Recommended APEC
Data Science & Analytics (DSA) Competencies

"We are currently preparing students for jobs that don't yet exist…using technologies that haven't yet been invented…in order to solve problems we don't even know are problems yet."

– Richard Riley, former U.S. Secretary of Education (1993-2001)

"We recognize the vital importance of continuing work towards an inclusive education agenda that will enable people of all ages to meet the challenges of a globalized world. Furthermore, realizing that equitable access to high-quality education and training will allow our people to develop skills and competencies from early childhood and throughout their lifetime, we must focus our efforts on improving the quality, mobility and access to education including in partnership with employers, and soft skills development."

– 2016 APEC Leaders' Declaration, Lima, Peru

Why DSA Competencies?

Jobs requiring a familiarity with DSA are rising dramatically, resulting in a shortage of qualified employees.[1] DSA is defined as the ability to gather, analyze and draw practical conclusions from data, as well as communicate data findings to others. In 2016, DSA-related jobs were at the top of those that employers in the Asia Pacific region are having the most difficulty filling.[2]

By identifying DSA competencies required by employers in a data-driven world, economies will be equipped to educate their workforce – preparing students and workers for the yet-to-be-defined jobs of tomorrow and helping economies to fulfill their economic potential. DSA-enabled knowledge workers will have skills not easily replaced by automation; instead, they will be better prepared to unlock the promise and potential of data and all the technologies that depend on it. We are all living in a big data, digital world. DSA skills will soon be fundamental at all levels of the workforce – from entry-level to the C-suite.[3]

Employers across every sector are being transformed by the data economy and have growing demands for DSA-enabled workers. Key sectors include: healthcare, financial services, manufacturing, research, retail, construction, mining, agriculture, aerospace, and government. U.S. data suggests that DSA-enabled workers represent one of the largest areas of employment and economic impact.[4]

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[1] APEC commissioned report "The Data Science and Analytics Skills Shortage: The Case for Action to Equip the APEC Workforce with the Competencies Demanded by Employers to Support Sustainable Economic Growth and Prosperity"
[2] http://manpowergroup.com/talent-shortage-2016
[3] http://www.bhef.com/sites/default/files/bhef_2017_investing_in_dsa.pdf
[4] http://www.bhef.com/sites/default/files/bhef_2017_investing_in_dsa.pdf

Recommended APEC DSA Competencies

A set of *Recommended APEC DSA Competencies* was developed to serve as a resource to enable academia and training providers to align the development of curricula, courses and programs to industry needs. It is also a valuable resource for government policymakers to manage skills development within their workforce and design policies that support the development of skills in data science and analytics. The competencies were developed by a 50 person Advisory Group composed of 14 APEC member economies, co-chaired by the global skills and knowledge company Wiley and the Business Higher Education Forum (BHEF). Advisory Group members comprised: business leaders who oversee data science and analytics needs for their organizations; academic leaders who oversee data science inter-disciplinary initiatives and curriculum; and government officials involved in human resources development. Advisory Group member organizations may be found in the "Acknowledgements" section of this document.

The following 10 competencies apply to teams comprising highly trained data scientists and a new emerging segment of DSA-enabled professionals. Data scientists and DSA-enabled workers are defined by a combination of these 10 competencies but possess different levels of mastery, comprised of business and organizational competencies, technical competencies, and workplace skills that drive value creation. This will help transform an organization's analytics capability.

Recommended APEC DSA Competencies:

Business and Organizational Skills

1. **Operational Analytics:** Use data analytics and specialized Business Analytics (Business Intelligence) techniques for the investigation of all relevant data to derive insight for decision making.

2. **Data Visualization and Presentation:** Create and communicate compelling and actionable insights from data using visualization and presentation tools and technologies.

3. **Data Management and Governance:** Develop and implement data management strategies and governance, incorporating privacy and data security, policies and regulations, and ethical considerations.

4. **Domain Knowledge and Application:** Apply domain-related knowledge and insights to effectively contextualize data, achieved by practical experience and exposure to emerging innovations.

Technical Skills:

5. **Statistical Techniques:** Apply statistical concepts and methodologies to data analysis.

6. **Computing:** Apply information technology, computational thinking, and utilize programming languages and software and hardware solutions for data analysis.

7. **Data Analytics Methods and Algorithms:** Capture, clean and inspect data. Implement and evaluate data analytics and machine learning methods and algorithms on the data to derive insights for decision making.

8. **Research Methods:** Utilize the scientific and engineering methods to discover and create

new knowledge and insights.

9. **<u>Data Science Engineering Principles:</u>** Use software and system engineering principles and modern computer technologies, incorporating a data feedback loop, to research, design and prototype data analytics applications. Develop structures, instruments, machines, experiments, processes, systems to support the data lifecycle.

Workplace Skills

10. **<u>21st Century Skills:</u>** Exhibit crosscutting skills essential for DSA at all levels, including but not limited to: collaboration, communication and storytelling, ethical mindset, organizational awareness, critical thinking, planning and organizing, problem solving, decision making, customer focus, flexibility, business fundamentals, cross cultural awareness, social and societal awareness, dynamic (self) re-skilling, professional networking, and entrepreneurship.

Examples of DSA-related jobs that align with the *Recommended APEC DSA Competencies*

- Data Scientists & Advanced Analytics
- Data Analysts
- Data Systems Developers
- Analytics Managers
- Functional Analysts
- Data-Driven Decision Makers

Recommendations for Action

Enabler	Employer	Academia	Government
Employer leadership and signaling	Increase leadership – level awareness of DSA value to business competitiveness		
	Accurately signal employer needs (e.g. better job profiles) with a focus on DSA-enabled workers		
Aligned Incentives and Action with Support from Government	Undertake joint workforce planning initiatives across all stakeholders to map employer/economy needs and define educational pathways, including apprenticeships, vocational education and other industry engagement opportunities (e.g. competitions, capstone projects, data sharing projects) supported by government policies to incentivize employer-academia partnerships (e.g. funding, convening, open data, broadband infrastructure etc)		
	Develop domestic standards and accrediting schemes for DSA-enabled		

	graduates and workers		

Accurate Data on Supply and Demand Pipeline to Understand DSA Gap	Conduct audit of existing workforce DSA skills	Conduct audit of existing courses/curriculum	
Quality Content to Ensure Mastery of DSA-Aligned Learning Outcomes	Work with faculty and providers to develop curricular content mapped to employer needs		
Faculty and Administrators with Skills Aligned to DSA-Enabled Mindset		Provide training and opportunities for professional networking, including focus on interdisciplinary and cross-border collaboration	
DSA-Awareness in K-12		Promote the value of DSA concepts and encourage their integration in K-12 education	

About Project DARE

Project DARE is an initiative of the Asia-Pacific Economic Cooperation (APEC) led by the United States (U.S. Department of Labor) with co-sponsorship from the governments of Australia, Japan, Malaysia, Peru, Chinese Taipei, and Viet Nam and endorsed by the APEC Business Advisory Council (ABAC).

As a project of APEC's Human Resources and Development Working Group (HRDWG), Project DARE seeks to facilitate development of a data analytics-enabled workforce across the APEC region to effectively support sustainable economic growth and prosperity in the Asia-Pacific region. Members of the Advisory Group that developed the *Recommended APEC DSA Competencies* may be found in the acknowledgement section.

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