Recording Data as an asset
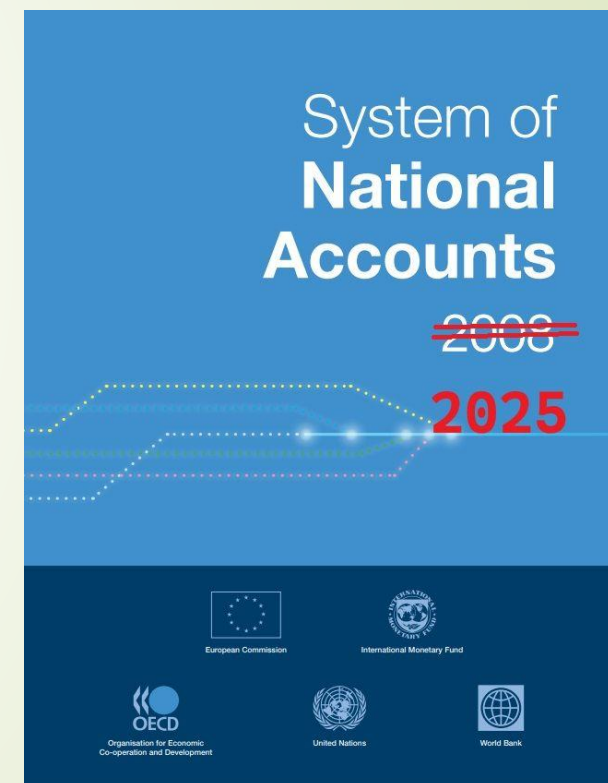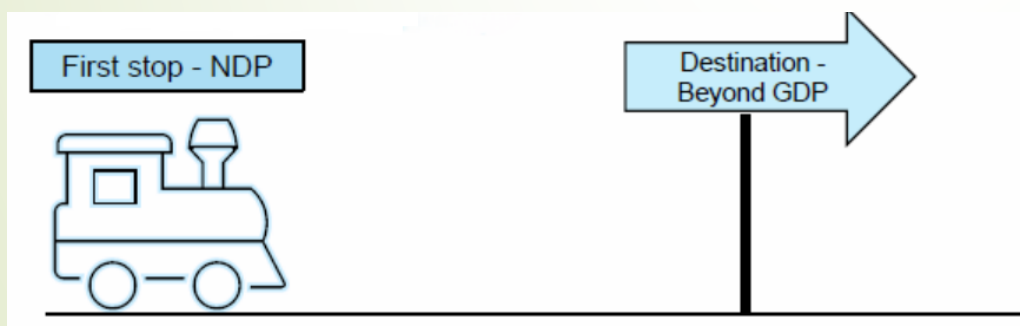
(Webinar on 2025 SNA Implementation)
June, 3 2025

Attiq-ur-Rehman
Deputy Director General
Pakistan Bureau of Statistics
Pakistan

2025 SNA

▰ Officially endorsed by **UNSC** during its **56th session in March 2025**.

▰ 2025 SNA retains **the basic theoretical framework of 2008 SNA**

▰ 2025 SNA is the **broadening of national accounts framework**

to better account for elements affecting **wellbeing and sustainability**

First stop - NDP

Destination -
Beyond GDP

System of
National
Accounts
~~2008~~
2025

European Commission International Monetary Fund

OECD
Organisation for Economic
Co-operation and Development

United Nations

World Bank

New 2025 SNA Recommendations

Conceptual changes	Globalization	Digitalization	Well-being and sustainability	Financial risks and vulnerability

• Data as an asset
• Depletion as cost of production
• Output of Central Bank
• Islamic Finance
• Renewable energy resources
	• Breakdowns of corporations into foreign-controlled, public, national private corporations
	• Extended SUTs
	• Data on Special Purpose Entities(SPEs)
		• Measuring of digital economy through:
		  o Digital SUTs
		  o Supplementary breakdowns of financial corporations to include fintech-related activities
		  o Capturing of crypto assets
			• Distribution of HH income, consumption and wealth accounts
			• Labor market tables
			• Thematic accounts for unpaid HH service work, education, human capital and health
			• Natural Capital accounts
			• SEEA
				• Supplementary tables on Non-bank financial intermediation
				• Additional details of some financial instruments

Recording Data as an Asset

Handbook on Measuring Data

Eurostat – IMF task team on measuring data as an asset in National Accounts

Erich Strassner – IMF

Nicola Massarelli – Eurostat

John Mitchell – consultant

- The handbook reflects the testing that has occurred on:
    - Choice of occupation and involvement rates
    - Non-Labor mark up methodology.
    - Several countries (e.g. Japan, Germany, **Pakistan**) have undertaken new research or tested alternative methodologies to improve source data available.

Annex 3.1: Volume estimates of data asset: The case of Pakistan

Pakistan Bureau of Statistics (PBS) has compiled both nominal and volume estimates of data asset. Overall, the PBS compiled five aggregates of data assets using two broad assumptions i.e.,) by using aggregate price changes from industry shares and ii) by deflators. These are discussed below:

Industry based shares of nominal estimates:

1) The first step is to derive nominal estimates of data assets through sum of cost approach including labor and non-labor components following the guidelines presented elsewhere in this handbook.

2) The second step is to deflate these estimates based on the Implicit Price Deflator (IPD) from industry-specific GVA at constant prices and nominal prices. The industries used reflect those contributing to the production of data. These industry-based volume estimates of data assets are then aggregated to have a measure of data asset at the total economy level.

Outline

Nominal estimates of data asset

- Methodology
- Nominal Estimates
- Limitations and Way Forward

Volume estimates of data asset

- Methodology
- Volume Estimates
- Limitations and Way Forward

Conceptual boundary of data in 2025 SNA

*"**Information** content that is produced by accessing and observing phenomena; and recording, organizing and storing information elements from these phenomena in a digital format, which provide an economic benefit when used in productive activities".*

Non-digital data

- While acknowledging that non-digital data exists, for the purpose of the 2025 SNA, only digital data is considered within the 2025 SNA production and asset boundary

Ancillary data

- If the data is not providing a direct economic benefit to the business, it is considered outside of the 2025 SNA production and asset boundary

Pakistan Bureau of Statistics

June 3, 2025

Methodology

$$C_{i,t} = \alpha \sum \tau_\omega W_{\omega,i,t} H_{\omega,i,t}$$

where

$C_{i,t}$ = Wage bill

$W_{\omega,i,t}$ = Average annual wage for each occupation (ω), industry (i), and year (t)

$H_{\omega,i,t}$ = Annual number of employees

τ_ω = Occupation-specific time-use factor

α = Mark-up that reflects other costs e.g. IC, CFC, and operating surplus

Wage Bill → Labor Cost → Average annual wage ✖ Annual Number of employees ✖ Occupation specific time use factor ✖

Wage Bill → Non-Labor Cost → Markup e-g IC, CFC and OS
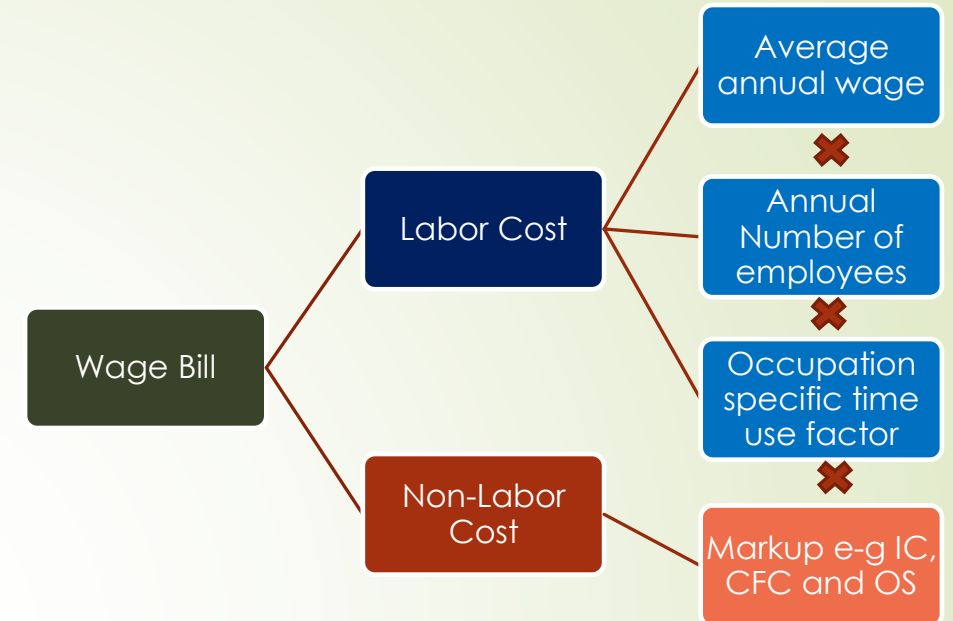
Explanation

➤ **The relevant occupations (ω),** that is a list of the occupations considered to be involved in producing data output. Importantly, the specific data input concerns the number of employees working in these occupations.

➤ **The labor costs of these occupations (W).** It cover all labor costs associated with occupations chosen.

➤ **The involvement rates specific to each occupation (τ).** Time use adjustment to acknowledge that each worker in the stated occupations is unlikely to spend 100% of its time producing data. This adjustment seeks to appropriately capture the proportion of their labor that is *actually* contributing to producing data output.

➤ **The mark-up representing non-labor cost (α).** These additional costs of production can be calculated and summed to the labor cost estimate, and if the information is available, countries should apply these known costs to the labor cost estimate. However, since this information will likely be unknown for most countries it is recommended that this non-labor expenditure is estimated by applying a proportional mark-up to the labor cost value.

Step-wise Methodology - Pakistan

Step 1: Estimation of labor costs for total economy by cross-classification of ***21 Industries*** (PSIC-2010 adopted from ISIC- Rev. 4) and ***433 occupations*** (PSCO-2015 adopted from ISCO-2008) from Labor Force Surveys for 2014-15, 2017-18, 2018-19 & 2020-21 by using ***number of employees*** and ***average wages***

Step 2: ***Identify occupations*** engaged in the production of digital data with following considerations:-

- Planning & development of digital data production strategy

- Accessing, recording, and storing information

- Processing, cleaning, and organising the digital data

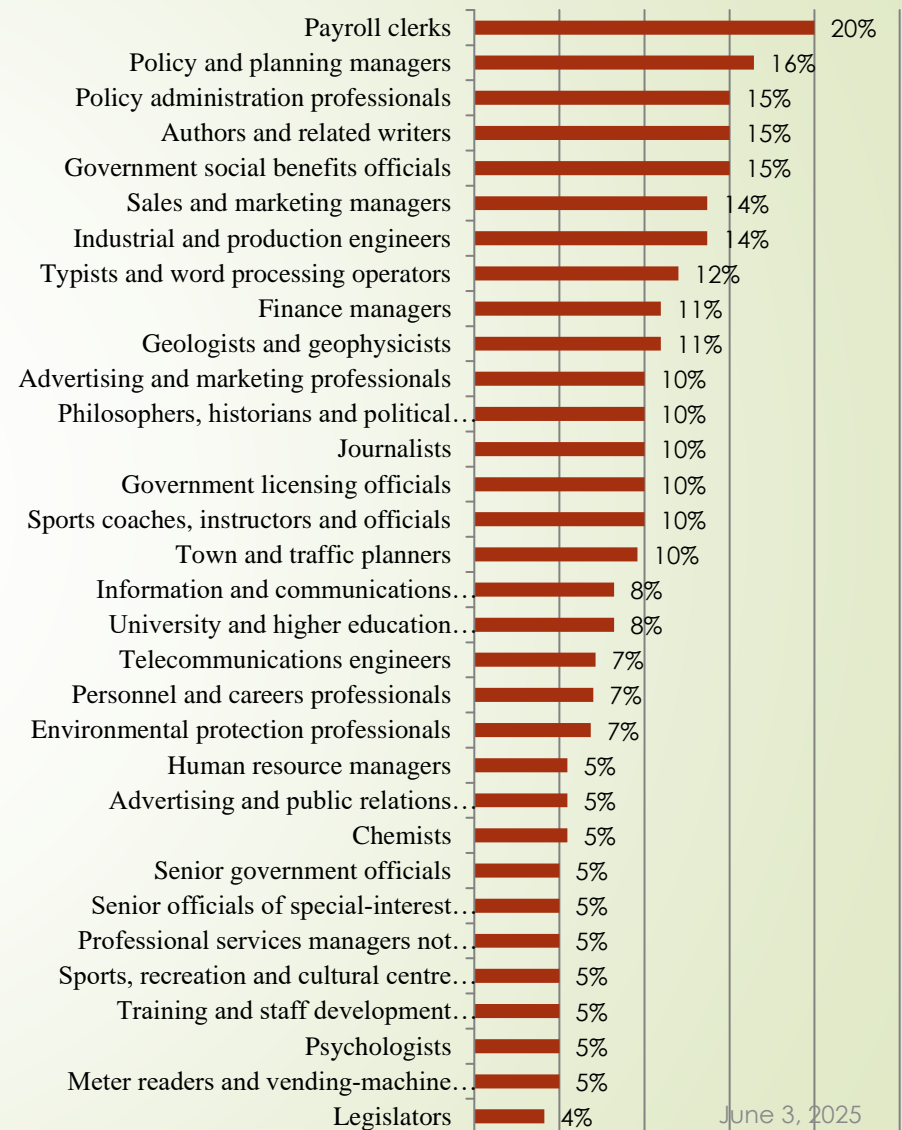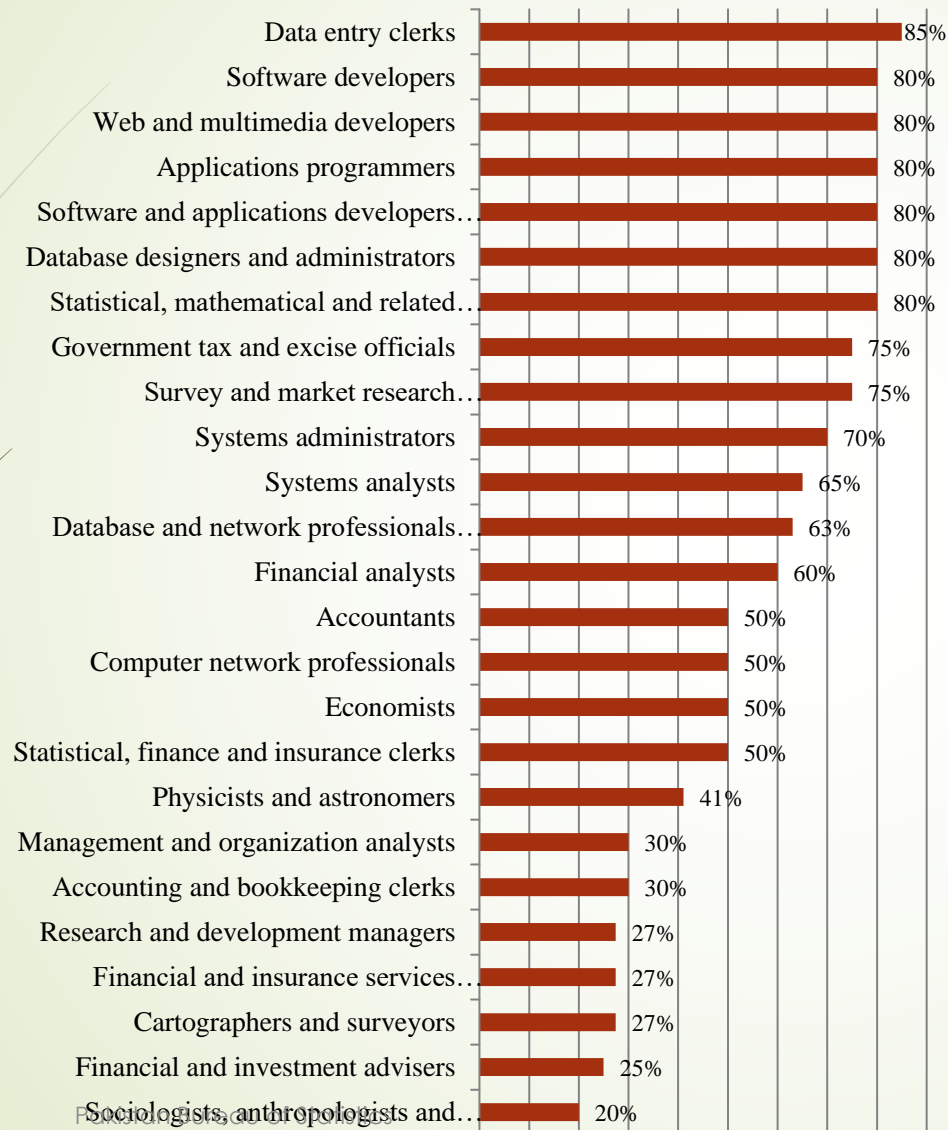# Step-wise Methodology - Pakistan

Step 3: *Occupation-specific time-use factor* between '0' and '1' for time / effort to produce data asset.

- No data source is available

- Time use factors are based on expert opinion/ group discussions

- 92 occupation at 4-digit level were analyzed

- Constant time factor for 21 industries under a specific occupation for 2014-15, 2017-18, 2018-19 & 2020-21

Summary of time factors by Occupations - Pakistan

Occupation	%
Data entry clerks	85%
Software developers	80%
Web and multimedia developers	80%
Applications programmers	80%
Software and applications developers…	80%
Database designers and administrators	80%
Statistical, mathematical and related…	80%
Government tax and excise officials	75%
Survey and market research…	75%
Systems administrators	70%
Systems analysts	65%
Database and network professionals…	63%
Financial analysts	60%
Accountants	50%
Computer network professionals	50%
Economists	50%
Statistical, finance and insurance clerks	50%
Physicists and astronomers	41%
Management and organization analysts	30%
Accounting and bookkeeping clerks	30%
Research and development managers	27%
Financial and insurance services…	27%
Cartographers and surveyors	27%
Financial and investment advisers	25%
Sociologists, anthropologists and…	20%

Occupation	%
Payroll clerks	20%
Policy and planning managers	16%
Policy administration professionals	15%
Authors and related writers	15%
Government social benefits officials	15%
Sales and marketing managers	14%
Industrial and production engineers	14%
Typists and word processing operators	12%
Finance managers	11%
Geologists and geophysicists	11%
Advertising and marketing professionals	10%
Philosophers, historians and political…	10%
Journalists	10%
Government licensing officials	10%
Sports coaches, instructors and officials	10%
Town and traffic planners	10%
Information and communications…	8%
University and higher education…	8%
Telecommunications engineers	7%
Personnel and careers professionals	7%
Environmental protection professionals	7%
Human resource managers	5%
Advertising and public relations…	5%
Chemists	5%
Senior government officials	5%
Senior officials of special-interest…	5%
Professional services managers not…	5%
Sports, recreation and cultural centre…	5%
Training and staff development…	5%
Psychologists	5%
Meter readers and vending-machine…	5%
Legislators	4%

Psychologists, anthropologists

June 3, 2025

Standard list of data producing occupations and involvement rates (Hand book)

ISCO code	Occupation	Proposed involvement rate	ISCO code	Occupation	Proposed involvement rate
4132	Data entry clerks	64%	3339	Business services agents not elsewhere classified	4%
4227	Survey and market research interviewers	52%	4214	Debt Collectors and Related Workers	4%
2521	Database designers and administrators	32%	4229	Client information workers not elsewhere classified	4%
2120	Mathematicians, actuaries and statisticians	25%	2132	Farming, Forestry and Fisheries Advisers	3%
3314	Statistical, mathematical and related associate professionals	25%	2133	Environmental protection professionals	3%
3511	Information and communications technology operations technicians	25%	4110	General office clerks	3%
2511	Systems analysts	20%	4221	Travel Consultants and Clerks	3%
4131	Typists and word processing operators	18%	4222	Contact Centre Information Clerks	3%
2165	Cartographers and surveyors	16%	4225	Inquiry Clerks	3%
2529	Database and network professionals not elsewhere classified	16%	4411	Library Clerks	3%
3513	Computer network and systems technicians	16%	4415	Filing and Copying Clerks	3%
2512	Software developers	15%	4416	Personnel Clerks	3%
3312	Credit and loans officers	14%	1212	Human Resource Managers	2%
2164	Town and traffic planners	12%	2211	Generalist Medical Practitioners	2%
2514	Applications programmers	12%	2212	Specialist Medical Practitioners	2%
2519	Software and applications developers and analysts not elsewhere classified	12%	2422	Policy administration professionals	2%
2522	Systems administrators	12%	2423	Personnel and Careers Professionals	2%
2523	Computer network professionals	12%	3230	Traditional and Complementary Medicine Associate Professionals	2%
3315	Valuers and loss assessors	12%	3333	Employment Agents and Contractors	2%
3433	Gallery, Museum and Library Technicians	12%	3334	Real Estate Agents and Property Managers	2%
1330	Information and communications technology service managers	10%	3344	Medical Secretaries	2%
2160	Architects, planners, surveyors and designers, nos	10%	3353	Government Social Benefits Officials	2%
2513	Web and multimedia developers	10%	3359	Regulatory government associate professionals not elsewhere classified	2%
3211	Medical imaging and therapeutic equipment technicians	10%	4212	Bookmakers, Croupiers and Related Gaming Workers	2%
3212	Medical and pathology laboratory technicians	10%	4224	Hotel Receptionists	2%
3213	Pharmaceutical Technicians and Assistants	10%	4226	Receptionists (general)	2%
3252	Medical records and health information technicians	10%	7233	Agricultural and Industrial Machinery Mechanics and Repairers	2%
4311	Accounting and bookkeeping clerks	10%	7543	Product Graders and Testers (excluding Foods and Beverages)	2%
4312	Statistical, finance and insurance clerks	10%	1114	Senior Officials of Special-interest Organizations	1%
1211	Finance managers	8%	1223	Research and Development Managers	1%
1346	Financial and insurance services branch managers	8%	1321	Manufacturing Managers	1%
2412	Financial and investment advisers	8%	1411	Hotel Managers	1%
2413	Financial analysts	8%	1431	Sports, Recreation and Cultural Centre Managers	1%
2621	Archivists and curators	8%	1439	Services Managers Not Elsewhere Classified	1%
2622	Librarians and related information professionals	8%	2140	Engineering professionals (excluding electrotechnology), nos	1%
2631	Economists	8%	2141	Industrial and Production Engineers	1%
3114	Electronics engineering technicians	8%	2142	Civil Engineers	1%

Standard list of data producing occupations and involvement rates (Hand book)

ISCO code	Occupation	Proposed involvement rate	ISCO code	Occupation	Proposed involvement rate
3116	Chemical engineering technicians	8%	2144	Mechanical Engineers	1%
3117	Mining and metallurgical technicians	8%	2145	Chemical Engineers	1%
3119	Physical and engineering science technicians not elsewhere classified	8%	2146	Mining Engineers, Metallurgists and Related Professionals	1%
3141	Life science technicians (excluding medical)	8%	2149	Engineering professionals not elsewhere classified	1%
3311	Securities and finance dealers and brokers	8%	2166	Graphic and Multimedia Designers	1%
3321	Insurance representatives	8%	2230	Traditional and Complementary Medicine Professionals	1%
3341	Office Supervisors	8%	2250	Veterinarians	1%
3512	Information and communications technology user support technicians	8%	2262	Pharmacists	1%
4211	Bank tellers and related clerks	8%	2264	Physiotherapists	1%
2111	Physicists and astronomers	6%	2269	Health Professionals Not Elsewhere Classified	1%
2112	Meteorologists	6%	2310	University and Higher Education Teachers	1%
2113	Chemists	6%	2351	Education Methods specialists	1%
2114	Geologists and geophysicists	6%	2421	Management and Organization Analysts	1%
2131	Biologists, botanists, zoologists and related professionals	6%	2619	Legal Professionals Not Elsewhere Classified	1%
2411	Accountants	6%	2643	Translators, Interpreters and Other Linguists	1%
2632	Sociologists, anthropologists and related professionals	6%	3118	Draughts persons	1%
2633	Philosophers, historians and political scientists	6%	3122	Manufacturing Supervisors	1%
2634	Psychologists	6%	3123	Construction Supervisors	1%
3342	Legal secretaries	6%	3133	Chemical Processing Plant Controllers	1%
3352	Government tax and excise officials	6%	3139	Process Control Technicians Not Elsewhere Classified	1%
3514	Web Technicians	6%	3142	Agricultural Technicians	1%
4213	Pawnbrokers and Money-lenders	6%	3153	Aircraft Pilots and Related Associate Professionals	1%
4313	Payroll clerks	6%	3154	Air Traffic Controllers	1%
4321	Stock clerks	6%	3240	Veterinary Technicians and Assistants	1%
4322	Production clerks	6%	3255	Physiotherapy Technicians and Assistants	1%
4323	Transport clerks	6%	3257	Environmental and Occupational Health Inspectors and Associates	1%
1213	Policy and planning managers	4%	3259	Health Associate Professionals Not Elsewhere Classified	1%
1219	Business services and administration managers not elsewhere classified	4%	3313	Accounting Associate Professionals	1%
1342	Health Services Managers	4%	3323	Buyers	1%
2152	Electronics Engineers	4%	3324	Trade Brokers	1%
2153	Telecommunications engineers	4%	6221	Aquaculture Workers	1%
2431	Advertising and marketing professionals	4%	7231	Motor Vehicle Mechanics and Repairers	1%
2432	Public relations professionals	4%	7232	Aircraft Engine Mechanics and Repairers	1%
2642	Journalists	4%	7321	Pre-press Technicians	1%
3111	Chemical and Physical Science Technicians	4%	7421	Electronics Mechanics and Servicers	1%
3112	Civil Engineering Technicians	4%	8111	Miners and Quarriers	1%
3113	Electrical Engineering Technicians	4%	9216	Fishery and Aquaculture Laborers	1%

Step-wise Methodology - Pakistan

Step 4: Derive labor cost of production of data asset for each industry as below

*Labor costs for data asset= Total labor costs (Step 1) * Time use factor (Step 3)*

Derivation of mark-up factors

Step 5: Derive industry-specific shares of labor cost w.r.t. data asset (Step 4) for each industry

Step 6: Apply wage shares obtained above to industry-wise aggregates of IC, CFC (Geometric method) & OS/MI (derived specifically as income GDP is not compiled) separately after adjusting for industry-specific raw-materials/inputs.

Step 7: Add IC, CFC & OS/MI to obtain non-labor component of data asset i.e. mark-up factors

Summary of industry-wise markups - Pakistan

Industries	2014-15	2017-18	2018-19	2020-21
Agriculture, forestry and fishing	5.06	5.52		4.09
Mining and quarrying	6.07	2.39	3.25	5.92
Manufacturing	1.70	1.60	1.65	1.66
Electricity, gas, steams and air conditioning supply	2.48	2.56	2.41	3.12
Water supply, sewerage, waste management and remediation activities	2.78	3.69	3.22	3.70
Construction	1.18	1.56	1.24	2.05
Whole sale and retail trade, repair of motor vehicle and motorcycles	1.97	1.83	1.92	2.46
Transportation and storage	2.81	2.11	2.25	2.17
Accommodation and food services	2.66	2.12	2.22	2.29
Information and communication	3.09	2.34	2.51	2.42
Financial and insurance activities	4.79	5.32	4.90	4.71
Real estate activities	4.94	3.02	4.06	3.67
Professional a, scientific and technical activities	4.83	4.63	4.90	3.38
Administrative and support services activities	3.96	4.18	5.83	3.63
Public administration and defence	1.75	1.68	1.80	1.81
Education	1.41	1.52	1.55	1.48
Human Health and social work activities	2.65	2.60	2.19	2.81
Arts, entertainment and recreation	1.98	1.61	1.75	1.26
other services activities	3.53	2.85	2.94	2.31
Activities of the households as employers	2.48	1.78	2.01	1.17
Total economy	2.65	2.62	2.66	2.50

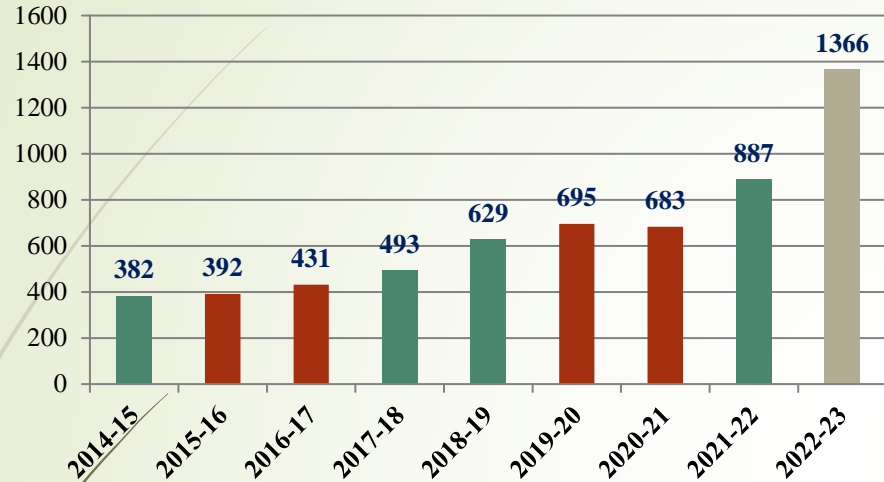# Step-wise Methodology – Pakistan

Step 8: Add labor component (Step 4) and non-labor component (Step 7) to obtain

nominal value of data asset for survey years

 or alternatively

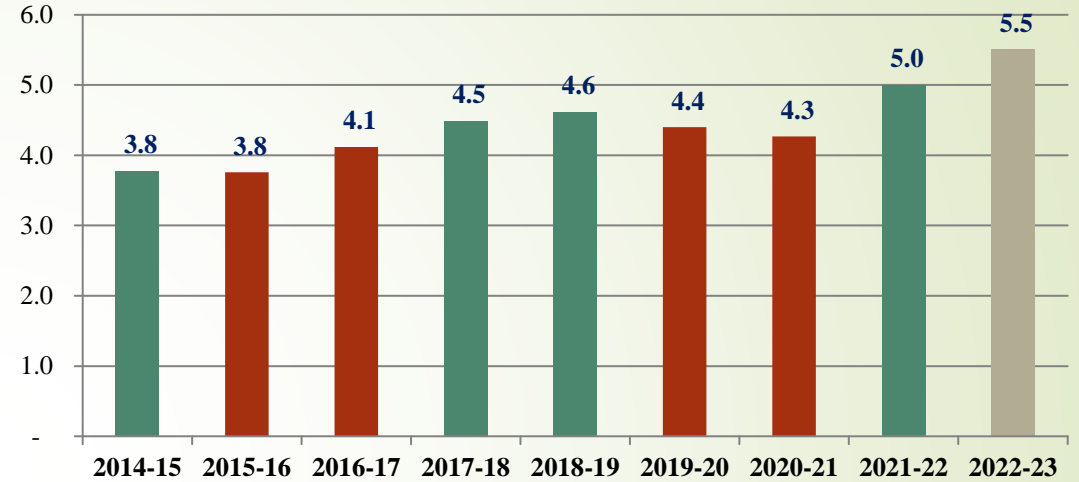By multiplying labor component (Step 4) by mark-up factors presented above
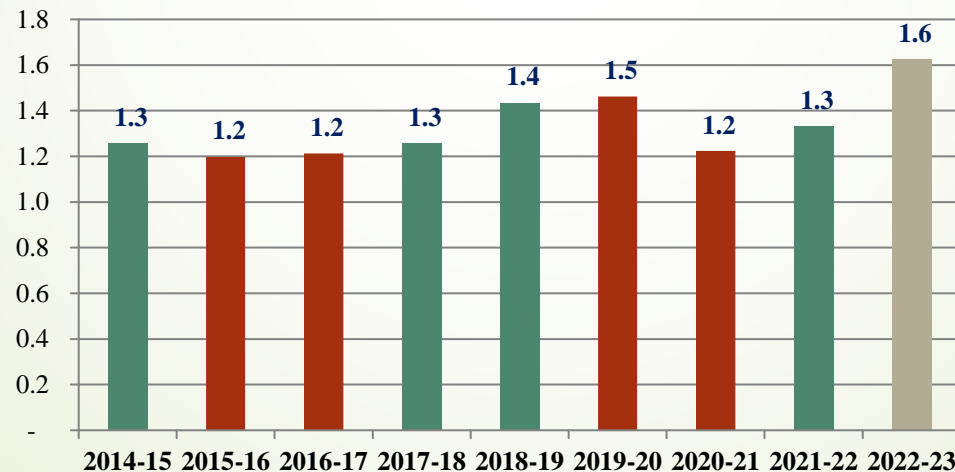
Series of nominal estimates - Pakistan

PKR in Billion

| Year	Value
2014-15	382
2015-16	392
2016-17	431
2017-18	493
2018-19	629
2019-20	695
2020-21	683
2021-22	887
2022-23	1366

US$ in Billion

Year	Value
2014-15	3.8
2015-16	3.8
2016-17	4.1
2017-18	4.5
2018-19	4.6
2019-20	4.4
2020-21	4.3
2021-22	5.0
2022-23	5.5

Data asset (% of GDP)

Year	Value
2014-15	1.3
2015-16	1.2
2016-17	1.2
2017-18	1.3
2018-19	1.4
2019-20	1.5
2020-21	1.2
2021-22	1.3
2022-23	1.6

Note: Missing values have been estimated by applying industry-wise shares to nominal value added

Pakistan Bureau of Statistics

June 3, 2025

Summary by industries (% share) - Pakistan
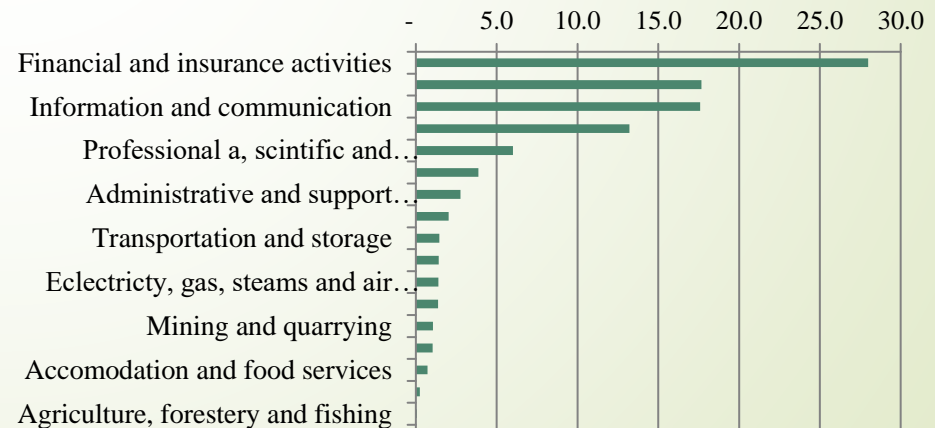

2014-15

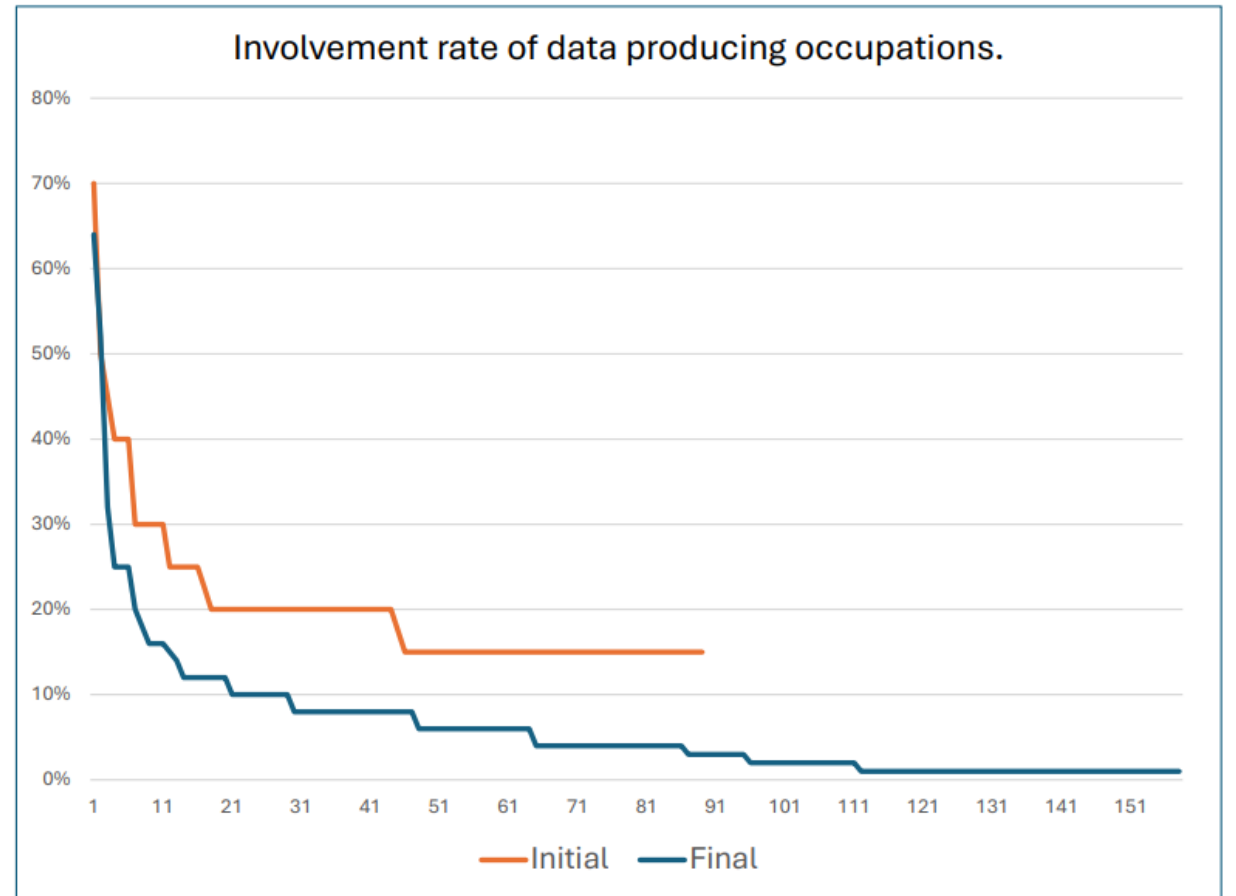**2017-18**

2018-19

2020-21

June 3, 2025
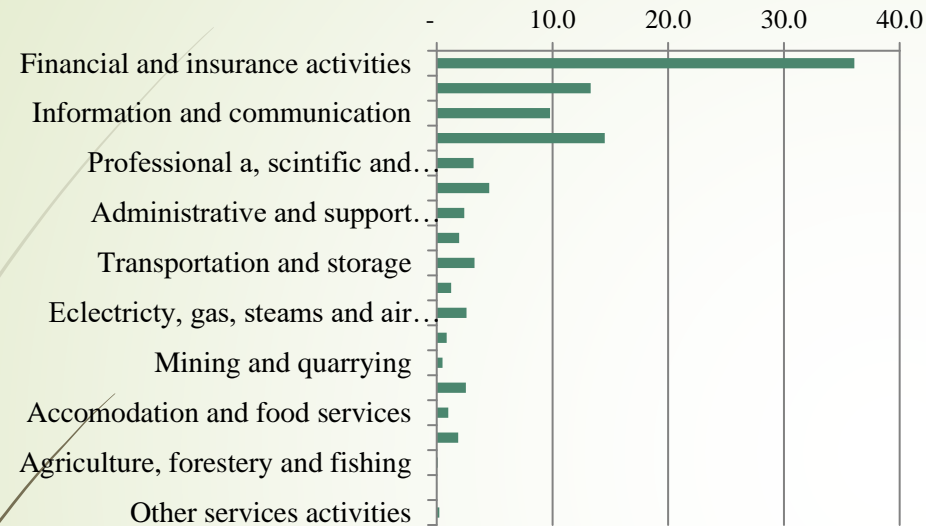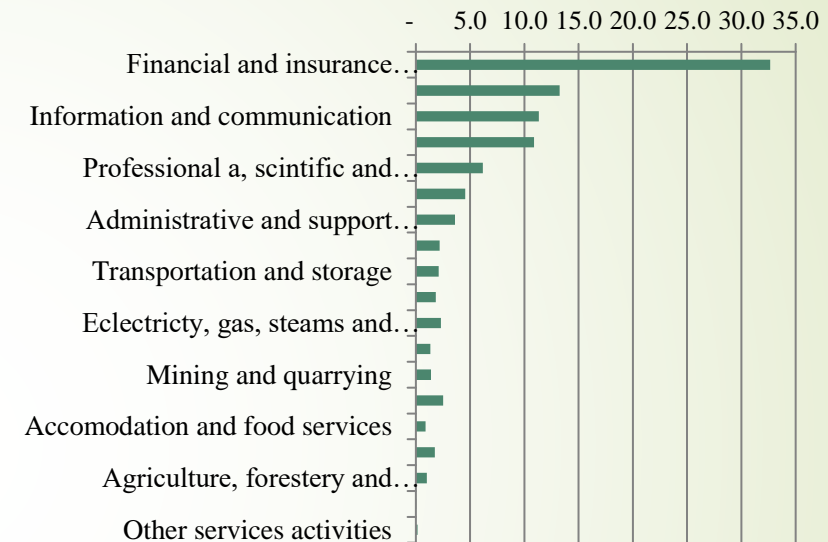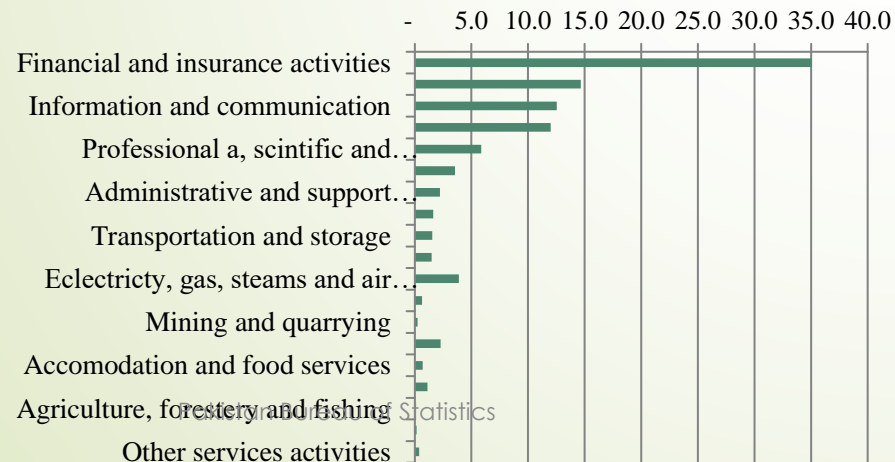
Limitations

- Use of expert knowledge in the selection of occupations

- Subjective estimates of time-factors

- No estimate of operating surplus as income GDP is not compiled in Pakistan

- Consistent labor force data, with more detail on occupations is available only for 2014-15, 2017-18, 2018-19 and 2020-21

- Direct estimation of data asset will depend upon availability of labor force data

Occupation and involvement rates (Recommended)

- Significant refinement on default occupation list based on empirical evidence (USA, OECD, GER & JAP) rather than based simply on subjective expert opinion.

- Results in a longer tail (more occupations) but with lower involvement rates.

- Testing has resulted in similar estimates to those obtained independently (i.e. entirely through ML).

Involvement rate of data producing occupations.

Way forward: Nominal Estimates of data Asset

Step	Short description	Standard recommendation	Alternative/Advanced Methods & Approaches (where applicable)
1	Identify occupations involved in data production	Occupation list compiled from task team	[1] Survey [2] Expert knowledge [3] Key words within statistical classification [4] Natural language processing (NLP) on job advertisements [5] Based on occupations selected by another country
2	Determine the number of employees in each occupational group	Survey / census data	
3	Determine the average wage in each occupational group	Survey / census data	

Way forward: Nominal Estimates of data Asset

Step	Short description	Standard recommendation	Alternative/Advanced Methods & Approaches (where applicable)
4	Determine the involvement rate for each occupational group.	List of involvement rates compiled by task team	[1] Survey [2] Expert knowledge / best guesses [3] Natural language processing (NLP) on job advertisements [4] Based on involvement rates from another country. [5] Key word search using occupation classification
5	Calculate total labor costs	(number of employees) * (average wage) * Adjustment to include non-wage labor costs * (involvement rate)	

Way forward: Nominal Estimates of data Asset

Step	Short description	Standard recommendation	Alternative/Advanced Methods & Approaches (where applicable)
6	Calculate non-labor costs, includes - Cost of inputs - Depreciation of assets used in production - Return to capital	One single mark-up applied to labor costs - Based on ratio from ISIC 62 and ISIC 63 (Total output / ROE)	[1] Survey focussing on data production expenses [2] One single mark-up on labor costs [a] Based on industries with large amount of output from data-producing occupations [3] Separate mark-ups covering intermediate consumption expenses, taxes less subsidies on production, CFC, and return to capital [a] Based on industries with large amount of output from data-producing occupations [b] Based on ISIC 62 and ISIC 63
7	Compute domestic own account data output	(labor costs) step 5 + (non-labor costs) step 6	

Volume estimates of data asset

Approaches – Volume estimates

1. By using industry-wise proportion derived from nominal estimates applied to volume estimates of GVA of respective industries

2. **Using Deflators**

   i. IT equipment index (from CPI)

   ii. IT salary index (Specifically derived by using data from PASHA* IT Salary Surveys)

   iii. Weighted Index (Two specifications)

      a) Salary (50%) & equipment (50%) (Assumption)

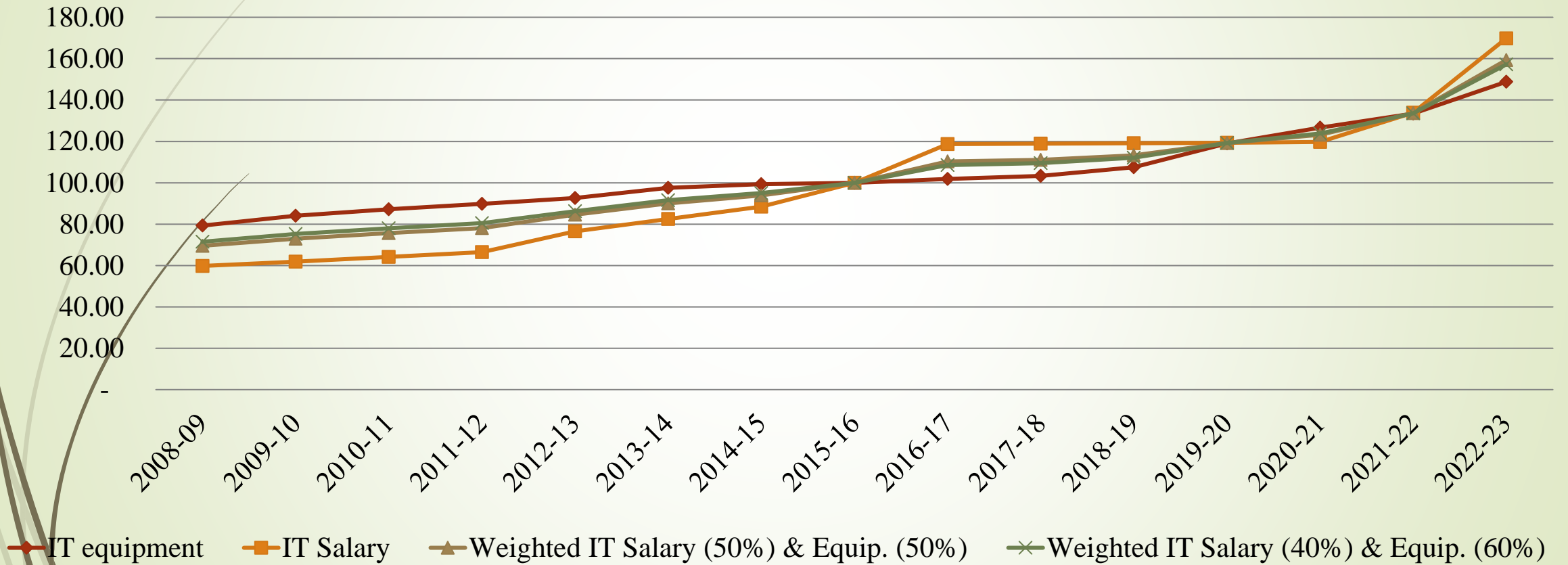   b) Salary (40%) & equipment (60%) (data asset weights)

   * PASHA = Pakistan Software Houses Association

Deflators – Items and Weights

IT equipment items		Weight (CPI)
1	Personal Computer with LED Monitor (17") DELL/HP/ACER CORE i5	0.0489
2	Laptop DELL/HP/ACER Core i5, Display (14'-15')	0.0489
	Total	0.0978
IT Salary Occupations		Weight (LFS 2014-15)
1	Programmer (IOS)	1.4478
2	Quality Assurance	2.4144
3	Graphics Designer	0.8272
4	Technical Writer	1.5663
5	Product Manager / Business Analyst	10.7004
6	Development Manager	1.5727
7	Project Manager	12.1220
8	Architect	1.5663
9	Database Administrator	3.8942
10	System Administrator	1.2657
11	Sales & Marketing Manager	33.8469
12	Manager/Finance Manager	28.7763
	Total	100.000

Index values

Index 2015-16=100

Volume Estimates

Volume estimates of data assets

Cons.1 (Nom Shares) — Cons.2 (IT Equp) — Cons.3 (IT Salary) — Cons.4 (50% weights) — Cons.5 (40% & 60% weights)
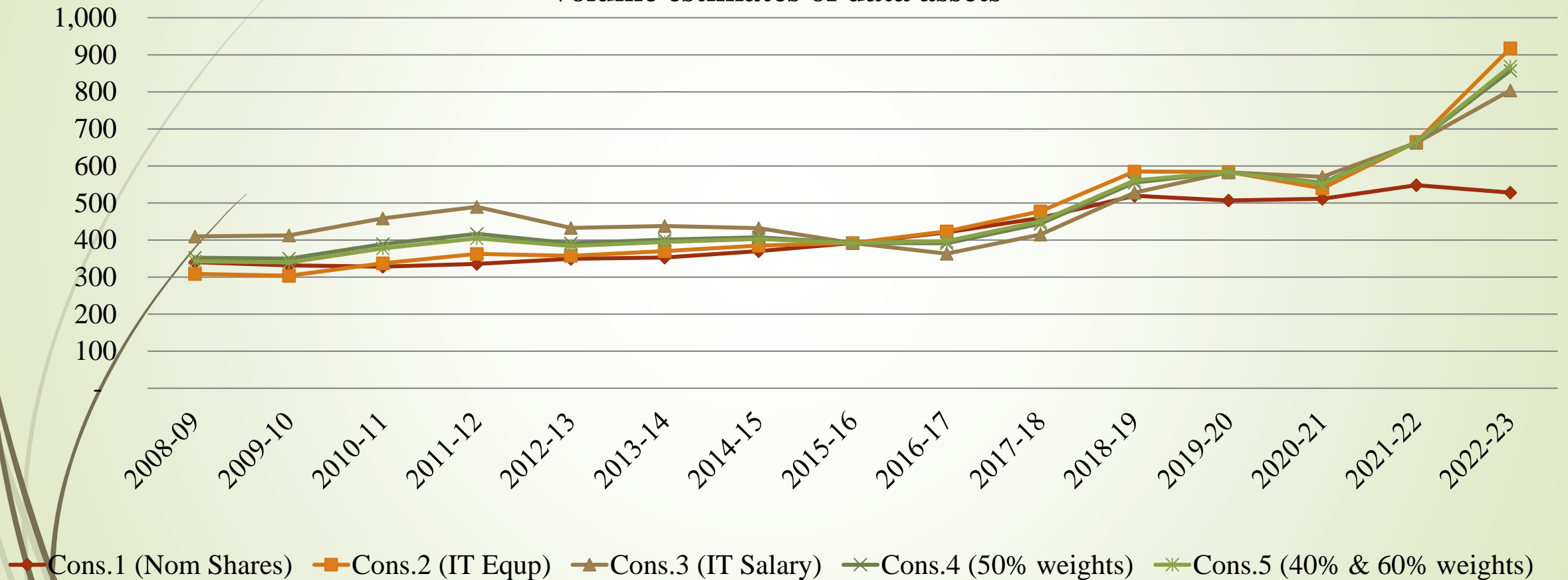
Limitations

- Wage index is not compiled and published in Pakistan. A special index has been derived

Way Forward

Step	Short description	Standard recommendation	Alternative/Advanced Methods & Approaches (where applicable)
1	Identify or estimate price indices for data	Use Implicit Price Deflator for similar IPP assets, taken from SUTs.	Compile data specific input price index based on input costs used in the production of data. Include adjustment for quality and productivity improvements.
2	Compute price-adjusted total data investment	Total data investment in current prices / price index	
3	Compute price-adjusted total data output	Total data output in current prices / data price index	

Capital Asset

Handbook on Measuring Data

Prepared by the Intersecretariat Working Group on National Accounts

Annex 4.1: Capital stock estimates of data asset: Case of Pakistan

Pakistan Bureau of Statistics (PBS) has compiled capital stock estimates of data asset using the Perpetual Inventory Method (PIM) following linear and geometric models. While the application of linear model requires fewer assumption i.e., nominal and volume estimates of data asset, asset life, price indices, the application of geometric model require additional assumptions i.e., retirement pattern (cut-off values), age-efficiency and age-profiles of assets. PBS has valued the capital stock of data assets at prices of base year i.e. 2015-16, the reference year of national accounts. PBS has also used capital stock estimates of data assets to derive estimates of consumption of fixed capital (CFC) under both linear and geometric methods.

Back

THANK YOU

2025 SNA (Change in Terminology)

2008 SNA	2025 SNA
• Compensation of employees	• Remuneration of employees
• Constant prices	• In volume terms
• Consumption of fixed capital	• Depreciation
• Financial intermediation services indirectly measured (FISIM)	• Implicit financial services on loans and deposits (IFSLD)
• Net errors and omissions	• Statistical discrepancy
• Resources	• Revenues
• Trade margin	• Distribution margin
• Uses	• Expenditures

2025 SNA (Classification update)

Classification	Status on UNSD website
• ISIC (Rev. 5)	• *New
• HS Codes (2022)	• *New
• COICOP 2018	• *New
• Classification of Business functions	• *New
• CPC (2.1)	