Philippines Data Analytics Sector Labor Market Intelligence Report

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Executive Summary

This labor market intelligence report provides a holistic overview of the supply, demand, and mismatch of skills in the Analytics labor sector of the Philippines. With the aim of informing skills trends and supporting growth of the labor market amidst the Fourth Industrial Revolution coupled with implications brought by the global pandemic, this report also presents an initial attempt in extrapolating the Philippine analytics workforce, with backcasted and forecasted projections from 2010 to 2028. Through a mixed-methods research, the study examined various quantitative, qualitative, and big data sources to understand the interplay of supply and demand for skills, and to provide corresponding key insights and recommendations intended to guide the Analytics Association of the Philippines, as the established Skills Sector Council, create an inclusive skills development roadmap.

The report highlights the need to standardize the definitions of Analytics roles, leveraging the framework proposed by the Analytics Association of the Philippines. We discuss the need for more specialized Analytics courses, the production of more instructors, Analytics as a distinct sector from IT-BPM, and the prospect of professional licensing and certification for the sector. We also highlight existing trends that promote the development of the Analytics labor sector such as women participation, work from home arrangements, online learning, the emergence of Analytics communities, and the impending importance of Data and AI Ethics.

Keywords: *data analytics, data science, data engineering, data steward, big data, machine learning, artificial intelligence, labor, Philippines, analytics association of the Philippines*

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A study of this nature could not have been successfully completed without the contributions and commitment of many people. The CirroLytix Research Services team would like to thank the staff and board of the Analytics Association of the Philippines, and PBEd team for their continuous support and guidance throughout the research process.

DISCLAIMER: The authors' views expressed in this publication do not necessarily reflect the views of PBEd or the Government of Australia.

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Background

A Future That Works

Philippine Business for Education (PBEd), with support from the Australian Department of Foreign Affairs and Trade (DFAT), is implementing a project called "A Future that Works" (AFW), which seeks to build coalitions among industry leaders by forming Sector Skills Councils (SSCs). With these SSCs, the project will develop and implement roadmaps for skills, and seek ways to bridge gaps which cause disconnect in offerings of education and training by institutions, placement of graduates, and job requirements of the industry (A Future That Works, n.d.).

To enable skills anticipation and identify mismatch, SSCs will collect and use Labor Market Intelligence (LMI). LMI refers to an activity or process of producing timely and reliable information and insights on the dynamics of the labor market for supporting decision-making and policy recommendations (Mezzanzanica & Mercorio, 2019).

By informing SSCs with LMI, they are empowered to build capacity through sector-specific strategies on current and emerging skill needs and job opportunities. As the pandemic continues to unfold, the need for sectoral LMI will become more crucial in developing the labor force in the Philippines.

The Analytics sector is one of the three sectors with an established SSC by AFW. The Analytics Association of the Philippines (AAP) was the tapped industry association as its SSC.

This report presents findings of the LMI study conducted for the Analytics industry in 2021.

Objectives

In line with the need to respond to issues brought by the COVID-19 pandemic and the challenges of the Fourth Industrial Revolution in the labor market, this labor market intelligence (LMI) study has been commissioned by PBEd to support AAP in developing a standard skills development roadmap for the Analytics sector.

The LMI will enable the AAP to plan and execute strategies in anticipating skills needs and mismatch. Specifically, the objectives of the LMI are to deepen understanding of:

- Trends and composition of the Analytics labor market demand and supply;
- The demand for Analytics jobs, and anticipated shortages of skilled workers in the digital economy;
- Estimation of the total data analytics labor force and expected growth trends; and
- Impacts of the ongoing COVID-19 pandemic and implications of the broader economic trend to analytics.

Methodology

Framework

This LMI study drew heavily from existing published LMI guides and frameworks particularly, "Guide to Anticipating and Matching Skills and Jobs," developed by the European Training Foundation, the European Centre for the Development of Vocational Training, and the International Labour Organization (ILO).

Figure 1 below describes the five steps in the development and use of LMI as presented by Rihova (2016) in the publication "Using Labour Market Information: Guide to Anticipating and Matching Skills and Jobs: Vol. 1".

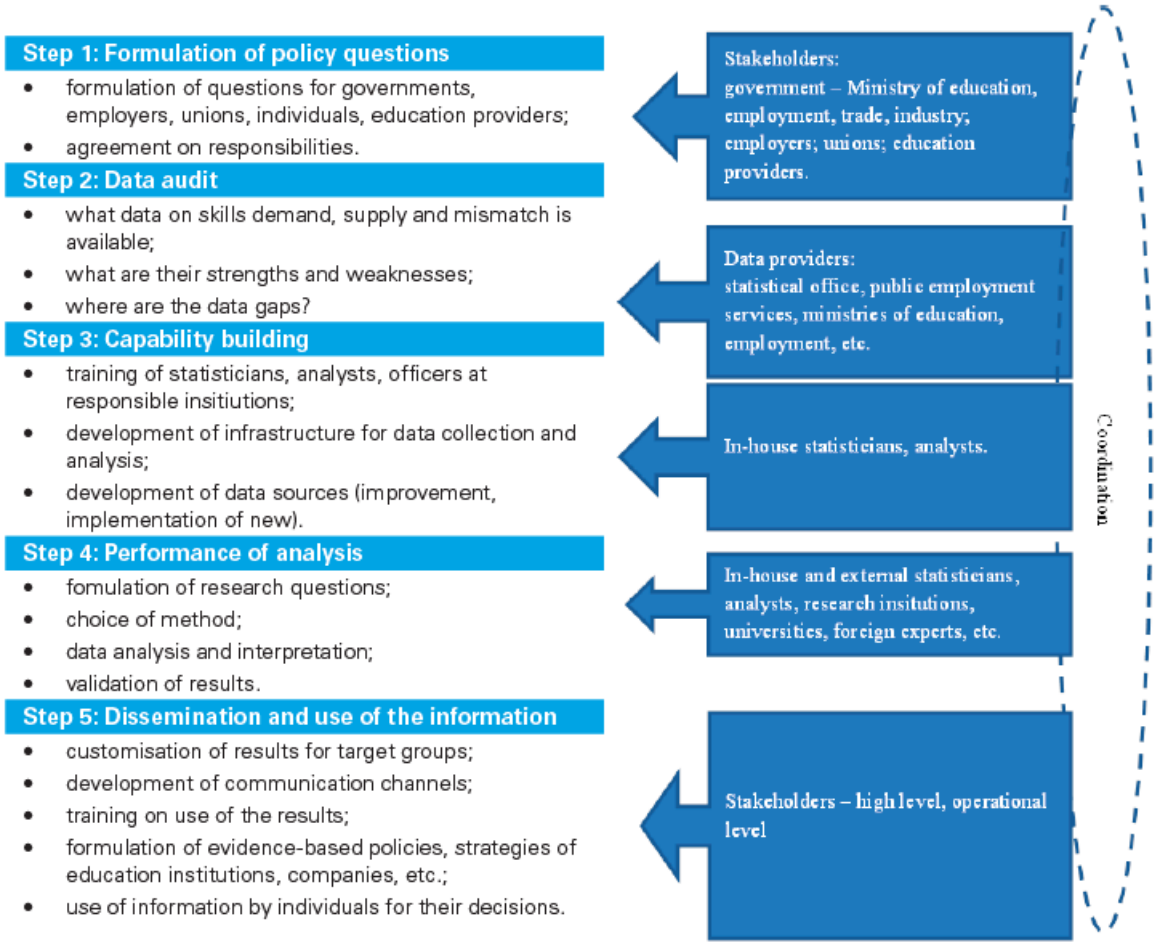


Figure 1: Steps in the use of LMI for matching and anticipation of skills

Rihova (2016) emphasized that a regular LMI system could contribute to better skills matching. Hence, a vital precondition or "Step 0" is to create an institutional framework that will be serve as the foundation in planning and developing sustainable LMI, and should cross all other steps.

Since this LMI study focuses on the Data Analytics sector, a more sector-specific approach was carried out centering on Data Audit and Performance of Analysis stages. ILO indicates the key stages in conducting sector studies that served as the general guide in conducting this LMI study (see Table 1). *(Note for the remainder of this document, the terms Analytics and Data Analytics will be used interchangeably unless otherwise indicated.)*

Table 1: Sector-specific strategy for LMI study (Wilson et al, 2016)

No	Stage	Details
P stage 00	Objectives	Clarify policy and other aims and objectives
P stage 01	Defining the sector	
P stage 02	Carrying out a data audit	Check existing data available
P stage 03	Consulting key stakeholders (institutional audit)	Identify and get on board all relevant stakeholders
P stage 04	Audience	Identify the main audience(s)
P stage 05	Clarify questions	Clarifying the key questions to be addressed
P stage 06	Choice of methodology	Deciding how best to answer the key questions and selection of optimal methods
Stage 1	Sector position and outlook	Sector characterisation; business environment; envisioning the future
Stage 2	Business capability implications	Gap in business capabilities required to achieve objectives
Stage 3	What type of skills?	Implications for types of skills needed
Stage 4	How many workers by skill type?	Modelling employment and skills demand
Stage 5	Skills supply gap	Gap between skills supply and types of skills needed
Stage 6	Proposed responses	Proposed response to future skills needs

Source: Modified from the ILO Skills for trade and economic diversification guide (Gregg et al. (2012)). Preliminary steps (P Stage 00-05) need to be carried out before executing the main study (stages 1-5).

AFW also implemented a common LMI framework to ensure that the SSCs follow the same approach in the collection, collation, analysis, and communication of the sectoral LMI. This also serves as a foundation in achieving the long-term objective of replicating the LMI system to other sectors in the future.

The AFW Common LMI model (Philippine Business for Education, 2021) was developed based on the basic structural elements of a Labor Market Information System (LMIS). It includes relevant institutions and functions to be performed and the required flow of information (see Figure 2).

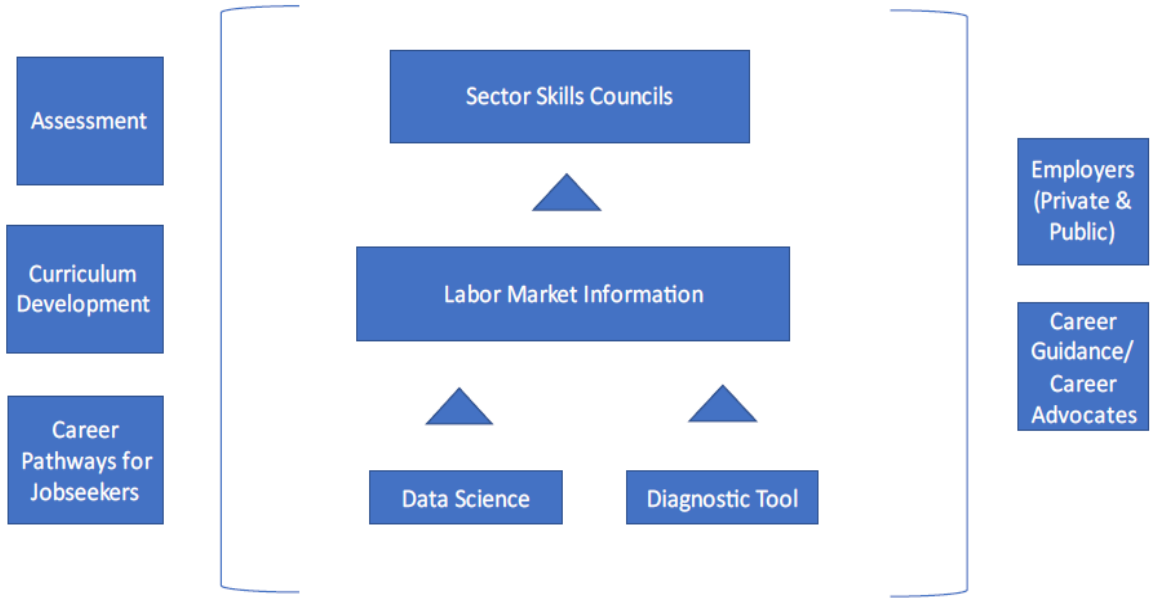


Figure 2: AFW Common LMI model

SSCs serve as the key actor of this model, with the **main objective of addressing job-skills mismatch**. The LMI model aims to inform and develop a standard skills development roadmap for the respective sectors.

The skills development roadmap will be established through 1) skills framework, and 2) policy standards from the SSCs. Skills frameworks can be updated every time there is a periodic assessment, while SSCs can set policy standards in the development of the skills roadmap.

Labor Market Information derived from a combination of quantitative, qualitative, and big data will enable the SSCs to plan and execute strategies that will address the job-skills mismatch.

The LMI model may be used by:

- **Career and employment practitioners,** both in the private and public sector, to understand the dynamic interplay between "supply" and "demand" in the labor market.
- **Guidance counselors and career advocates**, including career advisers and work coaches, to create career guidance programs based on career pathways, and to improve the career readiness skills of students and young professionals.
- **Course designers and curriculum developers** in considering the skills that will be needed in the future for those embarking on education and training programs.
- **Jobseekers and employers** to develop standard career assessments as a basis for acquiring or improving the required skills for the SSC.
- **Policymakers and planners** to develop strategies for the labor markets of the future. It will strengthen the linkages among the key actors in education, government, and industry.

By adopting the frameworks and steps highlighted in carrying out this LMI study, we also included novel approaches such as utilizing big data and marrying it with traditional quantitative and qualitative data for a more all-encompassing analysis of the sector. Figure 3 visualizes our simplified mixed-methods approach to our research study. The findings and insights from big data gathering were triangulated and integrated with focus group discussions (FGDs) and key informant interviews (KIIs) to achieve a harmonized and holistic view of the labor market.

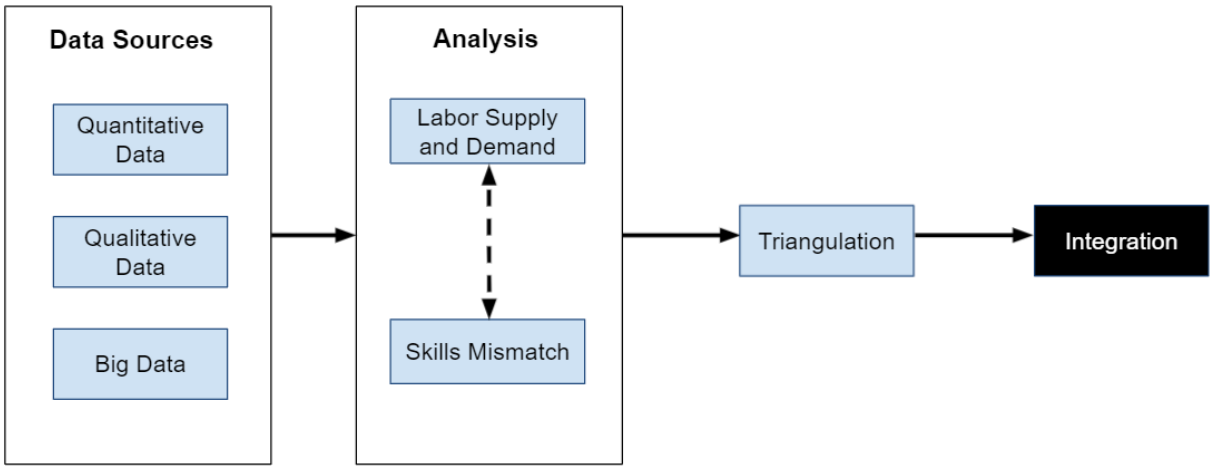


Figure 3: CirroLytix LMI Analytical Framework

In the following sections, we look more closely at the key elements of our LMI approach: Data sources, Data Analysis, Triangulation, and Integration (see Table 2).

Data Sources

Table 2: Summary of LMI Data Sources

	Big Data	Quantitative	Qualitative
Objective	Infer intention and characteristics of populations from digital traces. Surface contextual insights and behavior from anonymous and unprompted data gathering.	Quantify data and generalize results from a sample of the population of interest. Measure the incidence of particular occurrence, view, or opinion in a chosen sample.	Gain an understanding of underlying reasons or motivations. Uncover trends or provide insights into the setting of a problem.
Data Sources	Facebook API LinkedIn Webscraping	Secondary Data Sources AAP Survey SPARTA Surveys Analytics Curricula	FGDs KIIs Document Review

Data Points	Facebook API (6.4M FB Records) Webscraping (3000 Job Postings)	AAP Survey (215 Respondents) SPARTA Professional Maturity Survey (17,881 Respondents) SPARTA Industry Maturity Survey (11,784 Respondents) Government Statistics (CHED, POEA, ADB, PSA) MS Degree Programs Curricula (Ateneo, UP Diliman, AIM, UA&P, and Mapua)	FGD Transcripts - (19 Respondents) KII Transcripts - (16 Respondents) Document Review

Quantitative Data

Quantitative data was gathered through a combination of secondary sources (national statistics records), select Analytics curricula, and employment surveys. Two types of surveys were acquired: 1) a survey distributed amongst AAP members particularly designed for industry scanning and 2) surveys obtained from Project SPARTA to assess the Analytics job families, professional maturity, and industry maturity in the sector

A. Secondary data sources

The following secondary data were gathered to identify supply and demand for labor at a national level and industry level:

- Workforce Data – Asia Pacific Economic Cooperation (APEC) Projections, Asian Development Bank (ADB)
- Higher Education Institution (HEI) Graduates by Discipline – Commission on Higher Education (CHED)
- Labor Force Survey – Philippine Statistics Authority (PSA)
- Overseas Filipino Workers (OFW) Data – Philippine Overseas Employment Agency (POEA)

The collected data was used to assess labor status (surplus/shortage) and derive indicators on the labor market.

B. AAP Survey

The survey was disseminated via the AAP membership and sampled a total of 215 respondents. The questionnaire (see Appendices) was designed to gather information on the respondents': (1) Personal Information; (2) Job characteristics; and (3) Skills assessment. Location may entail differences in opportunities or requirements, profiles of the labor force, and/or access to tools or enablers in joining the workforce.

C. Project SPARTA Surveys

As Project SPARTA is the only massive initiative by the government and the private sector to train 30,000 Filipinos in Analytics, we saw it fit to use the data collected by the project for this LMI study. We requested access for the surveys rolled out by Project SPARTA from 2020-2021 through one of its

courses to assess learners' Professional Maturity, and their organization's Industry Maturity, based on the framework developed by AAP.

D. Analytics Curricula

We screened curricula of select Analytics degree programs being offered in the country, and mapped the courses (excluding elective and specialization courses) against the recommended Data Science and Analytics (DSA) Competencies by APEC By doing this exercise, we were able to initially assess how these degree programs fare in equipping the students with the necessary skills and competencies, and identify if there are gaps that need to be addressed.

The following Analytics graduate degree programs were sampled for comparison:

- **Ateneo de Manila University** – MS Data Science (MSDS)
- **Asian Institute of Management (AIM)** – MS Data Science
- **Mapua University** – Master in Business Analytics (MBA)
- **University of Asia and the Pacific (UA&P)** - Master in Applied Business Analytics (MABA)
- **University of the Philippines Diliman (UPD)** – Professional Master in Data Science (PMDS)

Big Data

Big data provides the opportunity to better understand labor market dynamics at a more granular level and monitor skill needs and trends in real-time. The team implemented two methods of data sourcing: 1) Webscraping of job postings to capture data on demand for skills by employers in the Analytics sector and 2) Social Media Interests via Facebook Marketing API to identify estimated count of potential labor supply in a point of interest.

A. Webscraping of Job Postings

A sample of 827 job postings were scraped from LinkedIn using the Analytics job roles: (1) Data Scientist, (2) Data Analyst, (3) Analytics Manager, (4) Data Steward, and (5) Data Engineer as keywords and analyzed for top skills and needs.

B. Social Media Interests via Facebook Marketing API

With Facebook being the most widely used social media platform in the country, it has the capability of reaching a representative audience in the Philippines (approx. 81m FB accounts out of a total population of 111m). In this study, we used the Facebook Marketing API to estimate interest in the sector in all regions of the Philippines by measuring audience sizes for the related keywords: (1) Analytics; (2) Data Science; and (3) Artificial Intelligence. The resulting target population count was used as a proxy for public interest in each given location.

Qualitative Data

From July 2021 to September 2021, we conducted a series of KIIs and FGDs with a total of 35 participants representing key actors in the labor market – Demand, Supply, and Enablers across the Analytics sector in the Philippines. In the interest of the safety of the participants and facilitators, the team had to take precautions against the ongoing COVID-19 pandemic, and conducted the study remotely. We structured our process workflow as shown in Figure 4.

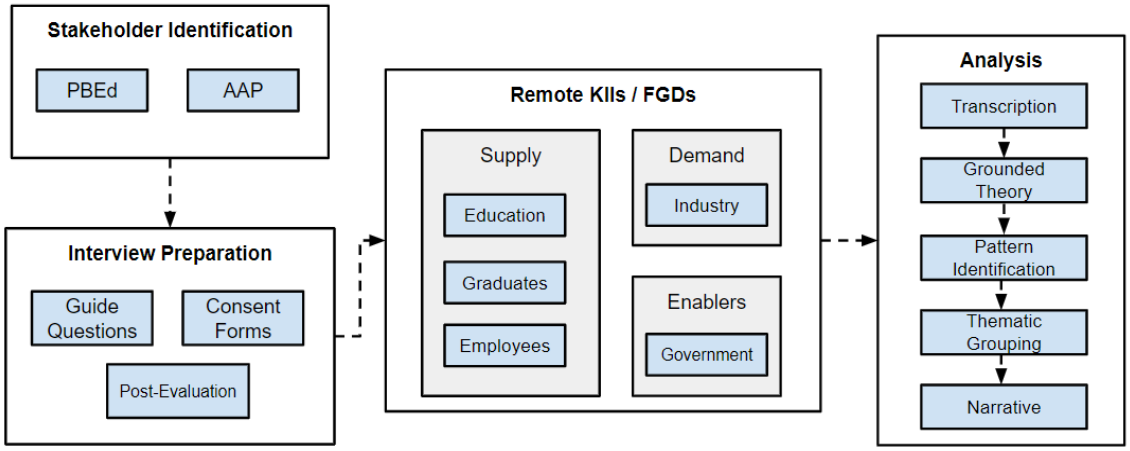


Figure 4: Process workflow of qualitative data collection and analysis

We initially categorized our participants according to three major groups: Education, Government, and Industry. Employees or Working Professionals across different industries, and Analytics job families comprised the fourth group. The fifth group was composed of graduates of Analytics-related courses from select institutions and training providers.

The first three groups of participants were invited for KII and FGD sessions, while the last two groups participated in separate FGDs. We purposely recruited our participants through collaborative efforts with AAP and PBEd, and our team's professional connections.

All interview sessions were conducted through online video-conferencing platforms like Zoom and Microsoft Teams, and usually lasted one to two hours. Each session was recorded to ensure an accurate transcript is saved for documentation. The sessions followed a standard format set by the team – one that began with reminders for the consent form, introduction by the facilitator of the team and the study, and setting the ground rules. This was followed by the meat of the discussion, and then concluding the session by asking the participants to answer post-session evaluation form. The questions for the interview were tailored according to the profile and group the participants belonged to (see Appendix for Guide Questions).

All transcripts were analyzed by drawing from the grounded theory (Chun et al, 2019). Transcripts were manually coded by highlighting sections of text – either phrases or sentences to initially describe their content or idea. Once codes were generated, patterns were identified to come up with themes. Codes were either turned into a theme or combined with other codes to create a theme.

The thematic analysis aims to interpret themes from the FGD and KII sessions and discover patterns and develop themes that emerged throughout the FGD and KII sessions. For this study, we uncovered themes to understand views and perceptions on job/skills mismatch, and job/skills fit in the Analytics sector. The results will be linked and supplemented to other parameters in the study (results of quantitative and big data analysis).

Data Analysis

We analyzed quantitative and big data using descriptive and diagnostic statistical methods, which described the present state of the labor market, along with the underlying events and stories behind it. Furthermore, topic models were used to uncover and identify clusters of words associated with job positions, as well as to determine the most frequent terms found in skill requirements. Topic modelling organizes, and offers insights to understand large collections of unstructured text contents.

Thematic analysis of qualitative data was used to fill gaps or to better understand and interpret quantitative and big data.

Triangulation

Triangulation of results from the analysis of the three main data sources was done to harmonize insights, and to assess how results from qualitative data analysis supplement or support the results from quantitative data and big data analysis. This stage aims to harmonize insights and gain a deeper understanding of the dynamics of the labor market.

Integration

Integration of analysis of qualitative, quantitative, and big data is a vital step in achieving congruence, and deriving insights on the overall status of the current labor market. At this point, we evaluated all aspects of the sector - workforce and the contexts from which the availability of employment and skills are determined, the specific demand for skills; issues related to supply for skills; and policies and key regulations that impact the labor market.

An extrapolation was employed to estimate the Analytics workforce in the country from 2000 to 2028 using APEC estimates, CHED data, and assumptions on migration and unemployment from PSA data.

Estimation of the Analytics Workforce

To determine the prospects for the Analytics labor force, this study made use of statistical fitting to generate projections from 2000 to 2028. The base trend of the Analytics labor force was anchored using the APEC workforce projections between 2016 and 2022 (APEC Human Resource Development Working Group, 2017). The remaining years of the base trend were estimated by solving for a likely participation rate of CHED graduates from relevant disciplines to arrive at the APEC projection. Finally, the input-output tables were solved using a migration rate and unemployment rate from PSA.

For relevant HEI disciplines, the calculation used CHED figures for Mathematics, Information Technology (IT), Business, Engineering, Natural Science, and Social Science graduates. Figure 5 summarizes this process.

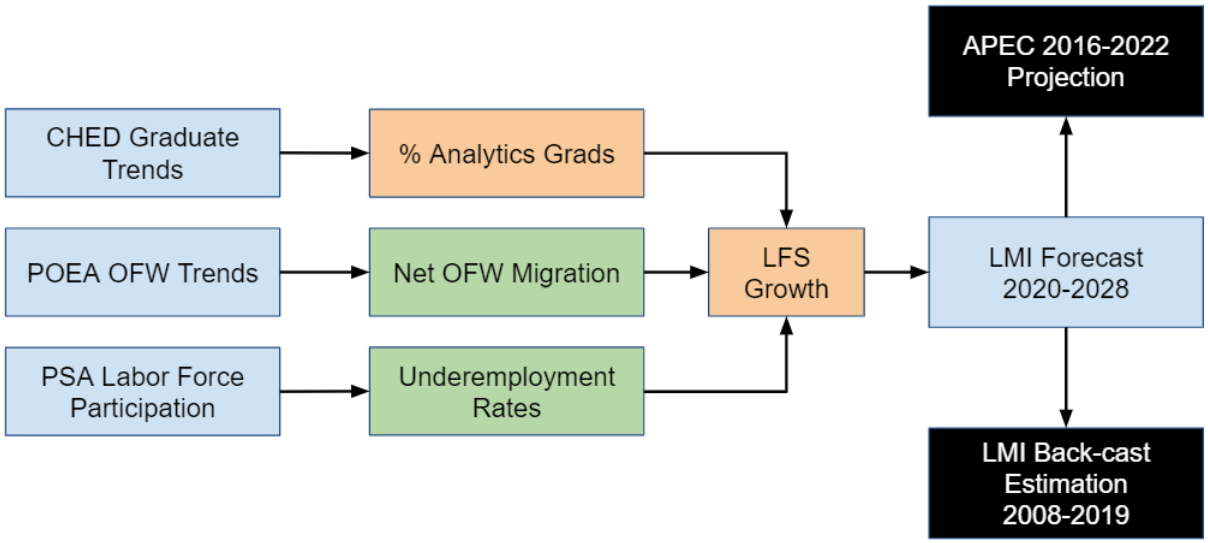


Figure 5: Estimating the Analytics workforce

Related Work

A handful of existing local studies have touched on skill needs and status of the analytics workforce. In 2018, the Department of Labor and Employment – Bureau of Local Employment (DOLE-BLE) identified Data Scientist, one of 13 occupations, as an emerging job through the JobsFit 2022 LMI report. Emerging jobs are defined as "occupations that are relatively new to the list of in demand and hard-to-fill occupations and do not exist in the labor market force before." These occupations are created because of technological advancements having significant impact on work.

The Technical Vocational Education and Skills Development Authority (TESDA) has also recognized Data Analytics and Artificial Intelligence under the IT Business Process Management (IT-BPM) sector as one of the emerging jobs/skills needed in the new normal given the situation of COVID-19 pandemic (TESDA, 2020).

With lockdowns imposed as preventive measures for COVID-19, companies are forced to adapt remote work options thus, opening up more freelance opportunities and work-from-home (WFH) arrangements across sectors including Data Science and Analytics (DOLE-BLE, 2020).

Quismorio et al (2019) assessed whether the existing curricula of Data Science and Analytics (DSA) undergraduate degree programs in the Philippines met the competency requirements of the industry. The study indicated that DSA competencies in the current workforce are scarce, and that there is misalignment between supply and demand of DSA roles. As employers are looking for graduates capable of performing the role of a functional analyst, HEIs are producing graduates that would fit more of the role of data engineers.

Quismorio provided two main recommendations: 1) the use of AAP's framework to define the Data Science and Analytics profession, and 2) the promotion of industry-academe-government linkages.

Sector Position and Outlook

This section describes the trends, features, and terminologies that flesh out the nature of the emerging Analytics industry today. With data being the catalyst for disruption, it is important to understand its role in the Fourth Industrial Revolution, its lifecycle and how it relates to Analytics, and look back at a couple of milestones that have shaped the Analytics discipline into a budding sector today in the Philippines. At the forefront of this revolution is the Analytics sector, paving the way for more job opportunities resulting from the rising demand for data skills.

The Fourth Industrial Revolution

First coined by the World Economic Forum in 2015, the Fourth Industrial Revolution (4IR) is now a fundamental trend that is powering industry with the development and adoption of breakthrough technologies that include artificial intelligence, 3D printing, robotics, and internet of things. The previous industrial revolutions were Water and Steam (First), Electricity (Second), and IT Automation (Third) (Schwab, 2016).

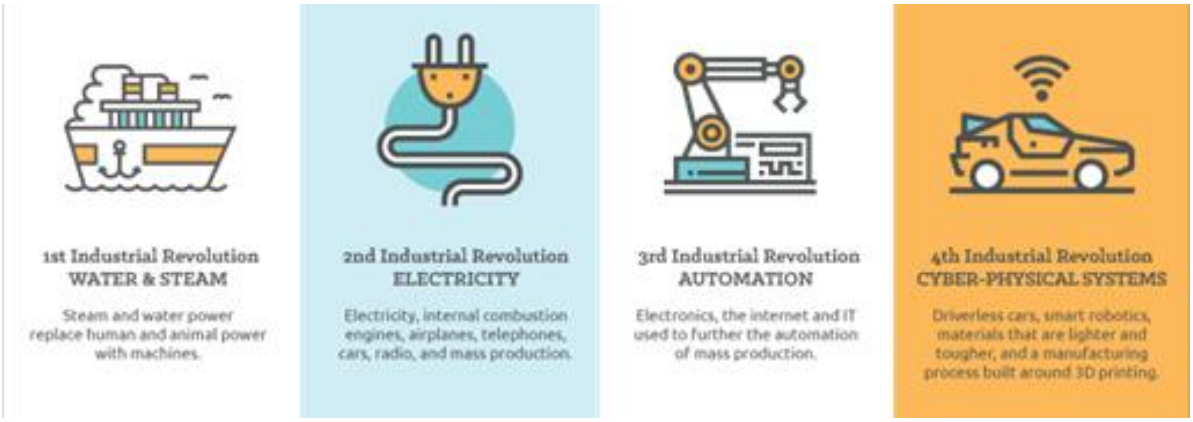


Figure 6: Industrial revolutions (Schwab, 2016)

This broad trend is further defined by themes that include the maturation of cyber physical technologies, data analytics driving new business models, pervasive sensing and actuation, ubiquitous connectivity, and unprecedented levels of data (Goenaga, Radtke, Speicher, & Westinner, 2017).

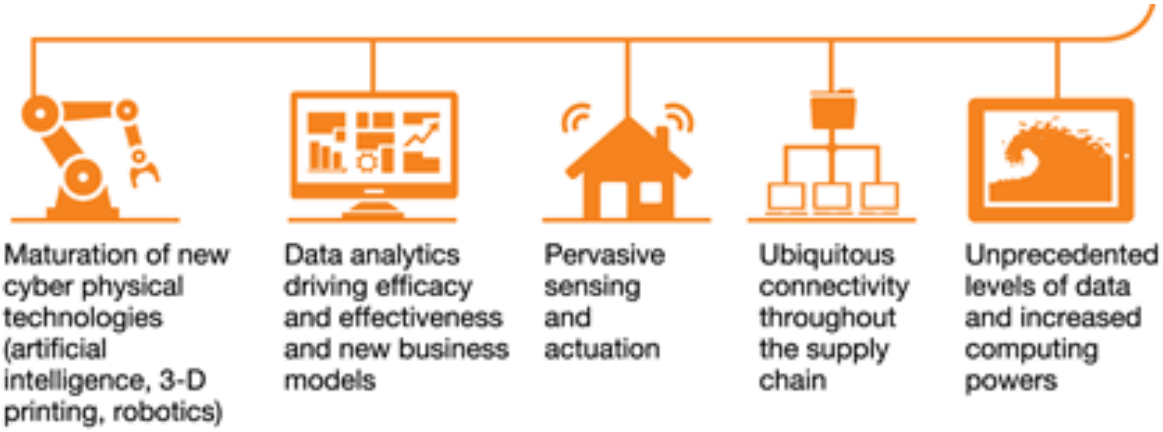


Figure 7: 41R themes (Goenaga, Radtke, Speicher, & Westinner, 2017)

While data had emerging roles in the previous industrial revolutions, it was not until the mainstream availability of the internet in the late 1990s that this became explicit. Until then, data was merely treated as an outcome of business processes.

The 4IR however puts data on center stage, which makes it necessary for organizations to take a deliberate approach in making data the prime mover in all their strategies.

Data Value Chain

It is helpful to look into how data progresses as captured by the Data Value Chain (DVC). The DVC traces the journey of data through a process of transformation into actionable insight that drives business value. Each phase in the chain is self-contained and managed by separate groups of individuals with specific skills and competencies (Ligot, 2017).

- Data Source – acquiring data from source systems, public data feed
- Data Repository – storing and processing the collected data to prepare it for use
- Data Analysis – consumption of data stored and preparation of reports, models, algorithms
- Data Application – translation of outputs of data analysis to make decisions

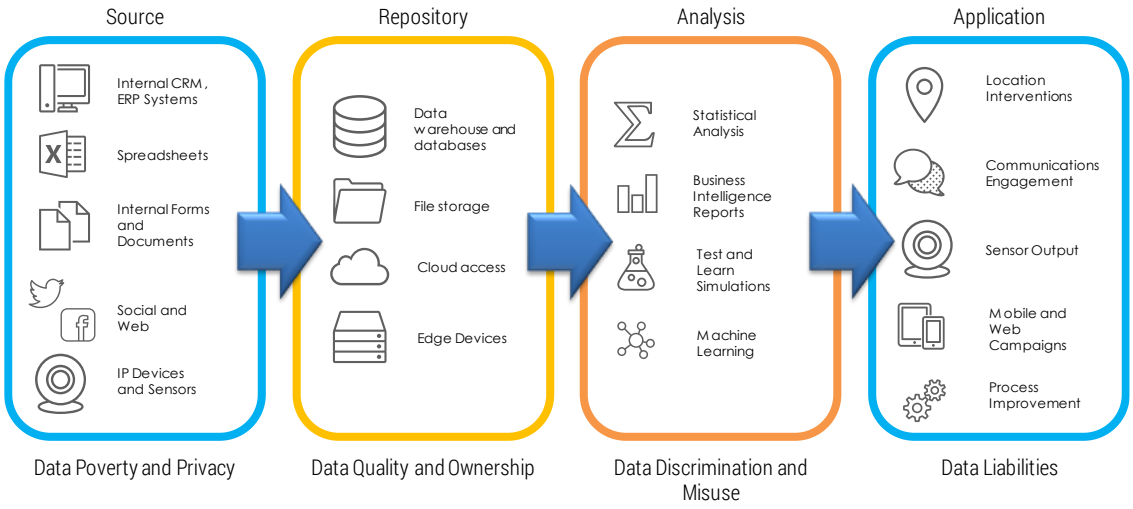


Figure 8: The Data Value Chain

At the same time, DVC also highlights ethical challenges related to data:

- Data Poverty – Is data available? Is it complete? Is it readily extractable?
- Data Privacy – Are personally identifiable information exposed? Are the owners of the data cognizant of its use?
- Data Quality – How complete is the data? Is there miscoded information? Is the data verified?
- Data Ownership – Have permissions been obtained for the use of the data? Has personal data been anonymized before use?
- Data Discrimination and Misuse – Are the reports truthful? Do models and algorithms fairly represent reality? Will decisions impinge on human rights or violate regulations?
- Data Liabilities – Who are accountable for the outcomes of data-driven decisions? What kind of recompense is provided if damages arise from data-driven outcomes?

Defining Analytics

While no clear-cut definitions exist for Analytics, one thing remains constant - Analytics is the practice of managing data. It is the data profession. This LMI takes on the AAP definition that is, "Analytics progresses data along the value chain as it transforms data to information to insight to imperatives (or actionable insights) with the purpose of delivering the right decision support to the right people and digital processes at the right time for the greater good" (Pelayo, 2019).

Analytics is also often defined by the specific use or objective related to data. The Gartner Analytics Ascendancy Model (GAAM) assesses the data maturity of an organization against four types of Analytics.

Table 3: Four types of Analytics based on GAAM (Eriksson, et. al., 2020)

	Descriptive Analytics	**Diagnostic Analytics**	**Predictive Analytics**	**Prescriptive Analytics**
Question it answers	*What happened?*	*Why did it happen?*	*What will happen?*	*How can we make it happen?*
Intervention	Collecting data, generating reports, graphs, charts, answers the question	Understanding trends, insights,	Modelling, forecasting	Decision-making

In the GAAM, an organization has reached the highest maturity level in the framework when it has the mindset and comprehensive capabilities to fully utilize data.

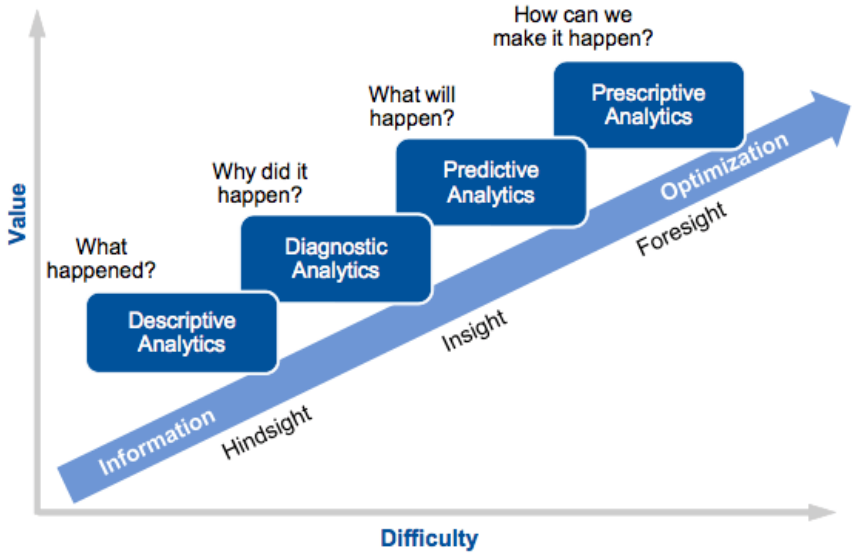


Figure 9: Gartner Analytics Ascendancy Model (Schaap, 2020)

Analytics Process Methodology

The practice of Analytics is also defined by a specific process of inquiry and implementation. The Cross Industry Standard Process Model for Data Mining (CRISP-DM) maps out the lifecycle of an analytics project, featuring the typical phases, the tasks, and relationships between the tasks (Chapman, et al., 1999). Methodological frameworks such as CRISP-DM help define the typical Analytics work environment and has implications for skills required from practitioners.

The following are the key steps of the CRISP-DM model:

- Business Understanding – this phase focuses on understanding project objectives and business requirements to convert them into analytics problem definitions and a plan designed to achieve the solution.
- Data Understanding – This phase covers data collection and exploratory data analysis to uncover data quality problems, and surface preliminary insights.
- Data Preparation –This phase transforms raw data into a form that will make it useful for analytical modeling, including feature selection and addressing quality issues.
- Analytical Modeling – This phase is where various modeling techniques and algorithms are applied and calibrated to produce the required insights and modeling outputs.
- Model evaluation – Once the analytical models are prepared, the quality of the output is reviewed (e.g. accuracy, fit) and assessed against business objectives (e.g. does the model predict the outcomes sought, do the variables describe the phenomena). Several models may be benchmarked against each other for applicability.
- Model deployment – This last phase implements the model into existing business process as an intervention.

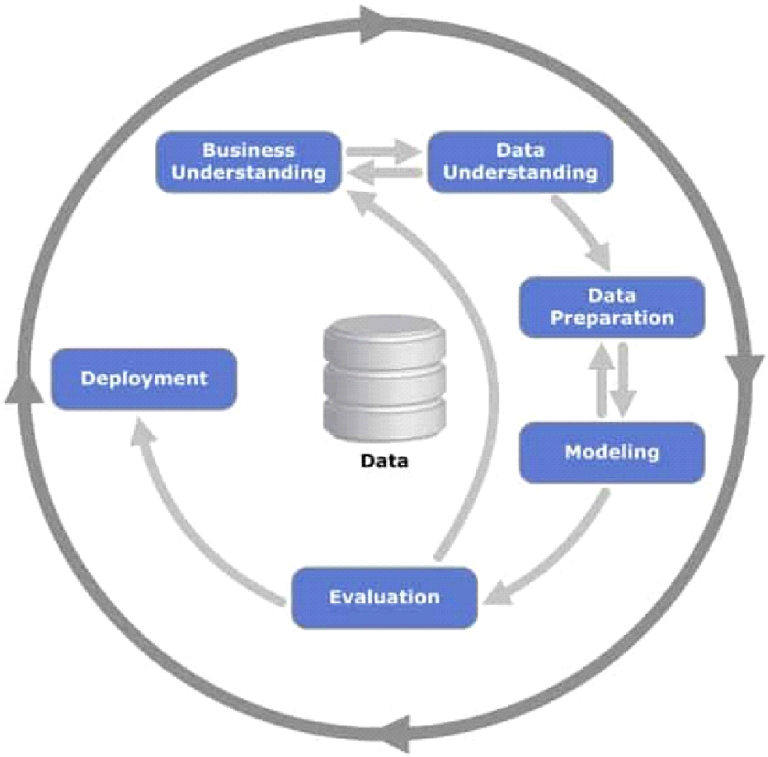


Figure 10: CRISP-DM Reference Model

Rise of Analytics

There has been an observed increase in public interest in Analytics in the Philippines. Google Search Trends for terms: “data analytics”, “data science”, and “machine learning” have experienced upward trends of seven years from 2014 to 2021.

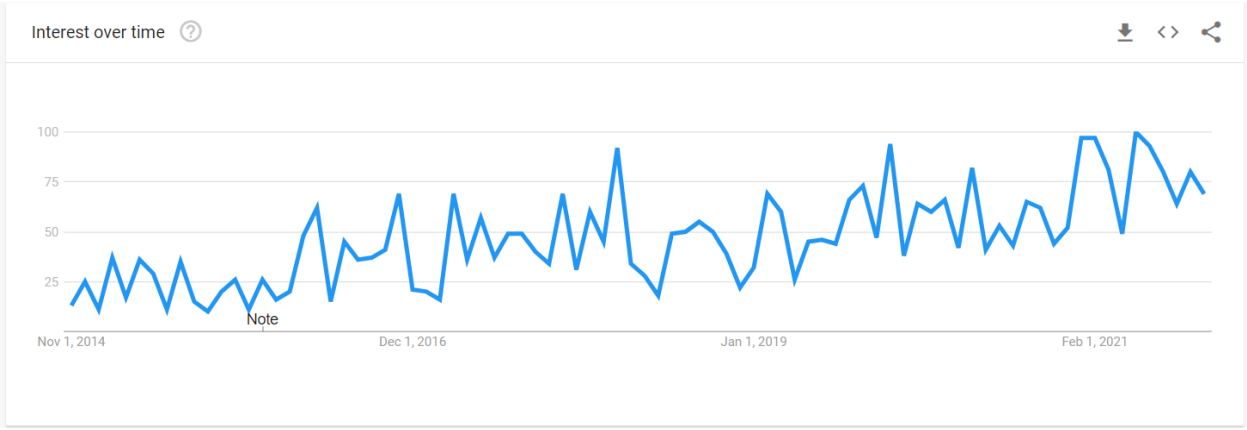


Figure 11: Search interest trend for “data analytics” in Philippines

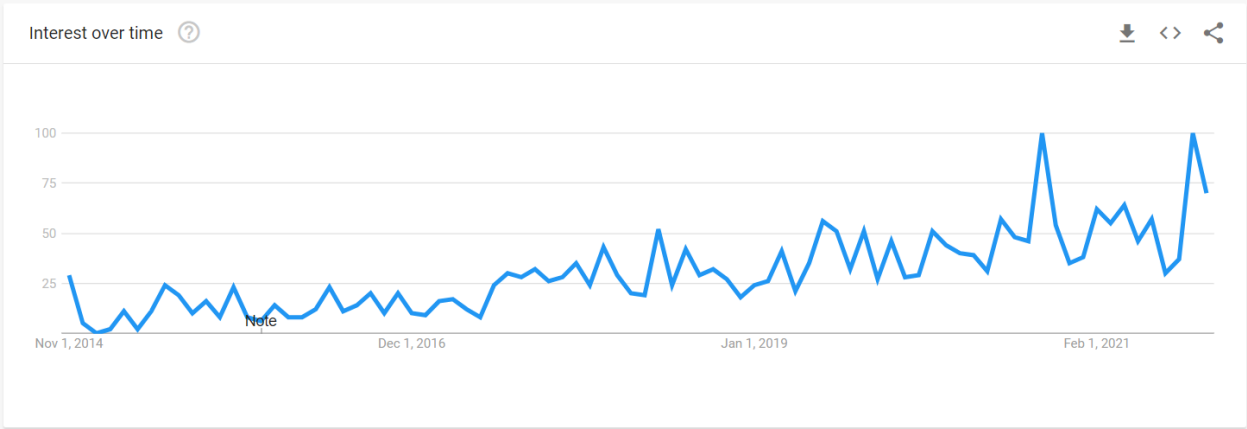


Figure 12: Search interest trend for “data science” in Philippines

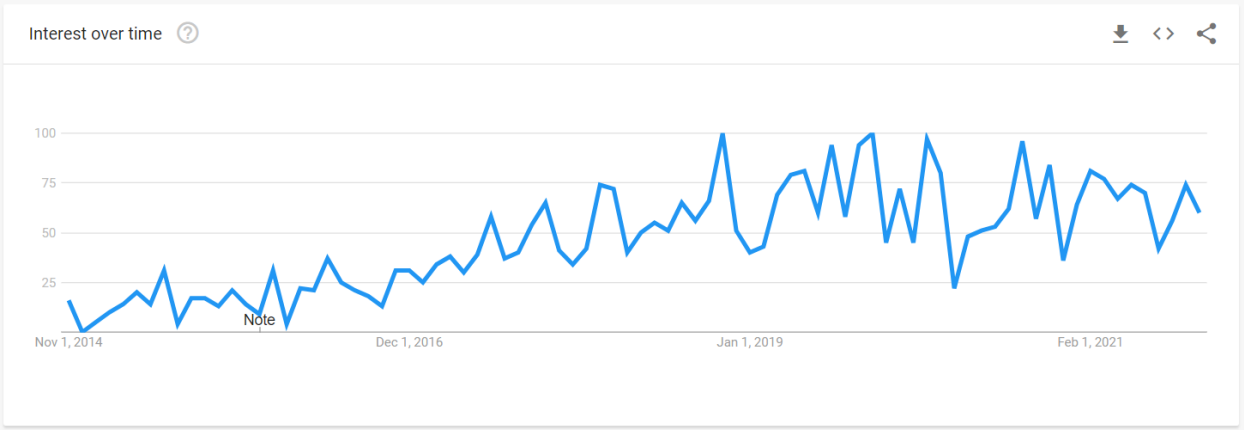


Figure 13: Search interest trend for "machine learning" in the Philippines

APEC Projection

In 2017, the Asia Pacific Economic Cooperation Human Resource Development Working Group reported a high demand for skills in Data Science and Analytics (DSA), but also mentioned a lacking supply in talent. The APEC data summarized in Table 4 projected a dramatic increase of required DSA workers in the Philippines at 131% change from 2016 (147,420) to 2022 (340,880), representing a net increase of nearly 200,000. At the same time, an increase of 370,000 workers is expected in the United States, which could have downstream impacts to skills demands in the Philippines business process outsourcing industry.

Table 4: Projected Data Science and Analytics (DSA) workforce demand in select countries

Economy	Current DSA Workers	Projected DSA Workers Needed	Percent Change
Malaysia	4,000 (Year 2016)	20,000 (Year 2020)	400%
Philippines	147,420 (Year 2016)	340,880 (Year 2022)	131%
Singapore	9,300 (Year 2015)	15,000 (Year 2018)	61%
United States	2,350,000 (Year 2015)	2,720,000 (Year 2020	16%

Source: APEC Human Resource Development Working Group (2017)

Analytics Association of the Philippines

The Analytics Association of the Philippines (AAP) is a non-stock non-profit professional membership organization founded in 2018. AAP's mission is to:

Develop the ecosystem that makes the Philippines a data-driven country, globally competitive in Analytics, and a leading source of Analytics talent, for the good of society.

As part of its mission, AAP has been lobbying for a shared common definition of Analytics as well as defining a set Analytics job families with corresponding skills and competencies. These definitions

were encapsulated in professional and organizational maturity models published and promoted by AAP (Pelayo, 2019).

As of 2021, AAP has a total of 210 associate members, 44 corporate members, and 8,385 followers on Facebook.

AAP Professional Maturity Framework

10 Recommended APEC DSA Competencies

The AAP Professional Maturity Framework is directly inspired by outcomes of APEC's "Data Analytics Raising Employment" (APEC Project DARE), which championed a set of ten (10) Data Science and Analytics Competencies to serve as a common standard to identify skills needed to develop a competitive data workforce. These competencies are grouped into three sub-categories: Business and Organizational Skills, Technical Skills, and 21st Century Skills.

Business and Organizational Skills

- **Domain Knowledge & Application.** Apply domain-related knowledge and insights to effectively contextualize data, achieved by practical experience and exposure to emerging innovations.
- **Data Management & Governance.** Develop and implement data management strategies, incorporating privacy and data security, policies and regulations, and ethical considerations.
- **Operational Analytics.** Use general and specialized business analytics/intelligence techniques for the investigation of all relevant data to derive insight for decision-making.
- **Data Visualization & Presentation.** Create and communicate compelling and actionable insights from data using visualization and presentation tools and technologies.

Technical Skills

- **Research Methods.** Utilize the scientific and engineering methods to discover and create new knowledge and insights.
- **Data Engineering Principles.** Use software and system engineering principles and modern computer technologies to develop data analytics applications.
- **Statistical Techniques.** Apply statistical concepts and methodologies to data analysis.
- **Data Analytics Methods & Algorithms.** Implement and evaluate machine learning methods and algorithms on the data to derive insights for decision-making.
- **Computing.** Apply information technology, computational thinking, and utilize programming languages and software, and hardware solutions for data analysis.

Workplace Skills

- **21st Century Skills.** Exhibit cross-cutting skills essential for Analytics at all levels, including but not limited to: collaboration, ethical mindset, empathy, social and societal awareness, dynamic (self) re-skilling, and entrepreneurship.

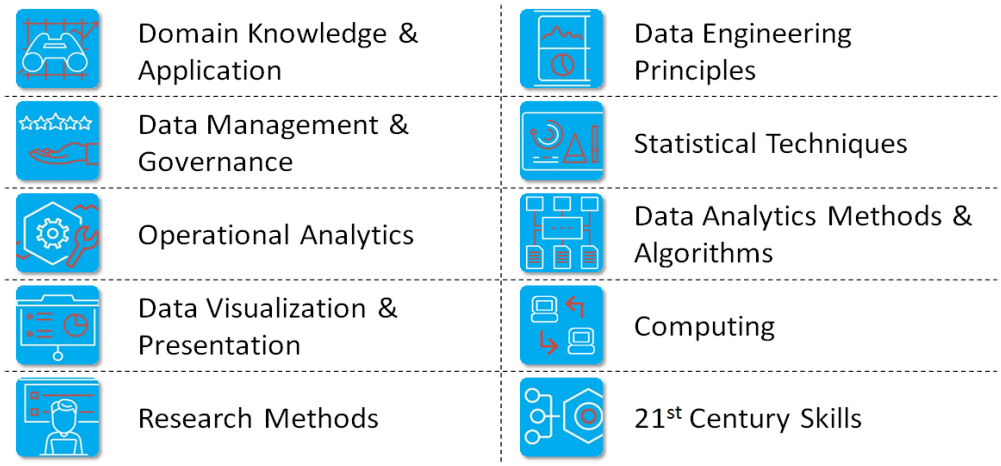


Figure 14: Recommended DSA competencies by APEC

Analytics Job Families

The original APEC DARE nomenclature was further distilled into a professional maturity framework which defined five analytics job families (Pelayo, 2019). These roles form the basis for organizations building an analytics team (see Figure 15).

The five job families include:

- **Data Steward** – Develops, enforces, and maintains an organization's data governance process to ensure that data assets provide the organization with high-quality data.
- **Data Engineer** – Designs, constructs, tests, and maintains data infrastructures including applications that extract, clean, transform, and load data from transactional systems to centralized data repositories
- **Data Scientist** – Leverages statistical techniques and creates analytical models to derive new insights from quantitative and qualitative data.
- **Functional Analyst** – Utilizes data and leverages on derived insights to help organizations make better decisions on a specific functional domain.
- **Analytics Manager** – Develops and guides data-driven projects, from initiation to planning, execution to performance monitoring, to closure.

	Data Steward	Data Engineer	Data Scientist	Functional Analyst	Analytics Manager
Role	Develops, enforces, and maintains an organization's data governance process to ensure that data assets provide the organization with high-quality data	Designs, constructs, tests, and maintains data infrastructures including applications that extract, clean, transform, and load data from transactional systems to centralized data repositories	Leverages statistical techniques and creates analytical models to derive new insights from quantitative and qualitative data	Utilizes data and leverages on derived insights to help organizations make better decisions on a specific functional domain	Develops and guides data-driven projects, from initiation to planning, execution to performance monitoring, to closure.
Field	• Business • Industry	• Information Technology • Information Science • Computer Science	• Mathematics • Statistics	• Business • Industry	• Project Management
Titles	• Data Privacy Officer • Data Security Officer • Data Governance Manager • Data Curator • Data Librarian	• ETL Developer • Data Architect • Data Warehousing Professional • Big Data Engineer	• Statistician • Statistical Modeler Advanced Analytics Professional	• Research Analyst • HR Analyst • Marketing Analyst • Financial Analyst • Operations Analyst	• Chief Data Officer • Project Manager • Data Engineering Manager • Data Science Manager • Analytics Translator

Figure 15: Five major Analytics job families

Project SPARTA

In 2020, the Department of Science and Technology Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD), in partnership with Development Academy of the Philippines (DAP), AAP, and Coursebank launched Smarter Philippines Through R&D, Training and Adoption (SPARTA). The program was designed to put in place the necessary education, research and development mechanisms to not only enable the Data Science and Analytics industry but also to advance smart governance practices (SPARTA, 2020).

Project SPARTA aims to produce 30,000 learners in data science, analytics, and related fields through online learning, and foster a community of data science and analytics practitioners through engagement activities such as conferences, hackathons, and online data challenges. SPARTA's three-point objective (see Figure 16) is to provide a sustainable supply of knowledge workers, improve the availability and ease of access of key public datasets to power R&D, and make way for targeted data science and analytics-enabled R&D projects aligned to government, private sector, and academia priorities (AAP, 2019).

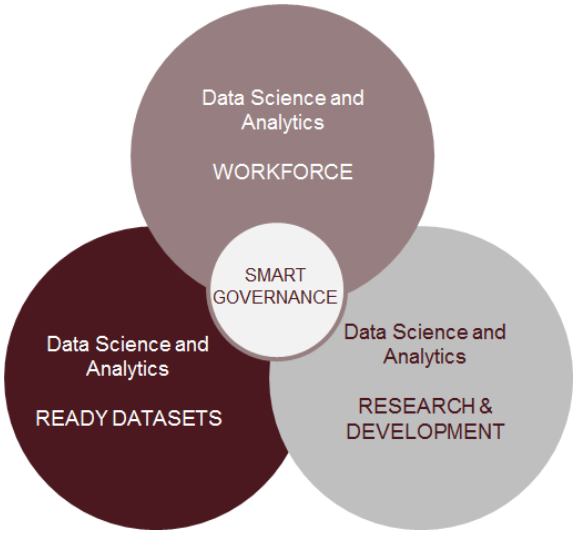


Figure 16: Project SPARTA objectives

COVID-19 Pandemic

To date, the ongoing COVID-19 pandemic continues to be a public health and economic crisis in the Philippines. In 2021, the country experienced two surges in COVID-19 cases from March-April and again from August-September. Around the time of both surges, unemployment rate was reported at 8.7% and 8.9% in April and September, respectively (PSA, 2021) which were marked increases from 2019 levels (5.1%). As of this report case counts have abated alongside government efforts to step up public vaccinations. Despite this bleak backdrop, demand for Analytics jobs remains high, attracting job seekers towards pandemic-resilient professions.

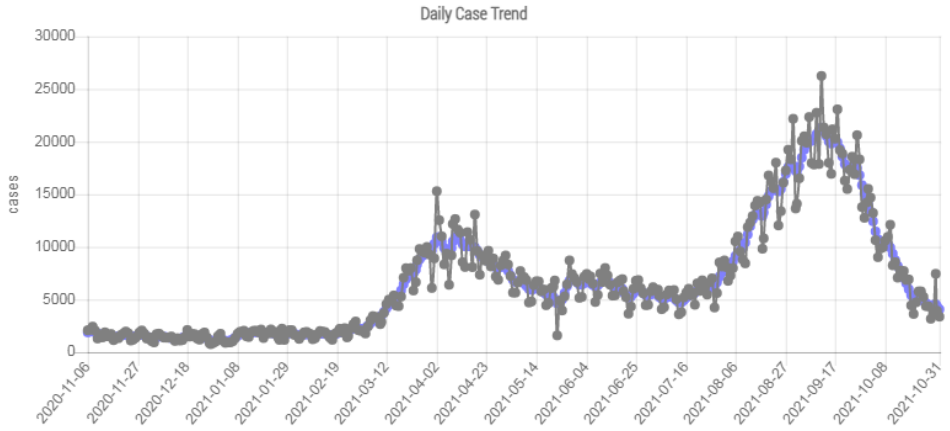


Figure 17: Philippine COVID-19 case surge in 2021 (L4H, 2021)

National Artificial Intelligence Roadmap

In 2021, the Department of Trade and Industry (DTI) launched the country's Artificial Intelligence (AI) Roadmap. The objective of the Roadmap is to be a guide for codifying and devising a strategy of national preparedness to maximize the benefits from employing AI technologies and developing AI economies, and also being mindful of the potential consequences and impacts of algorithms to processes and business models (DTI, 2021).

The roadmap prescribes (7) key imperatives and (42) strategic tasks that need to be pursued to cover four (4) dimensions of the national strategy:

- Digitization and Infrastructure
- Research and Development
- Workforce Development
- Regulation

The roadmap includes two (2) pillars in its structure based on the Global AI Index - Innovation and Implementation, and highlights the creation of a National Center for AI Research (NCAIR), which will house research scientists and engineers serving as the country's hub for AI research.

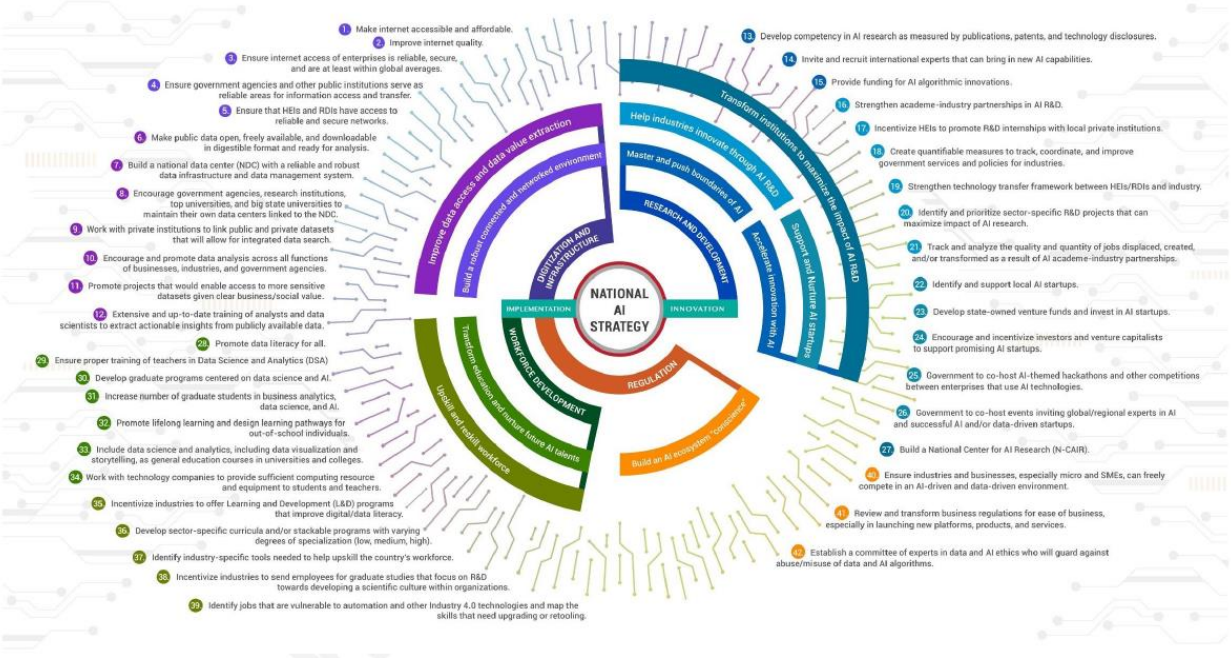


Figure 18: Philippines National AI Strategy (DTI, 2021)

Sector Indicators

This section provides the prevailing economic conditions against which we assess the labor market for Analytics. We also feature indicators from data gathered to establish the industry, community, and geographical distribution of the Analytics labor market.

Philippines Economic Indicators

National Level Statistics

The country has been experiencing continuous growth since 2016 with an average of 8.8% Real gross domestic product (GDP) growth until 2019 (Figure 19). Due to the pandemic, real GDP was down by 8.1%. Effectively, the labor force decreased by 0.7%

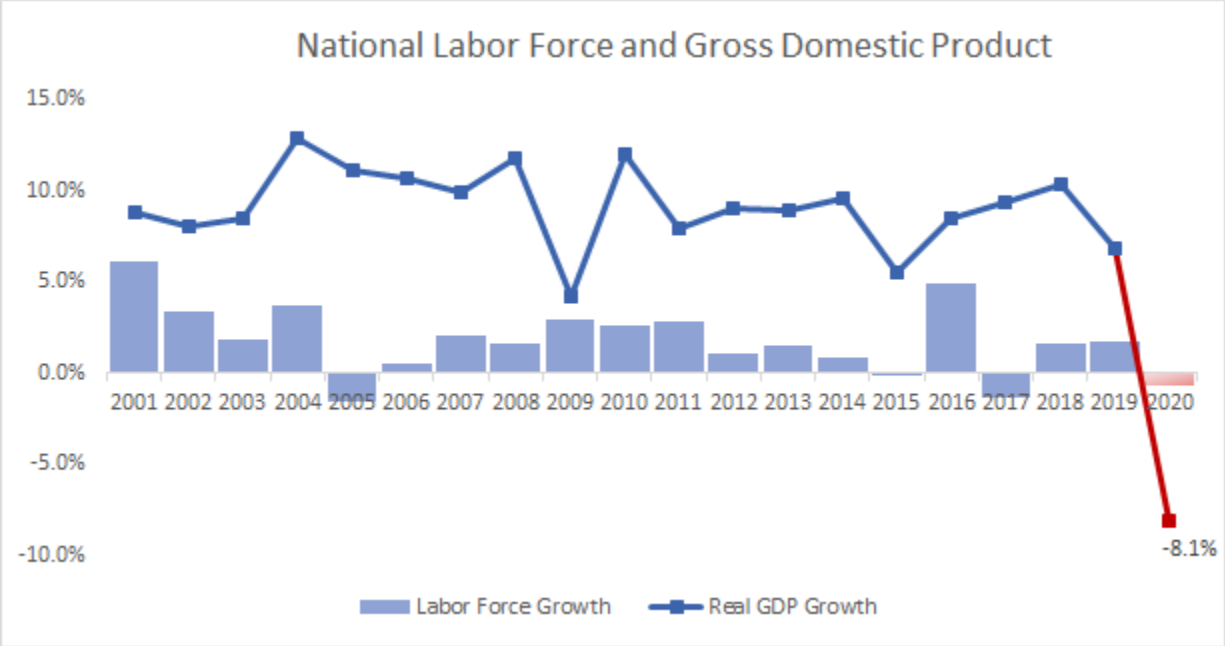


Figure 19: Annual National Labor Force Rate and GDP (PSA, 2021)

The decrease in the labor force can be attributed to the massive increase in unemployment rate at 10.26% (Figure 20), represented by an approximately 98.8% increase in the number of unemployed (2.2 million) from 2.3 million in 2019, to 4.5 million in 2020. Considerably, the impact on labor force participation was not as immense with a decline of 2%.

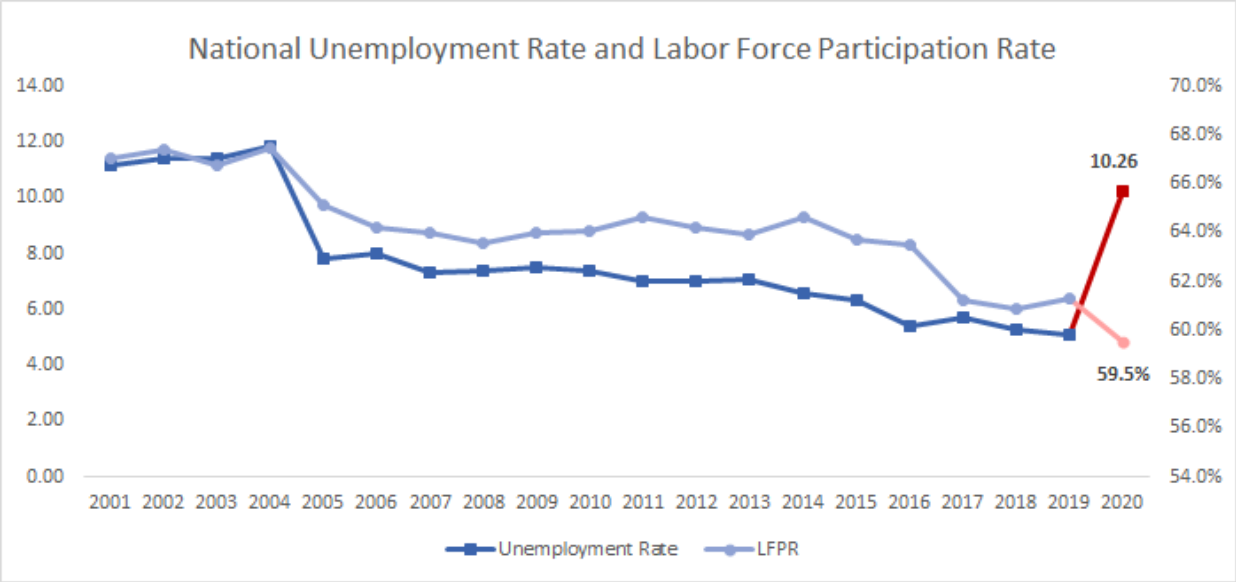


Figure 20: Annual National Unemployment Rate and Labor Force Participation Rate (PSA, 2021)

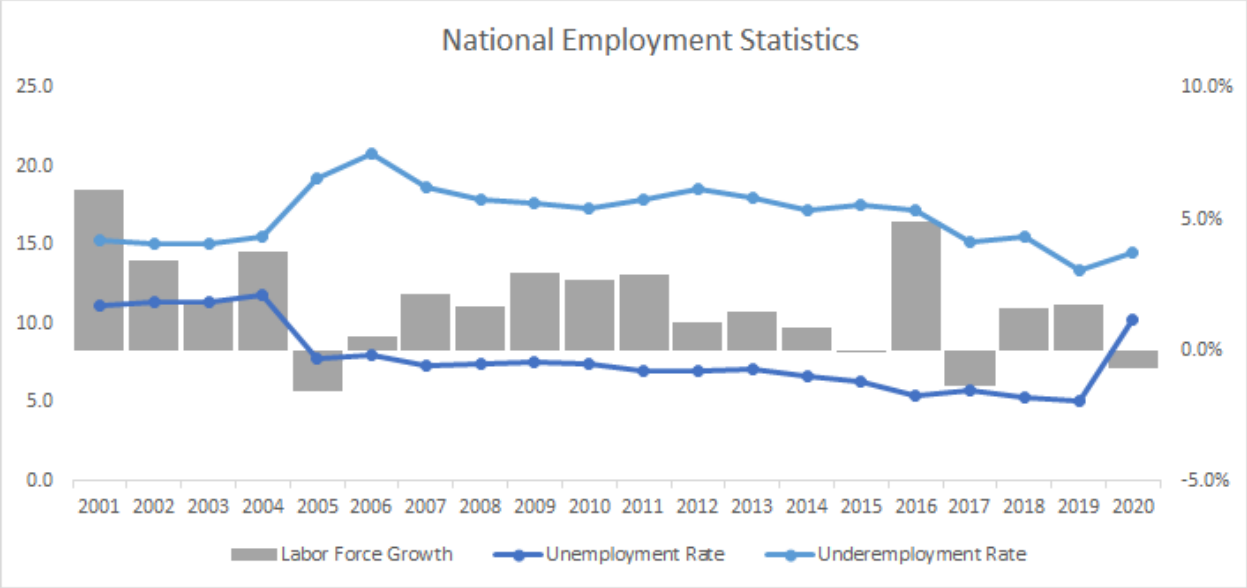


Figure 21: Annual growth of National Employment Indicators (PSA, 2021)

Sectoral Level Statistics

The Information and Communications covers computer programming, consultancy, data processing, hosting, web portals, and other related activities, which could represent analytics activities.

The Information and Communication (IC) sector, which represents roughly three percent (3%) of the total GDP, showed a growth of 5.3% in Gross Value Added (GVA) in 2020 (see Figure 22).

The Communication subsector, which represents 92% of the total IC sector, experienced growth in GVA at 7.1%. Such growth counterpoised the decline of 11.6% GVA in the Information & Publishing subsector, which represents only 8% of the total IC sector (see Figure 23).

Notably, the number of employed people under the IC sector experienced a massive decline at 17.8%.

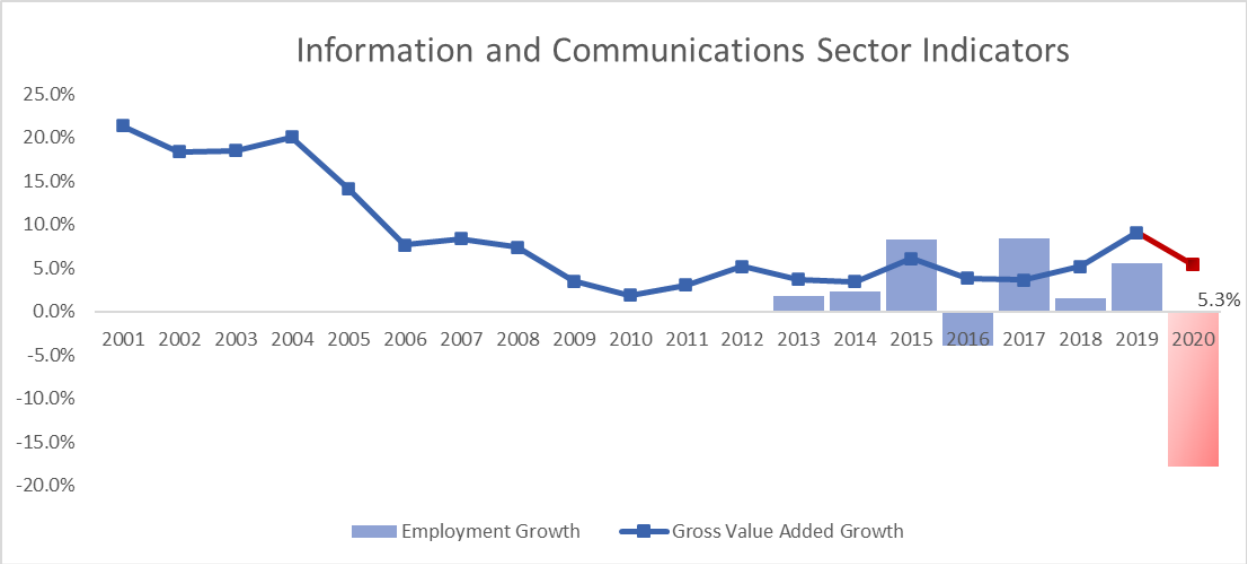


Figure 22: Annual growth of Information and Communications Indicators (PSA, 2021)

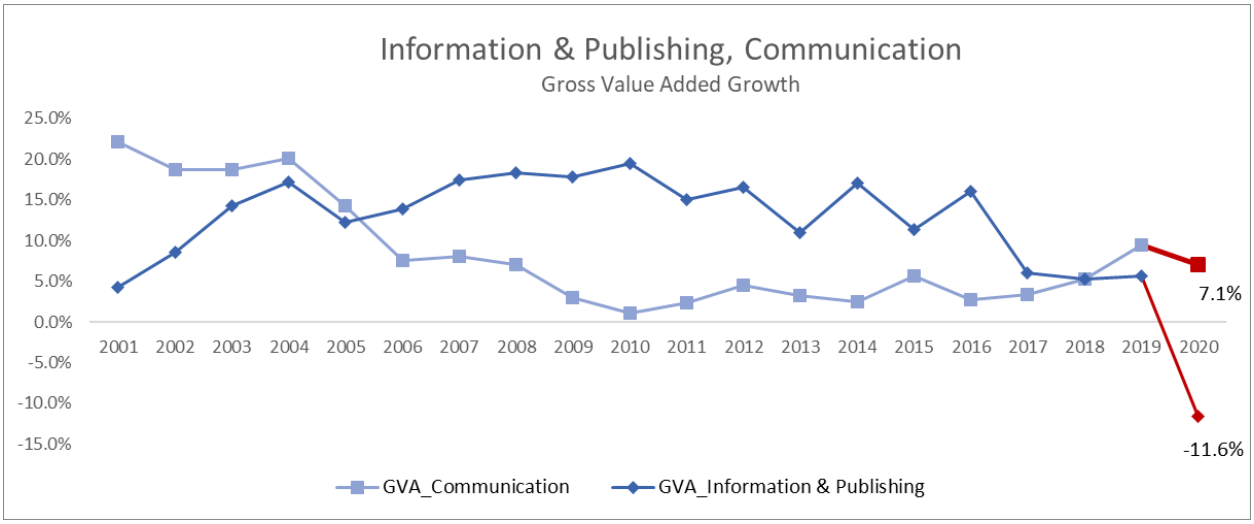


Figure 23: Annual GVA growth of Information & Publishing and Communications sub-sectors (PSA, 2021)

Industry Distribution of Analytics Jobs

Sampled job postings from social media platform LinkedIn provided the distribution of jobs as they appear in the market today. Out of the 827 job postings sampled, at least one-third came from the IT & Services industry. These include data technology providers and business processing outsourcing (BPO) firms. Financial Services industry was a close second. It was noted in the FGDs that many leaders in the Analytics industry have had stints in Financial Services.

Table 5: Distribution of DSA job postings by industry (Linkedin, 2021)

Company Industry	**Job Postings**	
Information Technology & Services	276	33%
Financial Services	169	20%
Internet	91	11%
Accounting	36	4%
Insurance	26	3%
Civil Engineering	23	3%
Computer Software	20	2%
Management Consulting	19	2%
Staffing & Recruiting	18	2%
Hospital & Health Care	14	2%
Outsourcing/Offshoring	13	2%
Others	122	15%
Total	**827**	**100%**

The LinkedIn data was confirmed by the results of the AAP survey where IT, BPO and Finance are among the top share of respondents. The Education industry also ranked highly, owing to the AAP membership coming from the academia, signifying professors and teachers skilling up for Analytics to cater to the growing learner demand for Analytics.

Table 6: Industry breakdown of survey respondents (AAP Survey)

Industry	**Respondents**	
IT, BPO, and Business Services	54	25%
Education	51	24%
Banking / Finance / Insurance	22	10%
Manufacturing	10	5%
Agriculture	10	5%
Healthcare	9	4%
Telecommunication	6	3%
Retail	6	3%
Energy	5	2%

Real Estate and Property	3	1%
Consumer goods / FMCG	3	1%
Others	36	17%
Total	**215**	**100%**

Sector Interest Through Communities

In addition to job postings, we also sampled Analytics-related communities and meetup groups which have a growing membership base on Facebook. 70 communities account for approximately 330,534 total members in the Philippines. Using a rough average of 4 groups per person puts the active population from these groups at 82,634 practitioners (see Table 7). Although not directly representing Analytics labor since students and non-practitioners also frequent these groups, monitoring community membership is a verifiable indicator of interest in Analytics and a possible leading indicator of labor supply over time.

The communities profiled are special interest groups or associations that are looking at data or related trends like Python / R programming, Data Science, Machine Learning and Artificial Intelligence and providing opportunities for its members to upskill themselves and join the Analytics sector.

Among the communities profiled are groups targeted towards women (e.g. WiTech, She Loves Data, FTW Foundation, Women Who Code Manila, Manila Women in Machine Learning and Data Science) indicating an effort to support women participation in Analytics.

Table 7: Membership in DSA Communities (Facebook, 2021)

Name	Members (No.)
Programmers,Developers	59,905
DEVCON Philippines	39,757
NASA Space Apps Philippines	29,481
Data Science World - R & Python Free Courses ✪	24,200
DEVCON Community Group	20,600
Project SPARTA	19,098
Data Ethics PH	13,800
Community: SPARTA PH	11,900
Data Science Philippines Discussion Group (Moderated)	10,000
Gteknolohiya	9,183
WiTech	8,926
She loves data	8,876
Software DevOps & Data	6,700
Data Science Philippines	6,436
Data Science Manila	5,300
FTW Foundation	4,979
Philippine Data Platform Forums	4,300
She Loves Data Group - Datadriven community for women in tech empowerment	3,500

Philippine Data Scientists Community - eScience	2,900
Women Who Code Manila	2,845
Python Philippines	2,652
Amagi Academy: Tech Courses and Communities	2,529
Eskwelabs Data Science Aral-Aral Group	2,300
Databeers Manila	2,227
Analytics Association of the Philippines - Public Forum	2,200
AI Pilipinas	2,200
Women Who Code Manila	1,700
R User Group - Philippines	1,506
AI Society	1,309
Big Data Analytics PH	1,300
Azure User Group Manila Meetup	1,239
Analytics Association of the Philippines	1,160
Power BI Users Meetup	1,110
MS in Data Science - AIM Group	1,060
School of Data Philippines	981
AWS AI/ML	962
AI Pilipinas	849
PizzaPy - Cebu Python Users Group	826
Analytics for Pinoys	816
Artificial Intelligence Philippines	812
Ph Cyber Geeks	745
WE-Tech Community	680
DataScience and BigData Cebu	595
[Manila] BIG DATA Tech Group	591
SPARTA PH: Data Engineer	452
PizzaPy - Cebu Python Users Group	409
AIM-Master of Science in Data Science	385
DataScience and BigData Cebu	378
DataScience.PH	360
Digital Analytics Philippines	356
AZUGMNL Azure User Group Manila	324
Manila Women in Machine Learning and Data Science	305
PyData Philippines	292
Talas Data Science Community	256
AI Design Philippines	243
Manila Artificial Intelligence & Deep Learning	229
Manila Analytics Freelancers	203
APAC Azure Data Communities	199
South Luzon Analytics Freelancers	171
MapR Users Meetup	143
Mindanao Analytics Freelancers	138
Robotic Process Automation (RPA) - Manila	108
Manila Excel Ninjaz Meetup	105
DataSpark - Manila Meetups	97
TheThingsNetwork Philippines	95

Analytics Association of the Philippines - Association Members	92
Iloilo Analytics Freelancers	80
Power BI Philippines UG	42
North Luzon Analytics Freelancers	21
Data and Analytics Manila	16
Total	**330,534**
Estimated Net Membership (1:4)	**82,634**

Sector Interest by Region

Using the Facebook Marketing API we estimated public interest in the Analytics sector using the total reach of related keywords - Analytics (520,000), Data Science (400,200) and Artificial Intelligence (6,430,000) in the Philippines (see Table 8). Similar to community membership, tracking this reach can provide a leading indicator of potential labor in Analytics as well as geographical distribution.

Across all the keywords, outside NCR notable regions with sizeable public interest in Analytics are CALABARZON, Central Luzon, Central Visayas.

Table 8: DSA Regional Interest (Facebook, 2021)

Region	Analytics		Data Science		Artificial Intelligence	
BARMM	3,800	1%		0%		0%
CAR	8,700	2%	7,100	2%	110,000	2%
NATIONAL CAPITAL REGION [NCR]	160,000	31%	120,000	30%	1,400,000	22%
ILOCOS REGION [REGION I]	18,000	3%	13,000	3%	260,000	4%
CAGAYAN VALLEY [REGION II]	11,000	2%	7,700	2%	150,000	2%
CENTRAL LUZON [REGION III]	53,000	10%	41,000	10%	760,000	12%
CALABARZON [REGION IV-A]	92,000	18%	77,000	19%	1,100,000	17%
MIMAROPA [REGION IV-B]	8,200	2%	6,400	2%	110,000	2%
BICOL REGION [REGION V]	17,000	3%	14,000	3%	270,000	4%
WESTERN VISAYAS [REGION VI]	28,000	5%	19,000	5%	360,000	6%
CENTRAL VISAYAS [REGION VII]	36,000	7%	28,000	7%	760,000	12%
EASTERN VISAYAS [REGION VIII]	14,000	3%	9,400	2%	170,000	3%
ZAMBOANGA PENINSULA [REGION IX]	10,000	2%	7,300	2%	150,000	2%
NORTHERN MINDANAO [REGION X]	17,000	3%	14,000	3%	240,000	4%
DAVAO REGION [REGION XI]	21,000	4%	20,000	5%	280,000	4%
SOCCSKSARGEN [REGION XII]	14,000	3%	10,000	2%	200,000	3%
CARAGA [REGION XIII]	8,300	2%	6,300	2%	110,000	2%
Philippines	520,000		400,200		6,430,000	

Supply of Labor

In this section we describe the nature of the Analytics labor supply. We start with a brief review of some mainstream curricula from schools that have started to offer specialized degree programs in Analytics, followed by trends in self-assessed competency from Project SPARTA participants, and finally looking at growth in related HEI disciplines from CHED.

Review and Comparison of Analytics Curricula

We mapped courses from a sample of specialized graduate degrees in Analytics to the APEC competencies.

A significant portion of all the courses offered focus heavily on technical skills, specifically, competencies in Statistical Techniques, Data Analytics Methods and Algorithms, and Computing. Fewer programs broadly cover other areas such as Leadership and 21st Century Skills (e.g. critical thinking, decision making, professional networking, entrepreneurship).

None of the courses sampled directly address the Operational Analytics competency which could indicate a problem with definitions. At the same time, none of the courses directly provide Domain Knowledge & Application which are likely addressed via electives or specialization courses based on the student's research or industry of interest.

Table 9: Mapping of Analytics competencies against selected Analytics-related MS graduate degree programs (School websites)

Competency	Ateneo (MSDS)	UPD (PMDS)	AIM (MSDS)	Mapua (MBA)	UA&P (MABA)
Data Management and Governance			AI Ethics		Ethics and Law in Data Analytics
Operational Analytics					
Domain Knowledge & Application					
Data visualization			Data Viz and Storytelling		Descriptive Analytics, Visualization, Storytelling
Research Methods		Knowledge Discovery in Data		Data Analysis and Design	
Data Engineering	Data Mining		Data Mining and Wrangling	Data Integration and Warehousing	Data Engineering
Statistical Techniques	Applied Statistics	Statistical Inference for Data Science Computational Statistics Statistical Machine Learning	Applied Computational Statistics	Statistical Analysis and Fundamentals of Analytics	Mathematics for Analytics Statistical Techniques
Data Analytics Methods and Algorithms		Forecasting Analytics	Mathematics for Data Science Introduction to Data Science Machine Learning I Machine Learning II Network Science	Predictive Modelling and Machine Learning Prescriptive Analytics	Analytics Algorithms Analytics Algorithms 2
Computing	Programming with Databases Big Data Processing	Programming for Data Analytics	Programming for Data Science Big Data and Cloud Computing	Programming 1: Introduction to Analytical Tools Programming II: Application of Analytics	Basic Computing Programming for Databases

Leadership and 21st Century Skills			Management Communications	Professional Issues and Social Concerns	Business Strategy and Analytics
			Language of Business	Strategic Management	Fundamentals of Business Mgt
			Human Behavior in Organizations	Special Topics in Business Analytics	Data-driven Organization
			Marketing in the Digital Economy		Insight Development and Innovation
			Business Economics		Human Perspective in Analytics
			Project Management		Management of Analytics Projects
			Financial Management		
			Innovation Management with Design Thinking		
			Negotiating Change		
			Operations Management		
			Strategic Management		
			Managing for Sustainable Development Impact		

SPARTA Scholars

Learning pathway data from Project SPARTA revealed that most of the SPARTA cohort are taking the Data Scientist pathway. The surveys also featured maturity levels directly based on the AAP frameworks. Against self-declared skill maturity, Data Stewards and Data Engineers generally report lower averages of competency and working experience while Functional Analysts report the highest level of self-declared competency and experience.

Table 10: Learning pathways and Analytics competencies of SPARTA scholars (Project SPARTA, 2021)

	Functional Analyst (domain, industry)	Analytics Manager (project management)	Data Scientist (statistical models, algorithms)	Data Steward (data governance, policy)	Data Engineer (ETL, data warehouse)
Count of SPARTA Scholars	3,160	2,600	6,057	2,982	3,082
% of Scholars	17.67%	14.54%	33.87%	16.67%	17.24%
Self-Rated Skills Maturity (0-3)					
Domain Knowledge & Application	1.12	1.23	0.93	0.80	0.82
Data Management & Governance	0.91	1.10	0.80	0.87	0.79
Operational Analytics	1.12	1.28	0.80	0.62	0.64
Data Visualization & Presentation	1.20	1.33	1.23	0.86	1.00
Research Methods	1.01	1.22	1.45	0.81	0.96
Data Engineering Principles	0.22	0.34	0.33	0.20	0.63
Statistical Techniques	0.66	0.83	1.12	0.50	0.59
Data Analytics Methods & Algorithms	0.55	0.75	0.89	0.43	0.57
Computing	0.69	0.82	0.96	0.57	1.01
With Working Experience	1,097	791	1,442	668	580
% Working	35%	30%	24%	22%	19%

Government Statistics

CHED

Based on the common educational background requirements in job postings, we selected Mathematics, IT, Business, Engineering, Natural Sciences, and Social Sciences as base HEI disciplines for analytics. Using available CHED statistics, the annual graduate base for Analytics grew from 235,251 in 2010 to 439,435 in 2019.

Table 11: HEI graduates by discipline (CHED, 2020)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mathematics	2,021	1,903	2,038	2,984	2,428	2,698	2,736	3,034	3,446	3,192
IT	49,786	54,225	66,672	72,879	72,976	74,477	77,250	73,646	77,747	81,477
Business	117,399	125,840	141,327	164,541	169,846	185,358	185,858	202,895	207,178	233,194
Engineering	49,373	57,439	56,690	59,399	63,539	70,646	76,423	82,794	86,860	87,083
Nat Sci	3,949	3,910	4,330	6,626	6,094	6,966	6,828	7,160	8,693	8,249
Soc Sci	12,723	13,168	13,816	15,953	18,831	21,160	22,281	22,324	25,099	26,240
Total New Graduate	235,251	256,485	284,873	322,382	333,714	361,305	371,376	391,853	409,023	439,435

Demand for Labor

In this section we describe the nature of the Analytics labor demand. We start with an indication of female participation in Analytics jobs across industries. We then examine the geographic distribution of Analytics workers by residence and work location. Wage distributions in the industry are studied across several dimensions, and we also look at trends in working from home, training during the pandemic, and job-seeking.

Jobs by Gender and Industry

Based on the AAP survey, there is a wide disparity in female respondent rates across industries. Analytics roles with higher-than-average female respondents are in Education, Finance, and Retail. Female respondent rate overall is at 38%.

Table 12: Distribution of jobs by gender and industry (AAP Survey)

Industry	Female		Male		Grand Total		Female Respondent Rate
IT, BPO, and Business Services	14	17%	40	30%	54	25%	0.26
Education	20	24%	31	23%	51	24%	0.39
Banking / Finance / Insurance	10	12%	12	9%	22	10%	0.45
Agriculture	5	6%	5	4%	10	5%	0.50
Manufacturing	4	5%	6	5%	10	5%	0.40
Healthcare	4	5%	5	4%	9	4%	0.44
Retail	4	5%	2	2%	6	3%	0.67
Telecommunication	2	2%	4	3%	6	3%	0.33
Energy	1	1%	4	3%	5	2%	0.20
Others	18	22%	24	18%	42	20%	0.43
Grand Total	82		133		215		0.38

Workers by Location

Many workers reside and work in NCR, however growing evidence for remote work setup shows workers based in Central Luzon, CALABARZON, Bicol, Central Visayas, Northern Mindanao and CARAGA also taking jobs in NCR.

Table 13: Residence vs. workplace location of workers (AAP Survey)

Region	Residence		Workplace	
BARMM	1	0%		0%
CAR	2	1%	3	1%
NCR – National Capital Region	96	45%	128	60%
Region I – Ilocos Region	9	4%	9	4%
Region II – Cagayan Valley	2	1%	2	1%
Region III – Central Luzon	15	7%	10	5%
Region IV-A – CALABARZON	38	18%	17	8%
Region IV-B - MIMAROPA	4	2%	4	2%
Region V – Bicol Region	9	4%	6	3%
Region VI – Western Visayas	3	1%	3	1%
Region VII – Central Visayas	14	7%	13	6%
Region VIII – Eastern Visayas	5	2%	5	2%
Region IX – Zamboanga Peninsula	2	1%	2	1%
Region X – Northern Mindanao	6	3%	5	2%
Region XI – Davao Region	2	1%	2	1%
Region XII – SOCCSKSARGEN	3	1%	4	2%
Region XIII – CARAGA	4	2%	2	1%
Grand Total	215		215	

Table 14: Matrix table of location of workers (AAP Survey)

		Workplace															
		CAR	NCR – National Capital Region	Region I – Ilocos Region	Region II – Cagayan Valley	Region III – Central Luzon	Region IV-A – CALABARZON	Region IV-B - MIMAROPA	Region V – Bicol Region	Region VI – Western Visayas	Region VII – Central Visayas	Region VIII – Eastern Visayas	Region IX – Zamboanga Peninsula	Region X – Northern Mindanao	Region XI – Davao Region	Region XII – SOCCSKSARGEN	Region XIII – CARAGA
Residence	BARMM															0.5	
	CAR	0.9															
	NCR – National Capital Region		44.2			0.5											
	Region I – Ilocos Region			4.2													
	Region II – Cagayan Valley				0.9												
	Region III – Central Luzon		2.8			4.2											
	Region IV-A – CALABARZON		9.8				7.9										
	Region IV-B - MIMAROPA							1.9									
	Region V – Bicol Region	0.5	0.9						2.8								
	Region VI – Western Visayas									1.4							
	Region VII – Central Visayas		0.5								6.0						
	Region VIII – Eastern Visayas											2.3					
	Region IX – Zamboanga Peninsula												0.9				
	Region X – Northern Mindanao		0.5											2.3			
	Region XI – Davao Region														0.9		
	Region XII – SOCCSKSARGEN															1.4	
	Region XIII – CARAGA		0.9														0.9

Wage Distribution Indicators

Gender

On average, the monthly wages of workers are Php 66,442. Disaggregating by gender shows that men are leading in terms of average wages (Php 76,936) vs. women (Php 49,421). Majority of the top-tier reported wages are from male respondents.

Table 15: Gender vs Wage (AAP Survey)

Salary Range	Female		Male		Grand Total	
15,000 and below	11	13%	15	11%	26	12%
15,001 to 25,000	15	18%	18	14%	33	15%
25,001 to 35,000	18	22%	22	17%	40	19%
35,001 to 45,000	5	6%	19	14%	24	11%
45,001 to 55, 000	5	6%	9	7%	14	7%
55,001 to 65,000	6	7%	10	8%	16	7%
65,001 to 75,000	7	9%	4	3%	11	5%
75,001 to 85,000	3	4%	4	3%	7	3%
85,001 to 95,000	2	2%	2	2%	4	2%
95,001 to 100,000	1	1%	1	1%	2	1%
100,001 to 125,000	5	6%	7	5%	12	6%
125,001 to 250, 000	4	5%	14	11%	18	8%
250,001 and above		0%	8	6%	8	4%
Grand Total	82		133		215	
Average Salary	49,421		76,936		66,442	

Age

Disaggregating by age shows top wages earned by ages 35 to 49. Average wages appear to peak at the 45-49 age range. The age distribution of respondents are majority in their late 20s and 30s.

Table 16: Age vs Wage (AAP Survey)

Salary Range	19-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+	Grand Total
15,000 and below	30%	14%	9%	7%	4%	0%	20%	0%	0%	12%
15,001 to 25,000	33%	14%	18%	10%	13%	0%	0%	33%	0%	15%
25,001 to 35,000	7%	25%	21%	17%	17%	9%	0%	33%	50%	19%
35,001 to 45,000	15%	13%	12%	7%	4%	9%	40%	0%	0%	11%
45,001 to 55, 000	4%	12%	6%	2%	9%	0%	0%	0%	0%	7%
55,001 to 65,000	11%	7%	3%	10%	4%	18%	0%	0%	0%	7%
65,001 to 75,000	0%	3%	12%	7%	0%	9%	0%	33%	0%	5%
75,001 to 85,000	0%	0%	3%	10%	9%	0%	0%	0%	0%	3%
85,001 to 95,000	0%	1%	3%	2%	4%	0%	0%	0%	0%	2%
95,001 to 100,000	0%	3%	0%	0%	0%	0%	0%	0%	0%	1%
100,001 to 125,000	0%	3%	6%	7%	13%	18%	0%	0%	0%	6%
125,001 to 250, 000	0%	4%	6%	12%	13%	18%	40%	0%	50%	8%
250,001 and above	0%	0%	0%	10%	9%	18%	0%	0%	0%	4%
Grand Total	27	69	33	42	23	11	5	3	2	215
Average Salary	25,556	44,312	52,197	98,036	99,457	146,364	92,500	40,001	108,751	66,442

Industry

Healthcare, Retail, and Finance report the highest average wages while Education and Agriculture sectors are on the lower end.

Table 17: Industry vs Wage (AAP Survey)

Salary Range	IT, BPO, and Business Services	Education	Banking / Finance / Insurance	Manufacturing	Agriculture	Healthcare	Telecommunication	Retail	Energy	Others	Grand Total
15,000 and below	11%	10%	5%	20%	30%	0%	0%	33%	0%	17%	12%
15,001 to 25,000	9%	20%	14%	30%	20%	22%	17%	0%	0%	17%	15%
25,001 to 35,000	20%	41%	5%	10%	0%	11%	0%	33%	20%	5%	19%
35,001 to 45,000	7%	12%	14%	0%	10%	0%	17%	0%	0%	21%	11%
45,001 to 55, 000	9%	2%	0%	10%	30%	0%	17%	0%	20%	5%	7%
55,001 to 65,000	9%	6%	9%	0%	0%	22%	0%	0%	40%	5%	7%
65,001 to 75,000	7%	0%	9%	10%	0%	0%	17%	0%	0%	7%	5%
75,001 to 85,000	2%	4%	5%	0%	0%	11%	0%	0%	0%	5%	3%
85,001 to 95,000	2%	0%	0%	10%	10%	0%	0%	0%	0%	2%	2%
95,001 to 100,000	0%	0%	9%	0%	0%	0%	0%	0%	0%	0%	1%
100,001 to 125,000	7%	2%	14%	0%	0%	0%	33%	0%	0%	5%	6%
125,001 to 250, 000	9%	4%	14%	10%	0%	22%	0%	17%	20%	7%	8%
250,001 and above	6%	0%	5%	0%	0%	11%	0%	17%	0%	5%	4%
Average Salary	76,806	38,922	92,160	50,250	34,250	113,334	67,501	106,250	77,501	67,381	66,442

Work From Home

Industry and Employment Group

All industries, save for Agriculture, reported marked increases in work from home during the pandemic. This was also observed across employment groups, including academia. Overall, the government sector lagged in fully adopting a WFH setup but still reported an increase.

Table 18: Industry vs. WFH Status (AAP survey)

Industry	WFH Before	WFH During	Change
IT, BPO, and Business Services	46%	87%	41%
Education	29%	69%	39%
Banking / Finance / Insurance	27%	86%	59%
Manufacturing	30%	60%	30%
Agriculture	100%	90%	-10%
Healthcare	33%	67%	33%
Telecommunication	67%	100%	33%
Retail	33%	67%	33%
Energy	20%	100%	80%
Others	45%	60%	14%
Grand Total	41%	75%	34%

Table 19: Employment Group vs. WFH Status (AAP Survey)

Employment Group	WFH Before	WFH During	Change
Academic (including schools, training centers, universities, colleges)	35%	75%	40%
Government	43%	57%	14%
Not-for-profit, NGO	50%	75%	25%
Owned Business (including freelancers and professionals)	60%	80%	20%
Private sector	42%	81%	39%
Grand Total	41%	75%	34%

Training and Job Mobility

Majority of respondents reported taking training to upskill themselves. Most respondents also reported seeking work, suggesting a high level of job mobility exists in the sector.

Table 20: Industry vs. Training Rate and Percentage of Job Seekers (AAP Survey)

Industry	Training Rate	Seeking Jobs
IT, BPO, and Business Services	76%	72%
Education	84%	47%
Banking / Finance / Insurance	86%	59%
Manufacturing	50%	70%
Agriculture	80%	90%
Healthcare	100%	44%
Telecommunication	83%	67%
Retail	83%	83%
Energy	80%	60%
Others	88%	69%
Grand Total	82%	64%

Table 21: Employment Group vs. Training Rate and Percentage of Job Seekers (AAP Survey)

Employment Group	Training Rate	Seeking Jobs
Academic (including schools, training centers, universities, colleges)	84%	53%
Government	86%	49%
Not-for-profit, NGO	100%	75%
Owned Business (including freelancers and professionals)	80%	80%
Private sector	79%	72%
Grand Total	82%	64%

Skills gaps and mismatch

This section describes possible skill gaps and mismatches between labor supply and demand in Analytics. Using text analysis of job descriptions, we examine the differentiation between the Analytics job families in the market. We looked at self-declared underutilization and mismatch from respondents in the AAP survey, and clustered existing job descriptions from LinkedIn to provide a counter-factual to the promoted analytics job families. We also examined self-declared organizational maturity across industries from the Project SPARTA survey.

Skills Sought by Job Category

Job descriptions from LinkedIn job postings were parsed for common keywords that were then matched to the ten APEC competencies. The presence of each competency was tallied across job postings from the prescribed AAP job families, save for Data Steward which had very few existing job openings.

Looking at the relative distributions, Data Engineering, Data Visualization, Data Analytics Methods and Algorithms, and Computing are highly represented skills across all Analytics roles. Leadership skills are highest in Analytics Managers and Data Scientists while Data Management and Governance are the least represented across all Analytics jobs. Despite some variation in distributions, similarities exist between Data Scientist, Data Analytics, and Analytics Manager roles.

Table 22: Percentage of jobs requiring skills under Analytics roles (LinkedIn, 2021)

Skills	Data Scientist	Data Engineer	Data Analyst	Analytics Manager
Data Management and Governance	6%	5%	7%	4%
Operational Analytics	24%	14%	11%	48%
Data visualization	49%	21%	74%	74%
Research Methods	42%	22%	35%	57%
Data Engineering	60%	39%	36%	48%
Statistical Techniques	64%	14%	28%	22%
Data Analytics Methods and Algorithms	56%	22%	39%	78%
Computing	60%	39%	74%	74%
Leadership	61%	31%	24%	96%

Skill Utilization and Mismatch

Reported skills underutilization is generally modest (0-30%) across industries however respondents declared high levels of job mismatch.

Table 23: Skill requirements in Analytics roles (AAP Survey)

Industry	Underutilization Rate	Mismatch Rate
IT, BPO, and Business Services	26%	56%
Education	12%	45%
Banking / Finance / Insurance	27%	36%
Manufacturing	30%	50%
Agriculture	10%	70%
Healthcare	33%	44%
Telecommunication	0%	33%
Retail	17%	17%

Energy	0%	100%
Others	12%	48%
Total	18%	49%

In this study, we define:

- **Underutilization** as the percentage of those who responded, "None to some of my capabilities are utilized in my job" to the question "How much of your capability is utilized in your current job?"
- **Mismatch** as the percentage of those who responded, "Totally different (100%)" or "Very different (50-99%)" to the question "How far is your current job from what you expected it to be back in college?"

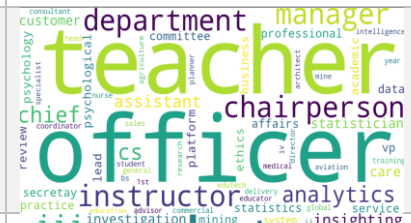
Skills by Job Cluster

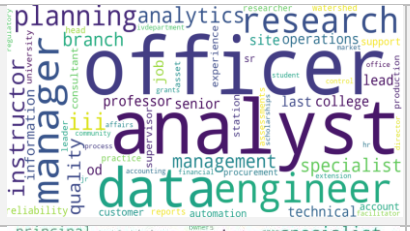
We performed text analysis on the free-form AAP survey responses for "What is the nature of your role?" and derived six clusters based on the words and terminologies used by respondents. Word clouds show common phrases and relative importance of skills in each segment.

Two job segments appear to represent academia: the Senior Academic and Academic Assistant. Two segments: Data Analytics Manager and Analytics Manager appear to represent more senior and supervisory roles. The remaining roles appear to indicate entry- and mid-level technical roles: Data Analyst-Scientist and Data Analyst-Engineer, representing slightly different combinations of technical skills.

Communication appears to be the most needed soft skill across all job segments. Also common are problem (solving), and teamwork skills. For technical skills, programming is the most frequent skill requirement in all job segments. Other commonly found needed skills include (data) analysis, analytic(s), and statistic(al) model(s).

Table 24: Job cluster and skill requirements (AAP Survey)

Cluster	Key Words	Skills Table
Senior Academic		Roles and Responsibilities / Main Job / Hard Skills / Soft Skills support / training / skill / communication student / support / model / solve practice / customer / programming / problem training / development / analytic / teamwork learn / data / data / work manage / provide / development / skill faculty / college / research / team service / health / technology / leadership experience / plan / design / think education / faculty / education / management
Data Analyst Scientist		Roles and Responsibilities / Main Job / Hard Skills / Soft Skills data / data / data / communication create / create / programming / teamwork report / report / statistical_modelling / problem insight / insight / sql / solve plan / dashboard / python / think business / conduct / data_visualization / management analytic / sale / visualization_data / time perform / process / analytic / collaboration process / plan / storytelle / work sale / information / clean / make

Data Analyst Engineer		Roles and Responsibilities	Main Job	Hard Skills	Soft Skills
		data	customer	programming	communication
		customer	data	skill	problem
		report	process	data_analysis	solve
		development	research	design	teamwork
		analysis	plan	knowledge	skill
		conduct	analytic	data	management
		business	management	research	think
		manage	ensure	analysis	stakeholder
		dashboard	report	project_management	collaboration
		identify	product	statistic	work
Analytics Manager		Roles and Responsibilities	Main Job	Hard Skills	Soft Skills
		data	data	programming	communication
		team	develop	data	problem
		develop	team	statistic	solve
		analytic	analytic	knowledge	teamwork
		manage	manage	model	management
		company	management	software	leadership
		business	project	analysis	team
		solution	development	business	think
		development	business	analytic	skill
		model	application	design	work
Academic Assistant		Roles and Responsibilities	Main Job	Hard Skills	Soft Skills
		teach	teach	programming	communication
		research	student	data	teamwork
		student	research	computer	skill
		extension	development	analysis	solve
		college	course	research	problem
		conduct	management	network	leadership
		community	conduct	model	analysis
		activity	graduate	skill	management
		facilitate_learning	level	design	write
		instruction	activity	data_analysis	adaptability
Data Analyst Business		Roles and Responsibilities	Main Job	Hard Skills	Soft Skills
		report	report	programming	communication
		project	data	data	problem
		data	team	proficiency	solve
		process	project	analytic	management
		strategy	management	excel	teamwork
		program	business	skill	time
		plan	assist	management	skill
		risk	ensure	data_analysis	think
		management	analytic	knowledge	project
		research	audit	analysis	work

Industry Maturity

Amongst Project SPARTA respondents, Banking, Financial Services, and Business Process Management are rated as the most mature while Wholesale, Mining, Non-profit are the least mature industries.

The highest number of Analytics respondents come from the Research and Advertising industries while Insurance and Automotive have fewest.

Table 25: Top 10 industries and their average maturity rating (Project SPARTA, 2021)

Rank	Top 10 Industries	Analytics Maturity Rating
1	Banking	3.24
2	Financial Services	3.01
3	Business Process Management	3.00
4	Telecommunications	2.99
5	Information Technology	2.94
6	Aerospace	2.91

7	Hospitality	2.81
8	Research	2.72
9	Insurance	2.70
10	Computers and Technology	2.69

Table 26: Bottom 10 industries and their average maturity rating (Project SPARTA, 2021)

Rank	Bottom 10 Industries	Analytics Maturity Rating
1	Wholesale	1.79
2	Mining	2.17
3	Non-Profit	2.20
4	Real Estate	2.21
5	Retail	2.23
6	Healthcare	2.27
7	Travel and Tourism	2.30
8	Agriculture and Fishing	2.31
9	Food Services	2.32
10	Government	2.32

Table 27: Top 10 industries and their percentage of employees doing analytics to total employees (Project SPARTA, 2021)

Rank	Top 10 Industries	% of DSA FTE
1	Research	20%
2	Advertising	19%
3	Computers and Technology	16%
4	Travel and Tourism	15%
5	Food Services	14%
6	Wholesale	14%
7	Non-Profit	14%
8	Retail	13%
9	Information Technology	13%
10	Media, Arts, and Entertainment	13%

Table 28: Bottom 10 industries and their percentage of employees doing analytics to total employees (Project SPARTA, 2021)

Rank	Bottom 10 Industries	% of DSA FTE
1	Insurance	5%
2	Automotive	6%
3	Mining	6%
4	Transportation	6%
5	Hospitality	7%
6	Banking	8%
7	Manufacturing	8%
8	Energy and Utilities	8%
9	Healthcare	9%
10	Telecommunications	9%

Estimating the Analytics Labor Force

Workforce Extrapolation

In estimating and forecasting the likely Analytics labor force, we chose to anchor on data from the APEC projection of 147,425 in 2016 and 340,870 by 2022. By establishing the base trend, we expect the uptrend for the Analytics labor force to hit 486,700 by 2028. The growth in the sector is underpinned by continued growth in annual CHED graduates related to the sector, and we estimated that annual participation from this pool has grown from 3% in 2008 to around 11-12% by 2019.

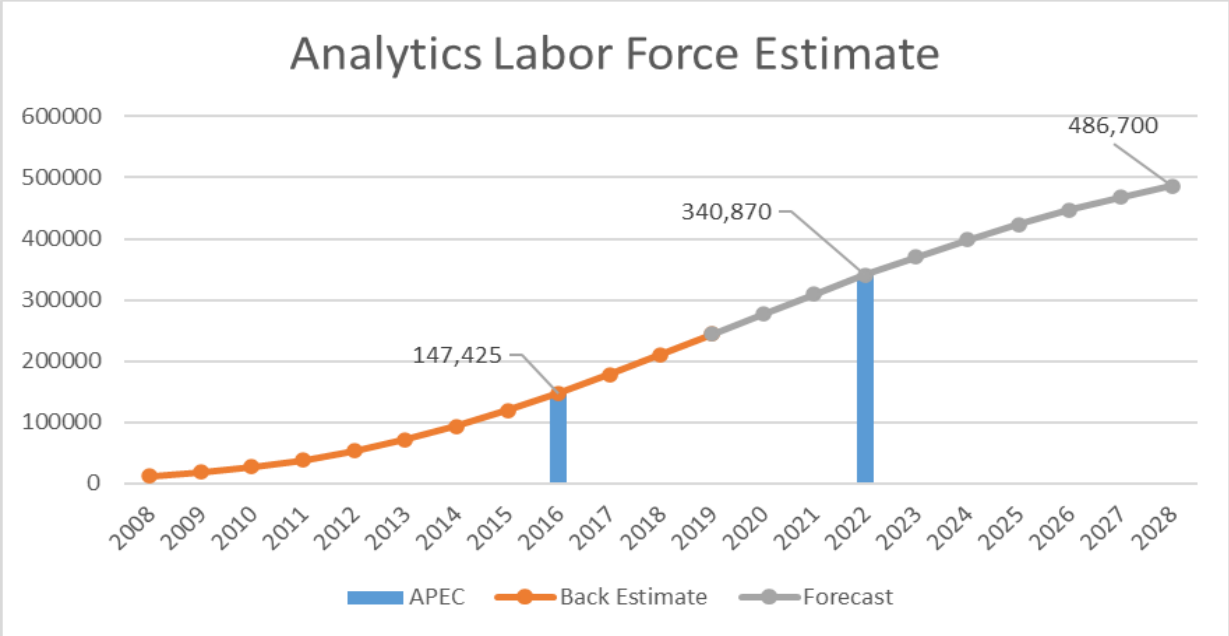


Figure 24: Annual Analytics Labor Force Extrapolation

Interview Findings

This section reports findings from a series of KIIs and FGDs conducted with 35 participants representing key actors in the Analytics labor market - Demand, Supply, and Enablers. The demographic profile of the participants is provided in the Appendices.

We categorized the themes according to participants' responses to the COVID-19 pandemic, perceptions on skills gaps and mismatch, and initiatives that were done to address the perceived skills gaps and mismatch. For each theme, we highlight selected salient quotes in Table A8 (see Appendices).

COVID-19 Pandemic Impact

Working from Home

With the onset of the COVID-19 pandemic, respondents reported displacement in their careers, with a few experiencing a career leap. Flexible work arrangements already existed for several respondents before the pandemic, but during the lockdowns everyone had to completely shift to remote work. All participants mentioned work from home as a major consideration, with many opting for their current jobs essentially to avoid going into a physical office.

Online Learning

Academia and learning institutions were fully disrupted, forced to conduct classes online. Everyone reported having to cope with the challenges of preparing online modules and implementing a Learning Management Syste.

Learners mentioned that ease of accessibility to the courses played an important factor in their training plans, utilizing different devices from mobile phones to laptop computers. For many learners, internet connectivity was a major concern, partly offsetting the low cost to attend a lecture online.

Skills Gaps and Mismatch

Job Description/ Roles Disparity

Most of the participants chose the Analytics field early on seeing the value of industry growth years down the line. Some reported misalignments between job descriptions, and the actual roles and responsibilities they ended up assuming, which pushed them to learn new technical skills. These skills included new programming languages and tools. Employer and employee respondents had disagreements on what Analytics roles entailed.

Old Jobs with New Branding

Participants mentioned that much of their current work in Analytics is an extension of what they have already done previously, just with new branding. Some participants had worked on jobs similar to roles called "Data Scientist" today. Despite coming from different backgrounds, working with data has always been part of their jobs.

Blending the Technical with Business

Most participants mentioned the importance of communication skills in their roles, citing the ability to convey ideas and insights from data as a crucial part of their jobs. Problem-solving and critical thinking is also important, which is the ability to ask the right questions and identify problems.

Although respondents reported mathematics and programming are a must for most jobs, a crucial gap is the ability to connect the technical skills with business know-how.

An emerging concern cited by some respondents is the importance of data and AI ethics due to the potentially harmful impacts of algorithmic biases, however this is not yet fully understood by practitioners due to lack of industry experts.

Current Trends in Bridging the Skills Gap

Industry - The Search for Unicorns

Despite emerging variations in job descriptions, recruits for Analytics jobs are still generally expected to know everything about data. Respondents report disparities between advertised jobs and the eventual roles they end up occupying, as well as rapid changes in the nature of the role (i.e. hired as a Data Analyst, but became a Data Engineer). High competition for talent between companies, while benefiting practitioners with above average job mobility, also results in high costs to recruit and retain talent. One respondent reported a 50-100% premium just to poach workers between competing firms. One unintended consequence of this as well is that small and medium sized employers are naturally boxed out of the Analytics labor pool, which limits penetration of skills to the typical industries such as IT and Finance.

In the periphery are companies who are already experiencing the growth in their internal data requirements due to digitalization, but are forced to rely on traditional IT resources to manage them. According to a respondent, less than 20% of Philippines companies can be said to be data-driven.

Individuals are Preoccupied with Upskilling

With industry pressure to hire the perfect analyst, most practitioners continue to be pressured to constantly update themselves to remain competitive. Most respondents mentioned that Analytics is a very interesting field with a very high learning curve due to the wide range of skills required to function in a role. Majority of respondents reported that endurance is needed to properly acquire the technical knowledge necessary, such as programming, analytics tools, and mathematics. Not coincidentally, most training options available to practitioners focus on technical skills training. However, despite the attention given to technical skills, respondents report that non-technical skills and soft skills are essential to thrive in the workplace, and the only way to acquire these is through actual on-the-job

experience. Two extremes are also observed amongst industry practitioners: Imposter Syndrome - where individuals continually doubt their abilities and the Dunning-Kruger Effect - where barely experienced individuals express an above-average confidence in their knowledge.

Non-Traditional Education Is Flourishing

The demand for upskilling has helped spawn the growth in non-traditional learning options such as bootcamps, online learning, and corporate training. Options such as Eskwelabs, Project SPARTA, and FTW Foundation offer training programs that are meant to level the playing field for people who want to upskill themselves and/or shift to an Analytics role. Instructors in these programs are usually existing practitioners, and offer courses that are up to date with industry requirements.

What makes these programs attractive is that students can do the modules in their own time. Synchronous classes are scheduled on Saturdays, or pre-recorded videos are made available to students to watch whenever they are available, enabling students to have full-time work on top of their studies. These programs also take less time than an undergraduate or graduate degree enabling people to immediately put to use the skills they gained. Online training and bootcamps are quite affordable, if not free, and serve to fill not just a training niche but an existing gap as HEIs have yet to move towards specialized training in Analytics.

HEIs Are Beginning to Move

At the same time, traditional universities and learning institutions have started to roll out specialized courses to get ahead of demand. Between 2018-2019, AIM, Mapua, and UA&P pioneered graduate programs for Data Science and Analytics, with UP, Ateneo, De La Salle University, and University of Santo Tomas (UST) shortly following suit. As one of the earliest offerings, AIM successfully created their MSDS curriculum through their existing alumni network to ensure their curriculum is contextualized with the latest industry developments. The AAP has also been partly influential in this regard, as the UA&P and UST programs have been inspired by their professional maturity framework.

Today, more institutions such as Manuel S. Enverga University Foundation and University of Southern Philippines Foundation, have included or are in the process of including subjects related to Data Science and Analytics in their current undergraduate degree programs. One concern these schools have is their teachers are not Analytics practitioners, and may not be able to provide students with real-world analytics hands-on experience. To offset this, they have made efforts to strengthen partnerships with the industry to arrange on-the-job trainings/internships/capstone projects. Plans for developing Data Science and Analytics undergraduate programs are in the works.

Government Has Yet to Recognize Analytics

Although roadmaps and skills frameworks exist for broader IT-BPM, Analytics is yet to be considered as a distinct skill set by government agencies. DTI and TESDA stated that they rely much on industry representation to further define what they need to work on in terms of certification or programs which can supply more talent in the market.

One bright spot is Project SPARTA, which was borne out of the DOST-PCIEERD's Good Governance through Data Science and Decision Support Systems program. Discussions on SPARTA began between PCIEERD and AAP as early as 2019, and through a unique collaboration between DOST, DAP, AAP,

and Coursebank was launched in 2020 shortly before the pandemic lockdowns. Although non-traditional training options were beginning to emerge, SPARTA was born out of an aspiration for something uniquely local, contextualized within local realities, and to be participated by a variety of students from different backgrounds. This endeavor is also meant to "fill" the skills gap in the different agencies of government, and to inspire conversations while being able to freely engage communities at the grassroots level, beyond the confines of government traditional bureaucracies. Total reported registrations for Project SPARTA have exceeded 36,000 as of 3rd quarter 2021.

The launch of the DTI AI roadmap also represents a signal that government is finally recognizing that data and Analytics have a role to play in nation-building, with multi-sectoral participation essential in crafting all its enabling policies.

Key Insights and Recommendations

This section concludes the report with a list of key recommendations to cover existing gaps and adapt to prevailing trends, as well as reinforcing the positive actions already in place for Analytics labor to thrive.

Definitions of Analytics roles need to be standardized

As the sector is still young, job roles and expectations are not yet clearly defined, with members of industry and academia not agreeing on job definitions causing confusion and sometimes frustration amongst job seekers and employees.

1. ***The AAP framework can provide a backbone for establishing a baseline but needs to be further validated.***

   A broader study should be conducted amongst HEIs and training providers to map learning outcomes of courses offered in their curricula against the prescribed DSA competency framework. This provides a common ground to identify systemic gaps in curriculum development, and also serves to signal to industry where the positive pockets for labor skills exist.

   Counter-factual analysis from online job postings and respondent job descriptions support the need for AAP to further refine the framework and encourage adoption.

2. ***More Specialized Courses Are Needed***

   As the Analytics practice is by nature interdisciplinary, involving elements from Statistics, Computer Science, and Business, the need for more specialized degrees and courses which blend these three education silos is imperative. This requires input from industry via AAP, but also support from CHED to encourage HEIs to rationalize their curricula. Curriculum development needs to consider not just technical skills but also communication, leadership, and ethics. A universally accepted skills framework backed by the government is imperative to reduce the friction from producing labor supply from HEIs and learning institutions and encouraging demand from employers.

3. ***Produce more Analytics teachers***

   While CHED and HEIs work to align Analytics curricula, a separate parallel effort must be made to produce more qualified Analytics instructors en-masse. This can be through a combination of distributed online learning inspired by SPARTA but should also involve programs that can encourage industry practitioners to teach in schools. Initiatives akin to DOST's Balik-Scientist program can be used to encourage industry experts to take part-time or full-time teaching roles while making it economically viable for them.

4. ***Analytics as a distinct sector from IT-BPM***

   Once a unified skills framework is recognized, TESDA, DTI, and the Department of Information and Communications Technology can begin to put programs in place to encourage Analytics labor development. Using Project SPARTA as a template, more specialized technical-vocational educational training programs aligned with the AAP framework can be rolled out, targeting the leading and nascent industries for adoption. Existing traditional verticals in IT-BPM (e.g. web development, game development, network engineering, cybersecurity) are highly complementary with Analytics. This serves to further increase the talent pool, and lower the recruitment costs for Analytics labor to make it more accessible to the public sector and micro, small, and medium enterprises.

5. ***Explore professional licensing and certification***

   Apart from curriculum alignment in academia, another possible outcome to rationalize the job requirements in analytics is the establishment of certification or licensing to standardize definitions. This can take the form of industry-led certifications (e.g. similar to Six Sigma, CFA) down to government regulated licenses via the Professional Regulation Commission. AAP could act as an effective bridge for dialogue on the prospects of such certifications as well as accrediting training providers that can support them.

Analytics Labor Development

Through dialogue between the government and AAP, programs should be initiated to further encourage positive trends already observed in the Analytics sector. Analytics profession has proven itself to be pandemic-resilient due to its predominantly WFH setup and demand will continue to rise. In the same manner, online learning is now the new norm for upskilling whether through HEIs or training providers.

1. ***Encourage Women to take up Analytics.***

   Technology fields are traditionally male-dominated, but Analytics is proving to be a profession where women can participate at equal footing. WFH arrangements have also made it more possible for women to balance work and taking care of children. Public and private sector should be incentivized to encourage more women to take up Analytics jobs to further widen

the talent pool.

2. ***Improve Broadband Infrastructure to support Work From Home***

   The majority of Analytic jobs continue to be centered around NCR, but early signs show that workers from other regions are able to take NCR jobs through WFH and remote working arrangements. The further development and build out of nationwide broadband will be conducive to WFH and will promote more cross-regional work arrangements.

3. ***Double Down on Online Learning***

   Early success of programs such as Project SPARTA show the potential of a broad-based education initiative in encouraging new entrants and career shifters into Analytics. Similar programs can be rolled out to further promote upskilling especially in the public sector which can help jump start digital transformation in respective non-government agencies and local government units

4. ***Support Analytics Communities***

   The emergence of special interest groups in Analytics is an early feeder into the Analytics labor force, but most of these communities are NCR-based. AAP and HEIs should foster the development of more communities in other regions to capitalize on growing public interest in Analytics, and provide grassroots support to industry and government initiatives.

   Private sector through AAP should promote industry-wide mentorship through events and fora to encourage skills development and best-practice sharing from more experienced practitioners to the new entrants in the labor market.

5. ***Embed Data and AI Ethics into Policies and Practices***

   As Philippine employers adopt Analytics as a practice, and begin unlocking opportunities with data, heightened risks of improperly managed data and algorithms are also created. While previously viewed as esoteric in an environment of low Analytics adoption, data and AI ethics became top of the agenda as the country transitions into a data-driven ecosystem. This will require embedding new expertise into existing practices (e.g., detecting sensitive data bias during model development). Ethical principles should be championed by AAP and government and embedded into new policies and regulatory frameworks to ensure that the risks of data are managed preemptively.

Limitations

While we have endeavored to provide a comprehensive view at the sector labor situation as possible, we must highlight the natural limitations in our study. Due to limited time to recruit respondents, our sample size of respondents for our surveys and interviews may not give a fully conclusive interpretation of the overall landscape of the Analytics labor market. Labor projections are also based on most recent public data available which in most cases, particularly for government statistics, can

be at least two or more years out-of-date, although reasonable diligence has been made to compensate for these challenges.

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Figures and Tables

Figures Used

Tables Used

Appendices

Table 29: Key Informant Interview Guide Questions - Education

Themes	Questions
1. Academe and Pandemic Response	• How has your industry changed within the last 5 years (excluding the pandemic)? • How has the pandemic affected the way you teach/train your students? • How have you/ the institution augmented or adjusted in lieu of the pandemic?
2. Skill sets, Academe and Industry needs	• Describe the current skill sets necessary in the industry. • What is your take on the current skills gap or mismatch in the industry? • Do you think there is a disparity between the courses being offered and the current skills needed in the industry? • Are you aware of any government or private sector led initiatives to address the gap? • Are there any of your students who have chosen to move abroad? Why? Where?
3. Partnerships with Private and Government Sectors	• Are there any relevant outcomes or significant scientific breakthroughs that have arisen out of your partnership with the industries in Analytics Sector? Can you highlight an instance?
4. Sector Specific Challenges and Recommendation	• Are there any factors you can identify that may impede or supplement your consultations you have with the industry? • What do you think is needed to maximize partnerships or linkages with education sector and industry?

Table A2. Key Informant Interview Guide Questions - Government

Questions
• What is your view on the current status of the labor market in the industry? (i.e. labor market imbalance, skills or qualification mismatch, emerging demand, emerging skills)
• Tell us about the initiatives you have to strengthen the labor market (i.e. addressing skills or qualification mismatch, labor market imbalance)
• What are the challenges you encounter in planning and implementing such initiatives?
• Tell us your assessment on the level of participation of the academe and industry to your initiatives
• What do you think is needed to maximize partnerships or linkages with academe and industry?

Table 30: Key Informant Interview Guide Questions - Industry

Themes	Questions
1. Industry Position and Outlook	• Describe how your company has evolved as an industry player. • From your perspective, what are the educational institutions that serve your business/industry? Why? (e.g. preferred schools, personalities attributed to region) • What technical positions and skills do you think will be demanded by your business and/or the sector in the future? Is this in the short term (next 12 months), medium (1–3 years), or long term (3+ years)? • What are some of the challenges/limitations of these workers (knowledge, qualifications, experiences, socio-emotional skills, attitudes,etc.)?
2. Challenges and Recommendations	• How has the work adapted due to the pandemic? How long do you foresee this set-up? • What are the current challenges to the industry? What industries are in direct competition with yours? • Describe the partnerships you have established with the private/public sector and the government. • Would the wage be proportional to the qualifications of newly hired employees? If there is a gap, how is this addressed? (training vs. starting salary trade- off) • Is there a gap between things learned (skills, knowledge, training) by employees in school and skills, knowledge, etc. needed on the job? If yes, how does your company compensate for this gap in the industry? • Is employee retention easy or hard? Do you find that you have to pay a premium to retain talent? • Is finding recruits easy or hard? Is it a highly competitive environment or is there a surplus of candidates?
3. Trends and Opportunities	• Kindly share your training plan for employees from newly on-boarded to tenured employees. • How does your company adapt to the challenges of the advancement of technology? (digitalization, new software, emerging skills) • How has your outlook for wages increased in the past 5 years? What is your expectation for wages in the next 5 year? • What are the underlying reasons / driving factors for establishing such programs and initiatives?

	• What are the core competencies that the institutions' programs intend to develop?

Table 31: Focus Group Discussion Guide Questions – Graduates

Themes	Questions
1. Industry Position and Outlook	• What are your considerations for choosing a job? (e.g. must be aligned to academic/educational background/degree/professional license, location, shift) • What are your target job titles? (e.g. when you look for a job, what are the keywords you search in job title?) • What are your expected job roles and responsibilities? • What are the skills that you expect to be used in your target job roles? • Are there any barriers/ challenges to entry which you have encountered when you are finding suitable employment positions? • Do you think accessibility in finding jobs is readily available to you? Are there any methods you seek to find new jobs?
2. Challenges and Recommendations	• Do you think your education has sufficiently equipped you with skills to find and keep a job? • If not, what skills do you think you would need? (ex. Technical skills: programming, Soft skills: effective communication skills, presentation skills, how to articulate the data in such a way that the client understands what is being said, what needs to be done and how you came up with it) • What do you think are necessary skills / tools that employees should possess in your field? • Can you share the positive as well the negative working conditions in your region?
3. Trends and Opportunities	• Can you highlight certain points in your training/internship/career orientation which you have employed to thrive in your field? Did you have any training/internships before being employed? • With the knowledge you have gained in university, do you think you have a edge for over say, another person from another region? Is there a level playing field? • Do you think some lessons/modules were unnecessary during your field of study? • Are there any recent topic which have come out recently that you would have wanted to learn that are Analytics related?

Table 32: Focus Group Discussion Guide Questions – Employees/Professionals

Themes	Questions
1. Job Title / Roles / Skills	• What are your considerations for choosing a job? (e.g. must be aligned to academic/educational background/degree/professional license, location, shift) • What are your target job titles? (e.g. when you look for a job, what are the keywords you search in job title?) • What are your expected job roles and responsibilities? • What are the skills that you expect to be used in your target job roles? • Are there any barriers/ challenges to entry which you have encountered when you are finding suitable employment positions? • Do you think accessibility in finding jobs is readily available to you? Are there any methods you seek to find new jobs?
2. Career Path	• Do you think your education has sufficiently equipped you with skills to find and keep a job? • If not, what skills do you think you would need? (ex. Technical skills: programming, Soft skills: effective communication skills, presentation skills, how to articulate the data in such a way that the client understands what is being said, what needs to be done and how you came up with it) • What do you think are necessary skills / tools that employees should possess in your field? • Can you share the positive as well the negative working conditions in your region?
3. Upskilling / New Training	• Can you highlight certain points in your training/internship/career orientation which you have employed to thrive in your field? Did you have any training/internships before being employed? • With the knowledge you have gained in university, do you think you have an edge for over, say, another person from another region? Is there a level playing field? • Do you think some lessons/modules were unnecessary during your field of study? • Are there any recent topic which have come out recently that you would have wanted to learn that are Analytics related?

Table 33: AAP Survey Questionnaire

Category	Questions
Personal Information	**1. First Name** **2. Last Name** **3. Age** **4. Gender** Male Female **5. Marital Status** Single Married Widowed Divorced Separated **6. Number of Children** **7. Area of residence (Region)** Region I – Ilocos Region Region II – Cagayan Valley Region III – Central Luzon Region IV- A – CALABARZON Region IV-B - MIMAROPA Region V – Bicol Region Region VI – Western Visayas Region VII – Central Visayas Region VIII – Eastern Visayas Region IX – Zamboanga Peninsula Region X – Northern Mindanao Region XI – Davao Region Region XII – SOCCSKSARGEN Region XIII – CARAGA NCR – National Capital Region CAR – Cordillera Administrative Region BARMM – Bangsamoro Autonomous Region in Muslim Mindanao **8. Area of Residence (Province)** **9. Area of Residence (City)** **10. What is your highest degree or level of school you have completed?** Elementary High School Bachelor's Degree (e.g. BS/ BA)

	Master's Degree or equivalent (e.g. MS, MA) Doctorate (PhD) Vocational **11. What is your degree / field / specialization?** **12. Name of last school attended** **13. What is your current employment status?** Self-employed Professional Employed full-time Employed part-time (including temporary and contractual) Freelancer Unemployed (currently looking for work) Unemployed (not looking for work) Unemployed Student Unemployed Retired **14. Total working years of experience**
Skills Characteristics	**15. What is the full title of your job?** **16. Describe your roles and responsibilities** **17. Describe what you do in your main job. Please describe as fully as possible.** **18. List down the top 5 hard skills needed in your job. Hard Skills are specialized technical knowledge (e.g. programming, statistical modelling, schematics, circuit design etc.)** **19. List down the top 5 soft skills needed in your job. Soft skills are generalized knowledge. (e.g. communication, problem solving, teamwork, etc.)** **20. How long have you been in your current position** (in years including fractions): **21. What is the name of your organization, employer, or trade name?** **22. Which of the following best describes your organization, employer, or trade name? (if unemployed skip)** Academic (including schools, training centers, universities, colleges) Government Private sector

	Owned Business (including freelancers and professionals) Not-for-profit, NGO **23. How many people work in your organization?** **24. What department / function / division do you belong to?** **25. Which of the following sub-sector industries do you work for?** Telecommunication Banking / Finance / Insurance Retail Consumer goods / FMCG Real Estate and Property Healthcare Education Agriculture Tourism Manufacturing IT, BPO, and Business Services E-Commerce Construction Gaming Energy Automotive and Shipbuilding Transportation and storage Social work Other **26. Location of organization, employer, or trade name (Region)** Region I – Ilocos Region Region II – Cagayan Valley Region III – Central Luzon Region IV-A – CALABARZON Region IV-B - MIMAROPA Region V – Bicol Region Region VI – Western Visayas Region VII – Central Visayas Region VIII – Eastern Visayas Region IX – Zamboanga Peninsula Region X – Northern Mindanao Region XI – Davao Region Region XII – SOCCSKSARGEN Region XIII – CARAGA NCR – National Capital Region CAR – Cordillera Administrative Region BARMM – Bangsamoro Autonomous Region in Muslim Mindanao

27. Location of organization, employer, or trade name (Province)

28. Location of organization, employer, or trade name (City)

29. Number of work hours per week

30. Did you work from home before the pandemic?

Yes
No

31. Are you working from home now?

Yes
No

32. Did any of the following happen to you as a result of the recent pandemic whilst working at this workplace? (Check all those that are applicable)

I was not working at this workplace during the pandemic
My workload increased
My work was reorganized
I lost my job / livelihood
I found a different job / livelihood
My wages were frozen or cut
My non-wage benefits (e.g. vehicles or meals) were reduced
My contracted working hours were reduced
Access to paid overtime was restricted
I was required to take unpaid leave
Access to training was restricted
I contracted COVID
My family contracted COVID
Others. Please specify.

33. Please select your current monthly salary range:

15,000 and below
15,001 to 25,000
25,001 to 35,000
35,001 to 45,000
45,001 to 55, 000
55,001 to 65,000
65,001 to 75,000
75,001 to 85,000
85,001 to 95,000
95,001 to 100,000
100,001 to 125,000

	125,001 to 250, 000 250,001 and above **34. How far is your current job from what you expected it to be back in college?** Totally different (100%) Very different (50-99%) Somewhat different (5-49%) Exactly as I expected (<5% difference) **35. Do you feel that the education you have received at the university/college has been adequate in developing hard skills in performing your job?** Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree **36. How would you rate the employment potential of your degree?** Very Good (You can get a job immediately) Good (Lots of options available) Fair (Options exist but lots of competition) Poor (There are options but you have to look for them) Very Poor (You're lucky to get a job) **37. How much of your capability is utilized in your current job?** All of my capabilities (100%) Most of my capabilities (50-99%) Some of my capabilities (5-49%) Very little to none of my capabilities (<5%) **38. For the past 12 months, were you looking for other work?** Yes No
Skills Assessment	**39. Did you take any on-the-job trainings /certifications to upskill yourself in your current field?** Yes No. **40. Apart from health and safety training, how much training / certification have you had during the last twelve months, either paid for or organized by your employer? (total number of**

	days) **41. Please list down the trainings/certifications your workplace has provided in the last twelve months.** **42. How was the training delivered? If mixed, select the most applicable option.** In-house training face-to-face External training provider face-to-face In-house training online External training provider online **43. What other resources for learning /upskilling did you use apart from the trainings/certifications your workplace provided? Check all that apply.** Online educational institutions (including digital courses and MOOCs) Self-study Conferences and seminars (including webinars) Traditional educational institutions (academic and vocational degrees) Web and Mobile apps Government programmes

Table 34: Summary of demographic profiles of qualitative data participants

Demographic profie of KII participants		
Characteristics	**n=16**	**%**
Gender		
Female	6	37.50%
Male	10	62.50%
Age Group		
24 - 27	1	6.25%
28 - 31	2	12.50%
32 - 35	1	6.25%
36 - 39	2	12.50%
40 - 43	1	6.25%
44 - 47	3	18.75%
48 - 51	1	6.25%
52 - 55	2	12.50%
56 - 59	1	6.25%
64 - 67	1	6.25%
N/A	1	6.25%
Sectoral Group		
Education	9	56.25%
Government	3	18.75%
Industry	4	25.00%

Demographic profie of FGD participants		
Characteristics	**n=19**	**%**
Gender		
Female	13	68.42%
Male	6	31.58%
Age Group		
24 - 27	4	21.05%
28 - 31	4	21.05%
36 - 39	3	15.79%
40 - 43	3	15.79%
52 - 55	1	5.26%
56 - 60	1	5.26%
N/A	3	15.79%
Sectoral Group		
Employees	6	31.58%
Government	4	21.05%
Graduates	6	31.58%
Industry	3	15.79%

Table 35: Summary of themes and interview quotes

Category	Themes	Quotes
COVID-19 Pandemic Response	Working from Home	"So it's very easy to transition to work from home. You just bring your laptop. I think the culture is a little bit more different." "So nung nagstart yung pandemic, I was still with my previous company so yeah... Work from home lahat ng training and coaching sessions nasa bahay lang ako. So after that I resigned, I wanted to pursue something different." "..but when the pandemic happened, I chose a career or a job that allows me to stay at home most of the time. And yeah, because previously, the companies previously I'm working with, they sometimes ask their employees to go to the office. I mean, that's a main consideration.."
	Online Learning	"So, in terms of the instruction part, actually part of the, the overall learning process begins with developing the materials, developing the course, designing the course, preparing the video presentations, learning assessments, among other things, that, and of course, putting this together, processing this. So that the sub-directed learner and just click the links and then run it on given their available time." "Yung pinaka challenge dito yung internet connection. Okay? So yeah, the tech support. To further and sustain with remote setup."
Skills Gaps and Mismatch	Job Description/ Roles Disparity	"There was a time I applied for a role named Data Analytics Manager, it's more focused on data engineering. So as much as possible, employers must be specific." "But when you're at the work already, sometimes you're just doing it for the data steward and I have an experience that

		they're looking for in the data analyst. But when I was part of the team, I'm the only analytics guy for the whole company because they are a manufacturing company. So I do the translating the data.... and I do the template and then I [do] the engineering part and I assess the data as a data analyst, and I create insight using dashboard. Sometimes it's misleading in terms of the job description." "..my title has already changed three times. Okay. So I started as a data analytics manager, okay. And after two years they changed it to full stop data engineer. Okay, and then after another two years they changed it to marketing data, scientists, okay? But to be honest, the type of job that I'm working actually did not change alone, okay? Okay. The types of projects so yes there's so the difference is that for data scientists type, medyo intimidating. Konti yung expectation, I do a bit of data modelling. Mahirap ilagay sa isang box kasi."
	Old Jobs with New Branding	.."I've been doing public policy analysis and that includes submitting legislative proposals to be included in the legislative mail essentially. I realized I've been doing it all along. The budget, the national budget, the General Appropriations Act have a lot of data analysis from various government agencies. So essentially, that's what I do. I am finding out trends.. I've been doing analysis related to public finance management." " I came from an engineering background, So technically all the way, I think of analytics. It's anybody's game talaga." "..I was a statistics teacher before, so we know very well that data analytics is super close to the work we have here is very related to statistics and actually is statistics is one of the backbone of data analytics, so still even though I shifted a career, andun parin yung pagiging teacher because I still managed to apply what I knew and I still manage to apply my profession. "
	Blending the Technical with Business	"Yeah. So at the start, so that's the business understanding, okay? The prerequisite to that is, they have to know that world, usually not their world." " So that's really the gap we're seeing there aside from the gap mismo on the data science na degree or data analyst or functional analyst. There's also this gap na the trained analytics people that we have are not trained to work with the industry." "What they actually need, aside from the analytics domain, they also look at the importance of communication, especially personal relations, and not just technical. Pag dating sa qualification, hindi lang Python, Machine learning. But when you do visualization, you have to be good at storytelling. Because of that, in terms of the labor force, yung communications may concern." "Soft skills would be communication as much as you have output, if you can't communicate properly, if you can't voice out concerns, medyo tigil lahat. Siguro the way you can describe this person. Not just well rounded, pero specific in the frame of analytics. "
Current Trends in Bridging the Skills Gap	Individual	"Yeah I think so because data analytics transcends skills kasi inter-disciplinary siya, so whether you are in health psychology economics or hard science like biology etc, especially physics, you will need a lot of data analytics, and you also need data science [or] because data scientists, because of the enormous data that we are producing, I even did not recognise that. Even in my job as a social scientist, indispensable yung data science and data analytics so yeah it will be a competency that I think would

		be expected by everyone later on. A bit different depending on the kind of actual job that you are doing." "What I like about analytics is that I guess it saves me a lot of time because well you can easily decide what to do if you have the right insights. So it's efficient for me. " "What I like most about analytics is ano, exciting because there's also something new that you can use for experiment on especially when providing advice to clients." "Yeah, I think well before. I wanted to, to be in the or to have an analytics job, but then tinitignan ko yung mga job descriptions or yung mga experiences needed, skill sets. And so, I don't think I have those. Let's say sometimes they would require at least, you know, one language for you. You need to know Python or R, or some data visualisation tool. Siguro na expose lang ako now on and so company when they introduced Alteryx. But yung knowledge hindi siya ganun ka in-depth. So that's when I decided to take up Masters related to analytics. " "Back in my first job, nagkaroon kami ng training kaya yun yung nagtrigger sakin to pursue this role. I started taking online courses, tapos during projects para ma practice yung Database skills may kasama na palang analytics na hindi ko alam. So when I continue my self study and taking up online courses until I get motivated, na nag persuade para kumuha ng different role in analytics."
	Institutional	"So my recommendation to that is yung capstone project or thesis, yung partnership namin is by giving us a project, a real word project that the student can work on. " "But I think, yeah, I think many of our learners were very lucky to have been there graduating at a time. When really like, the startup ecosystem is also growing here in the Philippines. They've been. Yeah, really lucky to have joined us. Like the first junior, like data people in teams like ... for instance, where the first data like person ever at .... was one of our graduates. You know, now it's got a very robust and mature data team, where our learners were able to be a part of that growth trajectory." ..." I had to change the curriculum in such a way that there are more generalists in Analytics. So they would see the whole range but it's more. There is more emphasis on the process of implementing data science and analytics, the business problem statement, creation and extracting, the value of presenting, the value of the analytics projects and presenting the insights. So the data storytelling everything else in between on the techniques, the algorithms, and all that meron pa rin yun. But we emphasise to the scholars that these are things that you should not be afraid of yeah. Now, learn new skills because pag labas niyo may bago na naman, but the methodologies are how you should, you know, the essential skills in data storytelling yun parin naman." "So we really deep dive into the Maths, meron kaming Mathematics for data science, there's also Applied Computational Statistics. These are really hard for a Mathematical computational courses and we even have machine learning one all the way into the machine learning three that looks at the latest trends in the Artificial Intelligence. But on top of that kasi ... you have managing innovation on design thinking, project management with agile for example and then there are the vertical courses when I say vertical, they are the functional courses, finance, marketing, operations. Kasi it's very important

		for future Data Science leaders to also know the basic language of these functions like accounting, finance. “

Labor markets are affected by a wide range of policies and government regulations. As an emerging sector, Analytics is no exception. As shown in Table 26, we consolidated a list of key regulations that would have theoretical impact on data and analytics.

Table 36: Key regulations related to Analytics

Bill	Date Enacted	Description
Cybercrime Prevention Act of 2012 : RA 10175	25-Jul-11	An Act Defining Cybercrime, Providing For The Prevention, Investigation, Suppression And The Imposition Of Penalties Therefor And For Other Purposes
Data Privacy Act of 2012 : RA 10173	25-Jul-11	An Act Protecting Individual Personal Information In Information And Communications Systems In The Government And The Private Sector, Creating For This Purpose A National Privacy Commission, And For Other Purposes
Intellectual Property Code of the Philippines : RA 8293	6-Jun-97	An Act Prescribing The Intellectual Property Code And Establishing The Intellectual Property Office, Providing For Its Powers And Functions, And For Other Purposes
The Special Economic Zone Act of 1995. : RA 7916 (as amended by Republic Act No. 8748)	25-Jul-94	An Act Providing For The Legal Framework And Mechanisms For The Creation, Operation, Administration, And Coordination Of Special Economic Zones In The Philippines, Creating For This Purpose, The Philippine Economic Zone Authority (PEZA), And For Other Purposes.
Freedom of Information (FOI) Program : EO No. 2, 2016	23-Jul-16	Operationalizing In The Executive Branch The People’s Constitutional Right To Information And The State Policies To Full Public Disclosure And Transparency In The Public Service And Providing Guidelines Therefor
Innovative Startup Act : RA 11337	23-Jul-18	An Act Providing Benefits And Programs To Strengthen, Promote And Develop The Philippine Startup Ecosystem
National Broadband Plan : DICT	23-Jun-17	In View Of This, The Philippine Government, In Its Desire To Accelerate The Deployment Of Fiber Optic Cables And Wireless Technologies All Over The Country, Particularly In Far-Flung Or Remote Areas, To Improve The Overall Internet Speed Of The Country, Developed The National Broadband Plan (NBP)
Telecommuting Act : RA 11165	23-Jul-18	An Act Institutionalizing Telecommuting As An Alternative Work Arrangement For Employees In The Private Sector
The Anti-Terrorism Act of 2020 : RA 11479	22-Jul-19	An Act To Prevent, Prohibit And Penalize Terrorism, Thereby Repealing Republic Act No. 9372, Otherwise Known As The "Human Security Act Of 2007"
Philippine Innovation Act : RA 11293	23-Jul-18	An Act Adopting Innovation As Vital Component Of The Country's Development Policies To Drive Inclusive Development, Promote The Growth And National Competitiveness Of Micro, Small And Medium Enterprises, Appropriating Funds Therefor, And For Other Purposes

Philippine Forensic DNA Database Act : HB 7204	29-Jul-20	An Act Improving And Maintaining Forensic Science Facilities, Establishing For The Purpose A Forensic DNA Database In The Philippines, Appropriating Funds Therefor And For Other Purposes
Freelancers Protection Act : Senate Bill 1810	7-Sep-20	An Act Providing Protection To Freelancers And For Other Purposes
Net Neutrality Bill : Senate Bill 2103	15-Mar-21	An Act Protecting Internet Consumers And Promoting Net Neutrality In Data Transmissions, And For Other Purposes
Full Digital Transformation Act of 2020 : Senate Bill 1793	26-Aug-20	An Act Mandating The Full Digital Transformation Of All Government Agencies, Officers And Corporations, Including Local Government Units, Appropriating Funds Therefor And For Other Purposes
National Digital Careers Bill : Senate Bill 1469	21-May-20	An Act Supporting The Growth And Development Of Digital Careers In The Philippines
Open Access to Data Transmission Act : Senate Bill 911	15-Aug-19	An Act Promoting Open Access In Data Transmission, Providing Additional Powers To The National Telecommunications Commission, And For Other Purposes
Jobs NextAct : Senate Bill 2271	2-Jun-21	An Act Jumpstarting Opportunities For Businesses And Ensuring Employability Of The Philippine Workforce Through Expanded Competency-Based Learning And Skills Training, To Drive Inclusive Development And Sustainable Growth, And Establishing For This Purpose A National Future Skills Council, And Appropriating Funds Therefor
National Employment Recovery Strategy (NERS) : Executive Order No 140 of 2021	25-Jun-21	Adopting The National Employment Recovery Strategy (NERS) 2021-2022 And Reinforcing Job-Generating Programs Through The NERS Task Force