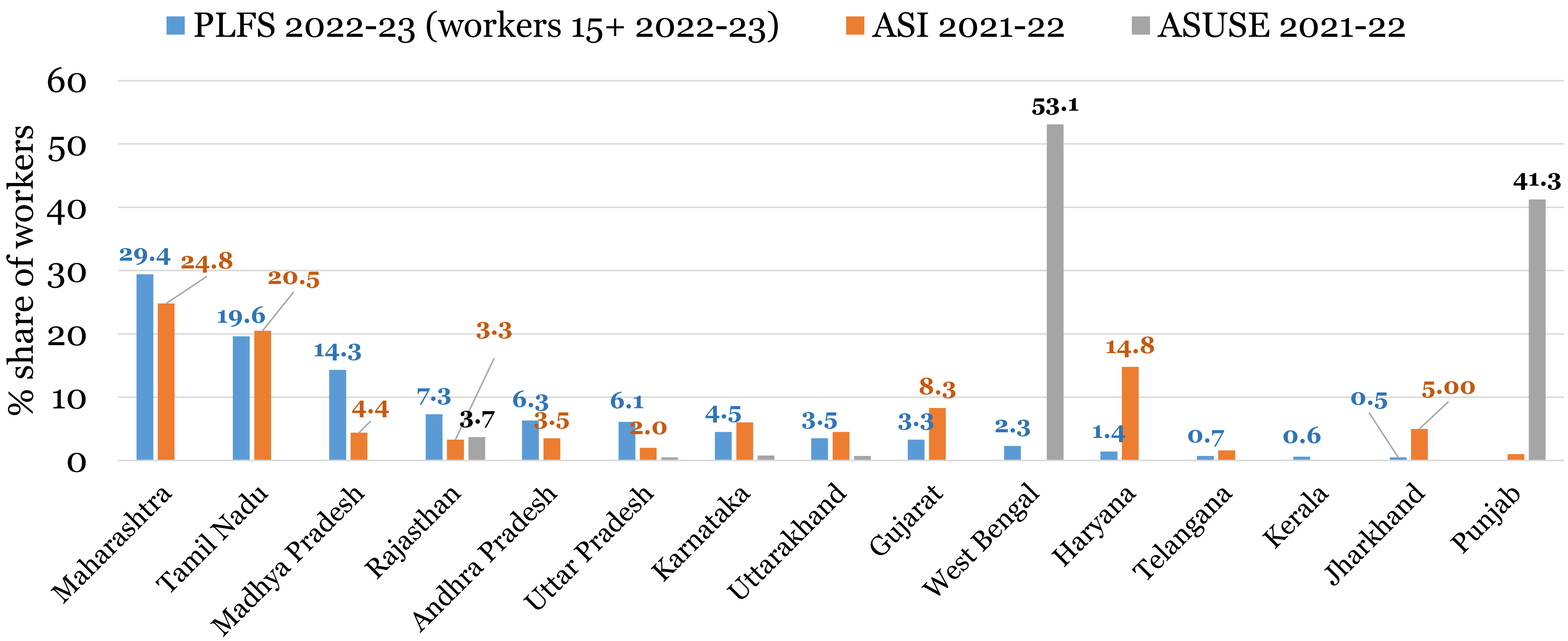
Back
Back to Sectoral Analysis

Parts and Accessories of Motor Vehicles				Motor Vehicles				Repair and Maintenance of Motor Vehicles			
State/UT	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***	***State/UT***	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***	***State/UT***	***ASI Rank***	***ASUSE Rank***	***Avg. Rank***
Himachal Pradesh	13	22	17.5	Himachal Pradesh	17	7	12	Chhattisgarh	17	18	17.5
Chandigarh	18	20	19	Chandigarh	17	7	12	Chandigarh	22	15	18.5
Puducherry	16	22	19	Delhi	17	7	12	Assam	16	21	18.5
Bihar	25	13	19	Bihar	17	7	12	Uttarakhand	20	19	19.5
Assam	24	14	19	Sikkim	17	7	12	Himachal Pradesh	23	20	21.5
Telangana	17	22	19.5	Arunachal Pradesh	17	7	12	Goa	21	24	22.5
Chhattisgarh	23	17	20	Nagaland	17	7	12	Jammu & Kashmir	24	22	23
D & N. Haveli & Daman & Diu	19	22	20.5	Manipur	17	7	12	Tripura	25	29	27
Goa	22	22	22	Mizoram	17	7	12	Manipur	30	25	27.5
Meghalaya	25	21	23	Tripura	17	7	12	Meghalaya	29	26	27.5
Sikkim	25	22	23.5	Meghalaya	17	7	12	Puducherry	28	27	27.5
Arunachal Pradesh	25	22	23.5	Assam	17	7	12	Nagaland	26	30	28
Nagaland	25	22	23.5	Chhattisgarh	17	7	12	Mizoram	27	32	29.5
Manipur	25	22	23.5	D & N. Haveli & Daman & Diu	17	7	12	Arunachal Pradesh	33	28	30.5
Mizoram	25	22	23.5	Goa	17	7	12	Andaman & N. Island	30	33	31.5
Tripura	25	22	23.5	Lakshadweep	17	7	12	D & N. Haveli & Daman & Diu	33	31	32
Lakshadweep	25	22	23.5	Puducherry	17	7	12	Sikkim	32	35	33.5
Andaman & N. Island	25	22	23.5	Andaman & N. Island	17	7	12	Ladakh	33	34	33.5
Ladakh	25	22	23.5	Ladakh	17	7	12	Lakshadweep	33	36	34.5

Back Component 1 Macro-analysis of sectoral shares & workforce

State Variations in 'Manufacturing of Motor Vehicles'

Maharashtra and Tamil Nadu are the common States which house the largest share of workers engaged in this sector but ASUSE indicate that West Bengal and Punjab also employ workers in this sector

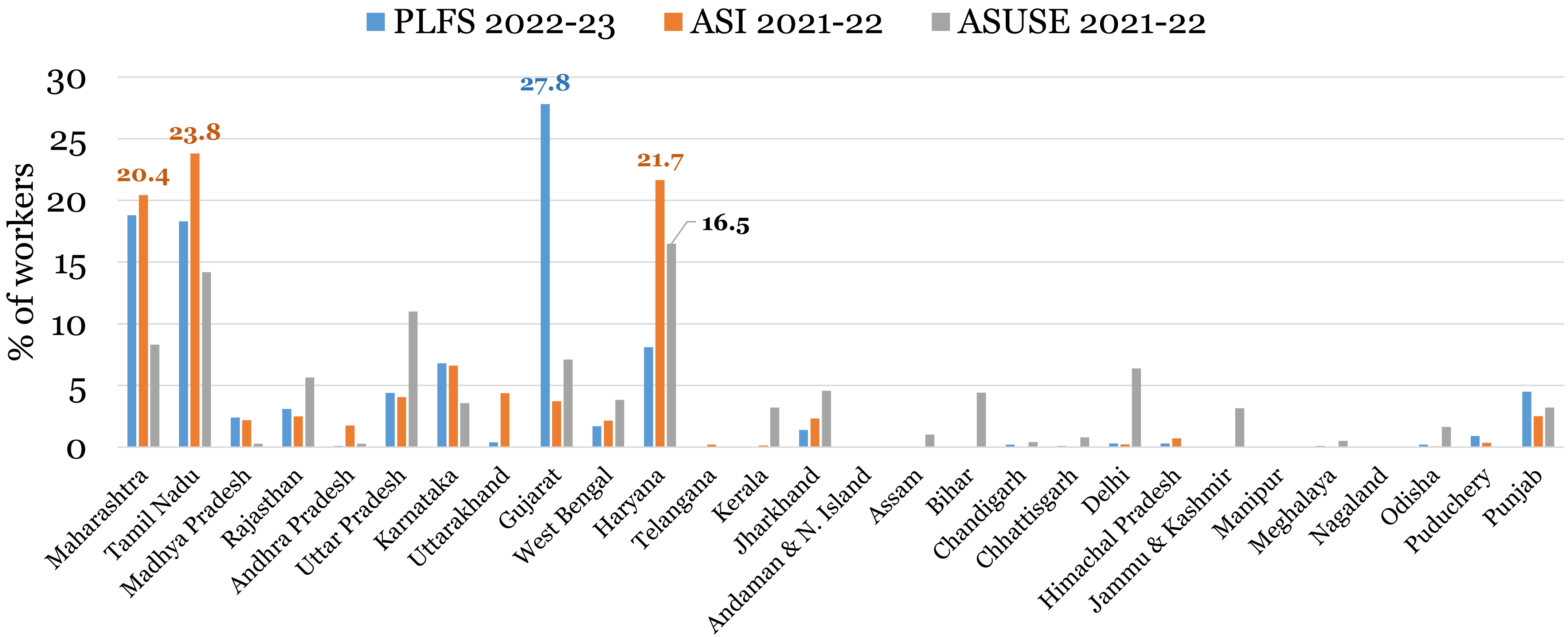


Sources: NCAER Analysis from PLFS 2022-23, ASI 2021-22 and ASUSE 2021-22

[Back]
[Back to Sectoral Analysis]

State Variations in Manufacturing of Parts & Accessories for Motor Vehicles

Gujarat, Maharashtra, Tamil Nadu and Haryana are the leading States which employ the most workers in this sector

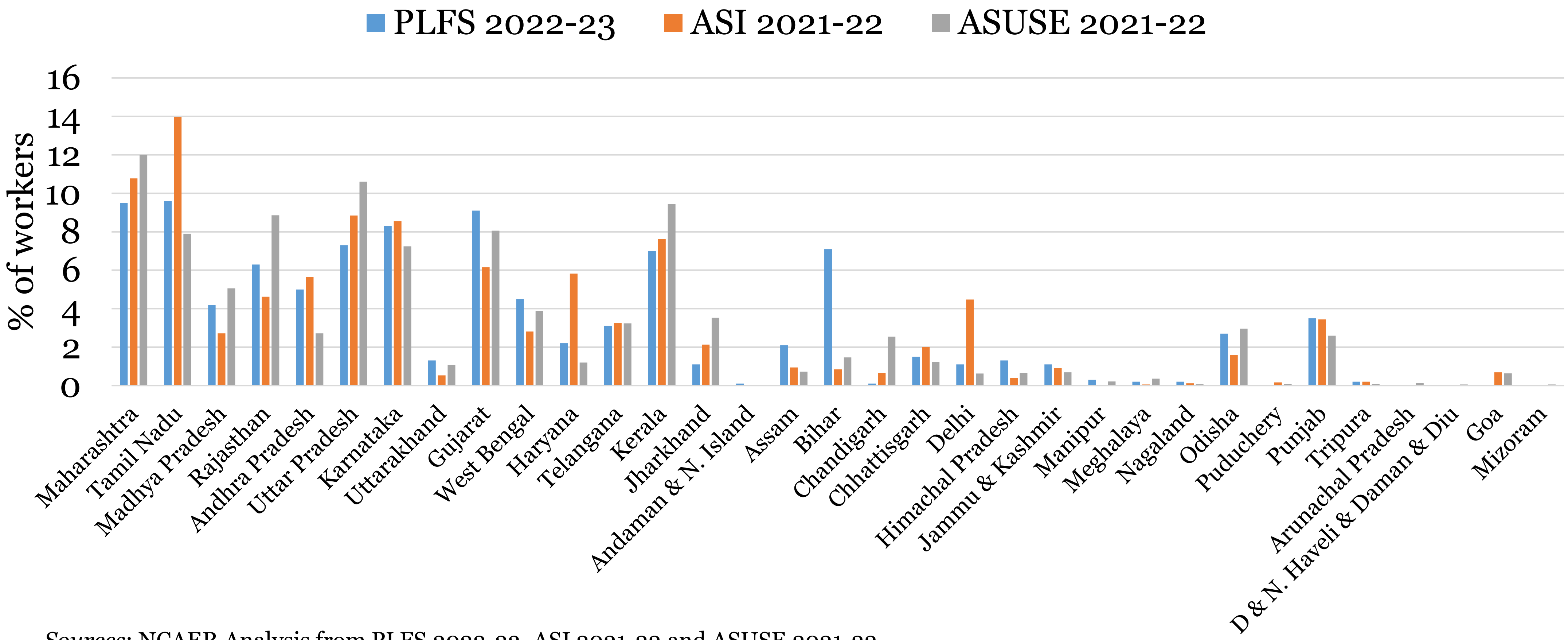


Sources: NCAER Analysis from PLFS 2022-23, ASI 2021-22 and ASUSE 2021-22

Back
Back to Sectoral Analysis

State Variations in Maintenance & Repair of Motor Vehicles

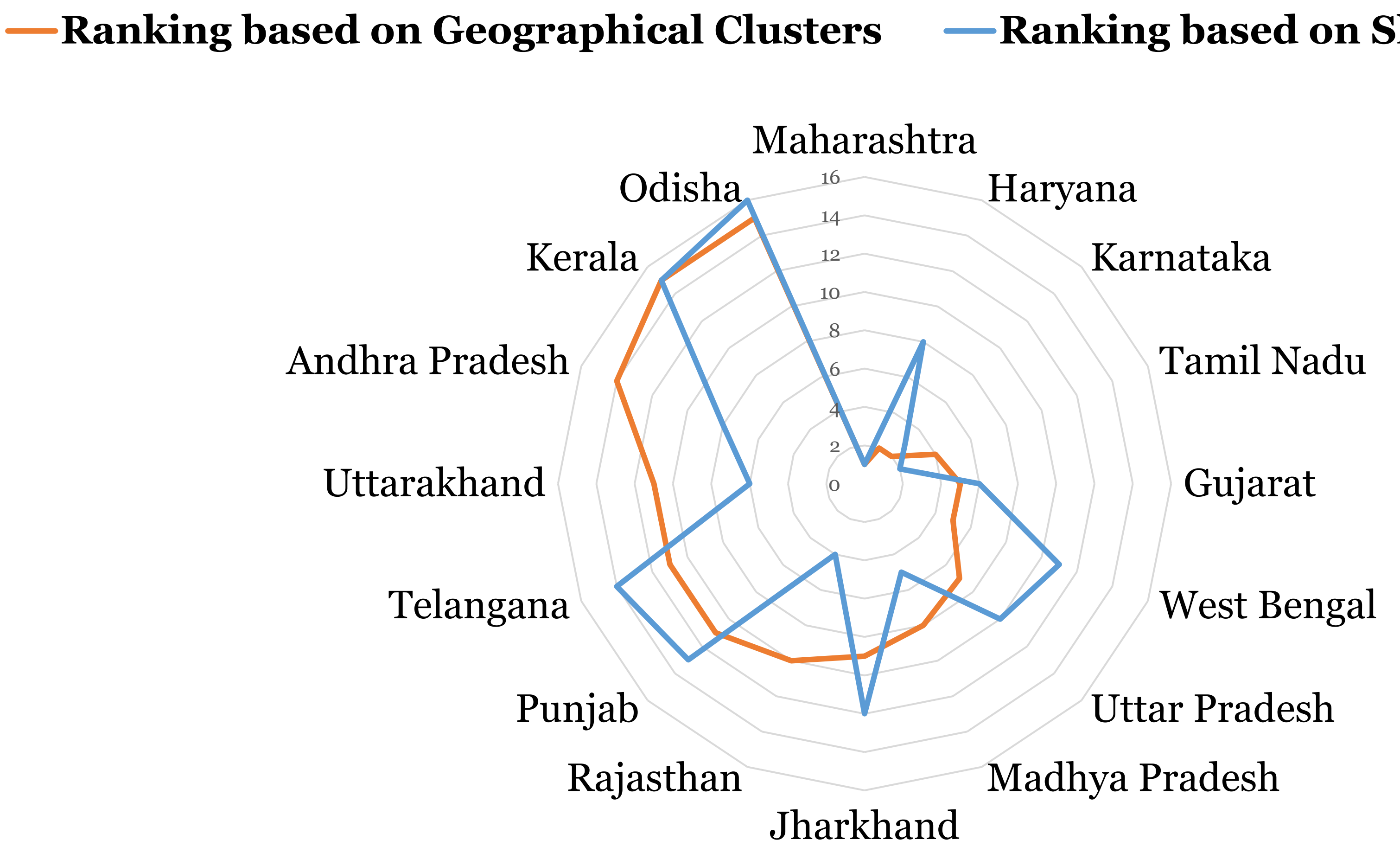
While majority of the workers are employed in Maharashtra and Tamil Nadu, every State employs workers in this sector



Sources: NCAER Analysis from PLFS 2022-23, ASI 2021-22 and ASUSE 2021-22

[Back]
[Back to Sectoral Analysis]

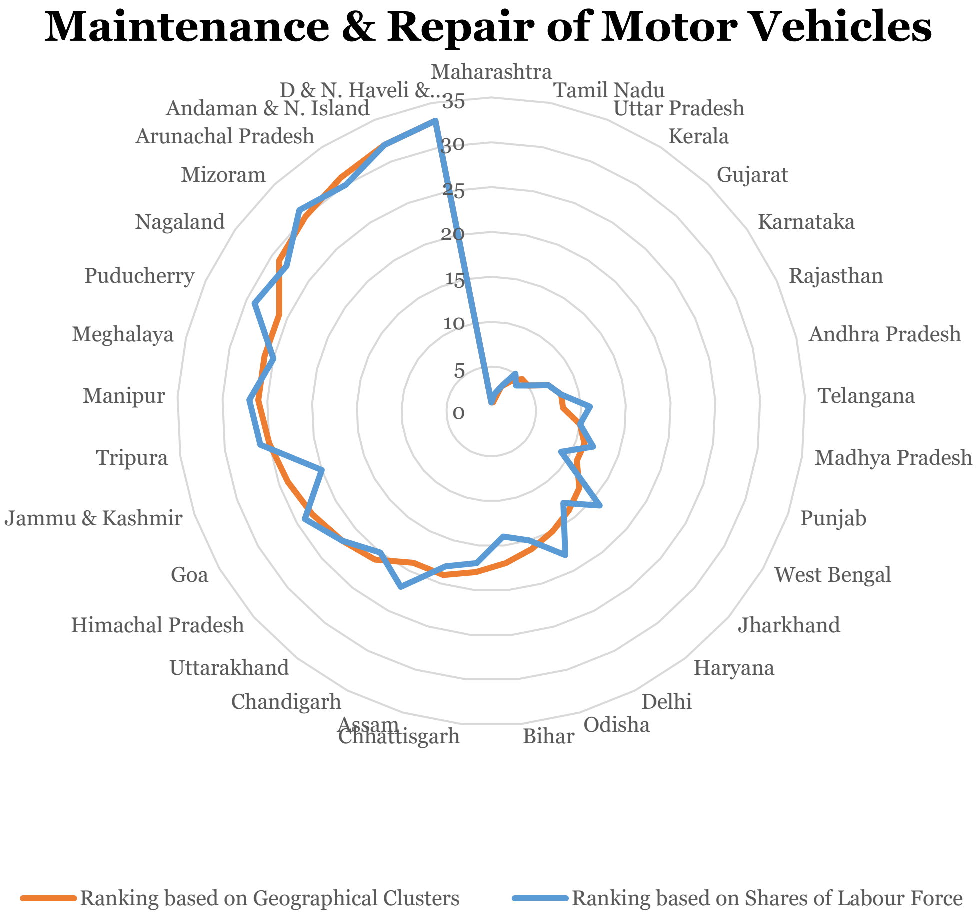
The correlation between rankings of geographical clusters and share of labour force is 0.7 for 'manufacturing of motor vehicles'



Note: Lower ranking means higher concentrations.
Sources: NCAER Computations from Geographical Cluster Computations and PLFS 2022-23.

[Back]
[Back to Sectoral Analysis]

The correlation between rankings of geographical clusters and share of labour force is 0.9 for both sectors- ‘manufacturing parts & accessories for motor vehicles’ and ‘maintenance & repair of of motor vehicles’



Note: Lower ranking means higher concentrations.
Sources: NCAER Computations from Geographical Cluster Computations and PLFS 2022-23.

Back
Back to Sectoral Analysis

Methodology for Computing Geographical Clusters-III

Sector	*Definition*	*Indicator*	*Sources of Data*
Generation of Solar Energy and Wind Energy	Porter (1990)	No. of operational units and operational capacity (MW)	NITI Aayog
Retail	Porter (1990)	No. of units	ASUSE, Retail Association of India and Number of Start-ups
IT	Delgado et al. (2014)		

Back

Geographical Concentration of Solar and Wind Energy Generation, as on 31 March 2024

Solar Electricity Generation

State	*Rank using Operational units (Numbers)*	*Rank using Operational Capacity (MW)*	*Average Rank*
Gujarat	2	2	2
Karnataka	1	3	2
Rajasthan	4	1	2.5
Tamil Nadu	2	4	3
Andhra Pradesh	5	7	6
Maharashtra	8	5	6.5
Madhya Pradesh	5	8	6.5
Uttar Pradesh	5	9	7
Telangana	12	6	9
Punjab	10	11	10.5
Haryana	14	10	12
Odisha	11	15	13
Chhattisgarh	15	12	13.5
Delhi	13	16	14.5

Wind Electricity Generation

State	*Rank using Operational units (Numbers)*	*Rank using Operational Capacity (MW)*	*Average Rank*
Gujarat	2	1	1.5
Tamil Nadu	1	2	1.5
Karnataka	2	3	2.5
Maharashtra	4	4	4
Rajasthan	5	5	5
Madhya Pradesh	5	7	6
Andhra Pradesh	7	6	6.5
Kerala	8	9	8.5
Telangana	9	8	8.5
Others	10	10	10

Back

Geographical Concentration of Solar Electricity Generation, as on 31 March 2024

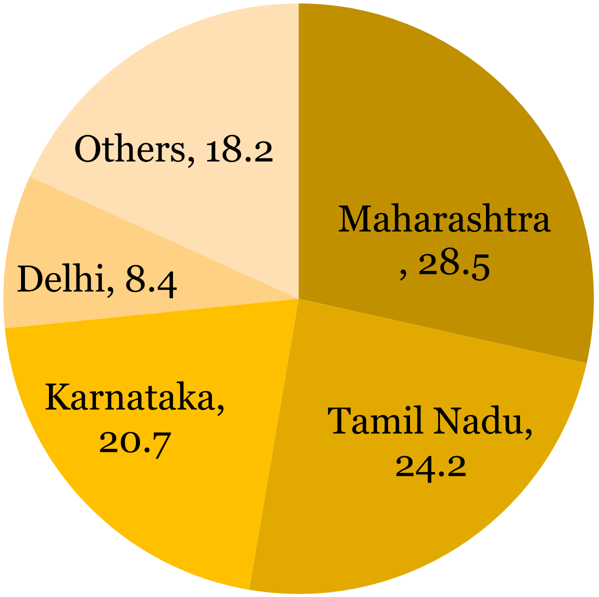
State	***Rank using Operational units (Numbers)***	***Rank using Operational Capacity (MW)***	***Average Rank***
Uttarakhand	17	14	15.5
Kerala	19	13	16
West Bengal	15	18	16.5
Bihar	17	17	17
Jharkhand	19	19	19
Assam	21	20	20.5
Arunachal Pradesh	9	32	20.5
Himachal Pradesh	23	21	22
Chandigarh	23	22	22.5
Jammu and Kashmir	23	23	23
Puducherry	23	24	23.5
Goa	23	26	24.5
Daman and Diu	23	27	25
Mizoram	23	28	25.5
Andaman and Nicobar Islands	22	29	25.5
Tripura	23	30	26.5
Manipur	23	31	27
Across India	38	25	31.5
Ladakh	32	33	32.5
Sikkim	32	34	33
Dadra and Nagar Haveli	32	35	33.5
Lakshadweep	32	36	34
Meghalaya	32	37	34.5
Nagaland	32	38	35

Back

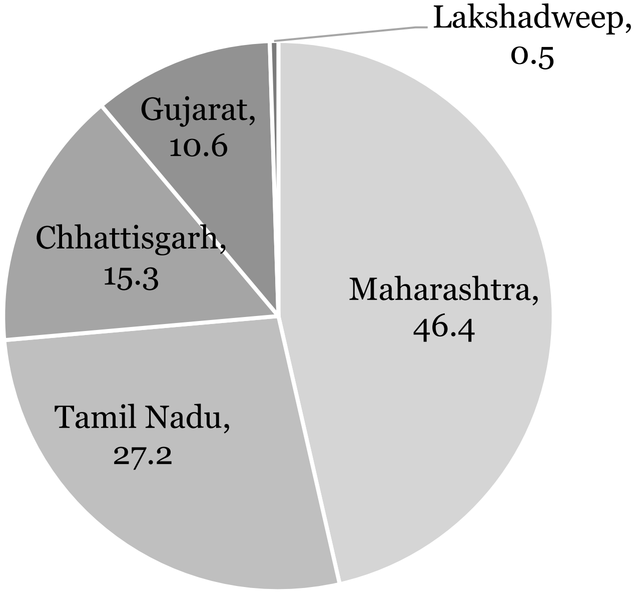
State Variations in Generation of Green Energy

Majority of the workers engaged in generation of green energy are located in Maharashtra and Tamil Nadu

Percentage Share of Workers (age 15+) Engaged in Generation of Solar Energy, 2022-23



Percentage Share of Workers (age 15+) Engaged in Generation of Energy Using Other Non-conventional Sources, 2022-23



Source: NCAER Analysis from PLFS 2022-23

Back

No mapping for generation of Green Energy

- *Relocation or Migration of Workers in the Industry*
  - PLFS is a household survey and it selects the households randomly within the sample areas. If in an industry located in the same sample area hires migrant workers from other areas, and they are accommodated within the plant, they will not be captured in the survey.
  - Another factor is 'daily migrants' working in an industry in a sample area. In the industries present in inter-state border areas, workers may be residing in one state, but working in another state. Data for such workers will be captured in States in which they are residing rather than in the States where they are working.

- *Time Period of Data Availability*
  - The identification of clusters using plant and installed capacity data is as of 31 March 2024. However, the PLFS data is for 2022-23.

- *Definition of Industry*
  - Given the scope of renewable electricity generation for this study, PLFS captures data for workers involved in 'electric power generation using solar energy' and 'electric power generation using other non-conventional sources'.
  - PLFS data does not specifically capture the number of workers associated with electric power generation using wind energy. Rather, it is clubbed along with data for other non-conventional sources, and can hence be misleading.
  - *Alternative methods*
  - Annual Survey of Industries (ASI)
  - ASUSE
  - Expert consultations
  - Primary scoping surveys

Back

Geographical Clusters in the Retail Sector

	Rank using ASUSE Survey, 2021-22	Rank using Retailers Association of India Members	Rank using No. of Start-ups	Average rank
Maharashtra	3	1	1	1.7
Karnataka	5	4	3	4.0
Uttar Pradesh	1	9	4	4.7
West Bengal	2	3	9	4.7
Tamil Nadu	6	2	7	5.0
Gujarat	8	10	5	7.7
Delhi	19	5	2	8.7
Haryana	15	7	6	9.3
Telangana	14	6	8	9.3
Madhya Pradesh	7	11	12	10.0
Kerala	17	7	11	11.7
Bihar	4	19	13	12.0
Andhra Pradesh	9	12	16	12.3
Odisha	10	13	14	12.3
Rajasthan	12	15	10	12.3
Punjab	13	17	15	15.0
Assam	16	14	17	15.7

Back

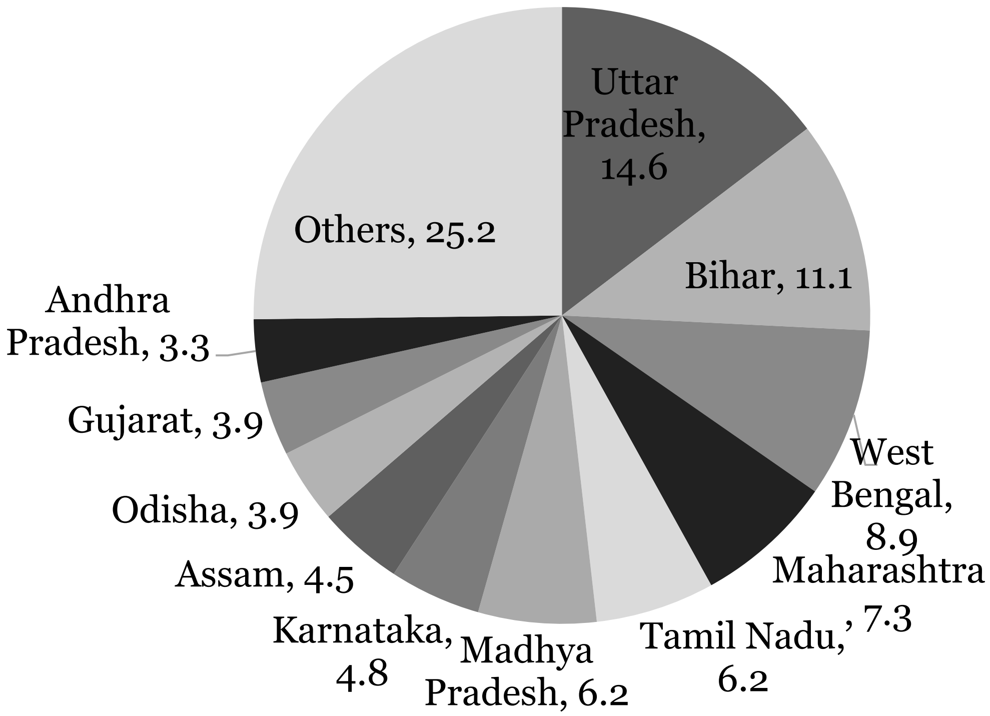
Geographical Clusters in the Retail Sector

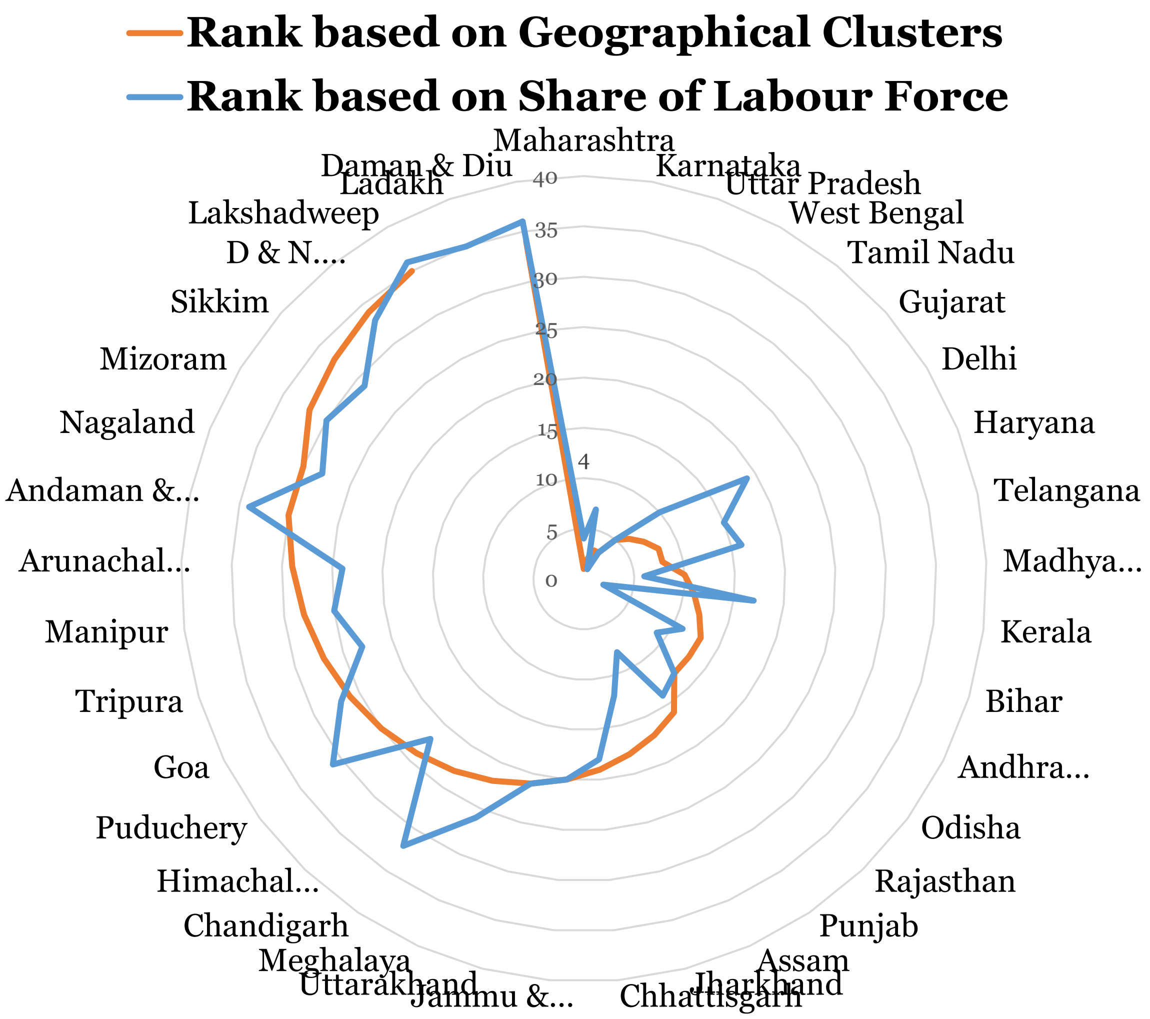
	Rank using ASUSE Survey, 2021-22	Rank using Retailers Association of India Members	Rank using No. of Start-ups	Average rank
Jharkhand	11	25	17	17.7
Chhattisgarh	20	18	17	18.3
Jammu & Kashmir	18	20	21	19.7
Uttarakhand	21	23	20	21.3
Meghalaya	24	16	25	21.7
Chandigarh	27	23	22	24.0
Himachal Pradesh	22	29	22	24.3
Puducherry	28	20	27	25.0
Goa	29	20	28	25.7
Tripura	25	29	24	26.0
Manipur	26	25	28	26.3
Arunachal Pradesh	23	29	28	26.7
Andaman & N. Island	32	25	27	28.0
Nagaland	30	29	25	28.0
Mizoram	34	25	28	29.0
Sikkim	31	29	28	29.3
D & N. Haveli & Daman & Diu	33	29	27	29.7
Lakshadweep	35	29	28	30.7

Back

Share of workers in the retail sector is relatively more dispersed

Percentage Share of Workers (age 15+) Engaged in Retail sale of food in specialized stores and Retail sale of clothing, footwear and leather articles in specialized stores , 2022-23





Back

Source: NCAER Analysis from PLFS 2022-23

Methodology for Computing Geographical Clusters in Information Technology

Pillar	*Indicator*	*Source*	*Link*
Infrastructure	Electricity Energy Sale for Commercial Purposes	Central Electricity Authority	https://cea.nic.in/dashboard/?lang=en
	Teledensity	Telecom Regulatory Authority of India Performance Indicators/Annual Report	(https://www.trai.gov.in/release-publication/reports/performance-indicators-reports)
	Internet Density		
Innovation	No. of start-ups	DPIIT	https://www.startupindia.gov.in/digital-map/maps
Business Environment	Number of STPs	STPI Annual Report	https://stpi.in/en/stpi-annual-reports
Human Resources/Skills	No. of colleges specialising in engineering & technology	ASHIE	https://aishe.gov.in/aishe-final-report/

Back

Geographical Clusters in IT Sector

State	*Infrastructure*	*Innovation*	*Human Resources*	*Business*	*Average*
Maharashtra	6.7	1.0	2.0	1.0	2.7
Tamil Nadu	6.7	5.0	1.0	3.0	3.9
Karnataka	8.0	2.0	5.0	1.0	4.0
Uttar Pradesh	12.0	4.0	6.0	5.0	6.8
Gujarat	10.3	7.0	4.0	9.0	7.6
Telangana	9.7	6.0	7.0	9.0	7.9
Andhra Pradesh	15.0	13.0	3.0	5.0	9.0
West Bengal	10.0	11.0	14.0	3.0	9.5
Delhi	6.7	3.0	19.0		9.6
Kerala	9.0	8.0	9.0	14.0	10.0
Rajasthan	13.0	10.0	10.0	9.0	10.5
Madhya Pradesh	18.7	12.0	8.0	7.0	11.4
Haryana	11.0	9.0	12.0	14.0	11.5
Odisha	19.3	14.0	11.0	7.0	12.8
Punjab	12.7	16.0	12.0	14.0	13.7
Bihar	19.3	15.0	16.0	14.0	16.1
Uttarakhand	17.3	19.0	17.0	14.0	16.8
Jharkhand	24.7	18.0	17.0	9.0	17.2

Back

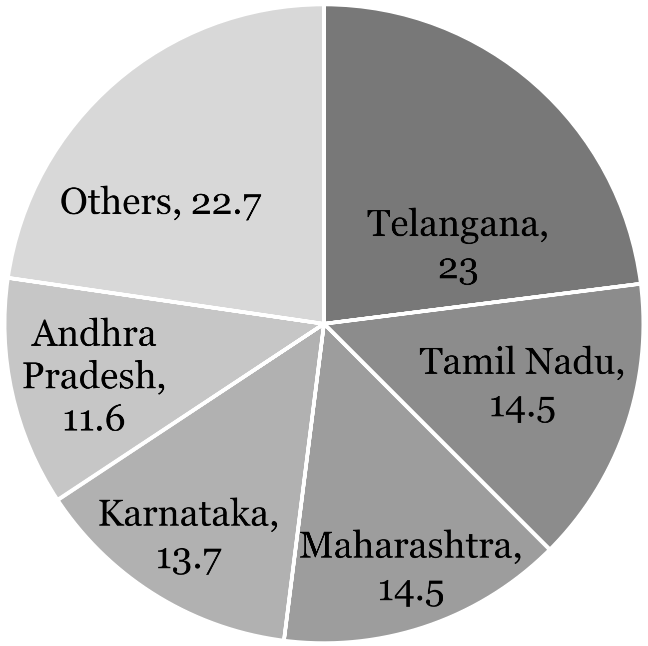
Geographical Clusters in IT Sector

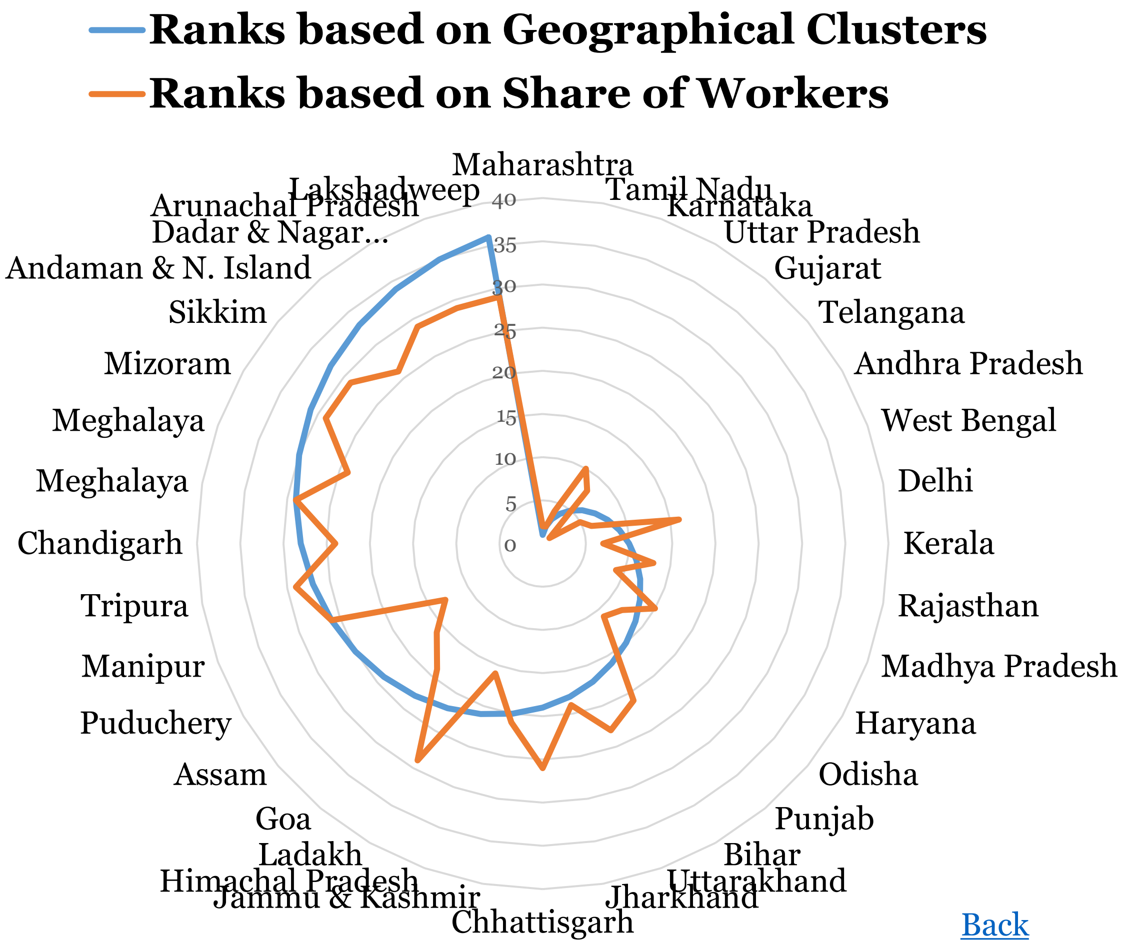
State	*Infrastructure*	*Innovation*	*Human Resources*	*Business*	*Average*
Chhattisgarh	23.0	17.0	15.0	14.0	17.3
Jammu & Kashmir	19.0	22.0	22.0	9.0	18.0
Himachal Pradesh	17.0	23.0	19.0	14.0	18.3
Ladakh	18.5				18.5
Goa	16.7		26.0	14.0	18.9
Assam	22.0	20.0	22.0	14.0	19.5
Puducherry	28.3	24.0	21.0	14.0	21.8
Manipur	26.7	25.0	24.0	14.0	22.4
Tripura	26.7	26.0	24.0	14.0	22.7
Chandigarh	18.3	21.0	29.0		22.8
Nagaland	26.7	29.0		14.0	23.2
Meghalaya	25.7	27.0	30.0	14.0	24.2
Mizoram	23.7	31.0	30.0	14.0	24.7
Sikkim	25.3	33.0	28.0	14.0	25.1
A & N Islands	24.0	28.0	30.0		27.3
Dadar & Nagar Haveli (incl. Daman & Diu)	31.3	30.0	27.0		29.4
Arunachal Pradesh	28.3	31.0			29.7
Lakshadweep	29.0	34.0			31.5

Back

The correlation between rankings of geographical clusters and share of labour force is 0.9 for ‘Computer Programming Activities’

Percentage Share of Workers (age 15+) Engaged in Computer Programming Activities, 2022-23



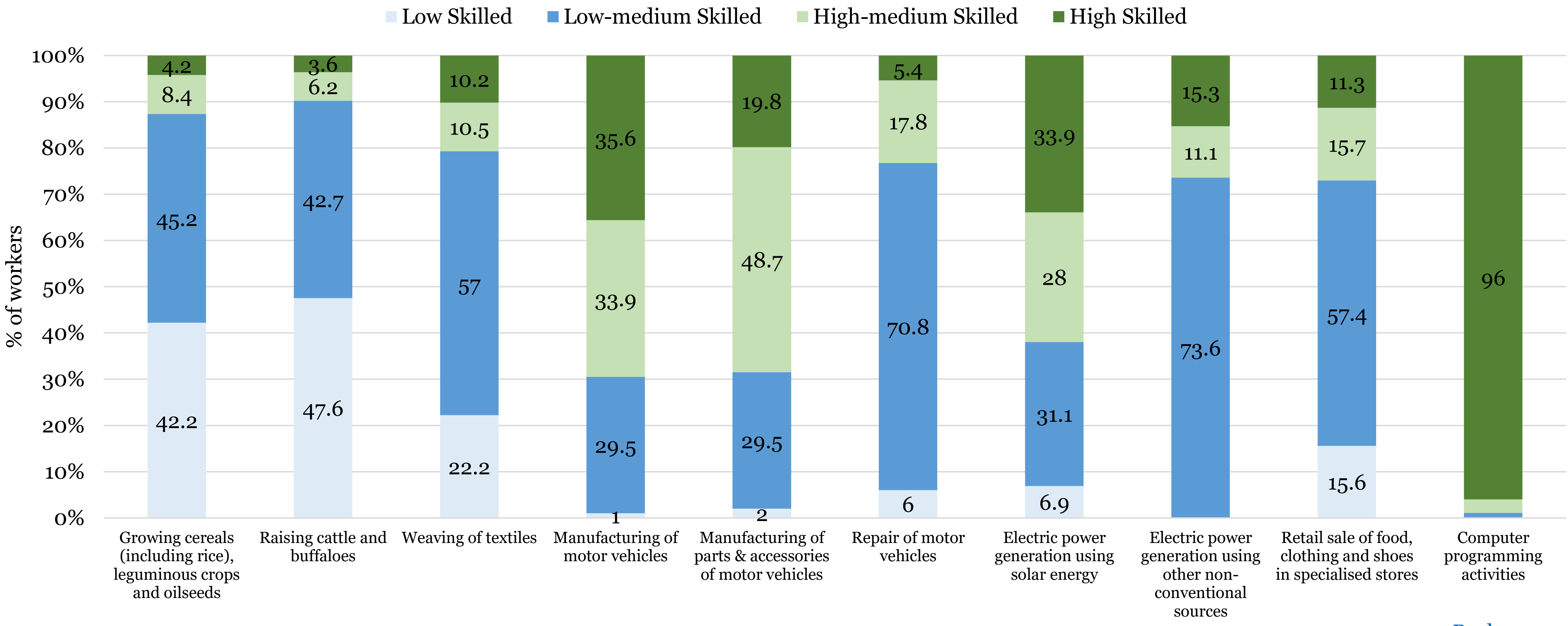


Note: Lower ranking means higher concentrations.
Sources: NCAER Computations from Geographical Cluster Computations and PLFS 2022-23.

Back

Qualifications of existing workers combining academic, technical and vocational educational attainment are mapped to high-growth sectors

There is a high variation of skills within sectors (2022-23) with the IT sector being dominated by high skilled workers and growing cereals & raising cattle and buffaloes dominated by low-skilled workers. The auto sector employs different types of skilled workers



Back

Note: See Annexure for definition of skills
Source: NCAER Analysis from PLFS 2022-23

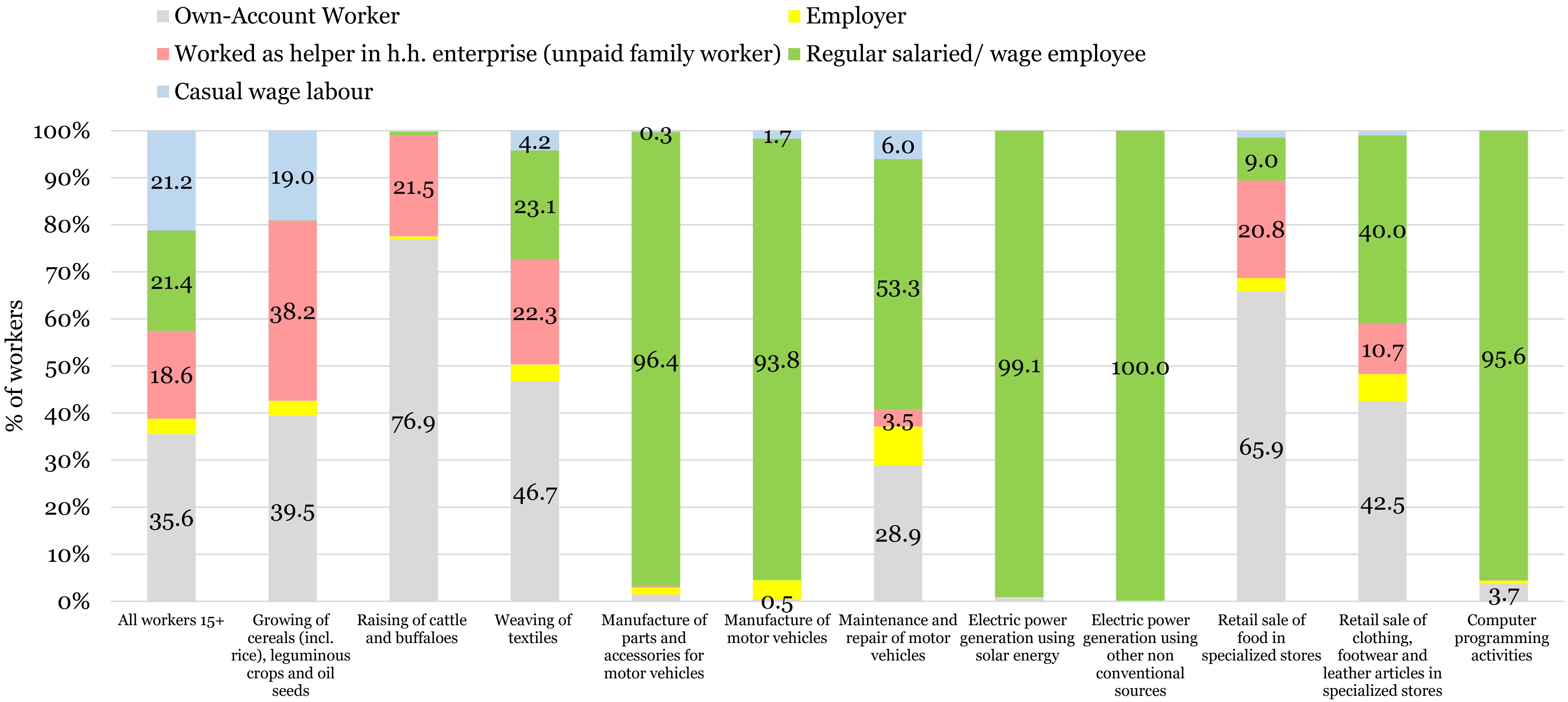
Defining skilled employment based on General, Technical and Vocational education

Low skilled	General education below primary, no technical and no vocational education
	General education below primary, no technical and some vocational education
Low medium skilled	General education primary to secondary, no technical and no vocational education
	General education primary to secondary, no technical and some vocational education
Medium high skilled	General education higher secondary, no technical and no vocational education
	General education higher secondary, no technical and some vocational education
	General education higher secondary, some technical and no vocational education
	General education diploma/certificate course, no technical and no vocational education
	General education diploma/certificate course, no technical and some vocational education
	General education diploma/certificate course, some technical and no vocational education
	General education diploma/certificate course, some technical and some vocational education
High skilled	General education graduate & above, no technical and no vocational education
	General education graduate & above, no technical and some vocational education
	General education graduate & above, some technical and no vocational education
	General education graduate & above, some technical and some vocational education

Back

108

Majority of workers are regular salaried/wage employees in the auto, green energy and IT sectors



Back

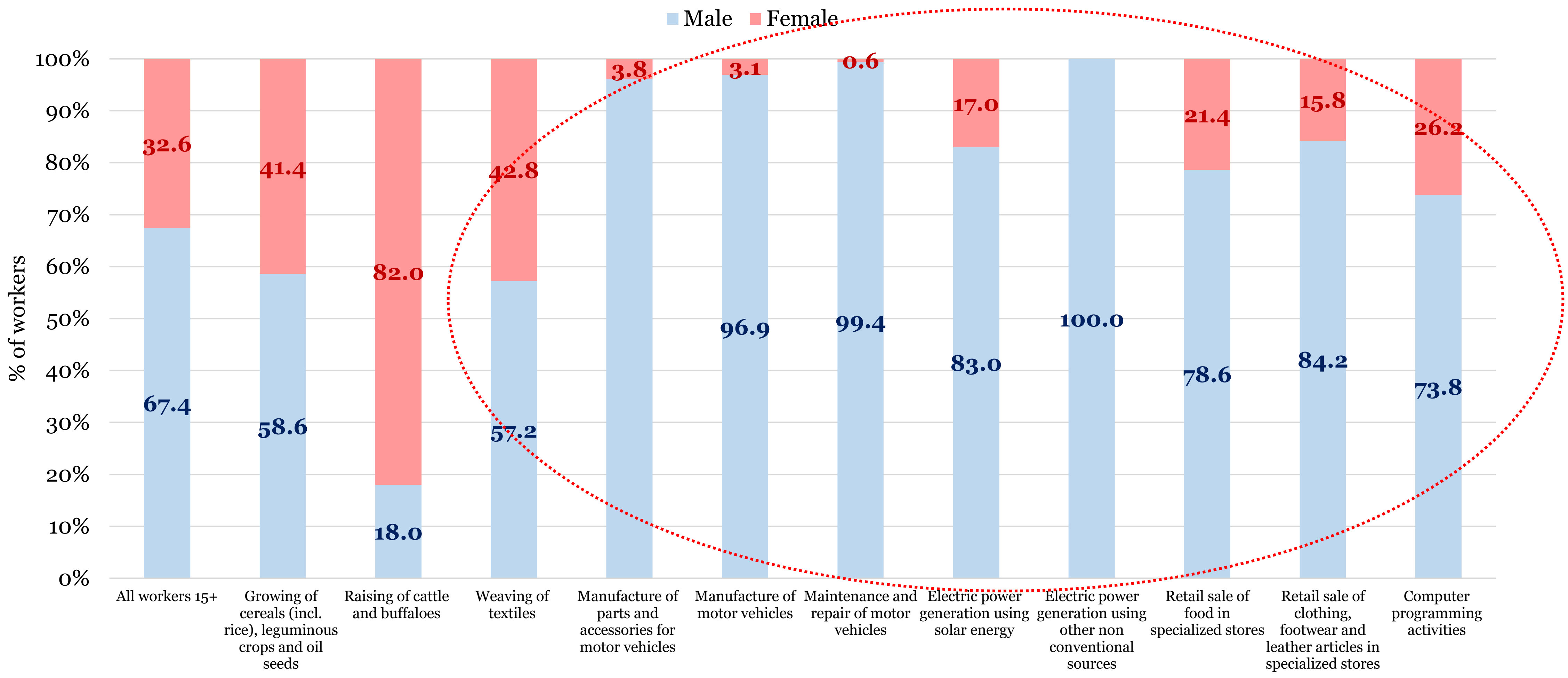
Source: NCAER Analysis from PLFS 2022-23

Using PLFS 2022-23 Top Occupations (by share of total workers in the sector) at the NCO 3-digit Code are identified here

Agriculture	Livestock	Weaving of Textiles	Motor Vehicles	Generation of Green Electricity	Retail	IT
Market Gardeners and Crop Growers (69%)	Animal Producers (87%)	Handicraft Workers (66.8%)	Manufacture of motor vehicles: are Assemblers (14 per cent), Physical and Engineering Science Technicians (12 per cent), Manufacturing Labourers (11.1%) and Machinery Mechanics and Repairers (10.8%)	Solar: Protective Service Workers (30%) Non-conventional sources: Manufacturer Labourers (46%)	Shop Salespersons (76.5%)	Software and Application Developers, and Analysts (77.4%)
Agricultural, Forestry and Fishery Labourers (16.9%)		Textile, Fur and Leather Products Machine (12.4%)	Manufacture of parts and accessories of motor vehicles: Machinery Mechanics and Repairers (27%) and Manufacturing Labourers (20%)	Solar: Electrical Equipment Installers and Repairers (12%) Non-conventional sources: General Office Clerks (27%)	Street and Market Salespersons (8.3%)	Information and Communications Technology Services Manager' (5%)
Subsistence Crop Farmers (8.9%)		Garment and Related Trades Workers (8%)	Repair and maintenance of motor vehicles: Machinery Mechanics and Repairers (79%)	Solar: Keyboard Operators (12%) Non-conventional sources: Mining, Manufacturing and Construction Supervisors (15%)	Managing Director and Chief Executives (8.7%)	Managing Directors and Chief Executives (2.1%)
Others (2.1%)		Managing Directors and Chief Executives (3.6%)		Non-conventional sources: Car, Van and Motorcycle Drivers (11%)	Street Vendors (Excluding Food) 2.3%	

Back

The share of female workers is low in the secondary & tertiary sectors barring textiles



Back

Source: NCAER Analysis from PLFS 2022-23

Occupational Mapping to derive a list of all possible job roles for each sector

- The PLFS gives 3-digit NCO 2015 code.
- Using the NCO 2015, we derived the 5-digit NCO codes under those specific NCO 3-digit codes to understand job roles that are ‘used’ in the industry.
- Mapped the SSC job roles available on website to the identified NCO 8-digit codes, wherever applicable.
- Derived an universe list of possible job roles for each sector.

Back

Job Roles for Producer Services – ‘Overheads’

NCO 3-digit Codes That Appeared in All 7 High-Growth Sectors

Managing Directors and Chief Executives	**Other Services Managers**	**Process Control Technicians**	**Business Service Agents**
General Office Clerks	**Keyboard Operators**	**Material Recording and Transport Clerks**	**Assemblers**
	Other Elementary Workers		

Source: NCAER Analysis from PLFS 2022-23

Back

Summary of Methodology of Forecasting of Jobs using I-O Analysis-I

- We are using the input-output analysis to project the total number of jobs in 2026-27 and the top 5 occupations that will find maximum employment. This is supplemented by stakeholder consultations to understand the job roles where there might be a skills shortage both now and in the near future (3 years)

- Number of jobs are projected over the next 3 years (2026-27) for the 7 high-growth sectors. Basic numbers are derived from the PLFS.

- Steps for projecting employment
  - National Accounts data (gives GVO data) are available till 2022-23
  - Gross value of output (GVO): Value of the total sales of goods and services + Value of changes in the inventories.
  - 2018-19 Input-output (I-O) analysis is used.
  - GVO/Output multiplier
    - Output generated in the entire economy due to one unit of output generated in the said sector.
    - 2018-19 I-O was used to estimate the output multiplier.
  - Employment multiplier
    - Number of (direct & indirect) jobs created in the entire economy due to one unit of output generated in the said sector.
    - 2018-19 output multiplier was multiplied with 2022-23 labour-output ratio to estimate the employment multiplier for 2022-23.

Back

Summary of Methodology of Forecasting of Jobs using I-O Analysis-II

- Number of jobs are projected over the next 3 years (2026-27) for the 7 high-growth sectors.
  - Make sectoral GVO assumptions
    - ***Scenario 1***
      - GVO numbers at current and constant price for the selected sectors are sourced from National Accounts Statistics 2024.
      - Then average of annual growth rates for the past three normal years (2018-19, 2019-20 and 2022-23) are used to project the GVO numbers for 2026-27 over GVO for 2022-23 at current prices.
      - Thus we get the projected GVO numbers for 2026-27 at 2022-23 price.
    - ***Alternative growth scenarios may be developed: NCAER developed one using IMF growth forecast for the next three years***
    - ***Scenario 2:*** Contribution of the sector to overall GVO growth in the economy =(Growth rate of the sector * Share of sectoral GVO)/Overall GVO growth rate
    - In 2022-23, Private Final Consumption expenditure grew at 6.8%, GDP at 7%, PFCE/GDP was 58%; (6.8*58)/7=56.3
    - Thus re-arranging the formulae, Growth rate of the sector=(Contribution of the sector to overall GVO growth in the economy*Overall GVO growth rate)/Share of sectoral GVO
    - Average of years 2018-19, 2019-20 and 2022-23 have been used here for all the variables to compute GVO

Back

Summary of Methodology of Forecasting of Jobs using I-O Analysis-III

- Using the above sectoral growth rate assumptions, estimate GVO in Rs trillion for 2026-27 at 2022-23 prices for both scenarios.

- Estimate number of (direct & indirect) jobs by multiplying employment multiplier with the projected GVO at the 64 I-O sectors

- Estimate jobs for the sub-sectors (that selected in the NCAER-MSDE analysis) by taking the job shares of the sub-sectors in the main sectors for the years 2022-23.

- For example, the share of jobs in 'raising of cattle & buffaloes' accounted for 46% in the livestock sector.

- The same shares were used to estimates jobs for 2026-27.

- For example, the overall number of jobs was projected for the livestock sector in 2026-27 and 46% of it was attributed to raising cattle and buffaloes.

- Distribution across occupations of ***ONLY direct jobs*** based on share of occupations for the year 2022-23 were computed from PLFS.

- Using the same shares, projections for the top 5 occupations were projected for 2026-27.

Back

Estimating Output and Employment Multipliers

- Estimated output multiplier using I-O analysis for 2018-19

- Estimated employment multiplier using I-O analysis for 2022-23

- Multiplier: The multiplier analyses **direct and indirect impact** of exogenous policy shock operated through final demand.
  - Example: Output multiplier in agriculture is equal to 1.3514
  - One Rs increase in final demand in agriculture sector results in total Rs 1.3514 value of output in the economy.
  - The concept of multiplier for a sector is dependent on the extent of inputs used or output supply of a sector. Output supply of capital goods is spread over a long time horizon unlike consumer goods.
  - Employment Multiplier: Total direct and indirect employment generated in the economy due to change in one unit of final demand in that sector.

Back

Step 1: Project Sectoral GVO estimates for 2026-27-I

Scenario 1 based on assumptions of three years' past growth rates

- Average Gross Value of Output (GVO) growth for 2018-19, 2019-20 and 2022-23
- For all-India and all sectors
- Assumed sectoral real GVO growth rates (using NAS data) published by the Ministry of Statistics & Programme Implementation) for projecting 2026-27 GVO at 2022-23 prices
  - Agriculture: 3%
  - Livestock: 6%
  - Textiles: (-) 3%
  - Transport: 9%
  - Electricity: 5%
  - Trade: 9%
  - Computer-related Services: 13%

Back

Step 1: Project Sectoral GVO estimates for 2026-27-II

Scenario 2: Using past shares of sectors and sectoral growth rates with the overall GDP growth projection being taken from the IMF

- Used projection of 6.5% GDP growth from IMF World Economic Outlook for 2024-25 to 2026-27 (A)
- Real GDP growth rate/ Real GVA growth rate for the years, 2018-19, 2019-20 and 2022-23: 1.0 (B)
- Real GVO growth rate/ Real GVA growth rate for the years, 2018-19, 2019-20 and 2022-23: 1.3 (C)
- Projected Real GVO growth for 2026-27: 8.5% (A*B*C)
- To compute the assumed real GVO growth at the sectoral level
  - ***Growth rate of the sector=(Contribution of the sector to overall GVO growth in the economy*Overall GVO growth rate)/Share of sectoral GVO Average sectoral growth rates (2018-19, 2019-20 and 2022-23)***
  - Average sectoral shares in overall GVO for the above-mentioned years
  - Computed contribution to overall GVO India growth as per the formulae
- Assumed sectoral real GVO growth rates for projecting 2026-27 GVO at 2022-23 prices
  - Agriculture: 3.9%
  - Livestock: 3.9%
  - Textiles: (-) 6.1%
  - Transport: 19.5%
  - Electricity: 6.8%
  - Trade: 10.2%
  - Computer-related Services: 12.4%

Back

Data Sources: 1. NAS used for GVA and GVO and IMF World Economic Outlook October 2024 for IMF Projections

Step 1: Summary of Assumptions of GVO Growth Rates from Both Scenarios

	Scenario 1 GVO Growth Rate (%) (Average)	*Scenario 2 GVO Growth Rate (%) (De-composition of IMF Forecasts*
Agriculture	3%	4%
Livestock	6%	4%
Textiles	(-)3%	(-)6%
Transport	9%	19%
Electricity	5%	7%
Trade	9%	10%
Computer-related services	13%	12%

- Alternative credible projections may be explored based on availability of data and feasibility
- **Scenario 1 is recommended based on ease of data availability and replicability**

Back

Step 2: Projecting GVO in Rs trillion for 2026-27 at 2022-23 prices

- Using the above sectoral growth rate assumptions, estimate GVO in Rs trillion for 2026-27 at 2022-23 prices for both scenarios.

- Using 2022-23 GVO numbers at current prices as base and growth rates from Step 1.
  - Scenario 1
  - Scenario 2

- We arrived at GVO numbers for 2026-27 at 2022-23 prices
  - Scenario 1
  - Scenario 2

GVO (₹ lakh crore) in 2022-23 prices

	2022-23	**2026-27**	
		Scenario 1	***Scenario 2***
Agriculture	31.2	34.9	36.4
Livestock	17.2	21.5	20.1
Textiles	11.5	10.2	8.9
Transport	18.2	25.8	37.2
Electricity	11.0	13.5	14.4
Trade	35.9	51.1	52.9
Computer-related services	20.6	34.0	32.8

Back

Step 3: Projecting Jobs for 2026-27 for Both Scenarios

- Estimate number of (direct & indirect) jobs by multiplying employment multiplier with the projected GVO at the 64 I-O sectors for the 7 sectors

- Assumptions
  - 2022-23 Labour Output Ratio
  - Used 2018-19 Leontief Inverse Matrix (assuming technology remaining same at 2018-19 level)
  - The Leontief Inverse Matrix shows the coefficients (economic multipliers) that measure the successive effects (layers of interlinkages) on the economy as a result of the initial increase in production of an economic activity branch. (https://en.eustat.eus/documentos/elem_15552/definicion.html#:~:text=The%20Leontief%20Inverse%20Matrix%20shows,of%20an%20economic%20activity%20branch.)

- Using projected sectoral GVO, we project direct & indirect sectoral jobs for 2026-27.

- Estimate jobs for the sub-sectors (that selected in the NCAER-MSDE analysis) by taking the job shares of the sub-sectors in the main sectors for the years 2022-23.

Back

Step 4: Projected Jobs in 2026-27 for Selected Sub-sectors (I-O Analysis)

lakh jobs	Growing of Cereals, Leguminous Crops and Oilseeds	Raising of Cattle and Buffaloes	Weaving of Textiles	Manufacturing of motor vehicles, parts & accessories of motor vehicles	Electric Power Generation using solar energy and other non-conventional sources	Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenance & repair of MVs	Computer programming activities
2022-23 from PLFS*							
	1,789.6	206.1	22.6	13.9	1.1	261.3	25.9
2022-23 using I-O Analysis							
Direct jobs	1,849.9	207.6	29.9	17.6	1.1	281.0	26.4
Direct + Indirect jobs	2,034.8	394.5	101.7	145.7	7.5	393.3	76.6

Notes: 1. The changes have been computed using actual numbers and may not match the numbers presented on the PPT due to rounding off.
2. Experiment tried using BES 3. Big Data Analysis in the IT sector

Back

Step 4: Projected Jobs in 2026-27 for Selected Sub-sectors (I-O Analysis)

lakh jobs	*Growing of Cereals, Leguminous Crops and Oilseeds*	*Raising of Cattle and Buffaloes*	*Weaving of Textiles*	*Manufacturing of motor vehicles, parts & accessories of motor vehicles*	*Electric Power Generation using solar energy and other non-conventional sources*	*Retail sale of food, clothing, footwear and leather articles in specialised stores and maintenan ce & repair of MVs*	*Computer programming activities*
Scenario 1 using Past Growth Rates: Projections for 2026-27							
Direct jobs	2,066.3	259.4	26.4	24.9	1.3	399.7	43.7
Direct+Indirect jobs	2,272.9	492.8	89.8	206.5	9.2	559.5	126.6
% Change in direct jobs over 2022-23 using I-O Analysis*	11.7	24.9	-11.6	41.7	22.4	42.3	65.3
Scenario 2 using IMF Growth Projections; Projections for 2026-27							
Direct jobs	2,157.5	241.9	23.2	35.8	1.4	414.4	42.1
Direct+Indirect jobs	2,373.3	459.7	78.9	297.4	9.8	580.1	122.2
% Change in direct jobs over 2022-23 using I-O Analysis*	16.6	16.5	-22.4	104.1	30.1	47.5	59.6

Notes: 1. The changes have been computed using actual numbers and may not match the numbers presented on the PPT due to rounding off.

Back

Step 5: Projecting Direct Jobs across Occupations in 7 High-Growth Sectors in 2026-27 in Both Scenarios-I

- Distribution across occupations of ***ONLY direct jobs*** based on share of occupations for the year 2022-23 were computed from PLFS.
  - The layers of interlinkages in the economy make it hard to estimate indirect jobs across others sectors (other than the said sector) and occupations.

- Using the same shares, projections for the top 5 occupations were projected for 2026-27.
  - For comparison purposes, top 5 occupations in the 7 sectors are estimated from the PLFS 2022-23. This was already estimated in Interim Report 1 and is presented again.

Back

Macro Dynamics

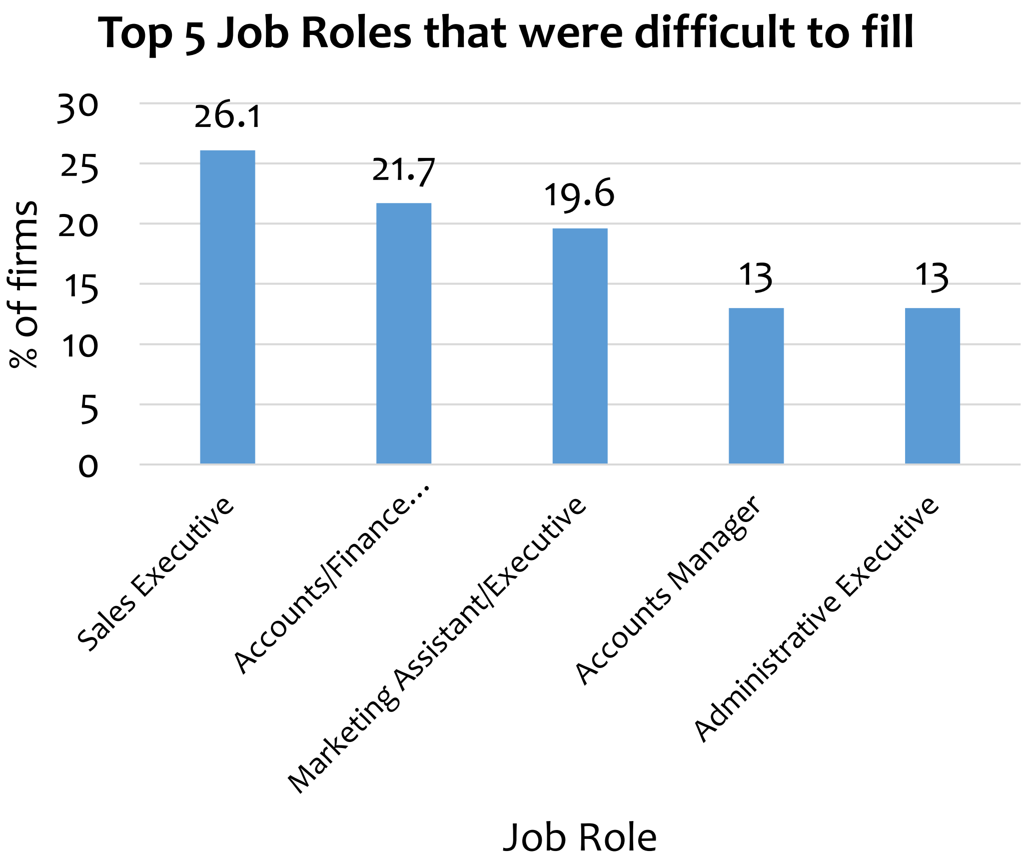
Business Sentiments in labour markets muted

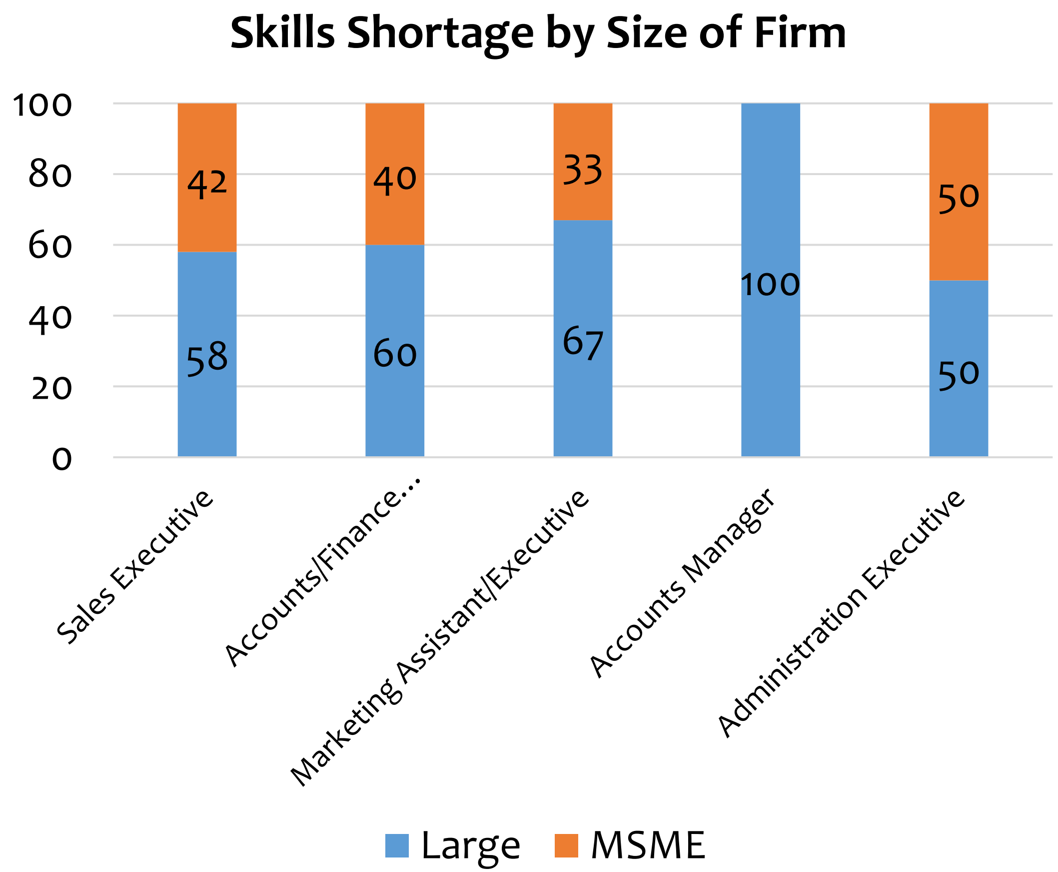
Source: NCAER-NSE Business Expectations Survey September 2024

Back

Back

Top 5 Job Roles that are most challenging to fill



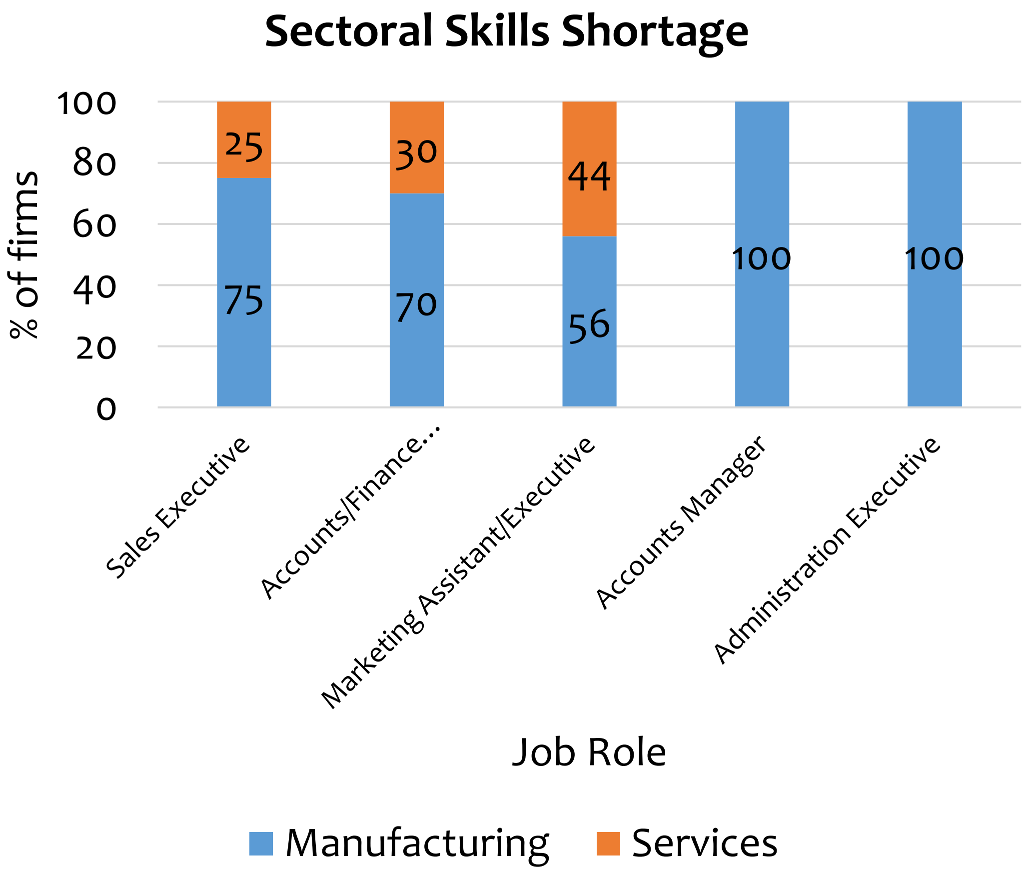


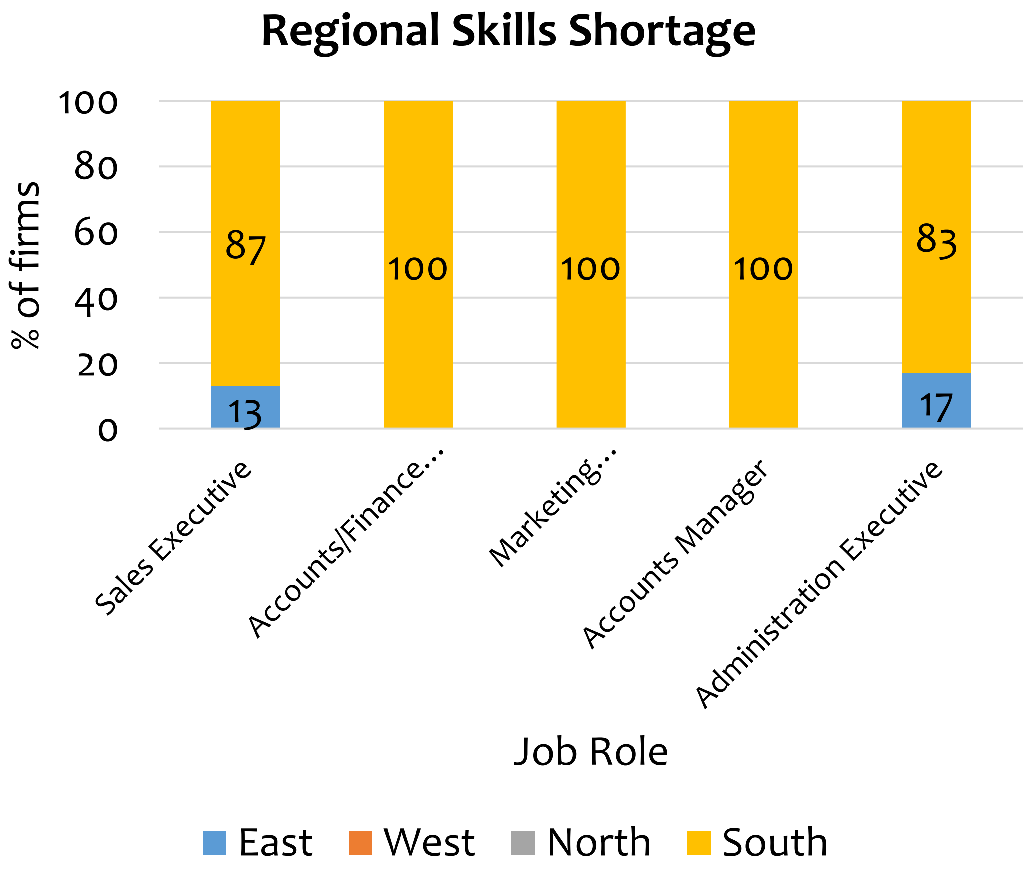
Source: NCAER-NSE Business Expectations Survey September 2024

Back

Where are the Skill Shortages?

South





Source: NCAER-NSE Business Expectations Survey September 2024Back

Back

Attributes about Job Roles that are difficult to fill

Attributes	Sales Executive	Accounts/Finance Assistant/Executive	Marketing Assistant/Executive	Accounts Manager	Administrative Executive
% of firms who reported a skill gap	26.1%	21.7%	19.6%	13%	13%
Fresher (F)/ Intermediate (I)/ Senior (S)	F: 50% I: 50%	I: 60%	F: 11% I: 89%	I: 100%	F: 17% I: 83%
Education	Class XII: 25% Graduate and above: 75%	Graduate and Above: 100%	Graduate and Above: 100%	Graduate and Above: 100%	Graduate and Above: 100%

Back

Source: NCAER-NSE Business Expectations Survey September 2024

Attributes about Job Roles that are difficult to fill

Attributes	Sales Executive	Accounts/Finance Assistant/Executive	Marketing Assistant/Executive	Accounts Manager	Administrative Executive
Years of Experience	0 years: 17% 1-5 years: 50% 5-10 years: 17% 10-15 years: 16%	0 years: 10% 1-5 years: 30% 5-10 years: 40% 10-15 years: 20%	1-5 years: 11% 5-10 years: 44% 10-15 years: 44%	1-5 years: 40% 5-10 years: 20% 10-15 years: 40%	0 years: 17% 1-5 years: 17% 5-10 years: 66%
Do you not find enough people for this job role at an appropriate salary?	54%	20%	11%	No response	17%
You find people but they do not have the skill set that you require for the job?	46%	20%	11%	No response	No response

Back

Source: NCAER-NSE Business Expectations Survey September 2024

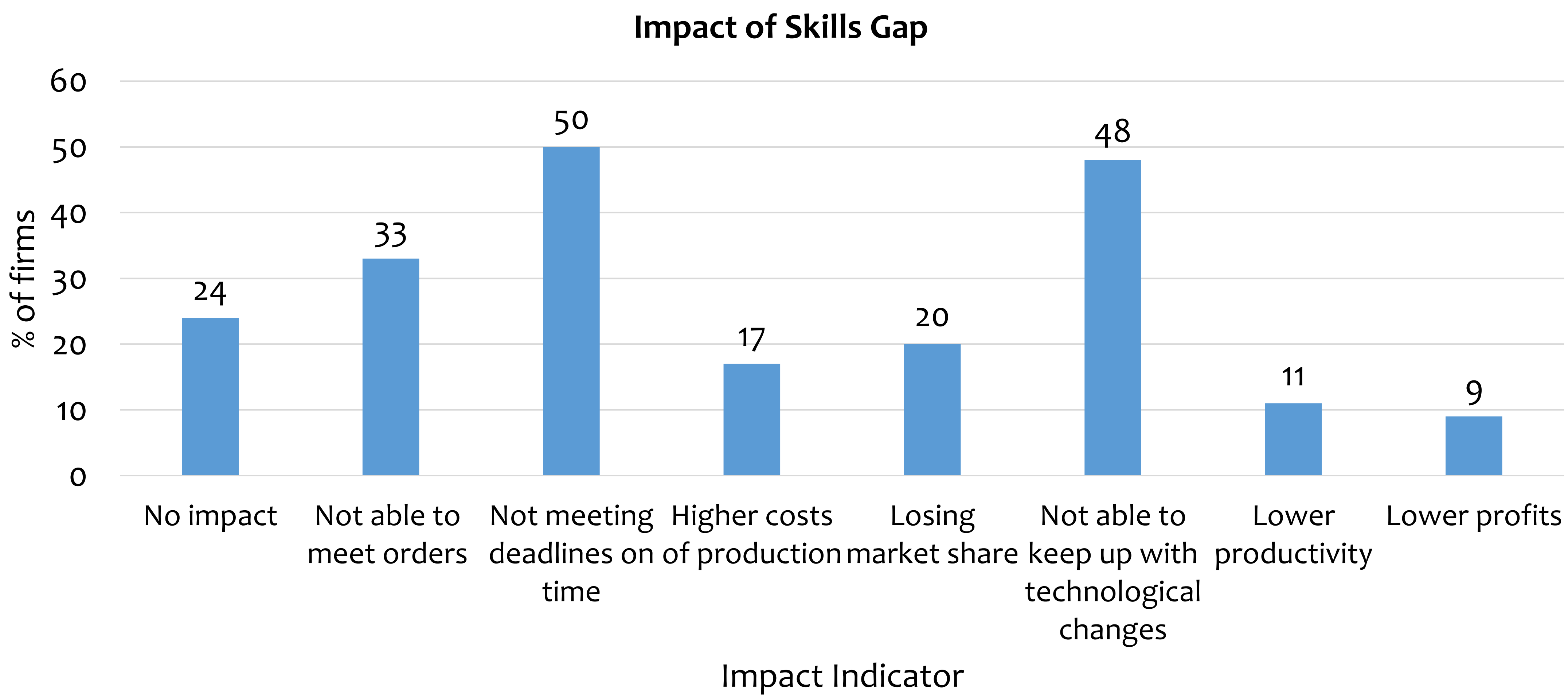
Skills Required about Job Roles that are difficult to fill

	Sales Executive	Accounts/Finance Assistant/Executive	Marketing Assistant/Executive	Accounts Manager	Administrative Executive
Reading	78%	100%	22%	16%	83%
Writing	67%	90%	22%	16%	83%
Active Listening	67%	50%	33%	16%	50%
Communication	89%	80%	78%	32%	100%
Team Work	67%	70%	66%	32%	50%
Problem-Solving	67%	30%	11%	16%	33%
Creative Thinking	56%	50%	55%	16%	16%
Digital Skills	56%	30%	44%	32%	33%
Attitude to Work		60%	44%	16%	50%

Source: NCAER-NSE Business Expectations Survey September 2024

Back

Impact of Skills Shortage



Source: NCAER-NSE Business Expectations Survey September 2024

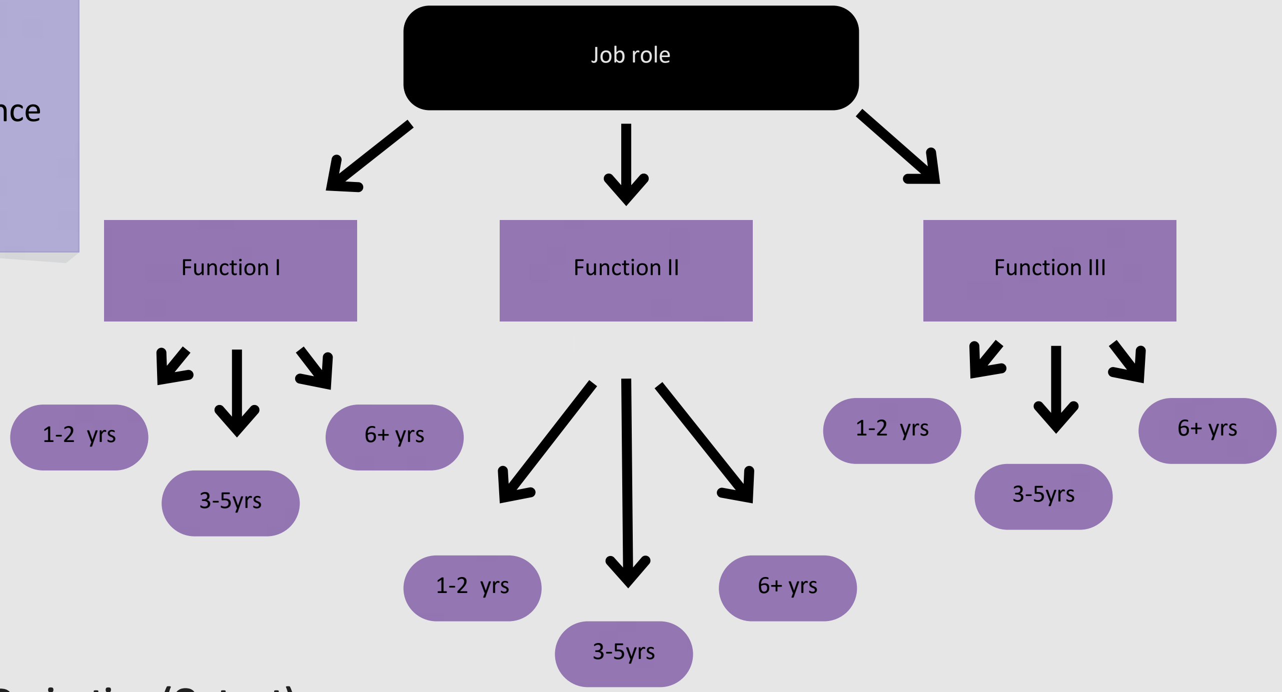
Back

APPROACH TO SKILL GAP MAPPING AND INSIGHTS

01

Job Role Definition
- identifying broader job roles
- Map them to specific functions (e.g., Function I, II, III)
- Consider years of experience

1. Job title
2. Company
3. Years of experience
4. J.D



02

Data Collection
- Source: Naukri job postings.
- Method: Web scraping using Python (Selenium).
- Structured data exported to Excel.

03

Data Cleaning & Categorization
- Clean raw data for consistency (e.g., titles, locations).
- Categorize based on predefined fields.

04

Insights Derivation (Output)
- Skill trends across industries.
- Gaps in candidate profiles versus employer requirements.

Title	Company	Experience	Salary	Loca
Sector Analyst	Redseer Consulting	0-1 Yrs	6-7 Lacs PA	Bengaluru
Analyst	Guidepoint	0-4 Yrs	Not disclose	Kolkata, M
FinOps - Analyst	Grant Thornton India Pvt Ltd	0-2 Yrs	Not disclose	Bengaluru
Analyst	Center Study Science Technc	0-1 Yrs	Not disclose	Bengaluru
Date Analyst (Unpaid)	Saveo	0-2 Yrs	Not disclose	Bengaluru
Analyst	Firstsource Laboratory Soluti	0-3 Yrs	Not disclose	Bengaluru
Analyst	Teamlease Digital	0-3 Yrs	1-4 Lacs PA	Hyderabac
Analyst	Colmore	0-3 Yrs	Not disclose	Bengaluru
Analyst	Mitsubishi UFJ	0-3 Yrs	Not disclose	Bengaluru
Growth Analyst	Unicard Technologies	0-2 Yrs	Not disclose	Bengaluru
Analyst - C&RM INDUS	Grant Thornton India Pvt Ltd	0-2 Yrs	Not disclose	Bengaluru

Input Scrape Export Clean Analyse

Back

Categorisation of Job Roles

Broad Skillset	Specific technical competencies	Typical Job Titles
Data & Cloud	Advanced Excel, Database Management, Python, ML & Data Science, Cloud Computing, Big Data, Network Programming	Data Analyst, Business Analyst, Business Intelligence, Quantitative Analyst, Data Scientist, Network Engineer, Cloud Developer
Software Development	Software Programmimg Languages (C,C++, Java, Javascript, Python, PHP, etc.), Other Programming Languages (Verilog, Matlab, Embedded C, etc.), DevOps	Software Engineer/Developer, Full Stack Developer, Web developer, App Developer, RTL/SOC Designer
IT and Product Management	IT Consulting, Solution Architecture, Product Management, Client Engagement, Project Management, Agile	Solution Architect, Tech Consultant, Product manager, Project Manager

Back

Assumptions

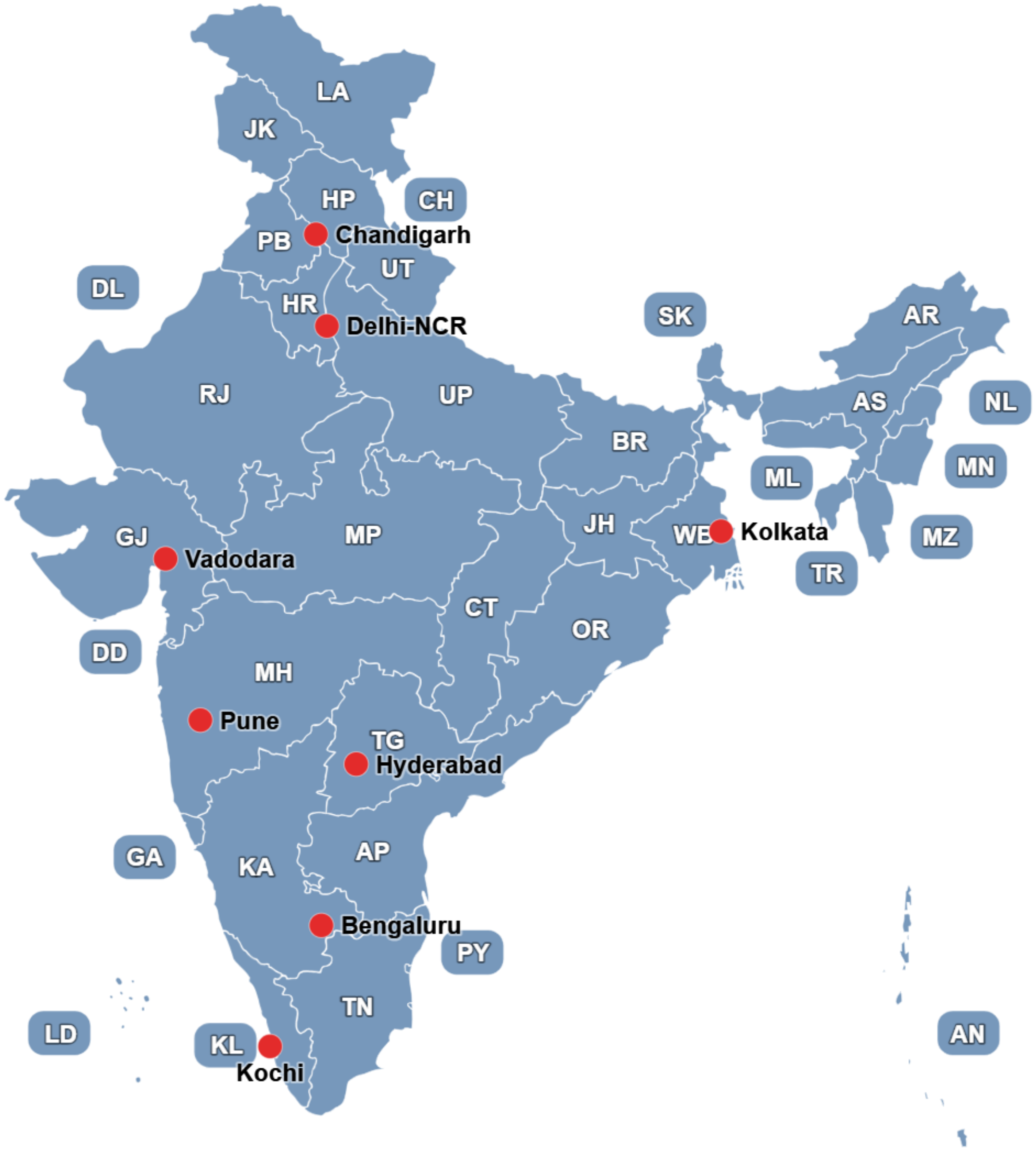
1. Data Source: The data used for this analysis has been sourced exclusively from Naukri.com, which serves as the primary and master database. Naukri.com is one of the largest job portals in India, offering a more comprehensive dataset compared to other platforms, including LinkedIn. This dataset has been utilized to demonstrate our methodology. Limitation – Job opening might be there which are not listed. The classification of industries has also been based on Naukri.com’s taxonomy.

2. Overlap in Roles: There is a potential overlap of approximately 10-15% between data points across various roles due to similarities in job descriptions and responsibilities. However, we have not discounted the value of jobs in these overlapping categories. While some correlation exists, it has not been removed to preserve the integrity of the methodology.

3. Role Categorization: Roles requiring transferable skills across multiple industries have been grouped under the category of “IT Consulting Services” to streamline the analysis.

Back

Cities Covered



- Delhi – NCR
- Bengaluru
- Pune
- Hyderabad
- Kochi
- Chandigarh
- Vadodara

Back

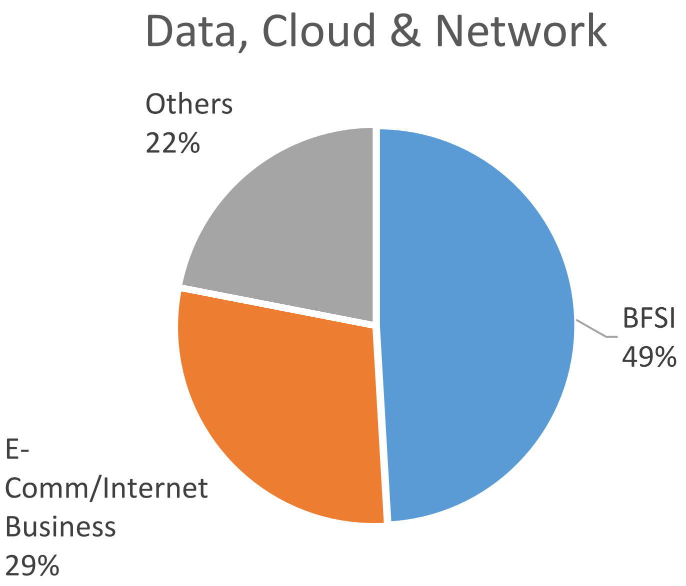
Delhi-NCR (1/2)

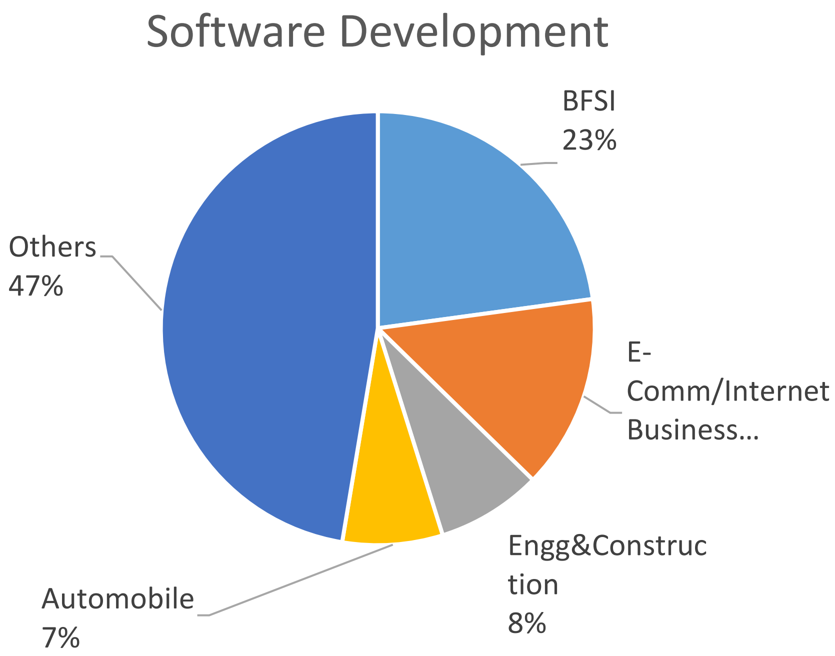
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	16324	BFSI	6201
			E-Commerce	4134
			Biotechnology	2067
			IT services& Consulting	2066
			NBFC	768
2	Product Management	5606	IT services & Consulting	9820
			BFSI	1698
			E-Commerce	1076
			Travel&Tourism	263
			Retail	187
3	Software Development	14311	BFSI	2090
			E-Commerce	1392
			IT services & Consulting	696
			Retail	696
			Consumer Electronics	677
Total		36,241		Totals

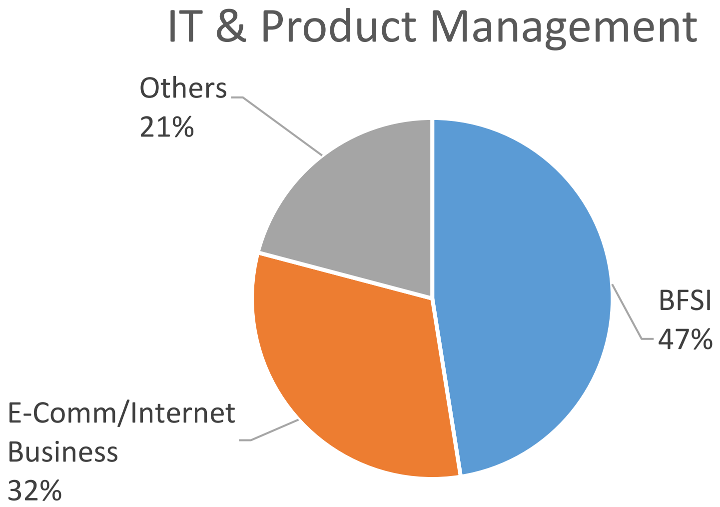
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	2036	16324
		1-2	3351	
		2-5	6977	
		5+	3960	
2	Product Management	0-1	161	5606
		1-2	253	
		2-5	1689	
		5+	3503	
3	Software Development	0-1	792	14311
		1-2	1655	
		2-5	6969	
		5+	4895	
Total				36241

Back

Delhi-NCR (2/2)







Back

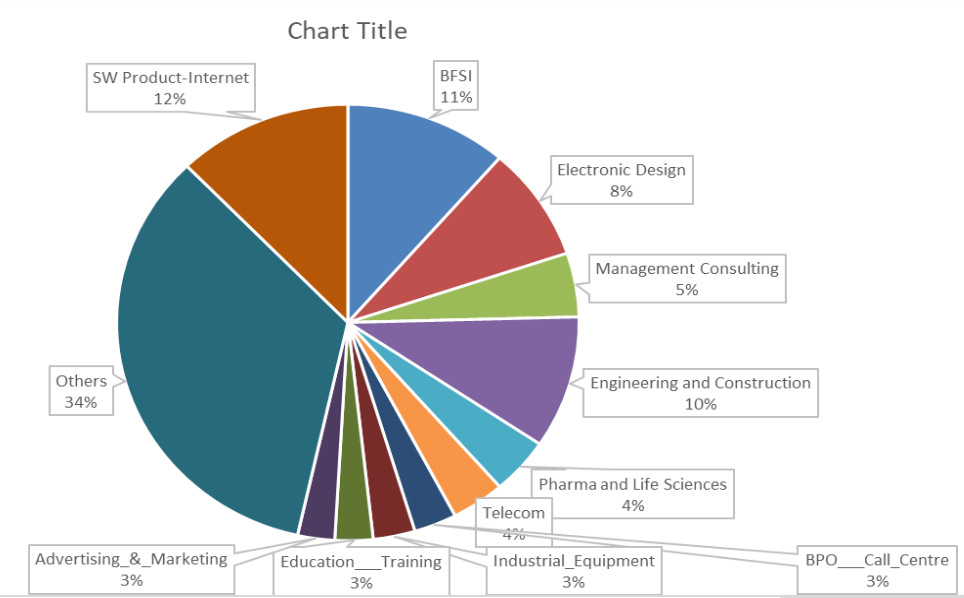
Bengaluru (1/2)

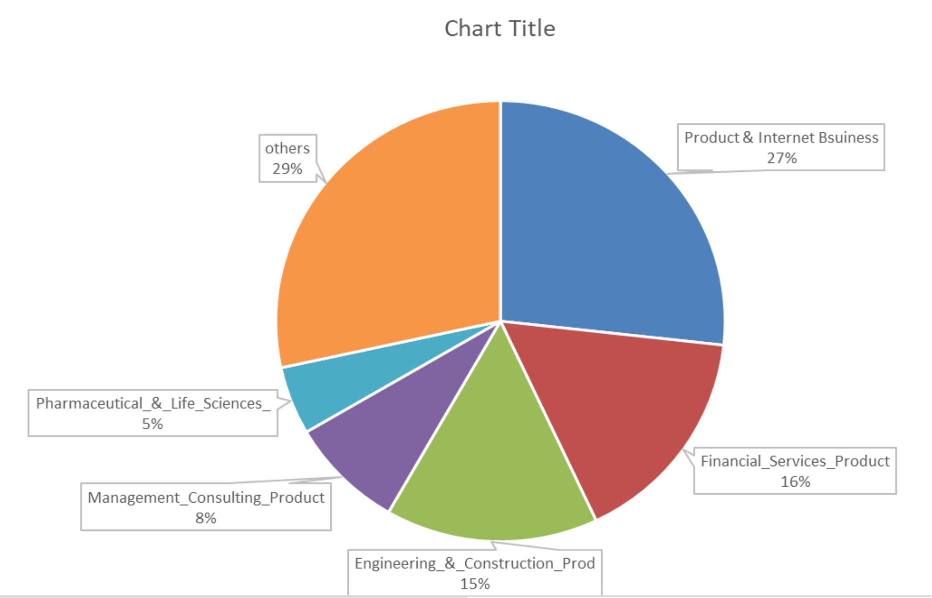
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	12751	Software-ITES	9369
			BFSI	933
			Management Consulting	379
			Pharma & Life Sciences	353
			Retail	226
2	Product Management	11561	Software-ITES	38475
			BFSI	2819
			Electronic Components	2093
			Management Consulting	1174
			Engineering and Construction	2430
3	Software Development	61016	Software-ITES	8686
			BFSI	638
			Engineering and Construction	601
			Management Consulting	326
			Pharma & Life Sciences	196
Total		85,328		

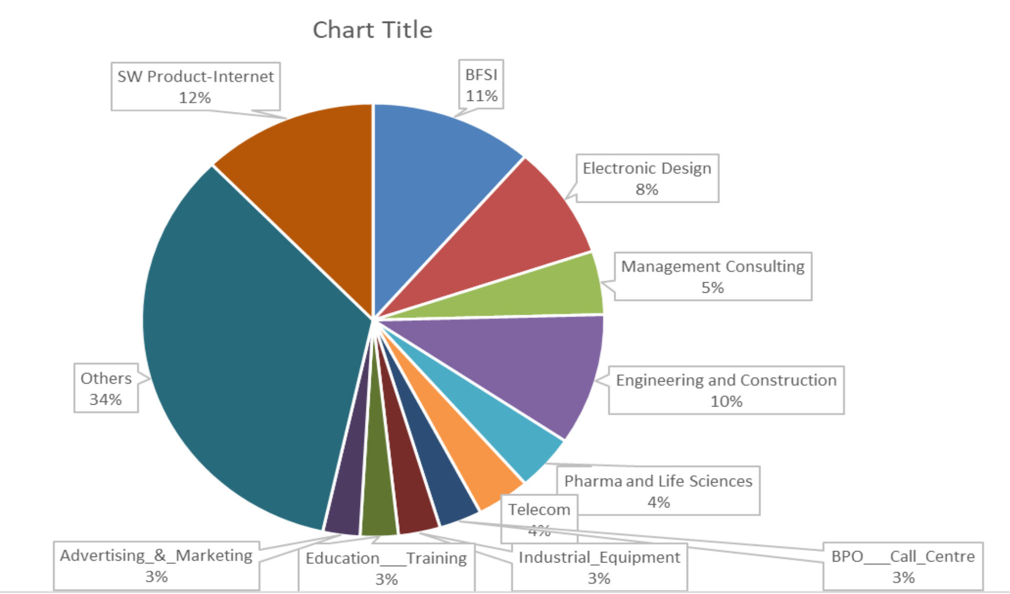
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	304	11252
		1-2	842	
		2-5	4557	
		5+	5549	
2	Product Management	0-1	223	10528
		1-2	505	
		2-5	3554	
		5+	6246	
3	Software Development	0-1	1312	14308
		1-2	3902	
		2-5	4992	
		5+	4102	
Total				36088

Back

Bengaluru (2/2)







Back

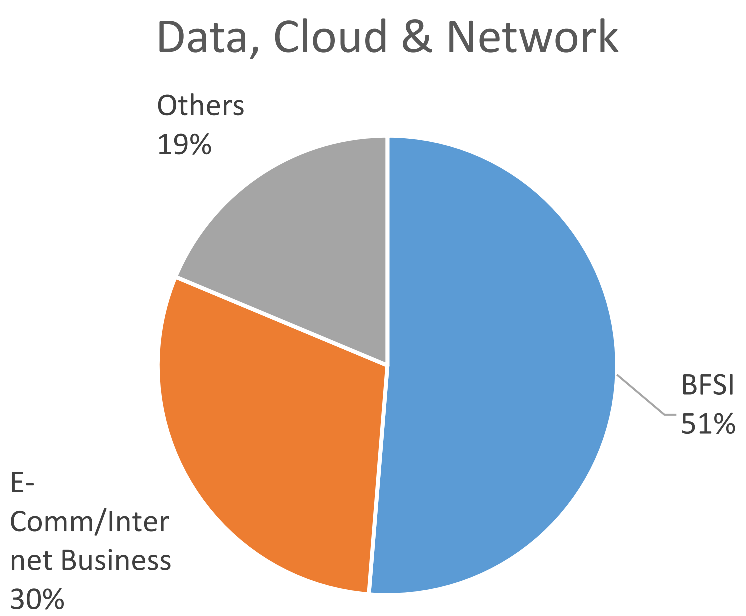
Pune (1/2)

Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	11424	BFSI	3840
			E-Commerce	2247
			Engineering&Construction	1280
			ITServices&Consulting	1280
			ManagementConsulting	1280
2	Product Management	5325	BFSI	1325
			E-Commerce	1308
			Engineering&Construction	654
			ITServices&Consulting	654
			ManagementConsulting	654
3	Software Development	16053	ITServices&Consulting	11350
			BFSI	1909
			E-Commerce	632
			Engineering&Construction	513
			Automobile	372
Total		32,802		

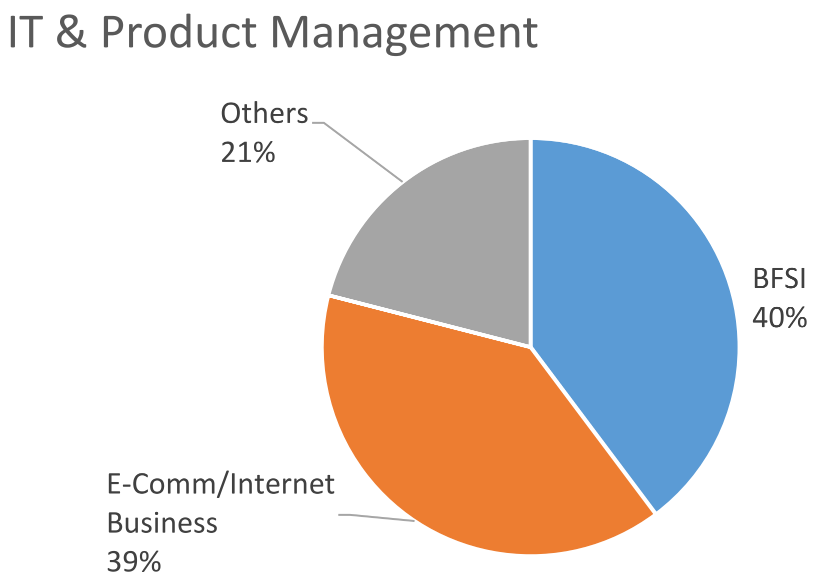
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	996	11424
		1-2	1637	
		2-5	5302	
		5+	3489	
2	Product Management	0-1	75	5325
		1-2	198	
		2-5	1373	
		5+	3679	
3	Software Development	0-1	634	16053
		1-2	1225	
		2-5	7353	
		5+	6841	
Total				32802

Back

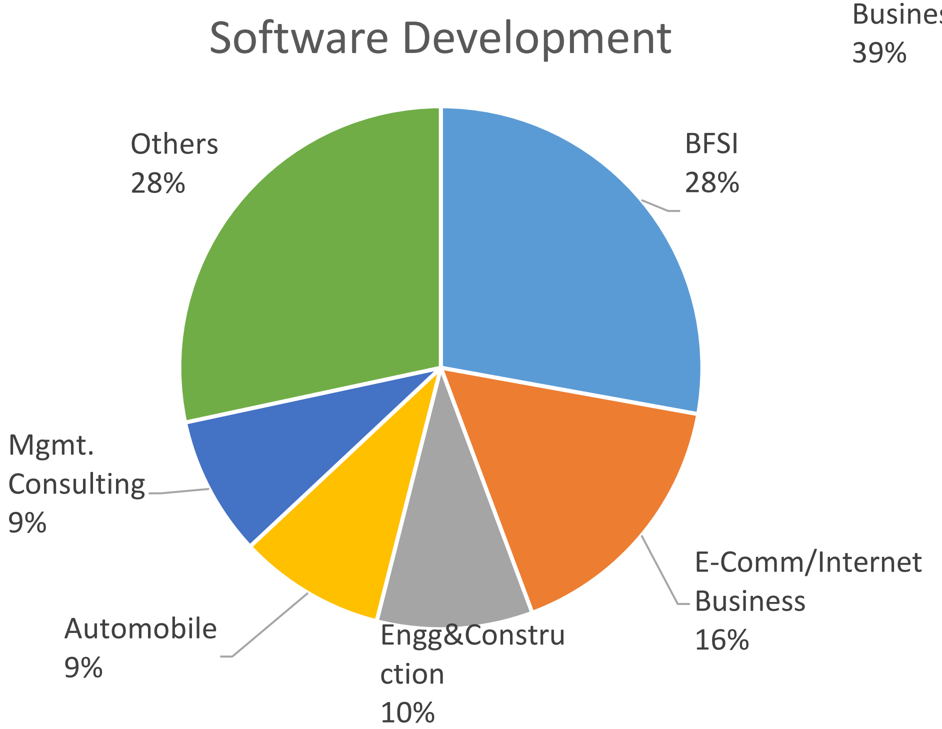
Pune (2/2)



Data, Cloud & Network
Others
19%
BFSI
51%
E-
Comm/Inter
net Business
30%



IT & Product Management
Others
21%
BFSI
40%
E-Comm/Internet
Business
39%



Software Development
Others
28%
BFSI
28%
Mgmt.
Consulting
9%
E-Comm/Internet
Business
16%
Automobile
9%
Engg&Constru
ction
10%

Back

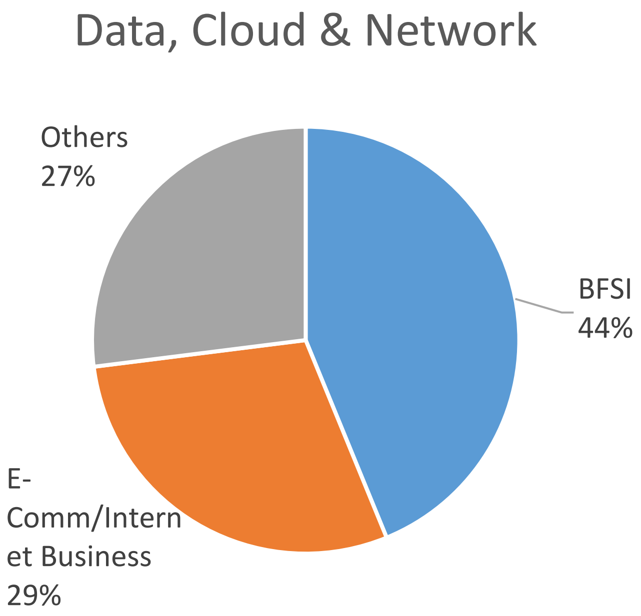
Hyderabad (1/2)

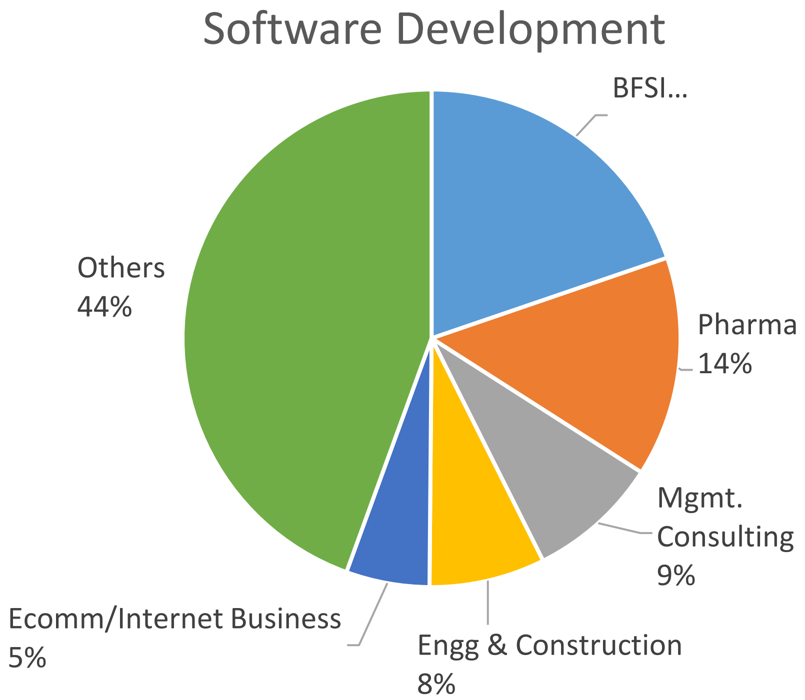
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	10063	BFSI	3891
			E-Commerce	2593
			ManagementConsulting	1297
			IT services& Consulting	1296
			Chemicals	594
2	Product Management	4854	BFSI	1790
			E-Commerce	1193
			Consumer Electronics	597
			IT services& Consulting	597
			ManagementConsulting	597
3	Software Development	12910	IT services & Consulting	9895
			BFSI	1155
			ManagementConsulting	503
			E-Commerce	317
			Consumer Electronics	120
Total		27,827		

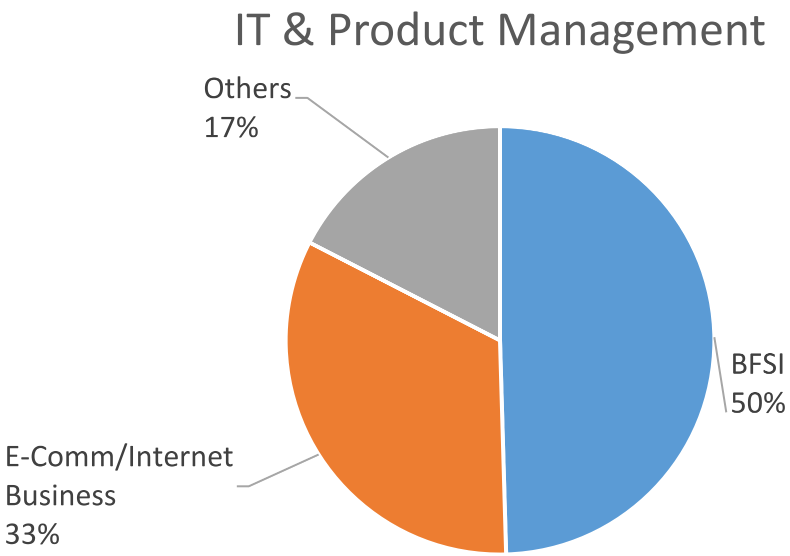
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	850	10063
		1-2	1304	
		2-5	4874	
		5+	3035	
2	Product Management	0-1	44	4854
		1-2	165	
		2-5	1284	
		5+	3361	
3	Software Development	0-1	373	12910
		1-2	883	
		2-5	5926	
		5+	5728	
Total				27827

Back

Hyderabad (2/2)







Back

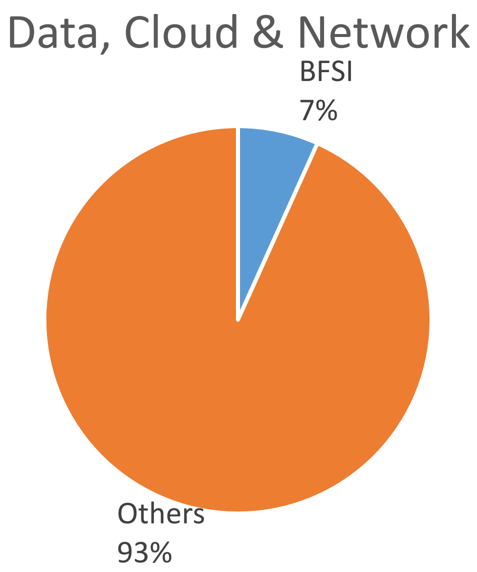
Kochi (1/2)

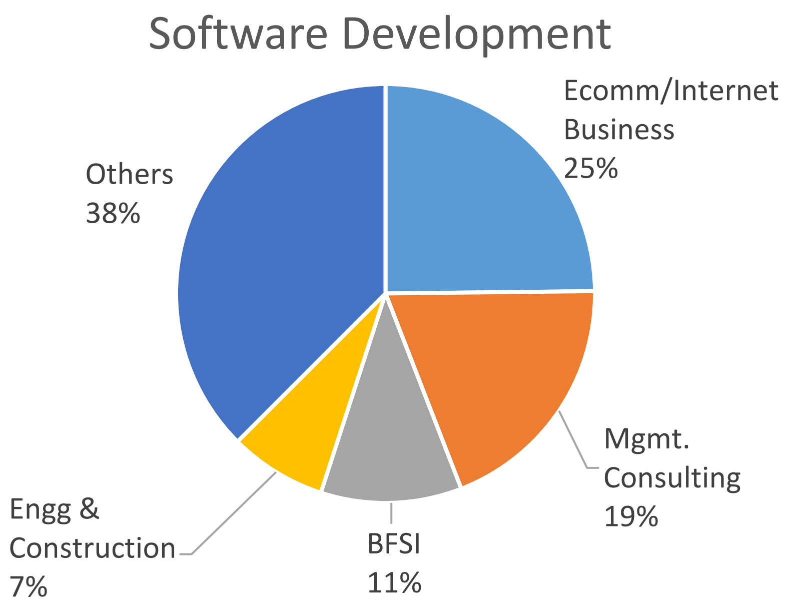
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	322	IT services& Consulting	116
			Management Consulting	116
			E-Commerce	25
			BFSI	12
			Advertising&Marketing	4
2	Product Management	329	E-Commerce	135
			IT services& Consulting	68
			Management Consulting	68
			Engineering&Constructio	13
			BFSI	11
3	Software Development	3337	IT services & Consulting	2757
			E-Commerce	139
			Management Consulting	108
			BFSI	61
			Advertising&Marketing	43
Total		3,988		

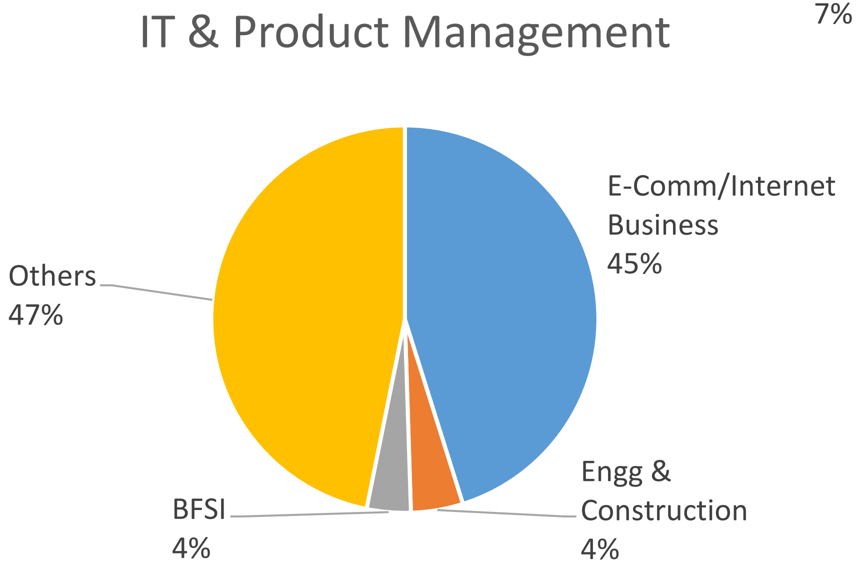
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	21	322
		1-2	73	
		2-5	135	
		5+	93	
2	Product Management	0-1	12	329
		1-2	21	
		2-5	108	
		5+	188	
3	Software Development	0-1	225	3337
		1-2	608	
		2-5	1613	
		5+	891	
Total				3988

Back

Kochi (2/2)







Back

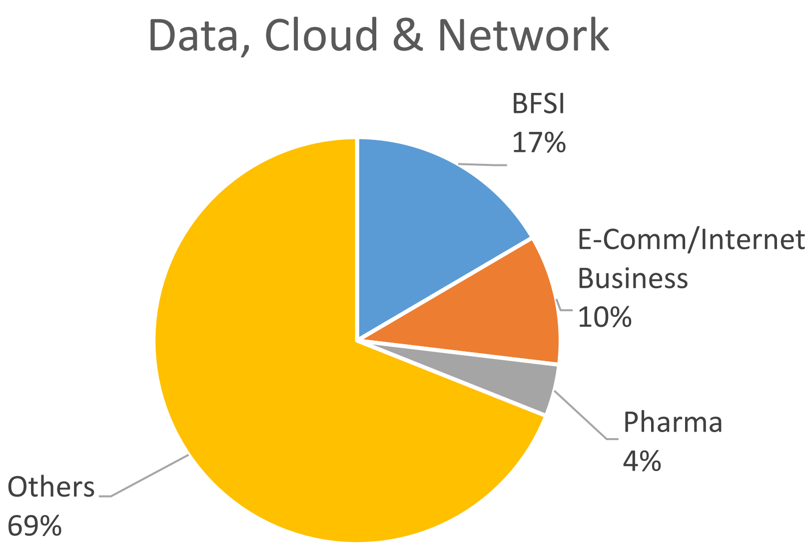
Chandigarh (1/2)

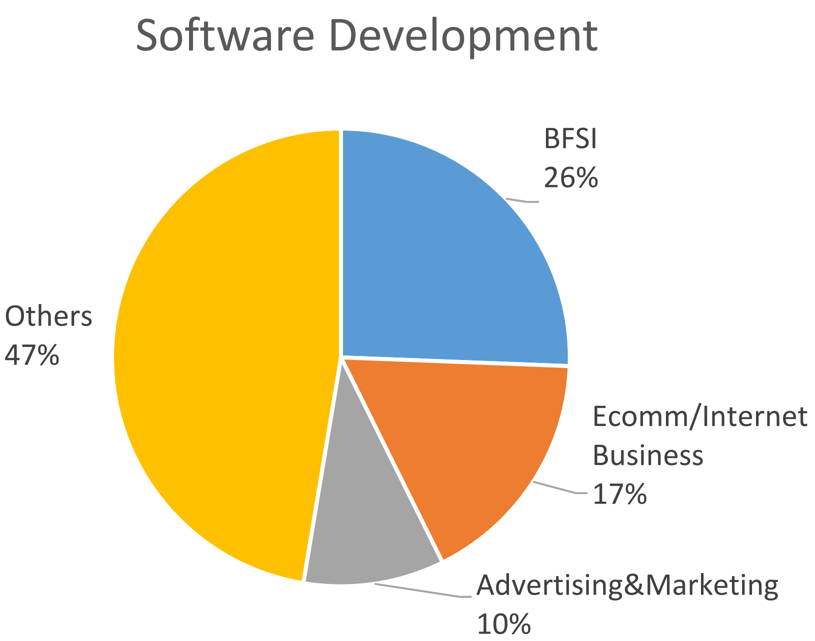
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	338	IT services& Consulting	68
			Chemicals	67
			Miscellaneous	67
			Power	67
			BFSI	24
2	Product Management	210	BFSI	47
			IT services& Consulting	34
			Ports&Shipping	34
			Power	34
			Printing&Publishing	34
3	Software Development	1289	IT services & Consulting	1084
			BFSI	72
			e-commerce	48
			Management Consulting	22
			Pharma&Life Sciences	11
Total		1,837		

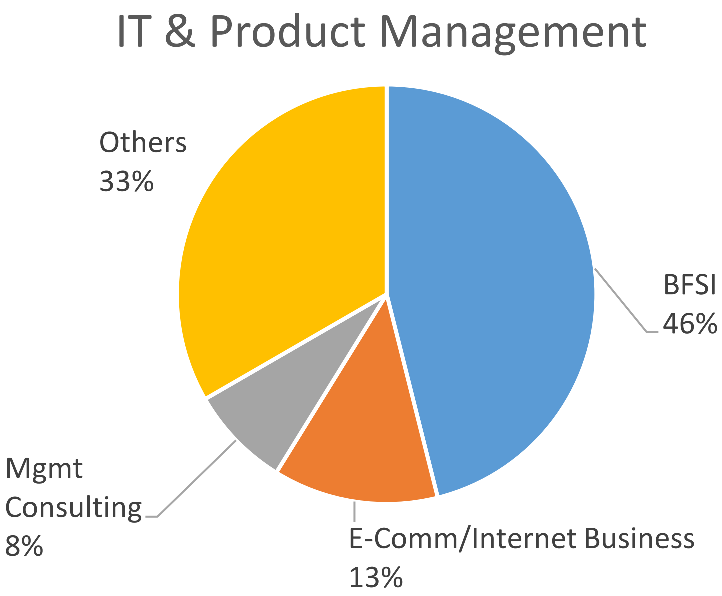
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	44	338
		1-2	91	
		2-5	139	
		5+	64	
2	Product Management	0-1	2	210
		1-2	53	
		2-5	86	
		5+	69	
3	Software Development	0-1	127	1289
		1-2	376	
		2-5	572	
		5+	214	
Total				1837

Back

Chandigarh (2/2)







Back

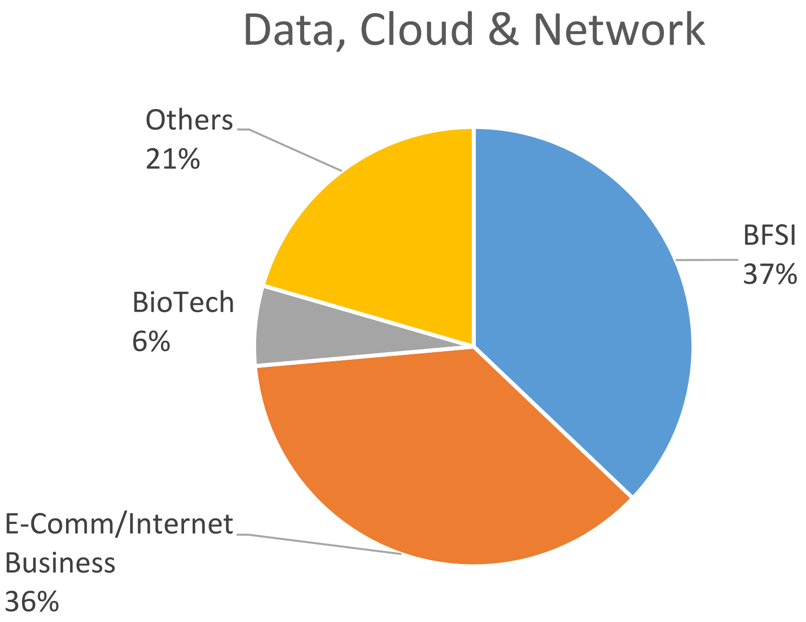
Kolkata (1/2)

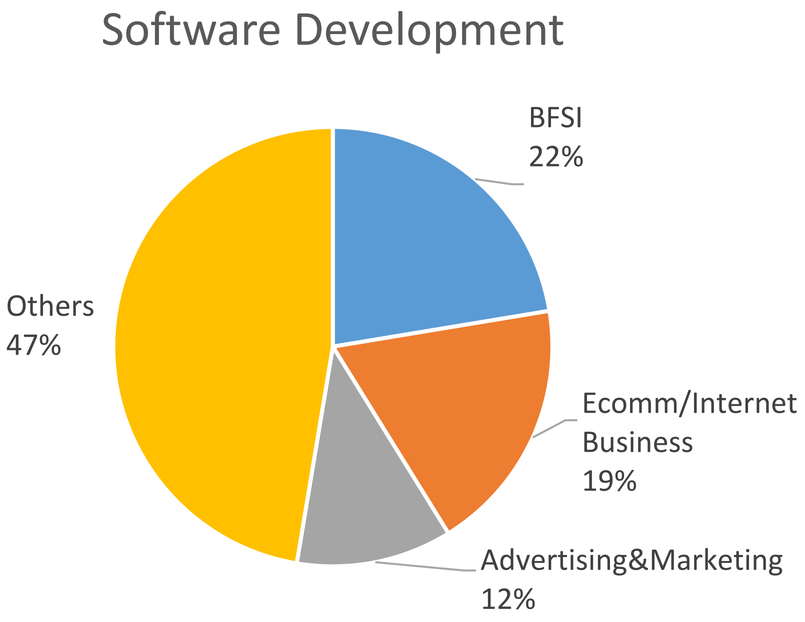
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	2799	BFSI	995
			E-Commerce	978
			IT services& Consulting	489
			Biotechnology	158
			Iron&Steel	17
2	Product Management	1181	BFSI	450
			E-Commerce	446
			ITServices&Consulting	24
			Automobile	10
			MedicalDevices&Equipm	9
3	Software Development	7644	ITServices&Consulting	6007
			E-Commerce	551
			BFSI	462
			Hotels&Restaurants	53
			MedicalDevices&Equipm	49
Total		11,624		

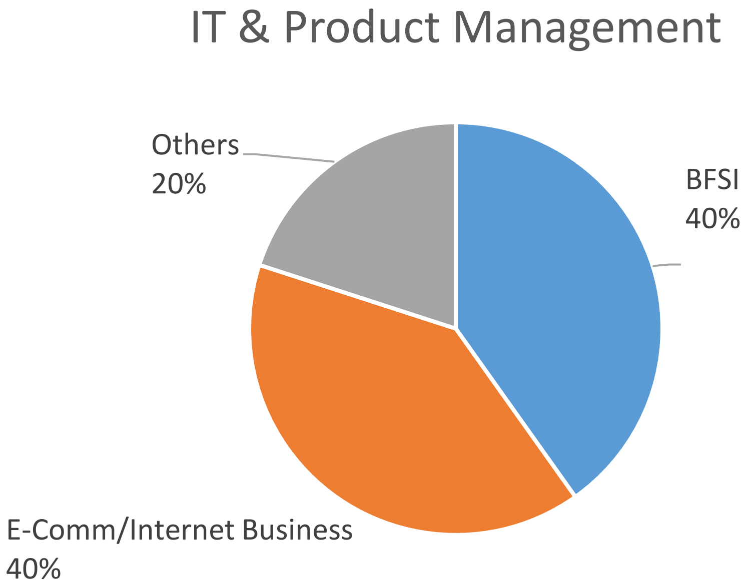
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	285	2799
		1-2	453	
		2-5	1278	
		5+	783	
2	Product Management	0-1	7	1181
		1-2	84	
		2-5	365	
		5+	725	
3	Software Development	0-1	285	7644
		1-2	883	
		2-5	3735	
		5+	2741	
Total				11624

Back

Kolkata - (2/2)







[Back](#)

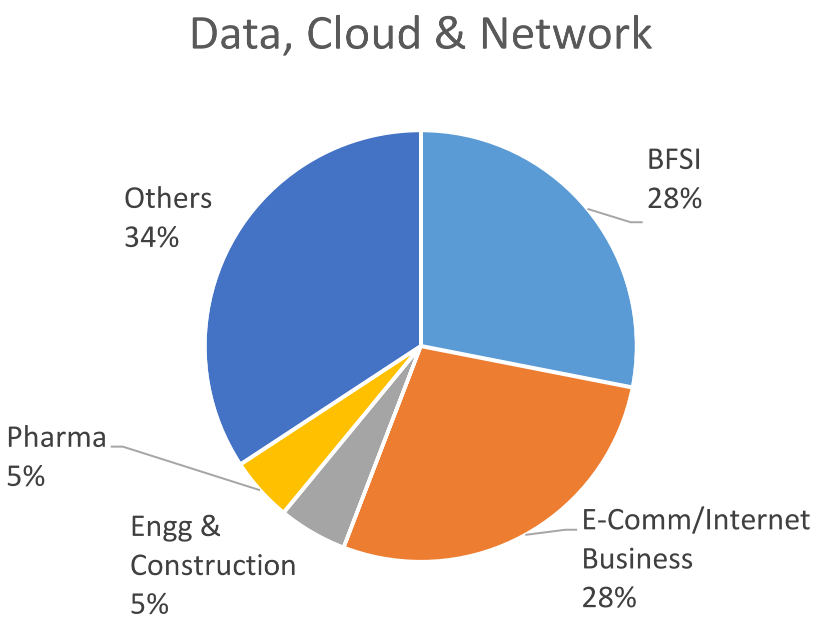
Vadodara (1/2)

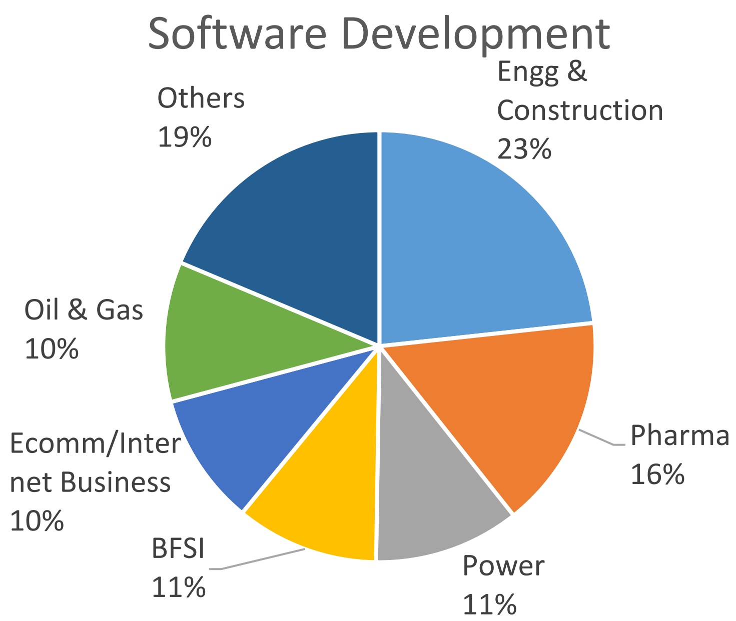
Workforce Sorted by Skills and Industry				
Sno.	Skills	Numbers	Industry	Numbers
1	Data and Cloud	622	BFSI	82
			E-Commerce	81
			IT services& Consulting	76
			Miscellaneous	76
			Textile&Apparel	76
2	Product Management	351	BFSI	105
			E-Commerce	58
			Engineering&Constructio	48
			IT services& Consulting	48
			Real Estate	48
3	Software Development	1137	IT services & Consulting	594
			Engineering&Constructio	113
			Pharma&Life Sciences	78
			Power	53
			BFSI	52
Total		2,110		

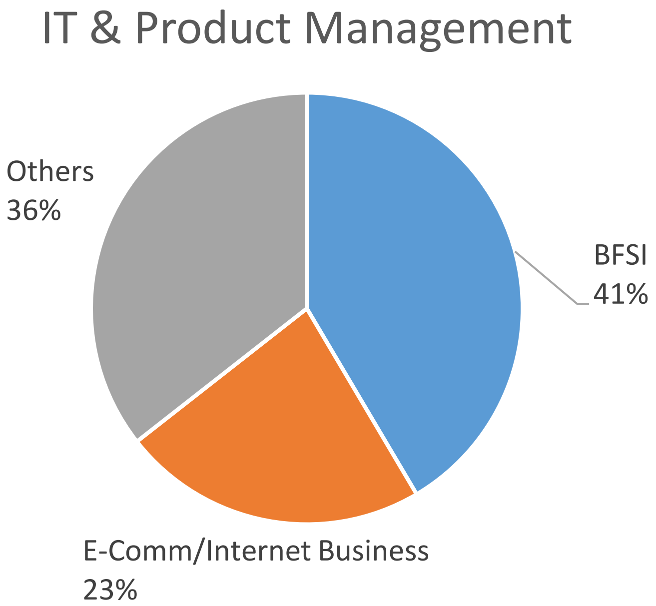
Workforce sorted by Work Experience				
Sno.	Skills	Work Ex (in years)	Number	Total
1	Data and Cloud	0-1	59	622
		1-2	136	
		2-5	250	
		5+	177	
2	Product Management	0-1	13	351
		1-2	21	
		2-5	133	
		5+	184	
3	Software Development	0-1	102	1137
		1-2	197	
		2-5	524	
		5+	314	
Total				2110

Back

Vadodara (2/2)







[Back](#)

All India Data Extrapolation – By Skillset

The data across the 8 cities were consolidated and then projected by 20% for the other cities.

Workforce Sorted by Skills			
Sno.	City	Skills	Numbers
1	Delhi NCR	Data and Cloud	16324
		Product Management	5606
		Software Development	14311
2	Bengaluru	Data and Cloud	12751
		Product Management	11561
		Software Development	61016
3	Pune	Data and Cloud	11424
		Product Management	5325
		Software Development	16053
4	Hyderabad	Data and Cloud	10063
		Product Management	4854
		Software Development	12910
5	Kochi	Data and Cloud	322
		Product Management	329
		Software Development	3337

Workforce Sorted by Skills			
Sno.	City	Skills	Numbers
6	Chandigarh	Data and Cloud	338
		Product Management	210
		Software Development	1289
7	Kolkata	Data and Cloud	2799
		Product Management	1181
		Software Development	7644
8	Vadodara	Data and Cloud	622
		Product Management	351
		Software Development	1137
9	Others	Data and Cloud	65572
		Product Management	35300
		Software Development	141236
Total		Data and Cloud	120215
		Product Management	64717
		Software Development	258933

[Back](#)

All India Data Extrapolation – By Work Experience

The data across the 8 cities were consolidated and then projected by 20% for the other cities.

Workforce Sorted by Work Experience			
Sno.	City	Work Exp (years)	Jobs
1	Delhi NCR	0-1	2,989
		1-2	5,259
		2-5	15,635
		5+	12,358
2	Bengaluru	0-1	1,839
		1-2	5,249
		2-5	13,103
		5+	15,897
3	Pune	0-1	1,705
		1-2	3,060
		2-5	14,028
		5+	14,009
4	Hyderabad	0-1	1,267
		1-2	2,352
		2-5	12,084
		5+	12,124
5	Kochi	0-1	258
		1-2	702
		2-5	1,856
		5+	1,172

Workforce Sorted by Work Experience			
Sno.	City	Work Exp (years)	Jobs
6	Chandigarh	0-1	173
		1-2	520
		2-5	797
		5+	347
7	Kolkata	0-1	577
		1-2	1,420
		2-5	5,378
		5+	4,249
8	Vadodara	0-1	174
		1-2	354
		2-5	907
		5+	675
9	Others	0-1	10,778
		1-2	22,699
		2-5	76,546
		5+	72,997
Total		0-1	19,760
		1-2	41,615
		2-5	1,40,334
		5+	1,33,828

Back

Industry Insights-Technological Changes-I

Sector	Digital Technologies	Sector-Specific technology	Others
Growing of Cereals, Leguminous Crops and Oilseeds (Farms)	Artificial Intelligence, Machine Learning (ML), Internet of Things (IoT), Big Data and Blockchain	Farm Machinery, PoS and Soil data	Drones, Satellite data and Statistical Model
Raising Cattle and Buffaloes	Artificial Intelligence	Artificial Insemination	Improved refrigeration technologies for better milk preservation
Weaving of Textiles	Artificial Intelligence, ML, Automation & Digital Technologies, Supply Chain invocations (Traceability, Block Chain, etc.)	• Sustainable Technologies (Eco-friendly chemicals/ dyes) • Circular/ Green/ Recycled/ Sustainable textiles • Advanced Materials (Technical Textiles, Smart Textiles, etc.)	
Electric power generation using solar and other non-conventional energy	Software to read and forecast solar and wind data	RE is a new technology in electricity sector; automation in O&M; Higher efficiency solar and wind modules, taller windmills	Offshore wind; green hydrogen

Back

Industry Insights-Technological Changes-II

Sector	Digital Technologies	Sector-Specific technology	Others
Manufacturing of MVs & its auto parts and repair	Artificial Intelligence/Machine Learning; software and cybersecurity	BS4 to BS6 (transition to BS7); electric, hybrid, and flex fuel vehicles; electronics in motor vehicles; automation and robotics in manufacturing and repair and maintenance	New materials and light-weighting components
Retail sale of food, clothing and shoes	Artificial Intelligence, Digitised Supply Chain-Internet of Things, GPS and RFID technology, Cloud/hybrid storage, AI/ML, Blockchain, Automated data loggers Barcode pricing	Electronic retail-Modern retail and e-Commerce; remote monitoring of stores	Data Analytics

Back

Industry Insights-Technological Changes-III

<table>
<tr><th>Sector</th><th>Digital Technologies – Across sector</th><th>Sector-Specific technology</th></tr>
<tr><td>Information Technology Sector</td><td>Python – AI/ML
Full stack developer
image and signal processing
Natural Language Processing
Large Language Model Building
Small Language Model Building
Deep Neural Networks
Cyber cloud security
Cybersecurity:
Cloud Computing
Data Protection
Econometric modeling
Blockchain and 5G Technology</td><td>For Agritech, commerce and EV
Remote sensing
Drip technology with cloud computing
For Manufacturing -
Robotics,
Embedded computing
Digital Twin
Pharmaceutical and Medical
3D modeling
3D Printing:
Robotics: Virtual and Augmented Reality (VR/AR)
Nanotechnology
Digital Twin
CRISPR
Bioprinting</td></tr>
</table>

Back

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations) -I

Growing of Cereals, Leguminous Crops and Oilseeds

	Drone Operator	Agriculture Advisor/Crop Advisor (Agri-tech)	IT-GIS Specialist (Agri-tech)	MIG-Welding Operator	Farm -Machinery Service Technician
NCO 3-digit code	834	132	Not classified in NCO	821	723
NCO 8-digit / QP code	8341.0200 (AGR/Q1006)	1324.9900	DGT/2012	8212.1901	7233
Match from Job Projections (611, 921, 631, 613 and 633) @					
No. of stakeholders which mentioned this (32)	6	14	3	8	9
Indicative computation of the extent of the need & vacancy rate (NCAER computations for 2026-27)	4,35,313 (if 25% net sown area is covered by drones)	-	2,44,083 (If 5% of the holdings are using GIS in the farming)	-	5,56,510 (If 70% of farmers use farm machinery)
Geography (survey was done): Bottom-up approach in Haryana	Karnal, Kaithal, Hisar and Faridabad, Haryana	Gurugram, Haryana and Pune, Maharashtra	Hisar, Haryana	Karnal, Faridabad & Hisar, Haryana	Karnal, Faridabad & Hisar, Haryana
Average monthly income (₹)	₹30,000	₹20,000-₹ 30000	₹42,746	₹ 16,000-₹23,000	₹ 15,000
Educational Qualifications	ITI Graduate/Short-term Skilling Programmes like PMKVY	Agricultural Graduate	Graduate	ITI Graduate	ITI Graduate

Note: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-II

Growing of Cereals, Leguminous Crops and Oilseeds

	Drone Operator	Agriculture Advisor/Crop Advisor (Agri-tech)	IT-GIS Specialist (Agri-tech)	MIG-Welding Operator	Farm-Machinery Service Technician
Skills required at the competency level (3 and more)	**Cognitive**: Advanced reading, Active Listening, Problem solving, communication skills, mathematical skills, digital skills, financial and resource management (entrepreneurial) **Socio-emotional**: Agreeable (entrepreneurial skills) **Technical & Vocational Skills (TVET):** Understanding of remote sensing, data analysis techniques, actual drone operations **Physical Skills**	**Cognitive**: Advanced reading skills, active listening, advanced digital skills, communication skills (including talking to farmers), business and local languages, problem-solving, judgement & decision-making, mathematical reasoning and science **Socio-emotional**: Skills needed for customer relationship (Agreeable, Extraversion), Conscientiousness (efficient), work independently in field settings, negotiation skills **TVET:** Agricultural knowledge, understanding of remote sensing, data analysis techniques, Precision Agriculture Techniques, Using AI, machine learning, and robotics, familiarity with blockchain for traceability and supply chain transparency	**Cognitive**: Advanced reading skills, Advanced digital skills, mathematical skills, mathematical reasoning, problem-solving, critical thinking, judgement & decision making skills, communication skills and critical thinking **Socio-emotional**: Conscientiousness and agreeable **TVET**: Proficiency in Geographic Information Systems (GIS) software	**Cognitive**: Reading literacy, speaking, communication, time management **Socio-emotional**: Conscientiousness (resilience), Agreeable (team-work), openness to experiences and emotional stability **TVET**: Expertise in MIG welding techniques and safety protocols and Ability to read and interpret technical drawings and specifications **Physical Skills**	**Cognitive**: Reading literacy, numeracy, customer service skills – active listening, problem solving, communication skills, financial and resource management (entrepreneurial) **Socio-emotional**: Agreeable (entrepreneurial skills) **TVET:** Knowledge of mechanical systems and electronic controls in modern equipment **Physical Skills**

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-III

Growing of Cereals, Leguminous Crops and Oilseeds

	Drone Operator	Agriculture/Crop Advisor	IT-GIS Specialist	MIG-Welding Operator	Farm -Machinery Service Technician
Skills Shortage	Yes	Yes	Yes	Yes	Yes
Skills Gap	Not Applicable (NA)	Yes	NA	Yes	Yes
Relevance of TVET System	NA	• Limited exposure to advanced agricultural technology • Agricultural University graduates do not have the appropriate skills to work with farmers	NA	• Not taught in TVET • Practical, hands-on training missing • Shortage of master trainers	• Practical, hands-on training missing • Limited exposure to advanced agricultural machinery
Gender (Challenges)	NA	No issue	No issue	Not Aspirational for women because of physical skills required at job	Not Aspirational for women because of physical skills required at job
Challenges Faced by Industries in Meeting Skill Requirements	NA	• Multi-disciplinary knowledge about agriculture and IT is missing • Academia-industry collaboration limited • Lack of trainers	No issue	• MIG Welders not found • Skills shortage being addressed by in-migration • Apprenticeship system is a gap; needs to be strengthened	• Shortage of master trainers • Not enough TVETs • Inadequate training at Vocational Institutes with theoretical training emphasized; need training thereafter
Industry-specific interventions that facilitate skill & capacity development (best practices)	NA	No issue	No issue	Offered permanent jobs with written contracts of more than 1 year and social safety nets to attract workers	• Industry developing labs in both higher education and vocational training institutes

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-IV

Growing of Cereals, Leguminous Crops and Oilseeds

	Drone Operator	Agriculture/Crop Advisor	IT-GIS Specialist	MIG-Welding Operator	Farm -Machinery Service Technician
Policy Recommendations	**Skill Training Programme**: Need to be expanded i.e. more programmes need to be introduced to train people as a Drone operator, thereby increasing supply; Strengthen the new training programme and ensure its spread all over the country **Curriculum Development**: Entrepreneurial skills should be taught along with TVET skills **Gender**: Drone-DiDi programme has already started and this can be further strengthened by ensuring that the curriculum includes socio-emotional & entrepreneurial skills especially targeted for women. **Skill Initiatives:** Apprenticeships should be made mandatory	**Skill Training Programme**: Needs to be expanded **Curriculum Development**: Latest TVET skills, case studies, field studies with live practice on field, practical training courses in post-harvest management, oral fluency in multiple (business plus local) languages and socio-emotional skills **Gender**: Strengthen socio-emotional skills and interaction with women farmers **Skill Initiatives:** Apprenticeships should be made mandatory; Encourage academia-industry collaboration	**Skill Training Programme**: Needs to be expanded, Introduce new programmes in agricultural universities; dual degree programmes in IT and agriculture **Curriculum Development**: TVET skills **Gender**: Will be attractive to women **Skill Initiatives:** Repeated summer internships in progammes	**Skill Training Programme**: Needs to be expanded; this should be introduced in the ITIs **Curriculum Development**: Arch and MIG welding need to be taught in ITIs **Gender**: Females can be encouraged for this job role **Skill Initiatives:** Local mismatches to be solved by increased coordination between industry and ITIs; Apprenticeships should be made mandatory for ITI students in welding	• **Skill Training Programme**: Needs to be expanded, new programmes on upskilling and re-skilling on latest machinery • **Curriculum Development**: Entrepreneurial skills should be taught along with TVET skills • **Gender**: Females can be encouraged for this job role and special training programmes may be designed for women like Drone-didi • **Skill Initiatives:** Farm machinery companies should be providing training & certification and also offer re-skilling & upskilling courses. Take lessons from the auto sector

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations) -V

Raising Cattle and Buffaloes

	Veterinary Technician/Assistant	Mechanic-Refrigeration and Air Conditioning	Dairy Technologist	Manager-Dairy Farm
NCO 3-digit Code	324	712	214	131
NCO 8-digit (QP code)	3240.9900 (AGR/Q4801; AGR/Q4802)	7127.0100 (FIC/Q9502)	2141.1900	1311.1400 (AGR/Q4101)
Match from Job Projections (612, 521, 632, 613 and 611) @				
No. of stakeholders which mentioned this	12	14	13	15
Location of firms/farms	Karnal, Hisar & Faridabad, Haryana; Pune & Kolhapur, Maharashtra; Jodhpur, Rajasthan and; North 24 Parganas, West Bengal	Karnal, Hisar & Faridabad, Haryana; South Bengaluru, Karnataka; Pune & Kolhapur, Maharashtra; Mohali, Punjab; Jodhpur, Rajasthan and; Bareilly, UP	Karnal, Hisar & Faridabad, Haryana; South Bengaluru, Karnataka; Pune & Kolhapur, Maharashtra; Mohali, Punjab; Jodhpur, Rajasthan and; Bareilly, UP	Karnal, Hisar & Faridabad, Haryana; South Bengaluru, Karnataka; Pune & Kolhapur, Maharashtra; Mohali, Punjab; Jodhpur, Rajasthan and; Ghaziabad & Bareilly, UP
Average monthly income (₹)	25 to 30,000	35 to 40,000	55 to 60,000	50 to 60,000
Educational Qualifications	Bachelor of Veterinary Science/Diploma Holder/NSQF Aligned Course	Industrial Training Institute (ITI) and NCVT/SCVT certification	B.Tech/M.Tech degree from NDRI/CCSHAU etc.	Management degree in Dairy Business/Diploma Holder/NSQF Aligned Course

Note: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations) -VI

Raising Cattle and Buffaloes

	Veterinary Technician/Assistant	Mechanic-Refrigeration and Air Conditioning	Dairy Technologist	Manager-Dairy Farm
Skills required at the competency level (3 and more)	**Cognitive Skills**: Reading, writing, numeracy, digital Skills, Resource Management (Entrepreneurship skills) **Socio-emotional Skills:** Extraversion **TVET**: Animal behaviour, Breeding, Disease awareness and Application of medicine and surgery	**Cognitive:** Reading, writing, numeracy and digital skills **Socio-emotional Skills:** Agreeable **TVET**: • Troubleshoot and repair electrical and air-filled control systems & its management • Bulk cooling management	**Cognitive Skills:** Reading, writing, numeracy and digital skills **Socio-emotional Skills:** Conscientiousness **TVET**: • Applying chemistry and microbiology, to dairy production processes to ensure quality and efficiency. • Expertise in techniques to enhance milk production and preserve milk to extend shelf life and maintain nutritional value. • Awareness of modern technologies	**Cognitive Skills**: Reading, writing, speaking, knowledge of local language and English/Hindi, digital skills, independent learner, active listening, creativity, learning strategies(learn & train their own staff), judgement & decision-making, resource management (time management, financial & resource management), communication skills (effectively communicate with employees, suppliers, buyers, and customers to build relationships and ensure smooth business operations) **Socio-emotional Skills**: Extraversion, Agreeable and Emotional Stability **TVET**: Knowledge about the sector

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations) -VII

Raising Cattle and Buffaloes

	Veterinary Technician/Assistant	Mechanic-Refrigeration and Air Conditioning	Dairy Technologist	Manager-Dairy Farm
Skills Shortage	Yes	Yes	Yes	Yes
Skills Gap	No	Yes	No	No
Relevance of TVET System	Good quality	Practical skills missing; skills mismatch	Good quality	Good quality
Gender (Challenges)	No issue	Not aspirational	No issue	No issue
Challenges Faced by Industries in Meeting Skill Requirements	Prevalence of unqualified workers	MSMEs face challenges because they do not have the capacity to skill	Finding workers	Finding workers
Industry-specific interventions that facilitate skill & capacity development (best practices)	Large and new-age farms are opening their own veterinary units	None	Research & Development on farms	On-job training given
Policy Recommendations	**Skill Training Programme:** Needs to be expanded **Curriculum Development:** Entrepreneurship skills need to be added to curriculum **Gender:** Maybe encouraged with additional socio-emotional skills **Skill Initiatives:** Special focus for women	**Skill Training Programme:** Needs to be expanded **Curriculum Development:** Practical skills to be made mandatory; curriculum needs to be aligned with present needs **Gender:** Maybe encouraged **Skill Initiatives:** Apprenticeships should be made mandatory	**Skill Training Programme:** Needs to be expanded **Curriculum Development:** Incorporate modern technologies in curriculum **Gender:** Maybe encouraged **Skill Initiatives:** Summer internships are recommended	**Skill Training Programme:** Needs to be expanded; **Curriculum Development:** Socio-emotional skills needs to be incorporated in the curriculum Gender: Maybe encouraged **Skill Initiatives:** Special training for women

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-VIII

Weaving of textiles- The survey reported that there are three job roles which are facing skill shortage

	Weaver-Handloom (Jacquard/ Loin loom)	Weaver- Power loom	Weaving Assistant (Handloom)
NCO-3 digit code	731	731	No code available
NCO 8-digit (QP code)	TSC/Q7306, TSC/Q7307 (7318.58)	TSC/Q2210 (7318.55)	No code available
Match from Job Projections (731, 815, 753, 112, 632) @			
No. of all stakeholders mentioned this (22)	16	11	16
Indicative computation of the extent of the need& vacancy rate (NCAER computations)	• Dominated by unorganised sector • Weavers working from their own workspace at home using own looms/cooperatives. • Unutilised capacity- more weavers, more output	• Dominated by organized sector • Migrated workers. • Unutilised capacity- more weavers, more output	• Dominated by unorganised sector • Weavers working from their own workspace at home using own looms/at cooperatives • Unutilised capacity- more weavers, more output
	There are 28.2 lakh handlooms in the country. Assuming that each loom requires one weaver and one weaver assistant - requires 56.4 lakh weavers in the country. In the power loom sector, there are 3.85 lakh looms. Assuming, on average, one weaver operates 8 looms simultaneously, one would need 0.5 lakh powerloom weavers. Totally the need is for 57 lakh weavers However, in the PLFS 2022-23, there were 13.3 lakh workers under the NCO code 731. Therefore, the skill gap under NCO code 731 is 43.7 lakh. However, this estimate is indicative as many handlooms are non-functional due to a variety of reasons and there may be other occupations under NCO 731. Even then just in the case of weavers, the skills gap is high. More precise numbers requires a survey.		
Manpower projection by 2030 (NCAER computations)*	Weavers required by 2030= 0.5 million , Allied workers required by 2030= 0.2 million		

Notes: @ Pink shade indicates no match between I-O quantitative top 3 occupation projections and survey-based top 3 occupation projections. Green shade indicates a match.

*Manpower does not change frequently in this industry. In alignment with the textile industry, manpower projections have been done till 2030.

[Back](#)
[Back to Sectoral Analysis](#)

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-IX

Weaving of textiles

	Weaver-Handloom (Jacquard/ Loin loom)	Weaver- Power loom	Weaving Assistant (Handloom)
Location of firms/farms	Varanasi, UP and Bengaluru, Karnataka	Ludhiana, Punjab and Solan, HP	Varanasi, UP & Bargarh, Odisha
Average daily income (₹)	Upto ₹ 600 per day, Product based payment	₹ 450-500 per day, less working hrs than handloom	₹ 200-300 per day
Educational Qualifications	Mostly illiterate/ upto primary	Primary/Matric	Currently in school
Skills required at the competency level (3)	**Cognitive Skills:** Reading, numeracy**,** Active Learning (Ability to learn new skills), Creative thinking-Ability to create new design patterns with different colour combinations; Digital Skills, Financial Management, Resources Management and Entrepreneurship Skills, **Socio-emotional Skills:** Conscientiousness (efficient, patience), instruction, persuasion, negotiation and networking skills **TVET**: Weaving, Setting up the loom and warp and how to manipulate threads and patterns, Basic knowledge of fabrics, yarn count, colours, designing and card punching skills, types of weaves & looms, quality parameters, marketing skills, Health consciousness due to heavy loom handling; **Physical Skills**- hand-eye coordination, ability to sit for long		
Skills Shortage	Yes	Yes	Yes
Skills Gap	No	No	No
Relevance of TVET System	It is relevant and providing basic skills for weaving and allied activities	It is relevant and providing basic skills for weaving and allied activities	Apprenticeship programme should be strengthened
Gender (Challenges)	Women are not able to operate heavy handlooms, they are involved in allied activities.	No issue	Varies by region depending on the nature of the loom

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-X

Weaving of textiles

	Weaver-Handloom (Jacquard/ Loin loom)	Weaver- Power loom	Weaving Assistant (Handloom)
Challenges Faced by Industries in Meeting Skill Requirements	Skills Shortage; spatial mismatch; tedious work conditions; low wages; not aspirational; spatial mismatch (unemployed weavers in one place and industry in another)	• Skills Shortage	Skills Shortage; tedious work conditions; low wages; not aspirational
Industry-specific interventions that facilitate skill & capacity development (best practices)	• Cooperatives help weavers acquire looms and set them up at their homes-this enables them to work from home and make it aspirational for the youth • Cooperatives helped weavers to onboard on government schemes (schools, scholarships etc.), which enable their longer tenure at the cooperative • Females employed in allied activities of knitting, stitching, designing, dyeing etc.	• Firms are providing training for specific skills • Providing accommodation	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage for Top Job Roles (Findings from Stakeholder Consultations)-XI

Weaving of textiles

	Weaver-Handloom (Jacquard/ Loin loom)	Weaver- Power loom	Weaving Assistant (Handloom)
Policy Recommendations	**Skill Training Programme**: Introducing basic weaving skills on handloom and power loom and setting up of looms, creative designing, usage of new fabrics/yarns & technologies, RPL needs to be encouraged **Curriculum Development**: Digital skilling, Automation and Digital Technologies, Sustainable Technologies Circular/ Green/ Recycled/ Sustainable textiles, Advanced Materials, Supply Chain invocations, Artificial Intelligence and Machine Learning, Entrepreneurial training **Gender**: Encourage women in new areas- designing (computerised), ICT skills which use CAD technology, new dyes (computerised), green textile **Skill Initiatives:** Encourage academia-industry collaboration, Guest faculties from industries, Vocational skilled teachers getting industrial training; industry visits; ITI adopted by large industry (like in the auto sector, Apprenticeships should be encouraged at the cooperative level **Others**: Improve spatial matching of industry and workers; Government in collaboration with industries may take initiatives to set up exhibition cum sale outlets with right customer group for weavers to directly sell their products e.g. one group did it recently for handloom; help with marketing; forecasting; designing		

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XII

Manufacturing of MVs & its auto parts and repair

Job roles	**1) Machine/CNC operator; Turner; Grinder; Tool and die maker**	**2) Technician / Mechanic; Motor mechanic**
NCO 3/8-digit	722- Blacksmiths, Tool Makers and Related Trades Workers	7231.0100: Mechanic, Automobile
No. of firms which mentioned this	5	3
Match from Job Projections (723, 932, 112, 821, 312 and 311)		
Extent of the need (sum of the numbers from stakeholder consultations)	15,000 + (now) & 20,000+ (three years from now)	15,000 + (now) & 20,000+ (three years from now)
Geography (where?)	RJ (Alwar), HR (Gurgaon), UK (Rudrapur), MP (Bhopal), GJ (Sanand-Hansalpur), MH (Pune), TN (Hosur), KR (Bangalore), JH (Jamshedpur)	Repair & maintenance: At workshops/dealerships across the country, in every city Manufacturing: HR (Gurgaon); GJ (Hansalpur)
Monthly income (₹)	~ 15,000 – 20,000	~ 15,000 – 20,000
Educational Qualifications	Diploma /ITI (electrical/ automotive/ fitter) / B.E. (automobile, mechanical or production engineering)	ITI (motor mechanics)

Notes: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections. Green shade indicates a match.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XIII

Manufacturing of MVs & its auto parts and repair

Job roles	1) Machine/CNC operator; Turner; Grinder; Tool and die maker	2) Technician / Mechanic; Motor mechanic
Skills required at the competency level (3)	**Cognitive**: Reading; writing; speaking; Communication skills; language (English/Hindi/local); Numeracy/ Mathematics; Active Listening / learning; problem solving; creativity, independent research; time-mgmt; gender diversity; **Socio-emotional**: Conscientiousness; Agreeable; emotional stability; Persuasion **Physical skills** **TVET**: Work on computers that runs machines involved in manufacturing wiring harness, knowledge of industrial safety (Machine operator in wire harness industry); operate the CNC machine which is numerically computerized, understand component drawing, tolerance, able to read instruments, Vernier caliper, micrometer and air gauges etc. (CNC operator)	**Cognitive**: Reading; writing; speaking; Communication skills (communication to supervisors); language (English/Hindi or Local); Numeracy/ Mathematics; Active Listening / learning; problem solving; critical thinking; judgement; systems analysis; time mgmt.; diversity; ICT skills, gender diversity **Socio-emotional**: Conscientiousness (punctuality, discipline, target-oriented, workplace etiquette, personal grooming, safety & quality mindset); open to experience; agreeable (teamwork); emotional stability (anger management) **Physical skills** **Global competence** **TVET:** Perform vehicle repair & maintenance, basic knowledge of computers, knowledge of electrical & electronic components (and familiar with high voltage modules), diagnostic tools, assembly operations, component loading & unloading of machines (motor technician), cost consciousness, environmental focus, information security, fire safety, use of personal protective equipment, and ***familiarity with hydrogen vehicles (future)***

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XIV

Manufacturing of MVs & its auto parts and repair

Job roles	**1) Machine/CNC operator; Turner; Grinder; Tool and die maker**	**2) Technician / Mechanic; Motor mechanic**
Skills Shortage	Yes	Yes
Skills Gap	Yes	Yes
Relevance of TVET System	No training for wiring/harness industry; Lack of practical experience	• ITI graduates do not have practical experience - do not have knowledge of manufacturing process (casting, welding, machining, painting and Japanese guiding principles of productivity); handling and usage of tools, working on conveyor lines, knowledge of process related defects • Lack of training on communication and socio-emotional skills i.e. they are part of the curriculum but not being taught well • ITIs have poor maintenance and upkeep, tools & machines are old/outdated/not working • Shortage of Master trainers • Little interest from ITIs to allow industry players to set up practical training facility • Lack of automotive trades at ITI in particular regions close to auto clusters (eg. Uttarakhand)
Gender (Challenges)*	Not perceived as a female job both from demand and supply sides	
Challenges Faced by Industries in Meeting Skill Requirements	Incur costs in making the hired workforce industry ready, resulting in longer lead-times; high attrition as workforce does not want to 'work with hands' and demands high salary	
Industry-specific interventions that facilitate skill & capacity development (best practices)	L&D divisions; Training on the job; Graduate Engineer Trainees; industry-academia collaborations (model ITI)	

Note*: Current practices to encourage female participation include implementing POSH in establishments; creche; active look-out for female candidates in manufacturing roles; treat all applications at par; adopt female specific ITI

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XV

Manufacturing of MVs & its auto parts and repair

Job roles	**1) Machine/CNC operator; Turner; Grinder; Tool and die maker**	**2) Technician / Mechanic; Motor mechanic**
Policy Recommendations	**Skill Training Programme**: Needs to be expanded; Practical experience with latest machines and technologies, aligned with industry requirements; Model ITI programmes or Dual Vocational Training programmes need to be encouraged **Curriculum Development**: Curriculum needs to be encouraged with industry guidelines; ITIs equipped with latest technologies, teachers from industry; field visits; improve pedagogy **Gender:** More women at ITI and engg colleges in relevant trades (hostel facilities; foresee automatic growth with EVs and automation (less physical tasks) **Skill Initiatives:** Compulsory OJT components during education/training; involvement of industry trainers for teaching and mentoring (aligning students interests and expectations for better matching and lowering attrition); encouraging women candidates in automotive trades (by awareness on POSH, creche, equal opportunity etc.); openness to new culture, language and food may also be included to help people transition to new places and language training	
Comments	Spatial mismatch in terms of where the jobs are and where the skilled workers are (and even training centres)	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XVI

Manufacturing of MVs & its auto parts and repair

Job roles	3) Power / Micro electronics engineers; AI/ML expert	4) Embedded Software Engineers; Vehicle Software Developer	5) AI Data Science Engineers; Automotive Cybersecurity Specialist
NCO 3/8-digit code	215- Electrotechnology Engineers	2512.0501: Embedded Software Engineer	252- Database and Network Professionals
No. of stakeholders which mentioned this	2	2	2
Match from Job Projections (723, 932, 112, 821, 312 and 311)			
Extent of the need based on stakeholders interviewed (sum of the numbers from stakeholder consultations)	100 (now) & 150 (3 years from now)	400 (now) & 2000 (3 years from now)	300 (now) & 1500 (3 years from now)
Geography (where?)	MH (Pune); UK (Pantnagar); JH (Jamshedpur); UP (Lucknow); GJ (Sanand); KA (Dharwad); TN (Chennai)	MH, TN(Chennai), KA	TN (Chennai), Delhi NCR, MH (Pune), KA (Bangalore)
Monthly income (₹)	~ 1,00,000 – 3,50,000	1,00,000 – 4,00,000	1,25,000 – 1,70,000
Educational Qualifications	B. Tech /M. Tech Engg (Power electronics/ Electrical/ Electronics / Communication / Instrumentation); M.Tech/PhD. Engg + AI/ML programs	B. Tech /M. Tech Engg (Electronics / Computer Science)	B. Tech /M. Tech Engineering (AI and Data Science; or Computer Science/IT + Cybersecurity Certificate)

Notes: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XVII

Manufacturing of MVs & its auto parts and repair

Job roles	3) Power / Micro electronics engineers; AI/ML expert	4) Embedded Software Engineers; Vehicle Software Developer	5) AI Data Science Engineers; Automotive Cybersecurity Specialist
Skills required at the competency level (3)	**Cognitive Skills**: Reading; writing; speaking; Communication skills; language (English); Numeracy/ Math (advanced); digital skills; Active Listening / learning; science; problem solving; critical thinking; creativity; independent research; judgement; systems analysis/evaluation; resource/time mgmt.; diversity; **Socio-emotional Skills**: Conscientiousness; Agreeable; emotional stability; instructing; negotiation; Persuasion **TVET:** Power electronics engineer: Apply power electronics in auto industry, design power conversion devices (convertors, AC/DC convertors, charges), develop test protocols, analyse performance in lab and in-field; Micro electronics engineer: Apply power electronics in auto industry, design PCB and controllers (every aspect of automobile is controlled by hyper-controllers); AI/ML expert: Knowledge of brining intelligence into the system (working on sensors, gesture control etc.), develop a training programme in AI/ML which is specific to automobile sector	**Cognitive Skills:** Reading; writing; speaking; Communication skills; language (English); Numeracy/ Math (advanced); digital skills; Active Listening / learning; science; problem solving; critical thinking; creativity; independent research; judgement; systems analysis/evaluation; resource/time mgmt; diversity; **Socio-emotional Skills**: open to exp.; conscientiousness; Agreeable; emotional stability; Adaptability **TVET:** Knowledge of automotive software, embedded systems, real-time operating systems, write embedded software (efficient codes) that can run micro controllers, develop and test software for vehicle control systems and diagnostics, Languages: 'C' (C/C++), Python, AUTOSAR, MATLAB	**Cognitive Skills:** Reading; writing; speaking; Communication skills; language (English); Numeracy/ Math (advanced); digital skills; Active Listening / learning; science; problem solving; critical thinking; creativity; independent research; judgement; systems analysis/evaluation; resource/time mgmt; diversity; **Socio-emotional Skills**: open to exp.; conscientiousness; Agreeable; emotional stability; Adaptability **TVET:** AI Data Science Engineers: Use legacy/big data to predict vehicle diagnostics (for predictable replacement cycles), predict demand to avoid build up of inventory and cater to emerging demand as well, knowledge and applications of Gen AI, knowledge of 'R' Automotive Cybersecurity Specialist: Analyze and secure automotive systems, security analysis, Fundamental cybersecurity principles and Cybersecurity frameworks, automotive protocols (like CAN), knowledge of security analysis tools, intrusion detection systems

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XVIII

Manufacturing of MVs & its auto parts and repair

Job roles	3) Power / Micro electronics engineers; AI/ML expert	4) Embedded Software Engineers; Vehicle Software Developer	5) AI Data Science Engineers; Automotive Cybersecurity Specialist
Skills Shortage	Yes	Yes	Yes
Skills Gap	Yes	Yes	Yes
Relevance of TVET System	Specialists in the auto sector are needed	Low availability of specialized training in software development for automotive application	Limited cybersecurity expertise with application in automotive sector.
Gender (Challenges)	Entry level challenge is not there but it is harder to retain women in higher positions as other industries offer higher returns and flexibility		
Challenges Faced by Industries in Meeting Skill Requirements	Need DD-SS matching, so that what is needed at industry can be provided by our education system (E.g. Students taking up electrical engineering has seen a drop in the last 5 years, resulting in their shortage. Seeing this fall in demand from students, even the universities have stopped BTech/MTech programs in electrical stream.)		
Industry-specific interventions that facilitate skill & capacity development (best practices)	Firms are developing engineers for all these roles internally		
Policy Recommendations	**Skill Training Programmes:** Need to be expanded i.e. more programmes need to be introduced to train people in these fields **Curriculum Development**: Curriculum development needs to take place at all levels of education. curriculum should be updated with industry guidelines Specialized/advanced courses, combining traditional engineering fields (mechanical/ electrical/ electronics/comp. science) with latest cross-cutting technologies such as mechatronics (mechanical+ electronics), power electronics (electrical+ electronics), automotive software & AI/ML (engg+ specialized courses in AI/data science with automotive industry in mind); development of soft skills should be integral to the curriculum **Gender:** Creche and flexible working hours **Skill Initiatives:** Academia-industry collaboration where traditional field develop specializations in the auto sector		

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XIX

Electric power generation using solar and wind energy

Job roles	**1) Solar Project Manager; Solar Installer; Solar PV Installer and O&M Technician (Surya Mitra)**	**2) O&M Technicians- Mechanical and Electrical**
NCO 3-digit code	742	311
NCO 8-digit code	7421.1401: Solar Panel Installation Technician	3113.0102: Maintenance Technician Electrical 3115.0102: Maintenance Technician – Mechanical
No. of stakeholders which mentioned this	6	5
Match from Job Projections (541, 413, 741, 932 and 411)		
Extent of the need based on stakeholders interviewed (sum of the numbers from stakeholder consultations)	50,000 (NISE), additional 20,000 (till March 2025)	3,660 (NIWE target until March 2025)
Geography (where?)	MP; Across India (with solar rooftop)	Windy states, such as: KL; TL; TN (Tirunelveli, Nagercoil, Udumalpet, Thenkasi); AP (Tadipatri); GJ (Kutch); KA (Shimoga)
Monthly income (₹)	12,000 – 15,000	15,000 – 20,000
Educational Qualifications	ITI/Diploma/B Tech (Electrical/Mechanical/ Electronics/ Civil/ Fitter/ Instrumentation/ Welder)	ITI / diploma (Mechanical/ electrical/ electronics/ Civil/ Fitter/ Instrumentation/ Welder)

Back
Back to Sectoral Analysis

Notes: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XX

Electric power generation using solar and wind energy

Job roles	1) Solar Project Manager; Solar Installer; Solar PV Installer and O&M Technician (Surya Mitra)	2) O&M Technicians- Mechanical and Electrical
Skills required at the competency level (3 and more)	**Cognitive skills**: Speaking; communication; digital skills; active listening; problem solving; time management; **Socio-emotional skills**: Conscientiousness; agreeable (teamwork); emotional stability; **Physical skills:** ability to work at heights, e.g. solar rooftop; or in confined spaces **Global competence** **TVET:** Fundamentals of electricity , electric components, necessary tools, measuring instruments and Solar PV; how to install, test, commission Solar PV systems efficiently, and operate, maintain, and troubleshoot solar PV systems; industrial safety; Solar field experience; knowledge of software (Sketchup, PVSyst), SCADA, working on computer (Word, excel, outlook etc.); **Need to work with drones in future for O&M/security (***overlap with drone operators in agriculture sector***)** Entrepreneurial skills (Managing projects, installations, and manage technicians)	**Cognitive skills**: Reading; writing; speaking; communication; language (business plus local languages); numeracy/math; digital skills; active listening; science; problem solving; critical thinking; creativity; systems analysis; resource/time management; diversity **Socio-emotional skills**: Open to experiences; conscientiousness; agreeable; emotional stability; **Physical skills**: climb windmills; ability to work at height and in confined spaces; actively access interspersed windmills; physically adjusting to different work shifts **TVET:** Wind energy knowledge and its electrical and mechanical aspects; O&M of the electrical and mechanical equipment- monitoring parameters and attending to breakdowns due to faults in machine parts; Knowledge of working at height and in confined spaces with high voltages, and of working with wirings, gearboxes, bearings, and hydraulic systems; understand health & safety practices in wind industry, SCADA

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXI

Electric power generation using solar and wind energy

Job roles	1) Solar Project Manager; Solar Installer; Solar PV Installer and O&M Technician (Surya Mitra)	2) O&M Technicians- Mechanical and Electrical
Skills Shortage	Yes	Yes
Skills Gap	Yes	Yes
Relevance of TVET System	• Field / site experience is necessary, but practical experience and training is lacking; communication skills are also lacking- how to talk to customers. • Programs are not imparting requisite knowledge (Trainees do not even know the difference between AC/DC, or between current and voltage). People tend to learn from online videos on YouTube or social media-- These are not the right places, and impart wrong knowledge. • They also should have knowledge of drill machines and grinder and other tools – but it is lacking. • Trainers do not have field experience, and only have bookish knowledge. It is important that training is being provided by good quality, experienced trainers, who have industry knowledge.	• Those coming from colleges are not familiar with wind sites, and only have theoretical knowledge. Have to be imparted safety related training as well as practical (i.e. skill requirement on the field). • Need to create people who can attend to mechanical and electronic aspects (mechatronics). • Lack of training centres with requisite facilities to impart training and those meeting NIWE's selection criteria (training centre in proximity to wind farm, MoU with industry for OJT and employability, trained faculty and infrastructure- classroom, labs, hostels)
Gender (Challenges)	Security and required physical skills work at sites make these occupations non-aspirational both from demand and supply sides; Lack of women in relevant trades at ITI	
Challenges Faced by Industries in Meeting Skill Requirements	ITI graduates have little practical skills, which means that firms incur costs and time in training them	
Industry-specific interventions that facilitate skill & capacity development (best practices)	Learning & Development divisions; Training on the job	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXII

Electric power generation using solar and wind energy

Job roles	1) Solar Project Manager; Solar Installer; Solar PV Installer and O&M Technician (Surya Mitra)	2) O&M Technicians- Mechanical and Electrical
Policy Recommendations	**Skill Training Programmes:** Training progammes needs to be expanded especially for training in the wind sector **Curriculum Development**: Practical experience at solar and wind sites, knowledge of latest equipment, data and analytical skills aligned with industry requirements; Emphasis on development of local skilled workforce; Get more Master trainers from the industry **Gender:** Security and reduced physical work at sites (lifts for climbing windmill; automated O&M); hostel facilities at ITI to encourage women in relevant trades; counselling and mentoring at high school level and encouraging women candidates by awareness on POSH, equal opportunity etc. **Skill Initiatives:** Dual vocational skilling programmes; apprenticeships should be made mandatory; Compulsory OJT components during education/training; involvement of industry trainers for teaching and mentoring (aligning students interests and expectations for better matching and lowering attrition);	
Comments	Remote location adds to spatial mismatch and hence one needs locally skilled workforce. Local coordination between industry and ITIs is critical.	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXIII

Electric power generation using solar and wind energy

Job roles	**3) Engineers; Electrical engineers- Power Systems Design; Civil and Electrical Engineers; Project Engineers**	**4) Resource Assessment; Site Surveyor; Resource Analysis**
NCO 3-digit/8-digit code	214- Engineering Professionals (Excluding Electrotechnology) 215- Electrotechnology Engineers	2165.9900- Cartographers and Surveyors, Other
No. of stakeholders which mentioned this	4	4
Match from Job Projections (541, 413, 741, 932 and 411)		
Extent of the need based on stakeholders interviewed (sum of the numbers from stakeholder consultations)	40+ (now) and 80+ (three-five years from now)	~ 25 (now) and ~50 (three-five years from now)
Geography (where?)	Corporate office: MH (Pune) Solar now: KA (Pavagada); TL (Mahabubnagar, Gadwal, (Veltoor, Tandur, Nirmal); RJ (Jaisalmer, Jodhpur, Barmer, Jaisalmer, Dedasari), MH (Dhule) Wind now: TN (Tirupur, Theni); GJ (Jamnagar, Mahidad, Samana, Sidhpur) , AP (Anantpur, Kurnool), RJ (Bhakrani, Sipla, Tejuva); MP (Chandgarh); MH (Andhra Lake, Jath, Khandke); KA (Hara, Saundatti) Solar future: RJ (Barmer); GJ (Banaskantha) Wind future: MP Hybrid future: RJ+MP (Jaisalmer + Dhar); GJ+MP (Bansakantha + Dhar); RJ+MP+TN (Jaisalmer+ Dhar + Dindigul); AP	Corp ofc: MH (Mumbai) Solar now: RJ (Barmer, Jodhpur, Jaisalmer) Wind now: AP (Anantpur, Kurnool) Hybrid future: AP Prospective future: TL, MP
Monthly income (₹)	Varies by experience: ~ 40,000 – 60,000	Entry-mid level: ~ 35,000 – 45,000
Educational Qualifications	B.E. / Diploma / B.Tech / M.E. (Electrical / Mechanical / Electronics/ Civil)	B.E. / B. Tech / Diploma / M.Tech (Environmental sciences/ electrical/ computers/ Mechanical/ Civil/ Electronics and Communication / Control & Instrumentation)

Notes: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXIV

Electric power generation using solar and wind energy

Job roles	3) Engineers; Electrical engineers- Power Systems Design; Civil and Electrical Engineers; Project Engineers	4) Resource Assessment; Site Surveyor; Resource Analysis
Skills required at the competency level (3)	**Cognitive skills:** Reading; writing; speaking; communication; language (local, English); numeracy/math; ICT skills; active listening/learning; science; problem solving; critical thinking; creativity; judgement; systems analysis/evaluation; resource/time managment; diversity; **Socio-emotional skills**: Open to exp; conscientiousness; agreeable; emotional stability; instructing; negotiation; persuasion **Physical skills** (particularly for on-site work) **Global competence** **TVET**: Engineers (Design engineers/Site Engineers/Forecasting and Scheduling engineers (O&M)): efficient plant design for optimal generation; oversee proper installation and material use, aligned with plant design; : planning, forecasting, and scheduling the production and delivery of products and services; coordinate with different teams and stakeholders to ensure timely and efficient execution of projects and tasks; Knowledge of RE systems and practical operations, and safety parameters; knowledge of MS Office; CAD/CAM; SCADA; PVSyst. Electrical engineers- Power Systems Design: Optimizing power transmission while reducing losses; knowledge of RE power transmission systems, Conversant with MATLAB / ETAP; Civil and Electrical Engineers: knowledge of RE project execution and O&M Project engineers: Implement the project as per the designs and specifications within the stipulated timelines. **Future training for BESS and Green H2.**	**Cognitive skills:** Reading; writing; speaking; communication; language (local, English); numeracy/math; ICT skills; active listening/learning; science; problem solving; critical thinking; creativity; judgement; systems analysis/evaluation; resource/time management; diversity; **Socio-emotional skills:** Open to exp; Conscientiousness; agreeable; emotional stability; instructing; negotiation; persuasion; **Physical skills** (need to climb towers, work at heights) **Global competence** **TVET**: Site surveyor: Identifying the right land parcels and activities regarding survey of land- to acquire land systematically; Knowledge of survey tactics and required equipment, operate equipment like TotalStation / GPS / AutoCAD; MS office Resource Assessment / analysis: Layout design (wind / solar) along with energy assessment for individual sites, knowledge of RE energy assessment (Study and analysis of wind and solar resources, in terms of geographical locations, historical trends, and quality), trained on software for resource assessment (eg WindPro); MS Office. Understand and perform health and safety practices at project site--Ground and Height

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXV

Electric power generation using solar and wind energy

Job roles	3) Engineers; Electrical engineers- Power Systems Design; Civil and Electrical Engineers; Project Engineers	4) Resource Assessment; Site Surveyor; Resource Analysis
Skills Shortage	Yes	Yes
Skills Gap	Yes	Yes
Relevance of TVET System	• Electrical engineers- Power Systems Design: no one training people in this field • Ground Execution- Civil and Electrical Engineers: people are not industry ready • People lack in-depth RE knowledge: both theoretical and practical knowledge. A curriculum needs to be designed for RE sector.	• Lack of institutes training people in these fields • No structured training method • People lack RE knowledge: both theoretical and practical knowledge • For wind sector, resource assessor and site surveyor programme is being implemented by NIWE, but there is a lack of training centres with requisite facilities to impart training, and those meeting NIWE's selection criteria (training centre in proximity to wind farm, MoU with industry for OJT and employability, trained faculty and infrastructure- classroom, labs, hostels)
Gender (Challenges)	There are some women in these job roles, and companies foresee an increase in women employment in these roles in next three years. Yet challenge comes from the fact that a ready-talent pool is not available (who have experience in RE on the technical side).	
Challenges Faced by Industries in Meeting Skill Requirements	Incur costs in making the hired workforce (from general engineering pool) industry ready and trained to RE needs	
Industry-specific interventions that facilitate skill & capacity development (best practices)	L&D divisions; Training on the job; Graduate Engineer Trainees	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXVI

Electric power generation using solar and wind energy

Job roles	3) Engineers; Electrical engineers- Power Systems Design; Civil and Electrical Engineers; Project Engineers	4) Resource Assessment; Site Surveyor; Resource Analysis
Policy Recommendations	**Skill Training Programmes:** Training progammes need to be expanded to fulfil specific needs of the RE sector. **Curriculum Development**: Develop specialized courses on RE technology (at present industry hires from general pool of engineering graduates, and trains them to RE needs); development of soft skills should be integral to the curriculum. **Gender:** Counselling and mentoring from high school level, encouraging women candidates in RE engineering trades, and generating awareness on renewable energy company practices (on POSH, equal opportunity etc.) **Skill Initiatives:** Compulsory OJT components during education/training; involvement of industry trainers for teaching and mentoring (aligning students interests and expectations for better matching and lowering attrition)	
Comments	Remote location adds to spatial mismatch and hence one needs locally skilled workforce. Local coordination between industry and engineering colleges is critical.	

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXVII

Electric power generation using solar and wind energy

Job roles	5) Site Managers / in-charge /supervisor; Construction / Project Managers	6) Asset Management; Quality & Vendor Management Engineers
NCO code (3-digit)	132	132
NCO code	1323.0100- Manager, Construction/Manager Construction Projects	1324.0100- Manager, Material Control/Manager Materials
No. of stakeholders which mentioned this	7	3
Match from Job Projections (541, 413, 741, 932 and 411)		
Extent of the need based on stakeholders interviewed (sum of the numbers from stakeholder consultations)	~ 35 (now) and 50+ (three years from now)	~ 21 (now) and ~45 (three-five years from now)
Geography (where?)	Corp ofc: TN (Coimbatore) Solar: TN, MH, GJ; KA (Pavagada); TL (Mahabubnagar, Gadwal); RJ (Jaisalmer, Jodhpur) Wind : AP, TN (Tirupur); GJ (Jamnagar, Bhuj) ; KA (Chitradurga, Harapanahalli, Harihar), MH (Satara, Nandurbar), RJ (Jaisalmer, Jodhpur); MP (Devas) Hybrid: KA (Kopal) Solar future: AP, MH, TN, RJ (Barmer); GJ (Banaskantha) Wind future: TN, GJ, MP Hybrid future: KA (Gudadur); RJ+MP (Jaisalmer + Dhar); GJ+MP (Bansakantha + Dhar); RJ+MP+TN (Jaisalmer+ Dhar + Dindigul)	Corp ofc: MH (Mumbai) Solar: TN, MH, GJ Wind: GJ, TN; RJ (Jaisalmer, Jodhpur); MP (Devas) Solar Future: AP, MH, GJ, TN, RJ Wind future: TN, GJ
Monthly income (₹)	Mid-Senior level positions: 1,30,000 – 1,90,000	Managerial position: ~ 80,000 – 1,00,000
Educational Qualifications	ITI / diploma / B.E./B Tech / M Tech (electrical/ mechanical/electronics)	Diploma / B.E. (Electrical/ mechanical/ civil)

Notes: @ Pink shade indicates no match between I-O quantitative top 5 occupation projections and survey-based top 5 occupation projections.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXVIII

Electric power generation using solar and wind energy

Job roles	5) Site Managers / in-charge /supervisor; Construction / Project Managers	6) Asset Management; Quality & Vendor Management
Skills required at the competency level (3)	**Cognitive skills**: Reading; writing; speaking; communication; language (local, English); numeracy/math; ICT skills; active listening/learning; science; problem solving; critical thinking; creativity; judgement; systems analysis/evaluation; resource/time management; cultural diversity; **Socio-emotional skills**: Open to exp; conscientiousness; agreeable; emotional stability; instructing; negotiation; persuasion; **Physical skills** (Actively access large wind sites, where each plant may be a km apart; climbing the tower for inspection) **Global competence** (especially concerning communication; can have people working for other global operations too; due to competition from global firms) **TVET**: Keeping projects up and running, without technical fault or challenge from locals; Manage and supervise site / construction functions and staff on site including the installation and O&M vendors; regularly reporting on plant performance; practical experience in wind and solar projects along with the theoretical RE knowledge; Knowledge of machine and managing O&M at wind plant site; awareness of safety considerations; Proficient in MS Office (Emails, Excel, PowerPoint) Project manager/Manager project design: Good communication, knowledge of CAD and other specific software (eg for solar: PVSyst software—to estimate generation from solar plant); project design and optimization of project cost with respect to RE (solar/wind) **Future skills relating to BESS; Green H2; bio-fuels**	**Cognitive skills**: Reading; writing; speaking; communication; language (local, English); numeracy/math; ICT skills; active listening/learning; science; problem solving; critical thinking; creativity; judgement; systems analysis/evaluation; resource/time management; diversity; **Socio-Emotional Skills**: Open to exp; conscientiousness; agreeable; emotional stability; instructing; negotiation; persuasion **Physical skills** (site-work, climbing wind-mills) **Global competence** (especially concerning communication; competition from global firms) **TVET**: Optimally and sustainably manage assets relating to their performance, risks and expenditures over their lifetime; Efficient asset management for better machine availability and more output; Basic managerial skill for asset management along with good communication- Ensure quality of the outsourced activities, developing vendors and managing the vendors; Practical experience in wind and solar projects along with the theoretical RE knowledge; Knowledge of MS Office and software for remote monitoring of solar and wind plants; safety awareness is important as work with electricity **Future skills relating to BESS; Green H2; bio-fuels**

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXIX

Electric power generation using solar and wind energy

Job roles	5) Site Managers / in-charge /supervisor; Construction / Project Managers	6) Asset Management; Quality & Vendor Management Engineers
Skills Shortage	Yes	Yes
Skills Gap	Yes	Yes
Relevance of TVET System	• Need to have engineering courses/B.E. in RE (No RE courses for entry/mid management level). NTPC / NTPI / IIT /UPES have engg courses related to power- but it is not enough to meet industry demand in terms of the numbers required. Courses should be run across states to overcome this spatial shortage. • Engineers: have theoretical knowledge, but application of knowledge is missing; For site roles: practical knowledge needs to be imparted. People need to be exposed to firm's green electricity systems • Entire skill set is needed- managerial & technical skills. Difficult to find people with both (particularly local people with managerial bent of mind) • Education and skilling system should at least impart overall awareness of safety considerations and provide a complete understanding of the core area of work	• Need to have B.E./diploma in RE (No RE courses for entry/mid management level). A curriculum needs to be designed for RE sector. When electrical/ mechanical engineers join, they do not have RE knowledge • Engineers: have theoretical knowledge, but application of knowledge is missing; For site roles: practical knowledge needs to be imparted. People need to be exposed to firm's green electricity systems.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage of Top Job Roles (Findings from Stakeholder Consultations)-XXX

Electric power generation using solar and wind energy

Job roles	**5) Site Managers / in-charge /supervisor; Construction / Project Managers 6) Asset Management; Quality & Vendor Management Engineers**
Gender (Challenges)	Security and required physical skills work at sites make these occupations non-aspirational both from demand and supply sides; absence of creche/childcare facilities on-site
Challenges Faced by Industries in Meeting Skill Requirements	Shortage of locally available capable people who can supervise construction and O&M on-site. These are senior/managerial level positions and it is difficult to shift with family to the remote site location- resulting in shortage as well as attrition.
Industry-specific interventions that facilitate skill & capacity development (best practices)	L&D divisions; Training on the job (particularly practical knowledge for site roles)
Policy Recommendations	**Skill Training Programmes:** Need for upskilling/reskilling programmes, to enable those with experience in other managerial / supervisory site roles (E.g. in conventional power) to take up such senior roles in RE. **Curriculum Development**: Curriculum should impart engineering (specific to RE) and managerial skills, along with practical experience at solar and wind sites; Emphasis on development of local skilled workforce; development of soft skills (especially excellent communication skills) and knowledge of safety considerations on-site should be integral to the curriculum **Gender:** Counselling and mentoring from high school level, encouraging women candidates in RE engineering trades, and generating awareness on renewable energy company practices (on POSH, equal opportunity etc.) **Skill Initiatives:** Compulsory OJT components during education/training; involvement of industry trainers for teaching and mentoring (aligning students interests and expectations for better matching and lowering attrition); skill development at local level

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXI

Retail sale of food, clothing and shoes in specialised stores: Demand shortage is there in four job roles

	Customer service representative/Sales Associate/Sales person/e-Commerce Marketing Assistant/Manager	*Merchandising Manager/ Associate*	*Logistics manager/ Associate*	*ICT Personnel/ Computer operator*
NCO 3-digit code	522	332		413
NCO 8-digit /QP code	5223.0100 (RAS/Q0103), 5223.0102 (G&J/Q8302), 5223.0103 (G&J/Q8303), 5223.0105 (RAS/Q0103), (RAS/Q0606)	3323.0102 (AMH/Q0901)	Not available	4132.0402 (SSC/Q2212)
Match from Job Projections (723,932,112,821,312,311)				
No. of stakeholders which mentioned this	7	3	2	5
Extent of the need based on firms interviewed (sum of the numbers from stakeholder consultations)	500~	50~	10~	5~
Location of firms/farms	Raipur, Chhattisgarh; Mumbai, Maharashtra; Delhi and Ghaziabad, UP	Raipur, Chhattisgarh; Mumbai, Maharashtra; Delhi and Ghaziabad, UP	Mumbai, Maharashtra and Delhi	Raipur, Chhattisgarh; Mumbai, Maharashtra; Delhi and Ghaziabad, UP
Average monthly income (₹)	10,000	25,000+	25,000	30,000
Educational Qualifications	10^{th} to Graduate	Graduate/ MBA	Graduate/ MBA	BCA/MCA

Notes: @ Pink shade indicates no match between I-O quantitative top 4 occupation projections and survey-based top 4 occupation projections. Green shade indicates a match.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXII

Retail sale of food, clothing and shoes in specialised stores

	Customer service representative/Sales Associate/Sales person	*Merchandising Manager/ Associate*	*Logistics manager/ Associate*	*ICT Personnel/ Computer operator*
Skills required at the competency level (3)	**Cognitive Skills**: Digital literacy, reading, writing, numeracy, communication skills, ability to speak well, active listening, active learning, problem solving, creativity, learning strategies (new products, new marketing techniques, technology at job), gender diversity, resource management (entrepreneurial skills) **Socio-emotional Skills**: Conscientiousness (good attitude, efficient, speed, agility), openness to experiences (flexibility), behavioural skills for dealing with customers- agreeable (working in a team), emotional stability, extraversion, negotiation and persuasion **TVET**: Occupation specific skills (information about products)	**Cognitive Skills**: Digital literacy, numeracy, communication skills, ability to speak well, language skills (business language & local language), problem solving, critical thinking, creativity, judgement & decision making skills **Socio-emotional Skills**: Conscientiousness **TVET**: Occupation specific skills (information about products)	**Cognitive Skills**: Digital literacy, numeracy, communication skills, ability to speak well, language skills (business language & local language), problem solving, critical thinking, creativity and judgement & decision making skills **Socio-emotional Skills**: Conscientiousness, agreeable and emotional stability **TVET**: Occupation specific skills = knowledge about value chain, transport, warehousing, finance etc.	**Cognitive Skills**: Advanced digital skills, mathematical skills, mathematics reasoning, critical thinking, communication skills (use non-technical language to understand and communicate) **Socio-emotional Skills**: Conscientiousness and agreeable **TVET**: Data analytics, Machine learning, AI based work, statistics
Skills Shortage	No	No	Yes; competition from other sectors	Yes
Skills Gap	Yes	Yes	No	No
Relevance of TVET System	Socio-emotional skills and practical skills are missing	Socio-emotional skills and practical skills are missing	This is fine	This is fine
Gender (Challenges)	• Women participation is limited to certain sub-sectors like clothing and apparel (30%-50%). • Working hours, locations pose challenges to female participation			

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXIII

Retail sale of food, clothing and shoes in specialised stores

	Customer service representative/Sales Associate/Sales person	*Merchandising Manager/ Associate*	*Logistics manager/ Associate*	*ICT Personnel/ Computer operator*
Challenges Faced by Industries in Meeting Skill Requirements	• Gap between what is taught (mainly for govt. sponsored training programmes-PMKVY and DDU-GKY) and what is actually happening at work • Hands-on-training not there • Industry is largely MSMEs; have little incentive to train as attrition rates are high; • MSMEs do not offer internships; summer jobs	• Gap between what is taught (mainly for govt. sponsored training programmes-PMKVY and DDU-GKY) and what is actually happening at work • Hands-on-training not there • Industry is largely MSMEs; have little incentive to train as attrition rates are high; • MSMEs do not offer internships; summer jobs	No challenge from the TVET system	No challenge from the TVET system
Industry-specific interventions that facilitate skill & capacity development (best practices)	• Large company are running their own training programme providing both technical and non-technical skills; • Willing to pay more for slightly more educated candidates (XIIth pass) • Gender sensitisation, public transport, flexible timings • Association with sector-skill council (RASCI), labournet, internal job posting (IJP) has helped companies find qualified candidates internally. • Traditional firms unaware about govt. skilling programmes			

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXIV

Retail sale of food, clothing and shoes in specialised stores

	Customer service representative/Sales Associate/Sales person	*Merchandising Manager/ Associate*	*Logistics Manager/ Associate*	*ICT Personnel/ Computer operator*
Policy Recommendations	**Skill Training Programme:** RPL and refresher courses **Curriculum Development:** Curriculum needs to be expanded to meet the market needs and frequently updated every 3 years; Sustainable textiles, Advanced Materials, Supply Chain invocations, Artificial Intelligence and Machine Learning, Entrepreneurial training **Gender:** Gender sensitisation app (recognition that gender diversity is important should be included in training) **Skill Initiatives:** Internships should be made mandatory at all levels **Others:** • Demand for jobs directly related to share of e-Commerce; Some jobs will get obsolete over time-cash collector, team supervisor and store supervisor and some jobs are evolving like remote operating executive; • Firms' sensitization about skilling, providing apprenticeships/internships, hiring skilled workers needs to be carried out		**Skill Training Programme**: Mandatory internship programmes **Curriculum Development**: TVET Skills; practical training, on-the-job training **Gender**: No issues **Skill Initiatives:** Firms should be encouraged to give internships and offer on-the-job training with certifications; More collaboration between MSMEs and local universities/colleges	**Skill Training Programme**: Introduce dual degree programmes in IT and retail trade **Curriculum Development**: TVET skills **Gender**: No issues **Skill Initiatives:** Repeated summer internships in degree/diploma progammes

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXV

Computer Programming Activities: Demand shortage is there in four job roles

	Data Engineering*	Business Analyst- Technical	Data Security	Functional/ Domain Analyst
NCO 3-digit code	252	251	252	Not available
QP code	HCLT/N0003/IT/2024 v1: Data Engineering with Analytics and Visualization IT-ITeS SSC NASSCOM/N0002/IT/2024: Data Engineering – IBM			
Match from Job Projections (251, 133, 112, 216, 413) @				
No. of stakeholders which mentioned this	15	10	17	17
Indicative computation of the extent of current needs & vacancy rate (NCAER computations from Big Data Analysis)*	200,000-225,000	50,000-60,000	40,000-50,000	70,000-80,000
Location of firms	Bangalore, NCR , Kochi , Hyderabad , Mumbai	Bangalore, NCR , Kochi , Hyderabad , Mumbai	Bangalore, NCR , Kochi , Hyderabad , Mumbai	Bangalore, NCR, Kochi , Hyderabad, Mumbai

Notes: @ Pink shade indicates no match between I-O quantitative top 4 occupation projections and survey-based top 4 occupation projections. Green shade indicates a match.

* Includes full stack developers

Back

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXVI

Computer Programming Activities: Demand shortage is there in four job roles

	Data Engineering*	Business Analyst- Technical	Data Security	Functional/ Domain Analyst
Average monthly income (₹) for 3-5 Years	1,25,000 – 1,70,000	1,25,000 – 1,70,000	3,00,000 – 4,00,000	~ 1,50,000 – 3,50,000
Note	Senior-level experience varies widely depending on experience, domain , location.			
Educational Qualifications	B. Tech /M. Tech Engg M.Tech/PhD. Engg + AI/ML programs	B. Tech /M. Tech Engg + AI/ML programs	B. Tech /M. Tech Engineering (AI and Data Science; or Computer Science/IT + Cybersecurity Certificate)	Domain Experience with any Graduation. Preference is Post Graduation

Back

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXVII

Computer Programming Activities

	Data Engineering	Business Analyst- Technical	Data Security	Functional/ Domain Analyst
Skills required at the competency level (3 or more)	**Cognitive Skills:** • Critical thinking, • Problem-solving, • Resource/time mgmt. • Algorithmic Thinking **Socio-emotional skills:** • Active Listening, • Patience • Cross-country cultural sensitivity- especially for Global capacity centres **TVET:** • Python – AI/ML • Full stack developer • image and signal processing • Natural Language Processing • Large Language Model Building • Small Language Model Building • Deep Neural Networks	**Cognitive Skills:** • Critical thinking, • Problem-solving, • Communication skills • Resource/time mgmt. • Design Thinking • Algorithmic Thinking **Socio-emotional skills:** • Active Listening, • Man management and Leadership • Entrepreneurship • Open to experience, • Patience • Emotional stability • Cross-country cultural sensitivity- especially for Global capacity centres • Cultural conscientiousness, • Empathy and sensitivity • Non-transactional attitude **TVET:** Technical coding skills as well as technical design skills. Typically has worked as Data engineer or a full stack developer	**Cognitive Skills:** • Critical thinking, • Problem-solving, • Algorithmic Thinking **Socio-emotional skills:** • Active Listening, • Patience • Emotional stability • Cross-country cultural sensitivity- especially for Global capacity centres **TVET:** Specialized skills in security in terms of – Data security, infrastructure security and access security. Specialized certification preferred	**Cognitive Skills:** • Critical thinking, • Problem-solving, • Communication skills • Resource/time mgmt. • Design Thinking • Algorithmic Thinking **Socio-emotional skills:** • Active Listening, • Man management and Leadership • Entrepreneurship • Open to experience, • Patience • Emotional stability • Cross-country cultural sensitivity- especially for Global capacity centres • Cultural conscientiousness, • Empathy and sensitivity • Non-transactional attitude **TVET:** In-depth domain knowledge – e.g. Health care, BFSI , engineering. Experience preferred

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXVIII

Computer Programming Activities

	Data Engineering	Business Analyst- Technical	Data Security	Functional/ Domain Analyst
Skills Shortage	No	Yes	Yes	No
Skills Gap	Yes	Yes	Yes	Yes
Relevance of TVET System	Yes	Yes	NA	No
Gender (Challenges)	No challenge in 1-3 years however as years of experience increases, female candidature reduces	No challenge: Women preferred	Rare skill and gender-based hiring is even rare	Functional domain in financial services and core engineering such as Heat power or High voltage
	▪ Remote working enabled the return to labour force participation ▪ Focused program to enrol women back in the workforce ▪ Diversity norms by level and function have helped increase LFP			
Challenges Faced by Industries in Meeting Skill Requirements*	▪ Tier II town - Job options and opportunities are limited, thereby hampering talent identification by corporates ▪ Talent gap at mid and senior level higher	▪ Tier II town - Job options and opportunities are limited, thereby hampering talent identification ▪ Talent gap at mid and senior level higher	▪ No formal course in engineering for data security	▪ Talent focused on coding rather than domain experience resulting in gap ▪ Tier II town - Job options and opportunities are limited, thereby hampering talent identification.
Industry-specific interventions that facilitate skill & capacity development (best practices)	• Capacity-building sessions on non–cognitive skills • Partnership with Institutes for skills • Hackathon • Cultural sensitivity initiative • Structured diversity and women in tech program			

Note: *The specific skill gaps that the IT Industry faces are shown here.

Back
Back to Sectoral Analysis

Assessment of Current & Future Skills Shortage (Findings from Stakeholder Consultations)-XXXIX

Computer Programming Activities

	Data Engineering	Business Analyst- Technical	Data Security	Functional/ Domain Analyst
Policy Recommendations:	**Skill Training Programme**: • Partner with Industries to structure course curriculum • Establish Centers of Excellence with Industry specific leaders • Encourage collaboration between educational institutions and research bodies to promote practical learning. **Curriculum Development**: • Focus on domain building and not just data analytics • Engage industry experts to co-develop training content and modules • Focus on non-cognitive skills • Communication Skills development focus **Gender**: • Focused program to enrol women back in the workforce • Diversity norms by level as well as function have helped increase LFP. • Ensure no Pay Gap is observed for women in tech **Skill Initiatives:** • Make internship compulsory, as in medical science • Collaborate with the industry for internship • Establish mentorship programs with experienced industry as a part of final-year project coursework • Organize intensive boot camps and hackathons **Others/Macro Policy :** • Emerging centres are driving demand, such as Indore, Bhubaneswar, Kochi, Chandigarh, Kolkata, Goa, Ahmednagar, Vadodara, Jaipur, Thiruvananthapuram, and Pune - primarily non-metros and emerging Metros. • Digital communication has reduced ‘ Virtual Distance’ in information but not necessarily ‘ connectivity distance’ impacting talent availability • Ensure appropriate – Air connectivity – Health care – State government ‘ perceived openness and ease of doing business ‘ – Education infrastructure			

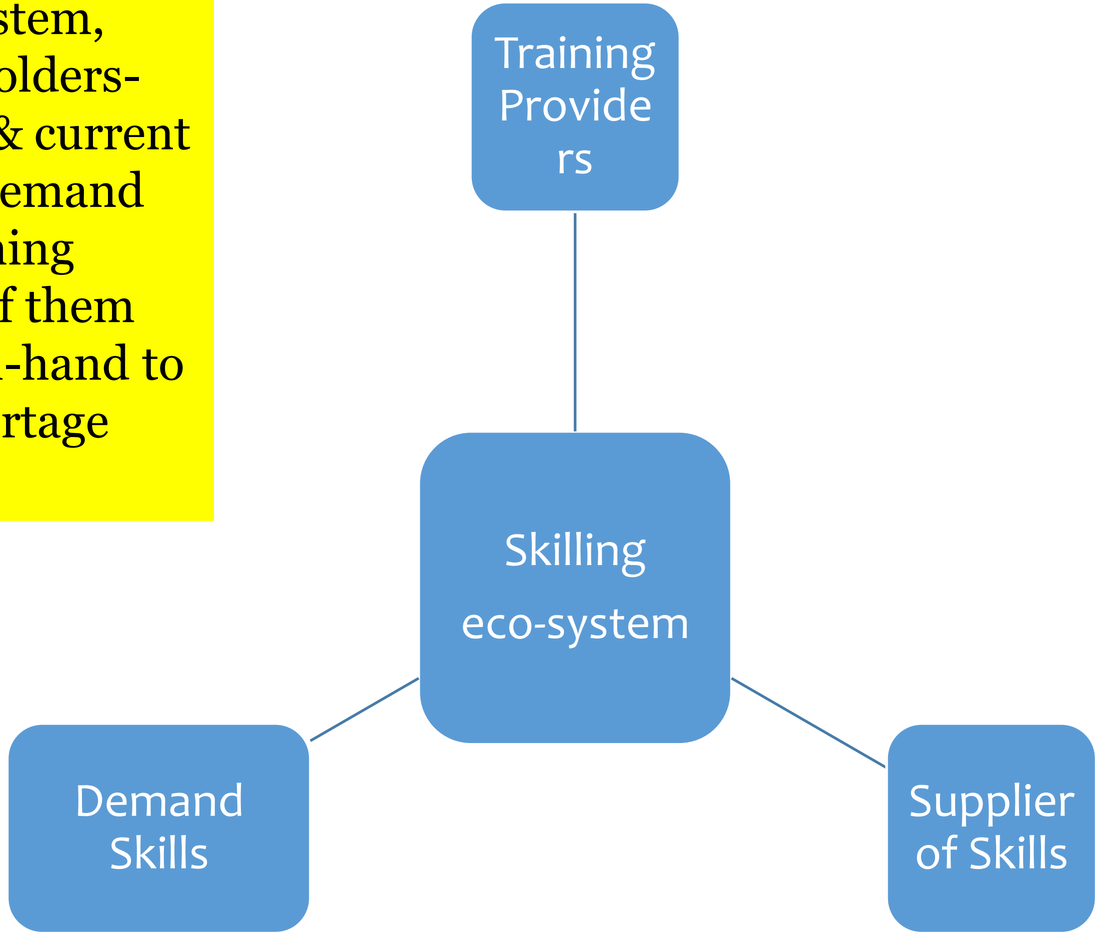
Back
Back to Sectoral Analysis

Industry Insights - Skills Gap (Summary)- IT Sector

Skills	Experience Level		
	< 3 yrs	3-7 Yrs	7-10 Yrs
Core Skills			
Technical Acumen	High	High	Medium
Problem Solving -	Medium	high	Low
Analytical	Medium	High	High
Project / Program Management	Low	Medium	High
Advanced Cognitive Skills			
Business Acumen	Low	Low	High
Leadership	Low	Medium	High
Continuous Learning	High	High	High
Design thinking	Medium	High	High
Strategic Thinking	Low	Low	High
Socio-emotional Skills			
Cross Functional Collaboration	Low	Medium	High
Interpersonal Communication	Medium	High	High
Ethics and Legal Awareness	Medium	High	High
Cultural Sensitivity	Medium	High	High

Recommendations- Policy Interventions to Address Systemic Issues-I

In the skilling eco-system, there are four stakeholders- prospective workers & current workers, firms who demand workers and the training providers. All three of them have to work hand-in-hand to address the skills shortage and gaps



Recommendations- Policy Interventions to Address Systemic Issues- II

Mismatch between employers and employees	
Improve the quality of the ITIs	Update curriculum to match latest industry needs (this needs to happen every 3 years), make practical training an important part of the curriculum, internships & apprenticeships to be made mandatory, improve pedagogy, periodically upskill teachers and master trainers. Industry partnerships with ITIs need to happen- every ITI should be partnered with an industry partner. Placement agencies need to be strengthened. Counselling and mentoring offered to students.
Poor foundational skills that cannot be improved by skill training programmes (ITIs or other short-term training programmes)	Improve the quality of schools to improve digital & financial literacy, active listening, active learning, reading, writing, speaking, math, attitude, flexibility, adaptability, working in a cooperative manner, conflict resolution, empathy, openness, gender diversity, patient and calm.

Recommendations- Policy Interventions to Address Systemic Issues-II

	Mismatch between employers and employees
Poor quality of higher education systems	Above skills, upgrade curriculums, improve pedagogy, quality teachers; industry-academia partnerships at all levels of education; encourage apprenticeships and internships; applied fields like agricultural machinery, dairy, engineering need to have mandatory on-field experience in every course they take; practical classes need to be taught by professors; introduce new courses; offer courses in the evening so that working professionals can update themslves
Local Skilling mismatch	District Magistrates need to facilitate local skilling eco-system needs work in close coordination with local market needs

Recommendations- Policy Interventions to Address Systemic Issues-II

Mismatch between employers and employees		
Traditional sectors' firms/farms need	Awareness	MSMEs made aware about govt. skilling initiatives in Tier 2 & 3 cities
	Re-orientation	Adopt digitisation, adopt technology, gains from hiring skilled workers; pay more; retention, teach what are perceived traditional taught in families to others; provide on-the-job training
	Re-skilling and upskilling	Existing employees need to be trained
	Attitude changes	Firms need to pay more; at the minimum use government welfare to provide social welfare benefits; recognition that old style of working needs to change
	Other interventions- outreach to market	Need help with marketing, forecasting, basically reaching the market etc.- either teach traditional firms those skills or provide them with help; Govt. extension programmes of departments have key roles to play; entrepreneurship skills – financial, personal, materials management

Recommendations- Policy Interventions to Address Systemic Issues- III

Mismatch between employers and employees	
Youth Aspirations mismatch-Youth do not want to take what firms have to offer-	Counselling and mentoring are important at all levels of education starting from secondary education and even at firms
Retention problem	Offer the mentoring, guidance, information about career path, better wage and better social welfare nets.
Wage mismatch	Wages information needs to be captured; firms need to be willing to pay for skilled workers and that recognition is missing. Youth need to be mentored too.
Identify the level of gap and fill that- Fresh or intermediate	Policy interventions will differ- auto has need for both fresh and intermediate but BES indicates that majority of firms are finding it hard to hire jobs at intermediate level- where is the gap?
Jobs that are demanded across sectors- IT, Sales, Accounts/Finance	Recognise that certain jobs are demanded across skills; demand and therefor wages are more

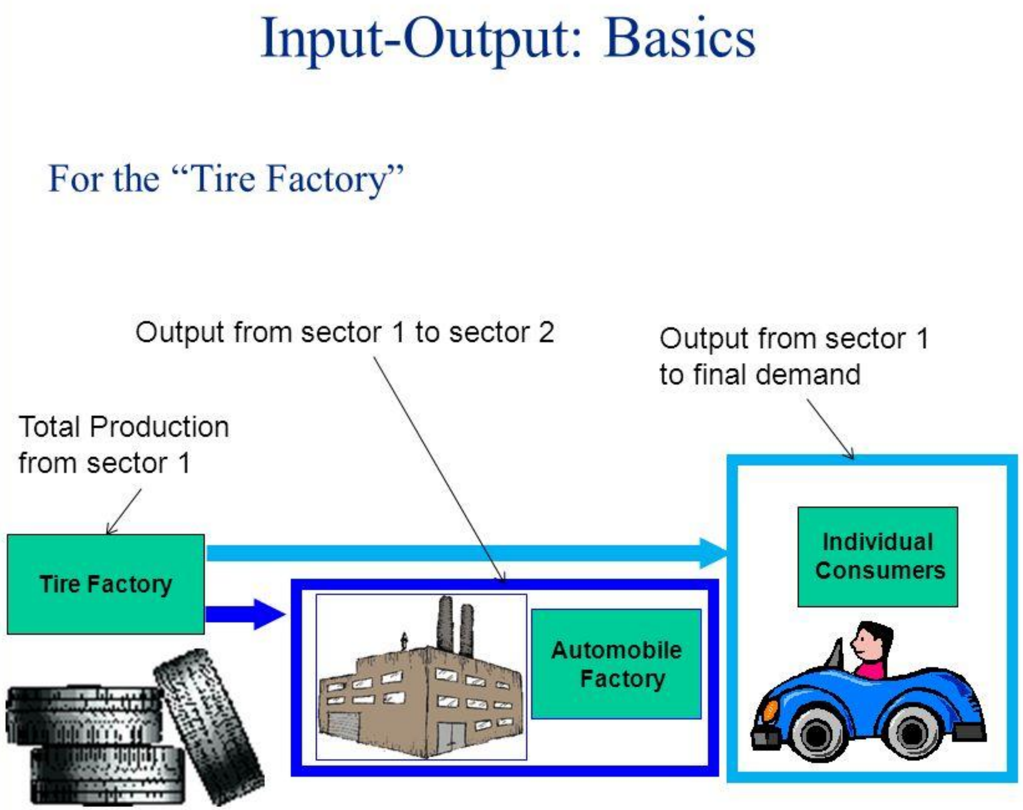
Recommendations- Policy Interventions to Address Systemic Issues-III

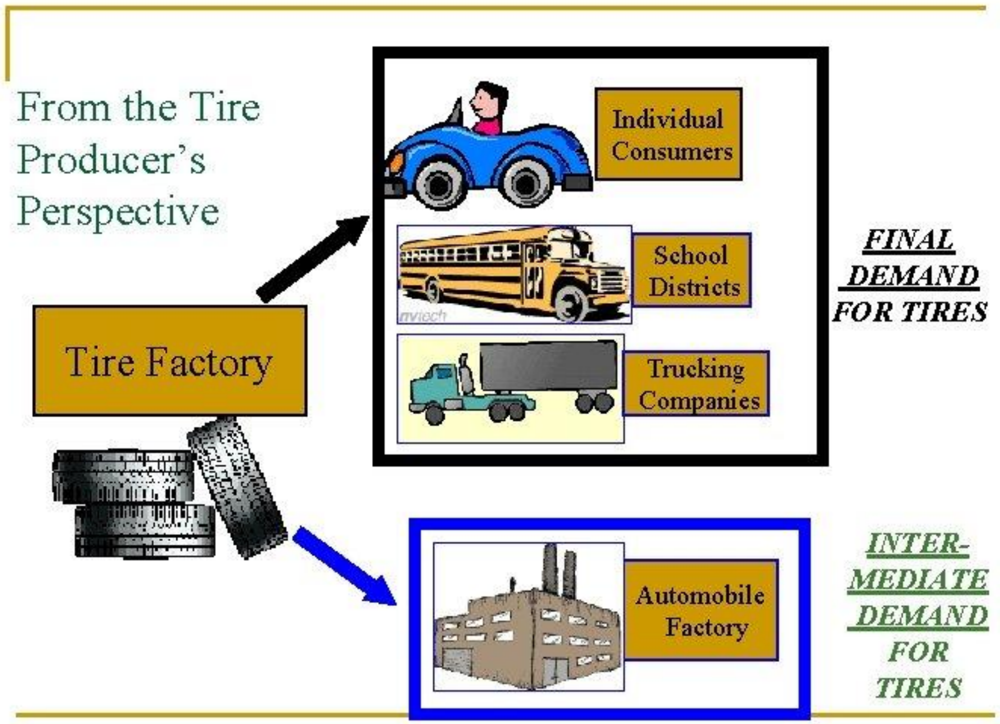
Mismatch between employers and employees	
Tech changes	New job roles coming up; old job roles going down; convergence of jobs (not able capture in numbers even with current data
MSMEs	Needs for multi-skilled workers
Digital Skills	Start from school onwards to including it in every phase of training
Socio-emotional skills	Start from school onwards to including it in every phase of training
Advanced Cognitive Skills	Need to be taught
Firms	Need to offer avenues for re-skilling and upskilling

Recommendations- Policy Interventions to Address Systemic Issues in Gender-IV

	Improve Female Labour Force Participation
Role Models	Positive role models in education and TVET system.
Female hostels near ITIs and industrial clusters	Counselling and mentoring are important at all levels of education starting from secondary education and even at firms
Provide transport to female workers	Security at work and while going or coming back from work
Change in mentality in schools	Men and women need to be taught about gender diversity; set aspirations that women can do all kinds of job roles including seemingly those roles which require physical skills
Change the conditions of work	Flexible jobs, offer them better pay or 'permanent' jobs; lifts for climbing windmill; automated O&M
Provide digital, financial and entrepreneurship skills to women	This will help women attain better labour market outcomes
Social security schemes	Leverage current government schemes to provide benefits to traditional workers

Why input-output analysis?





garnet.acns.fsu.edu/~tchapin/urp5261/lectures/Input-Output%20Overview.ppt

Not enough to measure jobs in the tire factory but also jobs created in other industries due to activities in the tire industry – either using inputs or supplying output

Back

Input and Output Markets: The Circular Flow

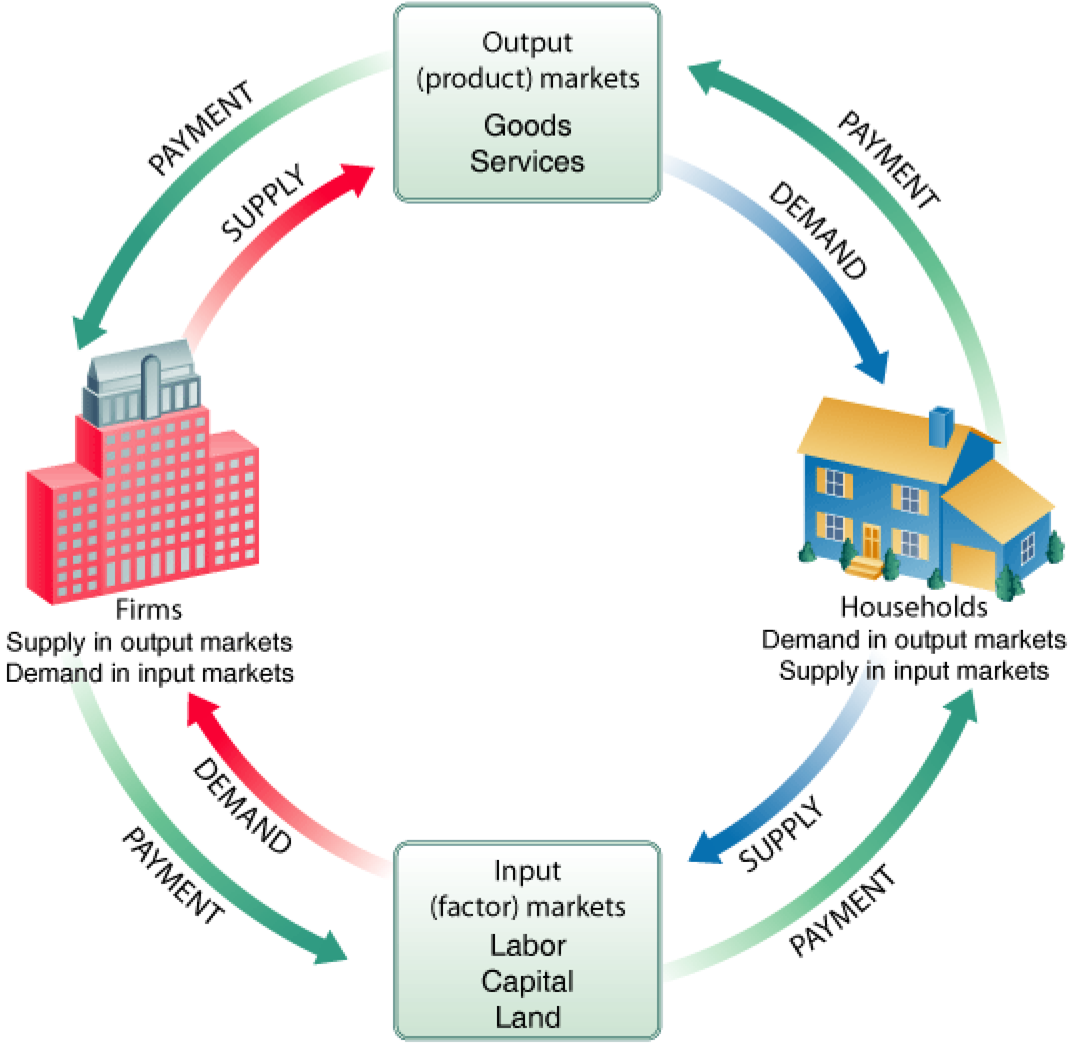


FIGURE 3.1 The Circular Flow of Economic Activity

[Back](#)

What is input-output analysis? - I

- Input-output analysis is a technique invented by Professor Wassily W. Leontief in 1951.
- It is used to analyse inter-industry relationship in order to understand the inter-dependencies and complexities of the economy and thus the conditions for maintaining equilibrium between supply and demand.
- Therefore this is a better measure than just estimating the direct impact.
- As the inputs of one industry are the outputs of another industry and vice versa.
- An input is obtained but an output is produced.
- Thus input represents the expenditure of the firm, and output its receipts.
- The sum of the money values of inputs is the total cost of a firm and the sum of the money values of the output is its total revenue.

Source: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004160614287891JaiLakshmi_App_Input_Output_Analysis.pdf

Back

Employment Multiplier-II

The Leontief inverse multiplier

$$R_{ij} = (I - A)^{-1}$$

Where,

$$A = a_{ij} = X_{ij} \div X_j$$

and I is identity matrix

$$l = L_j * (I - A)^{-1}$$

Where L_j is row vector of direct coefficients of labour input to GVO (Rs Lakh)

$$l_1 = L_j * \left(\widehat{I - A}\right)^{-1}$$

Total indirect Employment coefficient $l_2 = l - l_1$

Where, $\left(\widehat{I - A}\right)^{-1}$ is a matrix of diagonal coefficients of Leontief inverse and off-diagonal elements are zero.

Similarly, the forward multiplier are computed as follows.

$$(I - B)^{-1}$$

Where,

$$B = b_{ij} = X_{ij} \div X_i$$

and I is identity matrix

Back

What is input-output analysis? - III

Input-Output Model					
Sectors	Agriculture	Industry	Services	Final Demand	Total Use
Agriculture	X11	X12	X13	F1	X1
Industry	X21	X22	X23	F2	X2
Services	X31	X32	X33	F3	X3
Net Indirect Taxes	T1	T2	T3		
Value added (Labour)	L1	L2	L3		
Value added (Capital)	K1	K2	K3		
Total Output	X1	X2	X3		

- No sector is stand-alone in the economy.
- All sectors are inter-dependent
  - Backward Linkages
  - Forward Linkages
- All sectors are included in the I-O analysis.
- What is X21? Output of industry used in agriculture
- What is X12? Output of agriculture used in industry
- Final Demand includes
  - Private Final Consumption Expenditure (e.g. Motor cycles and scooters) (C)
  - Gross Fixed Capital Formation (I)
  - Change in Stocks
  - Government Final Consumption Expenditure (G)
  - Exports – Imports (X-M)

Source: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004160614287891JaiLakshmi_App_Input_Output_Analysis.pdf

Back

What is input-output analysis? -IV
Illustrative Example of Input-Output Table

	Input Output Table 2007-08, Rs trillion											
	Agriculture	Mining & Mfg	Services	Intermediate USE	PFCE	GFCE	GFCF	CIS	EXP	less IMP	TFUSE	Total Use
Agriculture	2.4	2.7	0.8	5.8	6.5	0.1	0.0	0.0	0.3	0.2	6.6	12.5
Mining & Mfg	0.8	22.2	4.9	27.9	7.2	0.7	15.4	2.0	4.7	10.2	19.8	47.7
Services	1.1	8.9	5.6	15.6	13.7	4.3	0.9	0.0	4.6	2.1	21.4	37.0
total input	4.3	33.8	11.2	49.3	27.3	5.0	16.3	2.0	9.6	12.4	47.8	97.1
Net Indirect Taxes	-0.3	1.6	0.7	2.0	0.5	0.1	0.7	0.0	0.7	0.0	2.1	4.1
Gross Value Added	8.5	12.3	25.0	45.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.8
Gross Output	12.5	47.7	37.0	97.1	27.8	5.1	17.0	2.0	10.3	12.4	49.9	0.0

Back

What is input-output analysis? - V

Technology Coefficient Matrix			
Sectors	Agriculture	Industry	Services
Agriculture	a11=(X11/X1)	a12=(X12/X2)	a13=(X13/X3)
Industry	a21=(X21/X1)	a22=(X22/X2)	a23=(X23/X3)
Services	a31=(X31/X1)	a32=(X32/X2)	a33=(X33/X3)

- a12: Value of agricultural output used in producing Rs 1 value of industrial output
- a21: Value of industrial output used in producing Rs 1 value of agricultural output

Source: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004160614287891JaiLakshmi_App_Input_Output_Analysis.pdf

Back

What is input-output analysis? - VI

A: Technology Coefficient Matrix (Illustrative)			
Sectors	Agriculture	Industry	Services
Agriculture	0.1812	0.1242	0.0199
Industry	0.0415	0.3887	0.1678
Services	0.0112	0.0968	0.0949

(I-A)-1: Leontief Inverse Matrix (Illustrative)			
Sectors	Agriculture	Industry	Services
Agriculture	1.2357	0.2630	0.0760
Industry	0.0907	1.7046	0.3181
Services	0.0250	0.1857	1.1399

- Leontief inverse matrix explains direct and indirect requirements in a sector to meet one Rs final demand in the sector
- Industry – An increase in Rs 1.00 in the final demand for agricultural goods results in an increase in the output of industry of Rs 0.09 and of services of Rs 0.02
- Multiplier: The multiplier analyses **direct and indirect impact** of exogenous policy shock operated through final demand.
  - ❖ Example: Output multiplier in agriculture is equal to 1.3514 (1.2357+0.0907+ 0.0250).
  - ❖ One Rs increase in final demand in agriculture sector results in total Rs 1.3514 value of output in the economy.
  - ❖ The concept of multiplier for a sector is dependent on the extent of inputs used or output supply of a sector. Output supply of capital goods is spread over a long time horizon unlike consumer goods.

Back

Proposed Sampling in the ToR

S.No.	*Stakeholders*	*Sample*	*NCAER Sample*
1	Industries (20 in each sector)	140	
2	National-level Industry Association (1 in each sector)	7	
3	Recruitment Agencies	5	
4	Placement cells/TVET Inst. (2 in each sector)	14	
5	Sector Skill Council (1 in each sector)	7	
6			Ministries-7
	Total Coverage	173	180

Survey

Sector		*Growing of Cereals, Leguminous Crops and Oilseeds*	*Raising Cattle and Buffaloes*	*Weaving of Textiles*	*Manufacturing of MVs & its auto parts and repair*	*Electric power generation using solar and other non-conventional energy*	*Computer program ming activities*	*Retail sale of food, clothing and shoes*	*Total*
Ministry		1	1	No response	No response	No response	1	1	4
Sector Skill Council		1	1	1	1	1	1	1	7
National-level Industry Association		1	1	1	3	2	1		9
No of Farms/Firms	Micro/ Small	7	6	11	3	3		7	
	Medium	5	3	6	4	4		4	
	Large	3	6	3	6	7		4	
	Total	15	15	20	13	14	17	19	115
No. of Placement Cells/TVET Institutions		5	3	5	2	2	3	2	17
Recruitment Agencies					1	1	1	1	4
Other Stakeholders		9	5		7	6	3	2	32
Firms plus Other Stakeholders		24	20	20	20	20	20	21	148
Total		32	26	27	27	26	27	26	191

Meta Data About Survey

Response Rates

Sector	*Firms/Farms' Response Rate*
Growing of Cereals, Leguminous Crops and Oilseeds	16%
Raising Cattle and Buffaloes	67.8%
Weaving of Textiles	12%
Manufacturing of MVs & its auto parts and repair	24%
Electric power generation using solar and other non-conventional energy	22%
Computer programming activities	
Retail sale of food, clothing and shoes	38%

Back

Meta Data About Survey

Frequency of Ownership of Firms/Farms

Sector	Public Sector	Public Limited	Private Limited	Individual Ownership/ Partnership	MNC	Limited Liability Partnership	Cooperatives	Others
Growing of Cereals, Leguminous Crops and Oilseeds			15					9
Raising Cattle and Buffaloes	4		2	2		1	11	
Weaving of Textiles	-	3 (Ltd. mills)	9	-	-	-	8	-
Manufacturing of MVs & its auto parts and repair		4	2	4	3			
Electric power generation using solar and other non-conventional energy		3	10		1			
Computer programming activities								
Retail sale of food, clothing and shoes		3	6	9				
Total								

Back

Meta Data About Survey

Frequency of Designations

Designation	*Growing of Cereals, Leguminous Crops and Oilseeds*	*Raising Cattle and Buffaloes*	*Weaving of Textiles*	*Manufacturing of MVs & its auto parts and repair*	*Electric power generation using solar and other non-conventional energy*	*Computer programming activities*	*Retail sale of food, clothing and shoes*
Cooperative owners/Proprietor		3	16	2			7
Human Resource/Learning & Development Managers/Director (Training)		1	3	8	6		1
Managing Director/CEO	12	4		1	4		1
Production-in charge/Designer			2				
General Manager/Senior Manager	2				9		10
Senior Managerial Positions-Operations	10	12		4			
Vice-President					1		

Note: This may not add up to 100% as NCAER team may have spoken to multiple people in the company

Back

Meta Data About Survey

Frequency of Location of Farms/Firms

Sector	Growing of Cereals, Leguminous Crops and Oilseeds	Raising Cattle and Buffaloes	Weaving of Textiles	Manufacturing of MVs & its auto parts and repair	Electric power generation using solar and other non-conventional energy	Computer programming activities	Retail sale of food, clothing and shoes
Andhra Pradesh		1					
Chhattisgarh							2
Delhi				2	2		8
Gujarat				1			
Haryana	21	12		3			
Himachal Pradesh			2				
Karnataka		1	3		3		
Madhya Pradesh					1		
Maharashtra	2	1		3	3		3
Odisha			1				
Punjab		1	1				
Rajasthan		1		1			
Tamil Nadu				1	3		
Telangana				1	1		
Uttar Pradesh		2	13		1		6
West Bengal		1		1			

Back