



المجالس القطاعية للمهارات  
Sector Skills Councils

# Digital Sector Sector Skills Framework

## Sector Overview, Job Families and Pathways

Issued by Digital Sector Skills Council  
**2025**

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## Foreword

Based on the Council of Ministers Resolution #254 dated 23/04/1442, the Labor Market Strategy was approved, aiming to initiate fundamental reforms in the labor market through a series of targeted initiatives. In response, the Ministry of Human Resources and Social Development, through its Skills and Training deputyship, has activated the Occupational Planning and Standards initiative, specifically via the key Sector Skills Councils project.

The Sector Skills Councils, composed of representatives from sector employers, line ministries, and other key stakeholders, have been instrumental in developing comprehensive Sector Skills Frameworks. These frameworks are carefully designed to identify the essential skills required across various sectors, ensuring that our workforce is well-prepared to thrive in a competitive global marketplace.

We are proud to present the Sector Skills Framework for the Digital Sector. This framework is the culmination of rigorous research and extensive stakeholder engagement. It delineates the technical and general skills required within the sector and provides a formalized articulation of the labor market's skills needs. Aligning skills development with the skills needed by the labour market, the framework aims to enhance employability, foster economic growth, and contribute to the sustainable development of the Kingdom.

We extend our sincere gratitude to all members of the Sector Skills Council, sector employers, educational institutions, and other stakeholders who have contributed to the development of this framework. The successful implementation of this framework will undoubtedly lead to a more competent and competitive workforce, driving innovation and productivity within the Digital Sector. Together, we can ensure that the Kingdom of Saudi Arabia remains at the forefront of global economic progress.



# Objectives of Digital Sector Skills Council



The Digital Sector Skills Council aims to achieve the following objectives:

- Determine requirements, standards and career pathways to support planning for professions and skills
- Establish consolidated sector intelligence with implications on current and future skills needs and challenges
- Align training and education programs with labor market needs
- Support in bridging skills gaps and skills shortages, and improving labor productivity
- Improve workforce skills across the sector

## Key contributors

### Sector Skills Council Members

“The Digital Skills Framework is a cornerstone of developing and preparing technical cadres, which was developed by the Digital Sector Skills Council, aiming to improve the productivity and performance of the workforce and create a labor market that attracts local and global talents and capabilities. It is one of the most important initiatives that aim to create a sustainable mechanism and partnership with government agencies, the private sector, education and training entities, and relevant stakeholders to plan skills at the sectoral level, in order to identify and meet the sector's need for skills, establish partnerships with them, and build a sustainable business model, as the Digital Sector Skills Council aspires to play an effective role in developing digital skills in the Kingdom.”



**Ibrahim N. AlNasser**  
(SSC Chairperson)

Deputy Minister for Future Jobs and Capabilities



**Dr. Ahmad Awad Alghamdi**  
Advisor



**Abdullah AlGhamdi**

Sector expert



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**Nader Shinnawi**  
Chief of Training Subsidy Program



# 01

## Introduction

This report is built to **detail out different components of the Sector Skills Framework for the Digital Sector in Saudi Arabia**. The report is to be used in tandem with **Digital Skills Dictionary Report and the Digital Skills Repository Excel Tool**.

The primary purpose of this report is to **outline the sector overview, its sub-sectors, key sector transformations and skills needs in line with sector transformations, as well as define job families and career pathways in the Digital sector**. Clearly established job families and career pathways will equip the sector stakeholders to make informed decisions with regards to skilling efforts, trainings required, sector policymaking, performance improvement, etc.

User can access Skills Dictionary Report

by clicking below



User can access Skills Repository Excel Tool

by clicking below



# Sector Skills Frameworks and their relevance to different stakeholders

A Sector Skills Framework (SSF) is a comprehensive tool that **outlines the skills needs within the sector**. It identifies the **skills required for each job family** across the sector's value chain(s). The Sector Skills Framework follows a **structured approach** to identify the skills required within the sector wherein first job families across sub-sectors are identified, followed by outlining key job roles, pathways and priority skills required.

The following is how the Sector Skills Frameworks are intended to support **key stakeholders of the Digital sector**:



## Employed and unemployed workforce

Workforce in the sector can **clearly understand the skills required** and **plan their professional development**. This will also facilitate mobility across jobs and enable unemployed members to **prepare for job roles of interest**.



## Employers

Employers can use the Sector Skills Framework to **plan employee-trainings in line with industry standards** for skills and **support skills-based hiring** rather than occupations-based hiring.



## Education and training entities

Education and training entities can use the framework to **assess alignment between learning outcomes of programs and skills identified in the Sector Skills Frameworks**. They can also leverage the framework to design programs based on current and future industry needs of the sector.



## Policymakers

Policymakers can use Sector Skills Frameworks to **understand industry's skills needs** and tailor policies to **address skills needs and shortages**.



## Funding entities

Funding entities can refer to Sector Skills Frameworks as **a guiding tool to identify areas that require funding** and enable optimized allocation of funds in the sector.



## Accreditation and licensing entities

Accreditation and licensing entities can use the Sector Skills Framework to **enhance accreditation and licensing process** in line with industry priority skills needs.



**Abdullah AlGhamdi**  
Digital Sector Expert

“ The Digital Sector Skills Framework will serve as a clear roadmap, outlining the essential and advanced skills needed for each profession. It is a powerful tool that will support the continuous growth and development of our workforce.

# Development approach and methodology

Establishment of the Digital Sector Skills Framework is aimed at **identifying sector's key skills needs** for various roles **within job families** across the sector. The Sector Skills Framework serves as a **foundational tool for workforce development**, ensuring the sector is **equipped with skilled talent** necessary to thrive and contribute to the Kingdom's national ambitions.

The development process leverages a **robust combination of primary and secondary research**, drawing from approximately **40+ main sources**. The tools and mechanisms adopted for developing the framework include: (1) Curated research from global SSF references (2) Roundtable discussions with industry experts

Initial development of Digital Sector Skills Framework entails defining the sector and its sub-sectors, collating relevant transformations for the sector by examining key sectoral transformations within the Kingdom as well as globally. From these transformations, implied skills needs are identified. Then a long list of skills is developed and validated in line with the various sources. Sector-specific global and local experts are also consulted to validate the findings.

**Digital SSC members actively and thoroughly develop and review** the different components of the framework. Multiple round-table discussions are conducted with leading sector-specific entities and other contributors, to gather industry views and ensure that Sector Skills Framework reflects the realities of the Digital sector skills needs in the Kingdom.

**11+** National strategies and key players' strategies  
(incl. Vision 2030, govt. entities and local players)



**3** Dedicated Digital sector local and global experts engaged through 1-on-1 interviews for specific inputs on sector transformations and skills needs

**6** Digital sector market reports and publications from leading global entities in the sector



**19** Digital Sector Skills Council member entities consulted and led the development of the various components of the Sector Skills Framework

**1,000+** inputs from Digital Sector Skills Council members to localize and refine Sector Skills Framework to solve skills needs within the Kingdom



**Key global Sector Skills Frameworks** to gather learnings and best practices for development of the Kingdom's Digital Sector Skills Framework and ensure coverage of skills needs

# 02

## Sector Skills Frameworks' applications

Sector Skills Frameworks are a critical tool primarily for two key sector stakeholders: **(1) Employers (2) Education and training entities**. The frameworks act as a guide **for these stakeholders to develop policies, curricula, skills development initiatives and organizational policies**. As part of this report, **multiple specific use-cases** of Sector Skills Frameworks are identified for these stakeholders and are present in the subsequent section.

# Sector Skills Framework use-cases for employers and education and training ecosystem entities

## Employers



Sector Skills Framework is an important tool for employers to enable targeted workforce development and recruitment. It helps align employers' workforce capabilities/ requirements with evolving industry needs and standards. The framework facilitates several applications:

- **Market segmentation:** Adopting SSC sector/ sub-sector definitions to unify language across the skills ecosystem to facilitate cross-entity and cross-sectoral discussions, engagements, & initiatives, for example, implementing unified language and definitions across Information Technology and Communications sub-sectors
- **Career pathway mapping:** Providing employers with career pathway maps at the job family level, helping to define progression plans, for example, identifying typical roles and their transitions within Software job family
- **Skills gaps identification:** Conducting skills gap analysis with Sector Skills Framework as the base, in order to ensure that the entity remains competitive by aligning its skills with evolving demands, for example, reviewing Sector Skills Framework and identifying growing demand for digital transformation expertise
- **Unified job family classification:** Categorizing new and existing efforts under the relevant job family by sub-sector, for example, unifying definition of the "Telecom Engineering" job family
- **Job roles definition:** Defining job roles and responsibilities in line with identified priority skills across different job families facilitating targeted hiring and setting job expectations, for example, including key skills requirements for a Product Manager in the job definition.

## Education & training entities



Sector Skills Framework is a reference point for education and training entities, helping them ensure their programs target priority skills in alignment with industry skills needs. There are multiple facets through which Sector Skills Framework enables this motive:

- **Funding prioritization:** Prioritizing funding for programs aligned with high-priority skills highlighted within Sector Skills Framework, for example, partnering with academies offering priority skills in AI
- **Program and curricula design:** Ensuring current and new programs address skills needs based on the Sector Skills Framework, for example, comparing skills learned in current programs versus identified skills needs for a refined curricula
- **Training gaps identification:** Ensuring coverage of education and training offerings across the job families identified by the Sector Skills Framework and targeting the right skills needed through a program, for example, launching digital transformation (i.e., data science and machine learning) training programs for particular levels
- **Licensing and accreditation:** Facilitating licensing and accreditation of programs addressing priority skills needs as identified by the Sector Skills Framework, for example, facilitating the accreditation process for cloud computing skills



**Najla Alsaif**  
Human Resources Director



“ One of Alat's primary goals is to drive job creation in industry and technology-related fields. Establishment of the Digital Sector Skills Framework to [...] develop skills within the targeted sectors will play a crucial role in helping us achieve this vision in the coming years.

# 03

## Digital Sector Skills Framework Overview

Digital Sector Skills Framework is built leveraging the following sector definition for **the Digital Sector**:

Digital sector includes the physical hardware and associated software that enables end-to-end Information and Communication Technology development and operations. It spans a wide array of activities and professions primarily centered around information technology and communications.

The subsequent section provides an overview of the Digital sector highlights and definitions for the two Digital sub-sectors: **(1) Information Technology (2) Communications**

## Key sector highlights

**~154**  
Billion

Size of Digital sector's GDP  
in KSA in SAR (2023)<sup>1</sup>

**4.1%**

Contribution of Information and Communication  
Technology sub-sector to GDP in KSA (2023)



The Digital sector employs **~112K private sector employees of KSA's labor force** of which 61% (~68.7K) are Saudis and 24% (~27K) are female<sup>2</sup>



**5G coverage** reaches **~53%** across the country and **~94%** in Riyadh (2023)



**Sector Investment** reached **~SAR 93 billion** in the digital infrastructure between 2016-2022



**Fiber optics** covers **~3.7 million** Saudi homes, with a **penetration rate of over 60%** (2023)

Note: (1) Not included activities in this Sectors skills framework: telecommunications infrastructure installation (classified under construction and real estate), sales and repair of electronic devices (classified under wholesale and retail), and digital marketing and advertising services (classified under professional and consulting services); Maps to National classification for economic activities section C division 26; section J divisions 58, 60, 61, 62, and 63; (2) MHRSD Business Intelligence (2023) data covering the private sector (linked to ISIC section J divisions 58 (only group 582), 60, 61, 62, and 63)

Sources: National classification of economic activities, MCIT, Communications, Space & Technology Commission, MHRSD Business Intelligence (2023)

## Digital sub-sectors' overview



### Information technology

#### Sub-sector level 1

- **Hardware:** Physical components of a computer system or electronic device
- **Software:** Programs and applications that provide instructions for the computer to execute specific tasks, ranging from operating systems to applications
- **Data center & cloud services:** Data center house and computing resources management, on-demand access to computing resources, storage, and applications over the internet
- **IT services:** Professional services that support the implementation, management, and maintenance of information technology systems
- **Emerging technology:** Innovations and technologies that are in the early stages of development and have the potential to significantly impact industries



### Communications

#### Sub-sector level 1

- **Wired and wireless telecommunication:** Services for Operation, maintenance, and provision of telecommunication services over wired and wireless networks e.g., fiber optic cables and cellular, and satellites
- **Broadcasting activities:** Services for broadcasting content for radio, television and data programs of entertainment, news, and talk














**Majid Bakarman**  
Human Resources Director



*The Digital Sector Skills Framework is a critical tool as it helps identify skills needs within the Digital sector, allowing stakeholders to allocate resources and training more effectively. It strengthens alignment between education and training outcomes and labor market demands [...] This framework is key for driving innovation and productivity [...]*

# Digital sub-sectors' overview










## Details of the Digital sub-sectors

Information technology			
Sub-sector level 1	Definition	Sub-sector level 2	Sample companies
<b>Hardware</b>	Physical components of a computer system or electronic device, including devices like processors, memory, and peripherals, used to perform digital tasks	Hardware Devices	  
		Handsets and wearables	
		Accessories	
		Data Center Hardware	
		Physical Access Hardware	
		Networking Hardware	
Other Hardware			
<b>Software</b>	Programs and applications providing instructions for the computer to execute specific tasks, ranging from operating systems to applications	End-user application	  
		Gaming Applications	
		Middleware and Firmware	
		Business Software	
		System Software	
<b>Data Center and Cloud Services</b>	Data center house and computing resources management, on-demand access to computing resources, storage, and applications over the internet	Data Center Services (Incl. Hosting and Colocation)	    
		Infrastructure as a Service (IaaS)	
		Platform as a Service (PaaS)	
		Software as a Service (SaaS)	
		X as a Service (XaaS)	
		Content Delivery Networks	

# Digital sub-sectors' overview

## Details of the Digital sub-sectors









### Information technology

Sub-sector level 1	Definition	Sub-sector level 2	Sample companies
<b>IT Services</b>	Professional services that support the implementation, management, and maintenance of information technology systems, such as consulting, support, outsourcing, and cybersecurity (incl. information security, electronic security, digital security)	Consulting Services	    
		IT Services Management	
		IT Staffing	
		Cybersecurity services	
		Support and Maintenance	
<b>Emerging technology</b>	Innovations and technologies that are in the early stages of development and have the potential to significantly impact industries	Systems Integration and Development	
		AR/VR	
		Robotics	
		Artificial intelligence	   
		Internet of Things (IoT)	
		Distributed Ledger Technology	
		Big Data	
3D Printing			

# Digital sub-sectors' overview

## Details of the Digital sub-sectors

### Communications

Sub-sector level 1	Definition	Sub-sector level 2	Sample companies
<b>Wired and wireless tele-communication</b>	Operation, maintenance, and provision of telecommunication services over wired and wireless networks e.g., fiber optic cables and cellular, and satellites	Wired telecommunications (e.g., fixed telecommunication services)	   
		Wireless telecommunications (e.g., satellite telecommunications, mobile broadband, microwave telecommunications)	
<b>Broadcasting activities</b>	Activities of broadcasting content for radio, television and data programs of entertainment, news, and talk	Radio broadcasting (e.g., assembling and transmitting aural programming via over-the-air broadcasts, cable or satellite)	
		Television programming and broadcasting activities (e.g., TV activities, channel subscription, operating the service of satellite connection to control)	 



## Sector's predominant transformations and their impact on skills needs

01 Global transformations	02 Relevant local sector transformations and strategic imperatives	03 Workforce transformations
<p>As part of the global transformations, major <b>developments, transitions, and patterns</b> are being observed around the world within the Digital sector, such as <b>Technological enablers, Infrastructure and security, Environment, social, and governance (ESG), and Customer centricity</b></p>	<p>With respect to local sector transformations and strategic imperatives, there are <b>significant advancements and shifts occurring specifically within KSA</b>. These include initiatives aligned with <b>National priorities, comprehensive National strategies (such as Vision 2030 National Transformation Program, ICT Strategy 2019-2023, etc.)</b>, and substantial <b>investments</b>. Additionally, <b>private and corporate initiatives</b> are playing a key role in shaping industry's landscape.</p>	<p>In relation to workforce transformations, noticeable changes, patterns, and shifts have been identified in factors like demand for <b>Flexible technology labor market, Demand outpacing supply, Technology enhancing collaboration, Location and co-location flexibility, Evolving talent experience</b>, and Rapid shift towards <b>new skillsets</b>.</p>

## 01 Global transformations

The Digital sector is undergoing rapid changes globally, shaped by numerous transformations across four main categories: **(1) Technology enablers (2) Infrastructure and security (3) Environment, social, and governance (ESG), and (4) Customer centricity.**

### Technology enablers

Within Technology enablers, **12 main technology transformations** in the following spaces - Internet of Things (IoT) applications and services, AR/VR, Robotic process automation, Advanced connectivity, Quantum computing, AI, Digital innovations, E-commerce, Metaverse integration, Game development, Remote work and Digital collaboration and Big data and advanced analytics, **are collectively changing the Digital industry and the workforce.**



#### Internet of Things (IoT) applications and services

IoT technology is transforming industries by **enabling remote monitoring and control of critical infrastructure**, such as telecom base stations and data centers. This capability allows for real-time management and increased operational efficiency, driving demand for IoT expertise.



#### Augmented and virtual reality applications

AR and VR technologies **are opening new ways to interact** with both the physical and digital world by integrating spatial computing and sensory inputs. These innovations are enabling applications like immersive training simulations and virtual communication platforms.



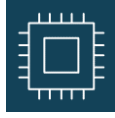
#### Robotic process automation

Automation is advancing through **software-driven robots and cobots, which perform routine tasks** like data extraction and cleaning. This frees human workers to focus on more complex responsibilities, enhancing productivity across the sector.



#### Advanced connectivity

New connectivity solutions, including 5G/6G networks, low-power wireless, and small satellites, are **driving digital innovation by supporting high-speed, reliable communication** across industries. These advancements are critical for smart cities, remote work, and enhanced digital experiences.



#### Quantum computing

Quantum computing is gaining momentum, with **investments aimed at revolutionizing data analysis to solve complex issues**, such as optimizing telecom networks. This technology has the potential to transform sectors that rely on rapid, large-scale data processing.



#### Artificial intelligence

AI technologies, from **virtual agents to advanced analytics, are enhancing business processes and network security**. They're used to detect issues, self-repair systems, and protect against fraud, creating a more secure and efficient digital environment reducing requirement for human intervention.



#### Investments in digital innovations

Companies are increasingly allocating **funds toward digital technology development, infrastructure, and upgrades**. These investments aim to boost capabilities, drive efficiency, and strengthen competitive advantages across industries – cutting down workforce requirements.



#### E-commerce

As consumer preferences **shift toward online shopping, businesses are investing heavily in digital infrastructure and intuitive interfaces** to meet demand. This transformation is driving the need for skills in digital marketing, user experience (UX) design, and e-commerce platform management to create seamless and engaging online shopping experiences.



#### Metaverse integration

Metaverse, a network of digital spaces for socializing, learning, and collaboration, is **evolving to offer immersive virtual experiences**. Developing the metaverse requires skills in 3D modeling, augmented reality (AR), virtual reality (VR), spatial computing, etc.

## 01 Global transformations



### Game development

Rise of digital gaming and e-sports, fueled by advancing technology and **shifting player expectations**, the **gaming industry is expanding rapidly**. This growth calls for skills in game design, software development, and interactive storytelling, as well as an understanding of user engagement in the digital age.



### Remote work and digital collaboration

COVID-19 pandemic **accelerated the move to remote and hybrid work models**, increasing the reliance on digital collaboration tools and infrastructure. Skills in remote communication, digital project management, digital infrastructure a development and cybersecurity are essential to support seamless and secure workflows.



### Big data and advanced analytics

Companies are leveraging **big data and advanced analytics to better understand consumer behavior and optimize business processes**. This transformation amplifies the demand for data science, statistical analysis, and business intelligence skills to turn vast data sets into actionable insights and drive innovation across sectors.

## Infrastructure and security

As companies **increasingly rely on digital services**, the focus on **secure, scalable, and efficient systems becomes critical**. There are **6 infrastructure enablers**—Cybersecurity, Blockchain, Cloud computing, and Next-generation network, that are not only reshaping operations across industries but are also driving demand for specialized skills.



### Cybersecurity

As digital services expand, so do the **risks associated with cyber threats, particularly for tech and telecom companies**. This heightened focus on security and requires skills in threat detection, risk management, and incident response to safeguard data and maintain the trust of users and clients.



### Blockchain

Blockchain technology is enhancing **transparency and security in data transactions, simplifying processes** in supply chains and tech operations. Skills in blockchain development, cryptography, and compliance are essential for professionals tasked with implementing and managing blockchain applications.



### Cloud computing

Reliance on **cloud infrastructure is growing** leading to development of **hybrid and multi-cloud environments**. This shift emphasizes the need for expertise in cloud architecture, data security, and network management, as companies strive to leverage cloud resources efficiently and securely.



### Open radio access network (ORAN)

Open radio access network **allows for open, flexible, and interoperable 5G networks**, making it easier to deploy adaptive cellular networks and is therefore **seeing rapid adoption**. Professionals with knowledge of network virtualization, radio network planning, and 5G technologies are essential to drive ORAN adoption and optimize network performance.



### Multi access edge computing (MEC)

Multi access edge computing brings **computation closer to end-users**, supporting applications that **require low latency and high bandwidth**, such as AR/VR and industrial automation. Skills in edge computing, network configuration, and application optimization are key as industries seek to enhance user experience through multi access edge computing.



### Next-generation transmission networks

Advances in transmission networks **support high-bandwidth, low-latency communication necessary for IoT and other data-intensive applications**. This evolution requires skills in network engineering, signal processing, and IoT integration, enabling industries to build and manage robust connectivity frameworks.

## 01 Global transformations

### Customer centricity

**Customer centricity is an upcoming priority across countries** and is being uplifted through seamless, personalized interactions. The emphasis is on creating **experiences that not only meet but exceed customer needs** by leveraging **Omnichannel strategies** and **Digital personalization**.



#### Omnichannel

Today's **customers expect smooth, integrated interactions across multiple communication channels**, from mobile apps to social media and customer support lines. To support this, telecom companies are adopting omnichannel strategies, which require skills in digital marketing, customer experience (CX) design, and cross-platform integration to create unified customer journeys.



#### Customer digital personalization

Companies are **leveraging big data and AI to tailor customer interactions** by predicting needs and accordingly suggesting relevant add-on services. This approach calls for expertise in data analytics, machine learning, and personalization algorithms, enabling businesses to deliver highly customized experiences that foster customer loyalty and engagement.

### Environmental, social and governance (ESG)

Environmental, social, and governance (ESG) considerations are **gaining importance rapidly and companies are adopting practices that prioritize sustainability and ethical standards**. This shift not only reflects **corporate responsibility but also influences skills requirements**, as organizations seek expertise in **Sustainable technologies & green IT** and **Data & AI ethics**.



#### Sustainable and green IT

Companies are embracing **eco-friendly technologies and practices** that reduce energy consumption and environmental impact. This transformation drives demand for skills in sustainable IT practices, energy-efficient system design, and carbon footprint management, enabling professionals to help organizations minimize their ecological impact.



#### Data and AI ethics

With increasing **reliance on data and AI, there is a strong focus on ethical data handling**, including privacy, consent, and fairness in AI applications. This requires knowledge in data governance, AI ethics, and regulatory compliance, as professionals work to ensure transparency and responsible use of data and AI technologies.



**Faisal Alotaibi**  
Human Resources Director



“ *The Digital Sector Skills Framework empowers individuals to acquire advanced, specialized skills that drive digital transformation and keep pace with rapid technological transformations, ultimately contributing to a robust and sustainable digital economy.* ”

## 02 Relevant local sector transformations and strategic imperatives

In the Kingdom, significant advancements and shifts are happening within the local sector, driven by initiatives aligned with National priorities & strategies, and involvement of private & corporate initiatives shaping the industry.



Saudi Arabia has launched multiple programs under **Vision 2030**, focusing on promoting the growth of the Digital sector, which include enhancements in the **digital infrastructure** and enabling the adoption of **Fourth Industrial Revolution (4IR)** technologies. A major contributor to this vision is the **National Transformation Program**

The **National Transformation Program** covers 7 themes, out of which, one of them is **Digital Transformation**. Key initiatives under the program include developing **sectoral digital policies** and legislation to enable digital transformation, expanding the Kingdom's 4G **wireless broadband coverage**, enabling 5G services and developing **e-government services**

In addition to the Vision 2030 and its strategic program, there are **National strategies** that focus on development of the Digital sector. Major National strategies and initiatives for the sector include:



**The ICT Strategy 2019-23 by MCIT**, which focuses on raising **Saudization in the ICT sector** to 50% and women's participation by **~50%** in the sector, creating **~25K more quality jobs** and raising the sector's contribution to GDP by **~50B SAR**

The **Smart Government Strategy (2020-24)** aims to create an **agile, capable, and innovative** government resulting in **new seamless Smart Government** experiences for beneficiaries, centered around their needs

The **National Strategy for Data and AI (2020)** included initiatives such as regulatory framework, incentivizing companies/ talent in the sector, investment funds, investor support programs, building R&D, power smart cities, etc.

The **Digital Government Strategy (2023-2030)** outlines Saudi Arabia's roadmap for digital transformation and aims to provide **personalized services for citizens**, improve the **ease of doing business**, and establish a **unified regulatory framework**

Complementing the efforts of the public sector, various development projects & investments are assisting the growth of the sector. **Digital Government Capacity Development Program (Quodrat-Tech)** by the Digital Government Authority in collaboration with other govt. entities, focuses on promoting and empowering the digital transformation plans in the government sector of the Kingdom through the development of human capacities and skills. **Saudi Digital Academy** collaborated with various private sector players like Amazon and Huawei to develop local talent within the technology domain



**Center of Digital Entrepreneurship (CODE)**, with innovation labs in **6 Universities**, in addition to **15** with **strategic partners**, empowers **local companies** to develop their tech business and transform their innovative ideas into a digital reality.

The **Saudi Digital Investment Frontier** develops digital tools that support the governance of digital procurement and encourage digital investment

## 03 Workforce transformations

In workforce transformations, there are noticeable shifts in factors such as **Flexible tech labor market, Demand outpacing supply, Tech enhancing collaborations, Location and co-location flexibility, Evolving talent experience, Rapid shift towards new skillsets.**

### Flexible technology labor market

With the rising demand for technology talent, companies are experiencing a **shortage of skilled professionals** alongside **increasing rates of attrition**. To address this gap and maintain business profitability, organizations are turning to a flexible labor market for technology workers, which includes options **such as temporary, freelance, and contract-based roles**. This approach also **aligns with the Vision 2030 goal of boosting job creation** within the Kingdom of Saudi Arabia. In support of this shift, KSA is **implementing initiatives to deploy 5G technology** and broaden internet access, which facilitates remote work and freelance work, enabling a more seamless and adaptable work experience for professionals.

### Demand outpacing supply

The global demand for technology talent is on a continuous rise to exceed supply. In the U.S., for example, **demand currently exceeds supply by over 120K jobs**, despite an **8% year-over-year increase in graduates** and a rise in certification enrollments. As a result, **only 13% of companies are able to acquire the talent** they need to meet their business goals. In the Kingdom, the demand for skilled professionals is increasing as well, **highlighting a gap between the industry's skills requirements and the current workforce's capabilities**. This gap underscores the need for enhanced workforce skills development to align with industry needs.

### Technology enhancing collaboration

Technology giants are **advancing artificial intelligence and the metaverse** to enhance collaboration and cohesion **within hybrid and remote teams**. By leveraging these technologies, **they aim to create more connected and efficient work environments**. In the Kingdom, **technology companies are also exploring the use of AI** to enable real-time collaboration among teams, boosting efficiency and optimizing workflows.

### Location and co-location flexibility

Employees are increasingly **demanding options for remote or hybrid work setups**, prompting companies to **adopt work-from-home software, virtual assistants, and digital HR managers** to support remote work environments. Many organizations are **expanding their hiring pools beyond local regions**, creating job opportunities and fostering diversity. In Saudi Arabia, **hybrid work has become a significant transformation within the technology workforce**, largely accelerated by the impact of the COVID-19 crisis.

### Evolving talent experience

Companies are **increasingly focused on providing career growth opportunities** to retain top talent in a competitive market. Technology firms are **actively investing in the professional development** of their employees, offering regular training to ensure they remain informed about the latest digital transformations. For example, **STC provides ongoing education programs** to keep its workforce up-to-date with industry advancements.



Workforce

### Rapid shift towards new skillsets

Many of **today's most in-demand skills did not exist a decade ago**, resulting in a shortage of emerging skills and an oversupply of traditional ones. This has **created a need to prioritize recruitment for roles requiring new skills** and to urgently reskill or upskill the existing workforce. In response, the Kingdom has **launched Tuwaiq Academy**, aiming to develop and enhance local talent through **collaborations with major technology companies like IBM, Apple, Meta, and Alibaba Cloud**.

# Key skills needs in line with sector transformations



## Technological enablers

### Internet of Things applications and services

- IoT tech design and development
- Embedded systems design
- Cybersecurity of emerging tech
- Strategy/ processes design and change management

### Augmented and Virtual Reality applications

- 3D modeling
- VR/ AR/ MR applications
- UI and UX design
- Strategy/ processes design and change management

### Robotic process automation

- Programming
- Robotic and automation technology application
- Risk management
- Strategy /processes design and change management

### Artificial Intelligence

- Computer vision
- Natural language Processing (NLP)
- Machine Learning (ML)
- Strategy/ processes design and change management

### Advanced connectivity

- Wireless network planning and optimization
- Network architecture
- Network security
- Strategy/ processes design and change management

### Quantum computing

- Quantum mechanics
- Computational modelling
- Error correction and fault tolerance
- Strategy/ processes design and change management

### Investments in digital innovations

- Financial analysis
- Portfolio management
- Risk management
- Strategy/ processes design and change management

### E-Commerce

- Data analytics and business intelligence
- Database management
- Payment gateway integration
- Strategy /processes design and change management

### Metaverse integration

- Data Analytics
- VR/ AR/ MR applications
- Cybersecurity of emerging tech
- Strategy/ processes design and change management

### Gaming development

- Game analysis and design
- Game programming, development, and testing
- Ethical game design
- Strategy/ processes design and change management

### Remote work and digital collaboration

- Cloud computing integration
- File management
- Troubleshooting
- Strategy/ processes design and change management

### Big data and advanced analytics utilization

- Data preparation and processing
- Machine learning (ML)
- Data visualization
- Strategy /processes design and change management

# Key skills needs in line with sector transformations



## Infrastructure and security

### Cybersecurity

- Cybercrime, data breach incident management, and cyber forensics
- Cryptography and encryption
- Cyber risk management
- Strategy/ processes design and change management

### Blockchain

- Cryptography and encryption
- Data structures
- Smart contract writing
- Strategy/ processes design and change management

### Cloud computing

- Cloud platforms
- Cloud development and operations management (DivOps)
- Cloud security
- Strategy /processes design and change management

### Open Radio Access Network (ORAN)

- RAN architecture
- Communication systems and protocol design
- Software development and integration
- Strategy /processes design and change management

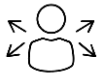
### Multi Access Edge Computing (MEC)

- Cloud architecture
- MEC automation
- Interoperability testing
- Strategy/ processes design and change management

### Next generation transmission network

- FTTX design
- OTN design
- Network security
- Strategy/ processes design and change management

# Key skills needs in line with sector transformations



## Customer centricity

### Omnichannel

- Customer experience management
- Customer data analysis
- Risk management
- Strategy/ processes design and change management

### Customer digital personalization

- Data analysis
- UX design
- Data protection management
- Strategy/ processes design and change management



## ESG

### Sustainable and green IT

- Energy management and efficiency
- Green software engineering
- Virtualization and cloud computing utilization
- Strategy/ processes design and change management

### Data and AI ethics

- Ethical decision-making
- Privacy protection
- Fairness and bias mitigation
- Strategy/ processes design and change management

# 04

## Sector's value chains, job families and their pathways

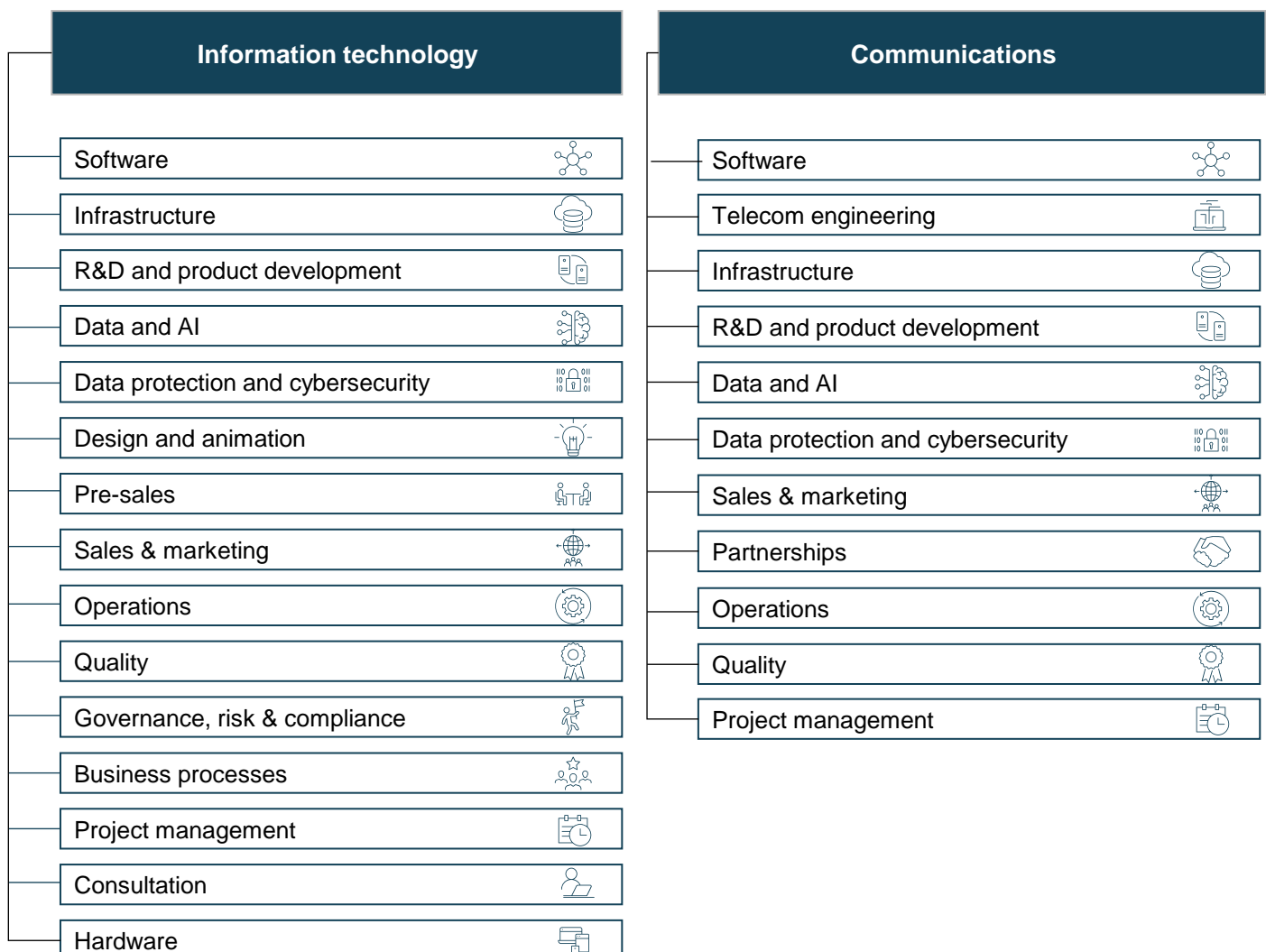
To support workforce development in the Digital sector and align with the National ambitions, Digital Sector Skills Framework report **outlines the sector's job families and career pathways**. By **mapping out sub-sectors, defining value chains and detailing job families across the value chains**, this report offers a **structured view of the opportunities and skills requirements** across the Digital sector. The purpose of this section is to **serve as a resource** for anyone interested in understanding the **diverse roles within the Digital sector, identifying key skills for supporting workforce development, and developing policies and training programs**.

# Introduction to job families

Job family refers to a **category of job roles** that perform related activities and have similar expertise across various organizations within a particular sector. Each **job family requires a distinct set of skills and tasks** to carry out critical functions within that sector.

Job families **are the foundation** to help categorize jobs into broader skills-based groups, making it easier to develop career paths and identify sector skills needs.

The following section of the **report presents a comprehensive value-chain analysis** for the two defined sub-sectors: (1) Information Technology (2) Communications. This analysis **meticulously maps 17 Digital job families across sub-sectors' value chains**. Through this mapping, the section highlights how the **job families contribute to the overall structure and functionality of the sector**.



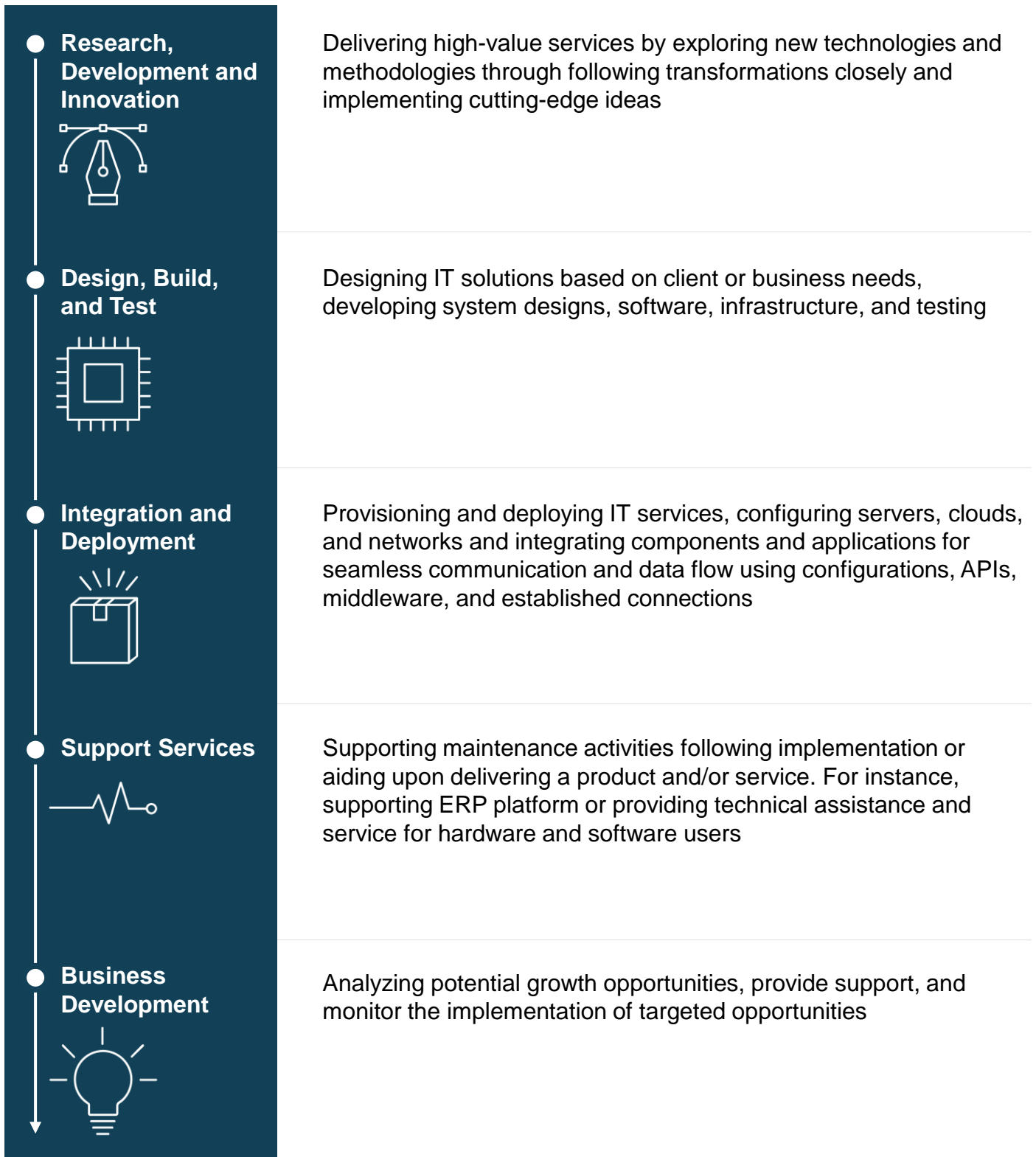
# 17 key job families identified within the Digital sector

<p><b>Software</b></p> <p><b>01</b></p> 	<p><b>Telecom Engineering</b></p> <p><b>02</b></p> 	<p><b>Infrastructure</b></p> <p><b>03</b></p> 
<p><b>R&amp;D and Product Development</b></p> <p><b>04</b></p> 	<p><b>Data and AI</b></p> <p><b>05</b></p> 	<p><b>Data Protection and Cybersecurity</b></p> <p><b>06</b></p> 
<p><b>Design and Animation</b></p> <p><b>07</b></p> 	<p><b>Pre-sales</b></p> <p><b>08</b></p> 	<p><b>Sales and Marketing</b></p> <p><b>09</b></p> 
<p><b>Partnerships</b></p> <p><b>10</b></p> 	<p><b>Operations</b></p> <p><b>11</b></p> 	<p><b>Quality</b></p> <p><b>12</b></p> 
<p><b>Governance, Risk and Compliance</b></p> <p><b>13</b></p> 	<p><b>Business Processes</b></p> <p><b>14</b></p> 	<p><b>Project Management</b></p> <p><b>15</b></p> 
<p><b>Consultation</b></p> <p><b>16</b></p> 	<p><b>Hardware</b></p> <p><b>17</b></p> 	

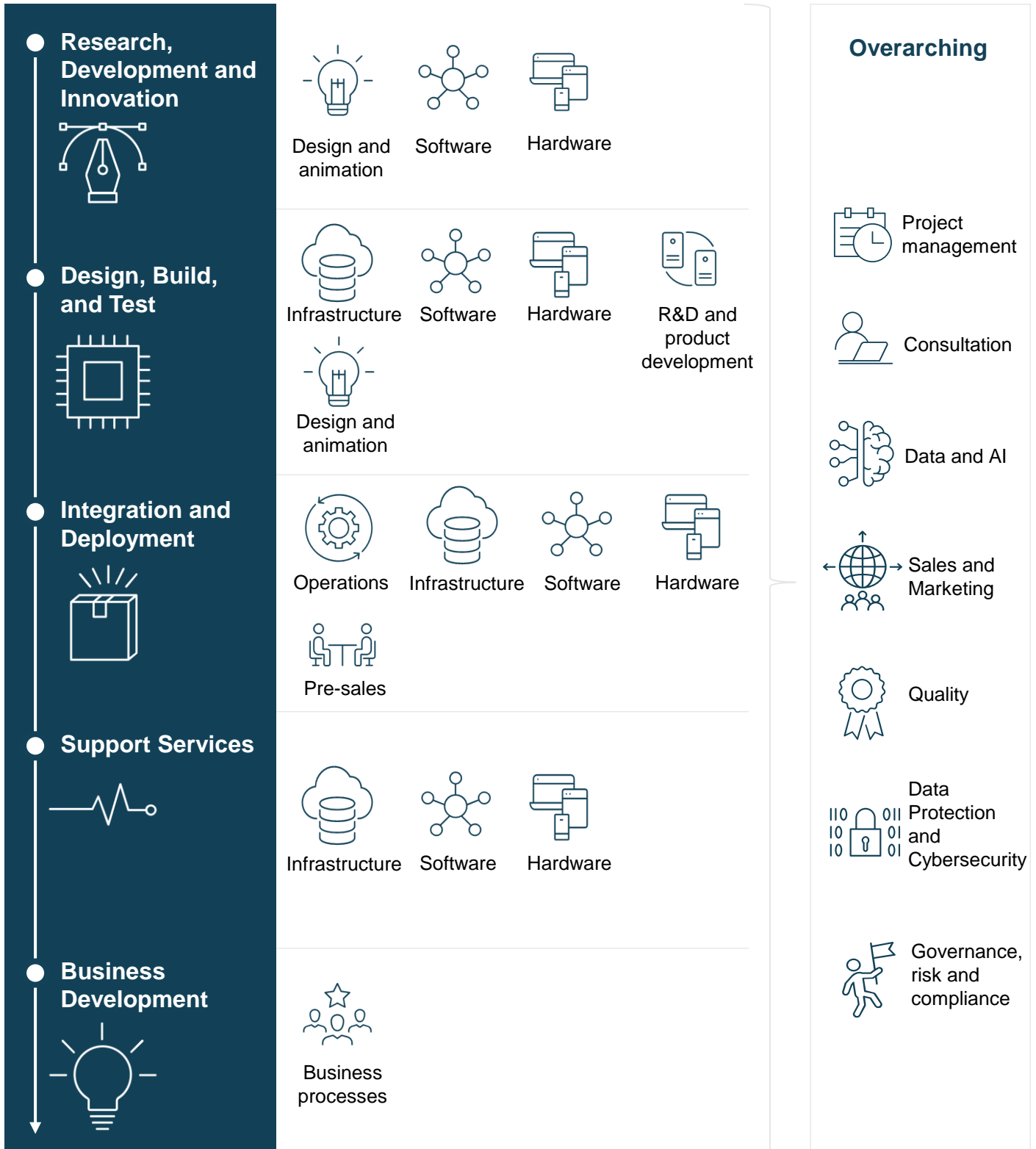
# Information Technology sub-sector value chain

The Information Technology sub-sector value chain has 5 key elements:

- (1) Research, development and innovation, (2) Design, build, and test,
- (3) Integration and deployment, (4) Support services, (5) Business development



# Job families mapped to the Information Technology sub-sector value chain



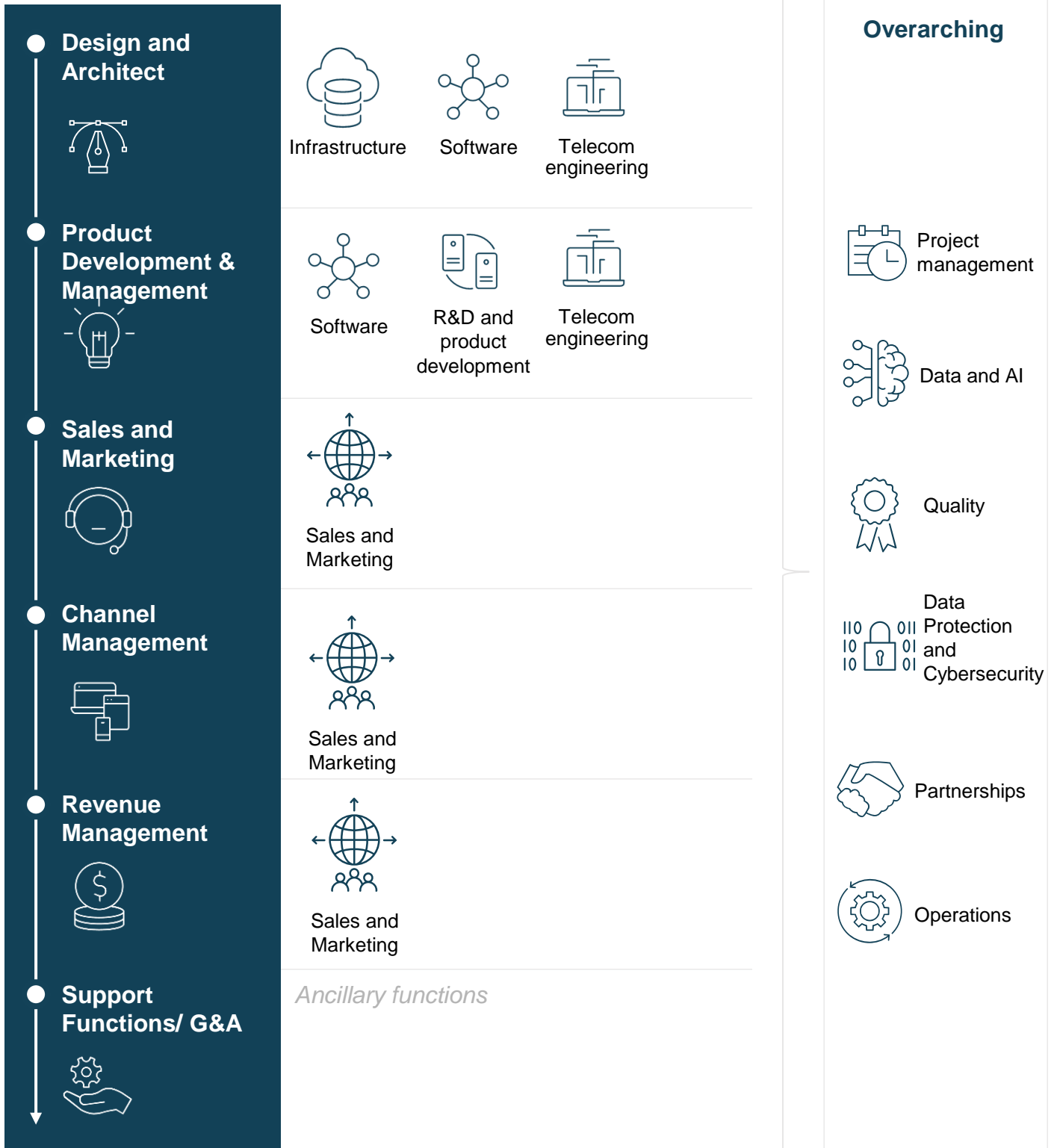
## Communications sub-sector value chain

The Communication sub-sector value chain has 6 key elements:

(1) Design and architect, (2) Product development and management, (3) Marketing and sales, (4) Channel management, (5) Revenue management, (6) Support functions/ G&A



# Job families mapped to the Communications sub-sector value chain



## Introduction to job family profiles

As part of the Sector Skills Framework, **job families have profiles accompanied with career pathway maps**. The profiles are essentially a guide to align job families and their skills requirements across a specific sector to ensure better workforce needs planning and development.

In the following section, job family profiles are detailed out for **17 job families** in the Digital sector. The **profiles outline in a structured way** the following elements:

- (1) Job family overview
- (2) Key job roles
- (3) Key tasks/ activities
- (4) Key relevant skills
- (5) Relevant certifications/ licenses
- (6) Relevant Unified Saudi Occupation Classification (USOC) codes

<b>Job family overview</b>	Offers a comprehensive brief of job family's role within the sector, emphasizing its core functions. It enables users to understand how the job family contributes to the broader sector
<b>Key job roles</b>	Provides a list of key roles in the job family enabling the users to understand what type of designations are available within the job family and what are the specific skills that are required for those jobs
<b>Key tasks/ activities</b>	Provides an overview of specific responsibilities and tasks associated with roles in the job family; helping users understand expectations
<b>Key relevant skills</b>	Provides list of essential skills for the roles in the job family to perform their key tasks as well as keep up with the requirements based on sector transformations
<b>Relevant certifications/ licenses</b>	Outlines select key licenses or certifications relevant (non-exhaustive) for key roles in the job family – in line with regulations/ policies in the Kingdom
<b>Relevant USOC codes</b>	Links relevant Unified Saudi Occupation Classification Codes on Unit level (level 4) to facilitate statistical reporting and automated updates

Digital Skills Dictionary Report and Digital Skills Repository are developed to complement this report. The dictionary provides detailed definitions on the sector's priority skills across the different proficiency levels, and the Excel tool is a repository of technical and general skills mapped to sub-sectors and job families.

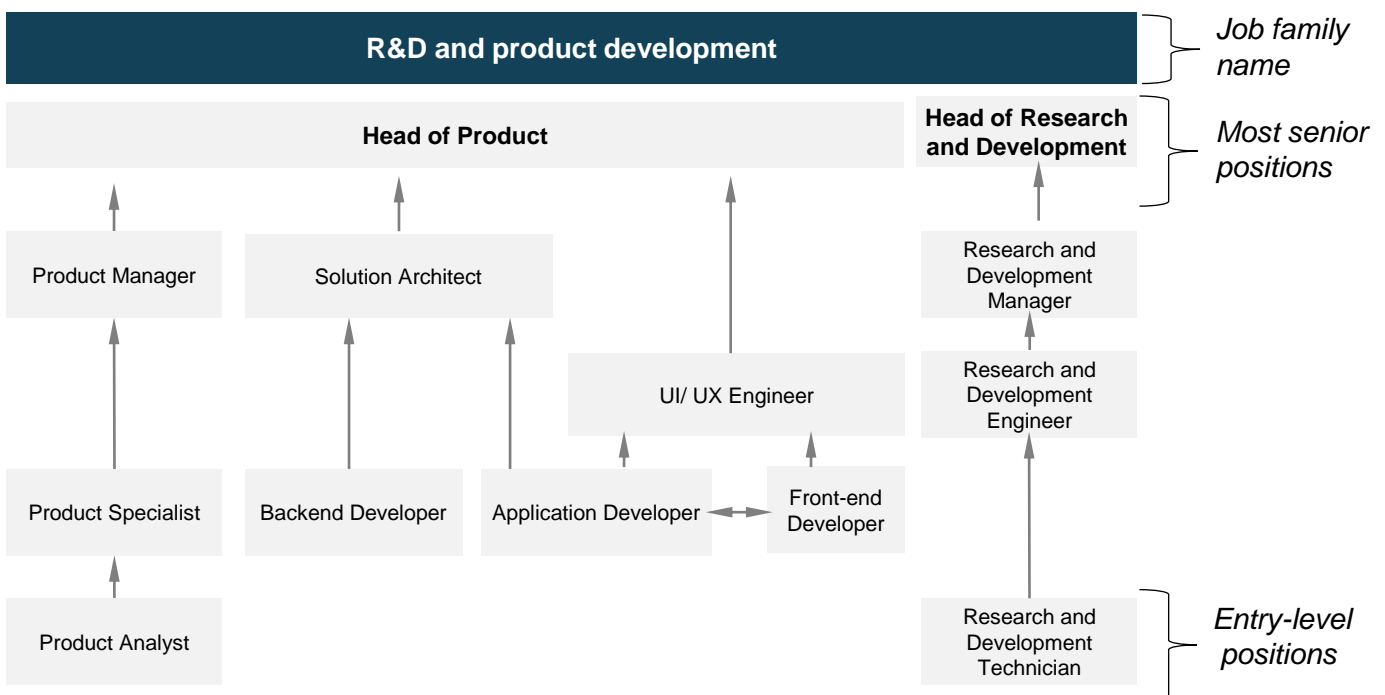
## Introduction to career pathway maps

Based on the key roles identified across the 17 job families in the Digital sector, **11 career pathway maps have been developed covering 200+ job roles**. The pathways are **designed to identify current and future roles within the sector**, providing a **clear vision of how professionals can move on, progress and plan their careers within a job family**.

The **focus of these pathways is primarily on specialized technical areas** within the sector. This approach was taken to **target the roles needed** for the sector. While these pathways predominantly address technical functions, it is acknowledged that they do not cover other supporting roles. For every career pathway map, skills and certifications/ licenses are defined at the overall job family level. For entry-level positions, technical sector-specific skills are particularly critical, whereas at senior levels, general skills become increasingly important along with technical skills.

The career pathway maps are a guide for sector stakeholders. Together with job family profiles, these career pathway maps provide an evidence-based foundation for designing relevant training programs, hiring strategies, educational curricula, skills initiatives, etc. These tools will help inform decisions on workforce development and ensure alignment with the industry's skill demands.

### Illustrative example: R&D and product development job family



**Dr. Iyad Katib**  
Member of Committee of  
Deans of Computer and  
Information Faculties



*The Digital Sector Skills Framework is an essential tool for workforce development, helping to align the skills of graduates with ever-changing labor market requirements. By identifying the skills required and directing academic programs towards meeting these skills needs, we will be able to enhance graduates' readiness and improve their career progression prospects.*

# 200+ job roles identified across job families depicted in the profiles

<p><b>Software</b> 16 job roles</p> <p><b>01</b></p> 	<p><b>Telecom Engineering</b> 15 job roles</p> <p><b>02</b></p> 	<p><b>Infra-structure</b> 20 job roles</p> <p><b>03</b></p> 
<p><b>R&amp;D and Product Development</b> 13 job roles</p> <p><b>04</b></p> 	<p><b>Data and AI</b> 17 job roles</p> <p><b>05</b></p> 	<p><b>Data Protection and Cybersecurity</b> 39 job roles</p> <p><b>06</b></p> 
<p><b>Design and Animation</b> 7 job roles</p> <p><b>07</b></p> 	<p><b>Pre-sales</b> 4 job roles</p> <p><b>08</b></p> 	<p><b>Sales and Marketing</b> 11 job roles</p> <p><b>09</b></p> 
<p><b>Partnerships</b> 4 job roles</p> <p><b>10</b></p> 	<p><b>Operations</b> 18 job roles</p> <p><b>11</b></p> 	<p><b>Quality</b> 4 job roles</p> <p><b>12</b></p> 
<p><b>Governance, Risk and Compliance</b> 10 job roles</p> <p><b>13</b></p> 	<p><b>Business Processes</b> 4 job roles</p> <p><b>14</b></p> 	<p><b>Project Management</b> 5 job roles</p> <p><b>15</b></p> 
<p><b>Consultation</b> 4 job roles</p> <p><b>16</b></p> 	<p><b>Hardware</b> 12 job roles</p> <p><b>17</b></p> 	

# Job family profiles and career pathway maps:

## (1) Software

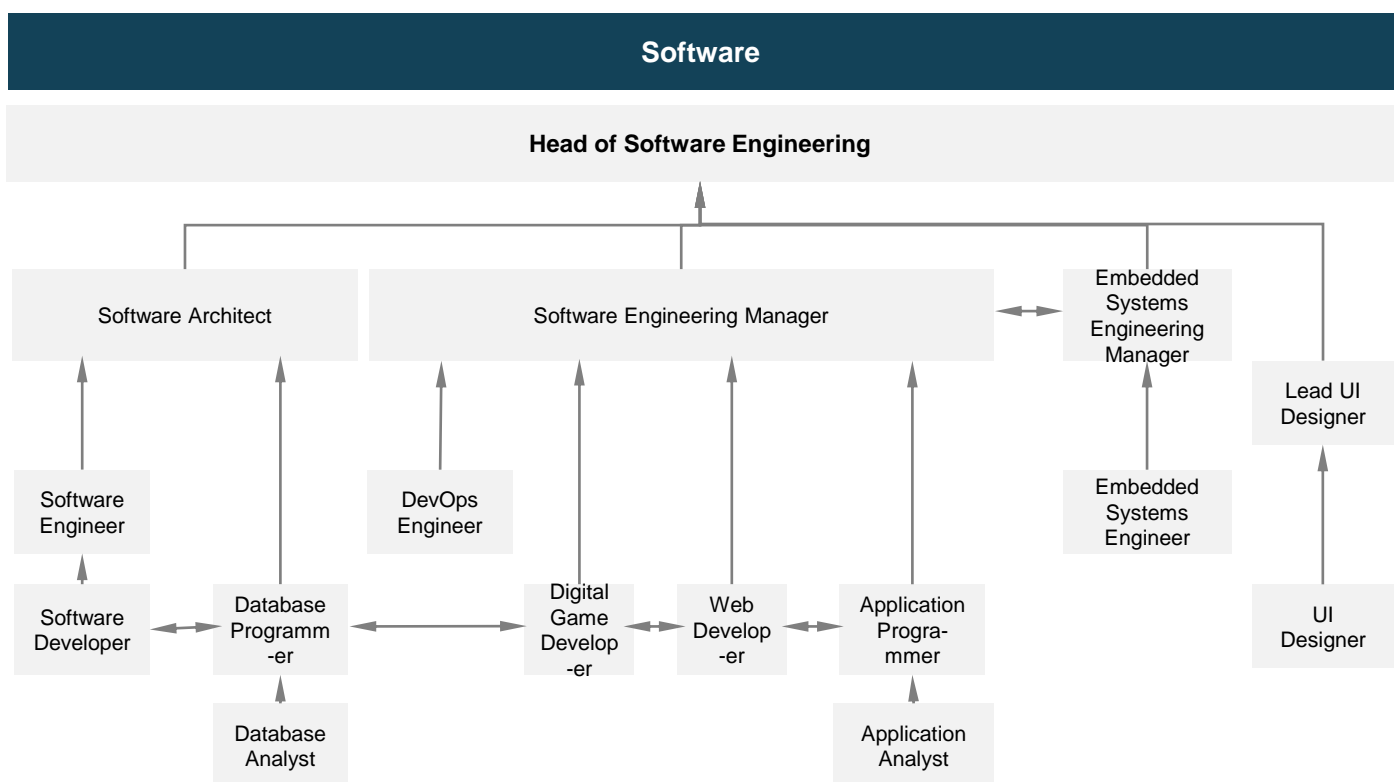
### Job family overview

The job family clusters roles that deal with **designing and engineering software and IT systems** with a focus on interrelationships between components.

**Key tasks/ activities** include:

- Designing software (back-end and front-end)
- Coding IT systems
- Developing user interfaces (UI design)
- Developing software
- Testing software
- Producing games
- Developing and optimizing LTE systems

The family **has 16 key job roles**: Head of software engineering, Software architect, Software engineer, Software developer, Database programmer, Database analyst, Software engineering manager, DevOps engineer, Digital game developer, Web developer, Application programmer, Application analyst, Embedded systems engineering manager, Embedded systems engineer, Lead UI designer, UI designer.



**Relevant USOC unit-tier codes for the job family:** 2512 Software developers, 2514 Applications programmers, 2519 Software and applications developers and analysts not elsewhere classified, 2521 Database designers and administrators, 1330 Information and communications technology service managers, 2513 Web and multimedia developers

# Job family profiles and career pathway maps:

## (1) Software

### Skills requirements

The listed job roles require skills related mainly to software development, coding and computer science. The core skills include agile software development, embedded systems design, game programming, development, and testing, scripting and programming languages, etc.

Full list of key skills is present in the table below providing a detailed view on job family skills needs.

#### Key relevant skills

- 3D software development
- Agile and DevOps methodology application
- Agile software development
- Embedded systems design
- Game programming, development, and testing
- Scripting and programming languages
- Software applications scripts development
- Software configuration
- Software design
- Software development and integration
- Solution architecture
- UI and UX design

### Relevant certifications/ licenses (non-exhaustive)

Software job family roles require computer science and software engineers for the job. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page) that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (1) Software

### Certifications

- Certified Web Professional – Web Developer (IWA)
- AWS Certified Developer – Associate (AWS)
- Certified Data Professional (CDP) (ICCP)
- Certified Software Quality Engineer (CSQE) (ASQ)
- Microsoft Certified: Azure Developer Associate (Microsoft)
- Certified Secure Software Lifecycle Professional (CSSLP) (ISC<sup>2</sup>)
- Certified Information Systems Security Professional (CISSP)
- Certified ScrumMaster (CSM)
- Certified Software Engineering Manager (CSEM) by IASA
- AWS Certified Solutions Architect – Professional
- Certified Software Development Professional (CSDP) by IASA
- PMI Agile Certified Practitioner (PMI-ACP)
- ISTQB Foundation Certified Agile Tester
- ISTQB Foundation Performance Tester Certified Tester - Performance Testing (CT-PT)
- Unity Certified User: VR Developer
- Unity Certified User: Programmer
- Unity Certified Associate: Game Developer
- DASA DevOps Fundamentals
- Certified DevOps Engineer – Foundation
- CIW User Interface Designer
- App Development with Swift Associate
- App Development with Swift Certified User
- OutSystems Associate Traditional Web Developer
- Angular Training Angular Certification - Level 1
- Oracle Java Certified Foundations Associate
- CIW JavaScript Specialist
- OutSystems Associate Developer (ODC)
- C# Certification
- Certified Entry-Level Python Programmer (PCEP)
- Frontend Development Certification
- Tester Mobile Application Testing
- AWS Certified DevOps Engineer
- ISTQB-Foundation Level Certification (CTFL)
- Microsoft Certified: Azure Developer Associate
- Designing and Implementing Microsoft DevOps solutions
- ISTQB Foundation Mobile Tester / Certified
- Unity Certified Associate: Programmer
- Unity Certified professional: Programmer
- Autodesk Maya Certified User

# Job family profiles and career pathway maps:

## (2) Telecom Engineering

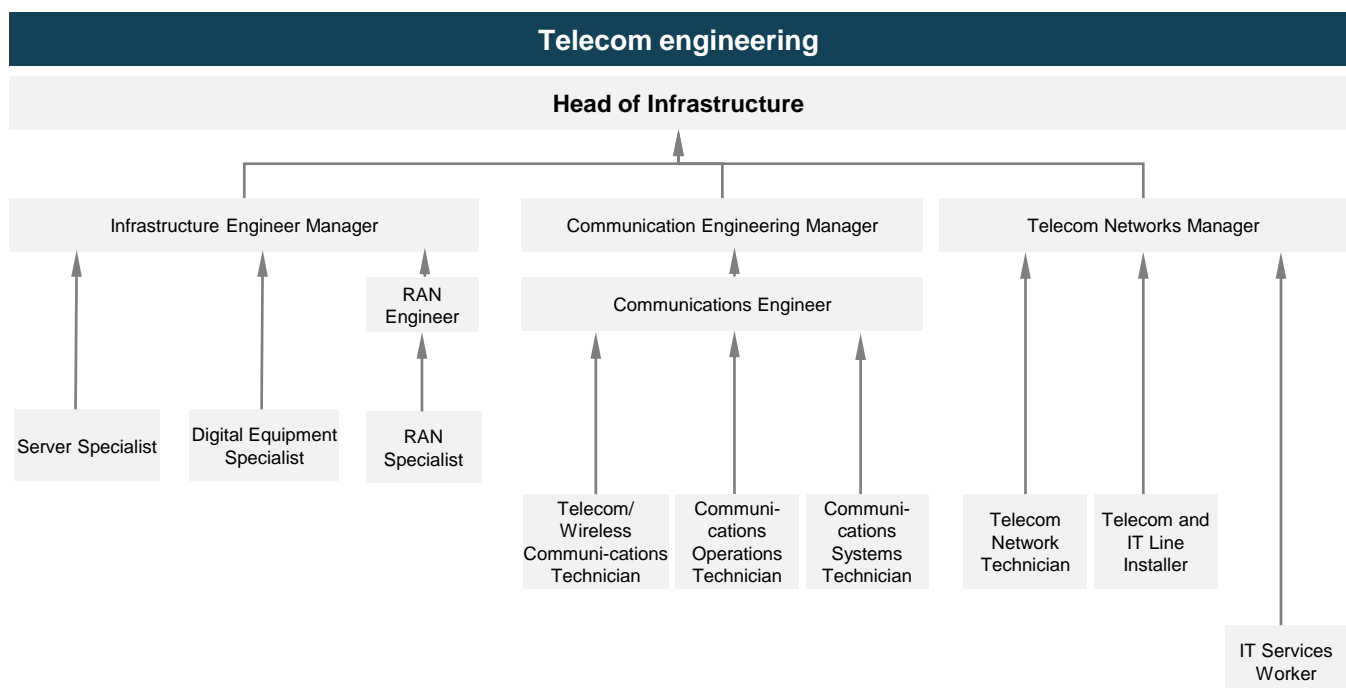
### Job family overview

Telecom Engineering clusters roles that deal with **designing, developing, and maintaining efficient telecommunications systems** for seamless communication through technologies like voice, data, and video.

**Key tasks/ activities** include:

- Designing and developing telecom systems
- Installing and configuring telecom systems
- Operating and maintaining telecom systems
- Optimizing radio frequency for maximum coverage & capacity
- Monitoring and analyzing RAN performance

The family **has 15 key job roles**: Head of Infrastructure, Infrastructure engineer manager, Server specialist, Digital equipment specialist, RAN engineer, RAN specialist, Communication engineering manager, Communications engineer, Telecommunication/ wireless communications technician, Communications operations technician, Communications systems technician, Telecom networks manager, Telecom network technician, Telecom and IT line installer, IT services worker



**Relevant USOC unit-tier codes for the job family:** 2153 Telecommunications engineers, 2522 Systems administrators, 3522 Telecommunications engineering technicians, 2149 Engineering professionals not elsewhere classified, 7422 Information and communications technology installers and servicers, 3114 Electronics engineering technicians, 3512 Information and communications technology user support technicians, 3513 Computer network and systems technicians, 3511 Information and communications technology operations technicians, 2523 Computer network professionals, 1330 Information and communications technology service managers

# Job family profiles and career pathway maps:

## (2) Telecom Engineering

### Skills requirements

The listed job roles require highly specialized skills as the day-to-day tasks demand application of telecom and electrical engineering. The core skills for Telecom Engineering job family include 5G RAN architecture, communication systems and protocols design, electronic circuit boards design and integration, radio frequency circuit design, small cell design and optimization, etc.

Full list of key skills is present in the following table providing a detailed view on job family skills needs.

#### Key relevant skills

- |  |                                      |
|--|--------------------------------------|
| • 5G RAN Architecture                              | • Software-defined radio programming |
| • Communication systems and protocols design       | • Virtual emulation testing          |
| • Electronic circuit boards design and integration | • Operating systems management       |
| • Radio frequency circuit design                   | • O-RU design and development        |
| • Small cell design and optimization               | • Project management                 |
|  | • Quality assurance                  |

### Relevant certifications/ licenses (non-exhaustive)

The job family is rooted in strong engineering expertise with a **significant presence of telecom and radio engineers and technicians** for the roles. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page) that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (2) Telecom Engineering

### Certifications

- Cisco Certified Network Professional (CCNP) Enterprise
- AWS Certified Advanced Networking – Specialty
- Certified Information Systems Security Professional (CISSP)
- Certified Wireless Network Administrator (CWNA)
- Google Certified Professional Cloud Architect
- Certified Fiber Optic Technician (CFOT)
- Certified Telecommunications Network Specialist (CTNS)
- Microsoft Certified: Azure DevOps Engineer Expert
- CompTIA Server+
- VMware Certified Professional – Data Center Virtualization (VCP-DCV)
- Microsoft Certified: Azure Administrator Associate
- SQL Server Database Administrator Training
- Linux Server Management and Security
- Client-Server Communication
- Windows Servers and System Center Operations Manager
- Certified MongoDB Server Administrator
- Certified Wireless Design Professional (CWDP)
- Red Hat Certified Specialist in Service Management and Automation (EX-358)
- 5G Associate Certification Nokia Bell Labs 5G Foundation
- 5G Professional Certification Nokia Bell Labs 5G Networking
- 5G Professional Certification Nokia Bell Labs 5G Network Slicing
- 5G Professional Certification Nokia Bell Labs 5G Secured Networks
- 5G Professional Certification Nokia Bell Labs Distributed Cloud Networks
- 5G Professional Certification Nokia Bell Labs Industrial Automation
- Huawei Certified ICT Associate 5G
- Certified Wireless Analysis Professional (CWAP)
- Certified Radio Operator (CRO)
- NOKIA 5G RAN Certification Program
- Microwave Communication Engineer Certification
- Certified Telecommunications Manager (CTM)
- Project Management Professional (PMP)
- Certified Wireless Network Professional (CWNP)
- IT Information Library Foundations Certification (ITIL)
- Certified Telecom Management Professional (CTMP)
- Registered Communications Distribution Designer (RCDD)
- Cisco Certified Network Associate (CCNA)
- CompTIA Network+
- 5G Associate Certification
- Certified Network Infrastructure Technician (CNIT)
- AWS Certified Solutions Architect – Associate
- Red Hat Certified Engineer (RHCE)
- Certified Kubernetes Administrator (CKA)
- Oracle Cloud Infrastructure Architect Professional Certification
- AWS Certified SysOps Administrator – Associate
- Fiber Optics Technician (FOT) Certification
- Nokia Bell Labs 5G Certification Program Artificial Intelligence and Data Driven 5G Networks
- Nokia Bell Labs and Mobile Networks 5G Certification Program 5G Cloud Native RAN
- Blockchain Foundation
- Internet Of Things Foundation
- Certified Blockchain Developer
- UiPath Certified Professional Automation Developer Associate
- Huawei Certified ICT Associate (Internet of Things)

# Job family profiles and career pathway maps:

## (3) Infrastructure

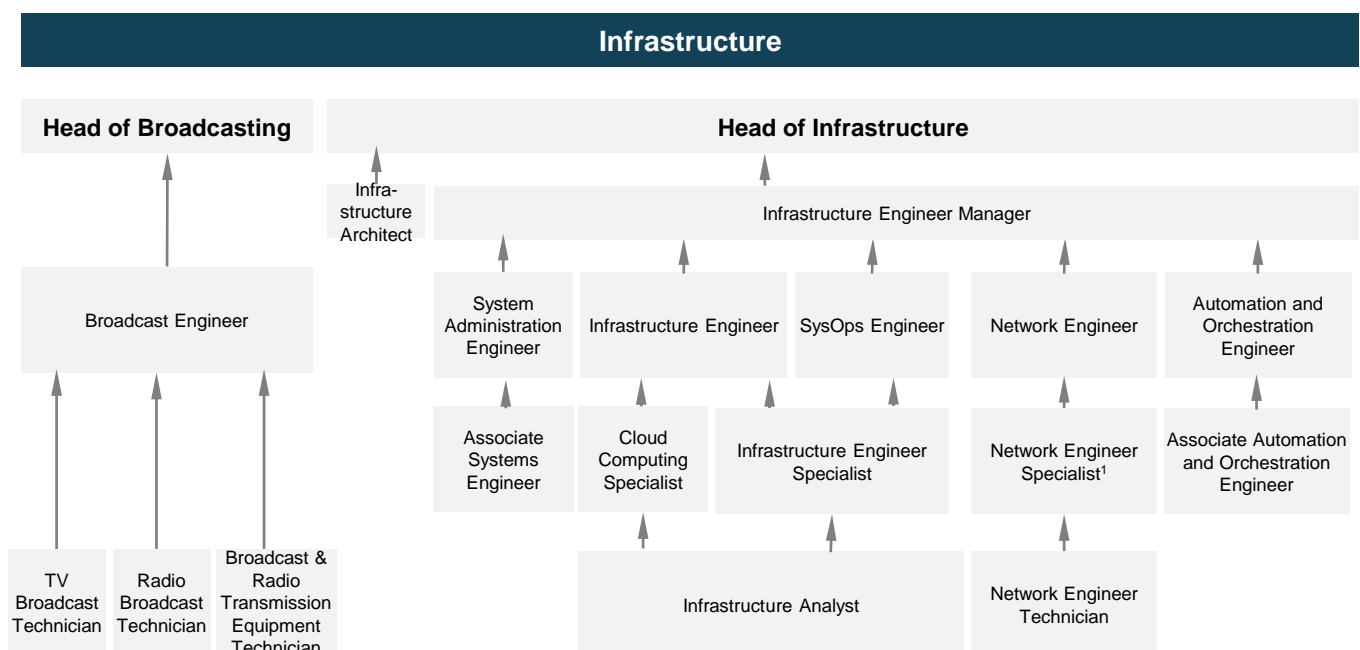
### Job family overview

Infrastructure job family roles deal with **developing the physical and virtual infrastructure** supporting the smooth functioning of daily IT and telecom operations.

**Key tasks/ activities** include:

- Designing, engineering, and managing physical infrastructure
- Developing and managing cloud computing infrastructure
- Integrating systems
- Designing and optimizing networks
- Ensuring site reliability
- Planning infrastructure capacity
- Maintaining infrastructure

The family **has 20 key job roles**: Head of Infrastructure, Infrastructure engineer manager, Infrastructure architect, Head of broadcasting, Infrastructure engineer, Cloud computing specialist, Infrastructure engineer specialist, SysOps engineer, Network engineer, Network engineer specialist, Automation and orchestration engineer, Broadcast engineer, TV broadcast technician, Associate systems engineer, Associate automation and orchestration engineer, Radio broadcast technician, Broadcast and radio transmission equipment technician, System administration engineer, Network engineer technician, Infrastructure analyst.



**Relevant USOC unit-tier codes for the job family:** 2153 Telecommunications engineers, 2522 Systems administrators, 3522 Telecommunications engineering technicians, 2149 Engineering professionals not elsewhere classified, 3521 Broadcasting and audio-visual technicians, 3114 Electronics engineering technicians, 2149 Engineering professionals not elsewhere classified, 2511 Systems analysts, 2523 Computer network professionals

Note: [1] Network Engineer Specialist role encompasses expertise in emerging technologies, including the management of neutral host networks

# Job family profiles and career pathway maps:

## (3) Infrastructure

### Skills requirements

The listed job roles require highly specialized skills as the day-to-day tasks demand application of telecom and electrical engineering. The core skills for Infrastructure job family include antenna installation, radio frequency engineering, cable/system wiring and equipment installation, cloud development and operations management, etc.

Full list of key skills is present in the following table providing a detailed view on job family skills needs.

#### Key relevant skills

- |  |   |
|--|---|
| • Antenna installation                         | • Infrastructure deployment                         |
| • Radio Frequency Engineering                  | • Network admin & maintenance                       |
| • Cable/system wiring & equipment installation | • OTN design  |
| • Cloud development & ops. mgt,                | • Network architecture design and planning          |
| • Cloud Management & E2E Service               | • Network Methodology and Strategy                  |
| Orchestration Design                           | • Telecommunications network equipment installation |
| • Comm. systems and protocols design           | • Wireless network planning and optimization        |

### Relevant certifications/ licenses (non-exhaustive)

The job family is rooted in strong engineering expertise with a **significant presence of network, systems, and infrastructure engineers and technicians** for the roles. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page) that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (3) Infrastructure

### Certifications

- AWS Certified Solutions Architect – Associate
- Google Cloud Professional Cloud Architect
- VMware Certified Professional – Data Center Virtualization (VCP-DCV)
- Red Hat Certified Engineer (RHCE)
- Certified Kubernetes Administrator (CKA)
- Oracle Cloud Infrastructure Architect Professional Certification
- AWS Certified SysOps Administrator – Associate
- Juniper Networks Certified Associate - Junos (JNCIA-Junos)
- Cisco Certified Network Professional (CCNP) Enterprise
- Cisco Certified Network Associate (CCNA)
- VMware Certified Professional - Network Virtualization (VCP-NV)
- Cisco Certified Internetwork Expert (CCIE) Enterprise Infrastructure
- Microsoft Certified: Azure Network Engineer Associate
- Certified Ethical Hacker (CEH)
- CompTIA Network+
- CompTIA Server+
- Microsoft Certified: Azure Administrator Associate
- ITIL Foundation Certification
- Certified Ansible Automation Professional
- AWS Certified Cloud Practitioner
- Microsoft Certified: Azure Administrator Associate
- Microsoft Certified: Azure Solutions Architect Expert
- Red Hat Certified System Administrator (RHCSA)
- Linux Professional Institute Certification (LPIC-1)
- Oracle Certified Associate, Oracle Linux 5 and 6 System Administrator
- Apple Certified System Administrator (ACSA)
- Alibaba Cloud Associate
- AWS Certified Cloud Practitioner
- Microsoft Certified: Azure Solutions Architect Expert
- Professional Cloud Architects
- Professional Cloud DevOps Engineer
- CompTIA Cloud Essentials
- ORACLE APEX Associate
- CompTIA Cloud+ Certification
- Google Associate Cloud Engineer
- Certified Broadcast Networking Technologist (CBNT)
- Certified Audio Engineer (CEA)
- Certified Video Engineer (CVE)
- Certified Broadcast Technologist (CBT)
- Certified Broadcast Radio Engineer (CBRE)
- Certified Broadcast Television Engineer (CBTE)
- HashiCorp Certified: Terraform Associate
- AWS Certified DevOps Engineer – Professional
- Microsoft Certified: DevOps Engineer Expert
- Docker Certified Associate (DCA)
- Google Cloud Professional DevOps Engineer
- Puppet Certified Professional

# Job family profiles and career pathway maps:

## (4) R&D and Product Development

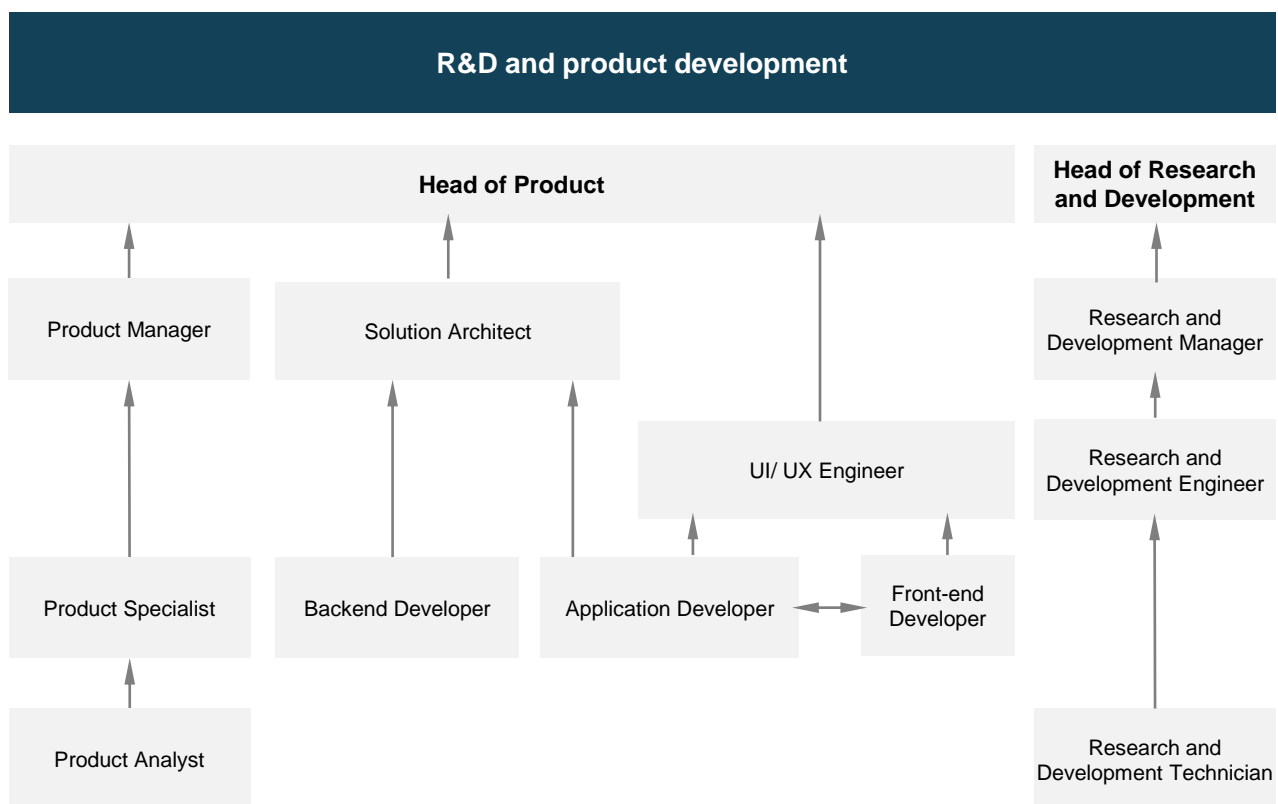
### Job family overview

The job family clusters roles that deal with **developing media/ application-based products** through research, design, manufacturing and product performance improvement (life cycle management).

**Key tasks/ activities** include:

- Conducting research and developing concepts
- Prototyping and iterating designs
- Designing and developing products
- Testing products
- Updating and enhancing product features

The family **has 13 key job roles**: Head of product, Head of research and development, Product manager, Research and development manager, Solution architect, UI/ UX engineer, Backend developer, Frontend developer, Research and development engineer, Product specialist, Product analyst, Application developer, Research and development technician.



**Relevant USOC unit-tier codes for the job family:** 1223 Research and development managers, 2512 Software developers, 2149 Engineering professionals not elsewhere classified

## Job family profiles and career pathway maps: (4) R&D and Product Development

### Skills requirements

The listed job roles require skills related mainly to knowledge of technical research and innovation. The core skills include application development, application integration, applications support and enhancement, artificial intelligence application in product development, user testing and usability testing, virtual, augmented and mixed reality application, etc.

Full list of key skills is present in the table below providing a detailed view on job family skills needs.

#### Key relevant skills

- Application development
- Application integration
- Applications support and enhancement
- Artificial intelligence application in product development
- User testing and usability testing
- Virtual, augmented and mixed reality application
- Product management
- UI and UX design
- Minimum viable product development
- Game programming, development, and testing

### Relevant certifications/ licenses (non-exhaustive)

The job family is rooted in strong engineering expertise with a **significant presence of product/software engineers and technicians** for the roles. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page) that are prevalent in the Kingdom.

## Job family profiles and career pathway maps: (4) R&D and Product Development

### Certifications

- Certified Scrum Product Owner (CSPO)
- Certified Scrum Master – Scrum Alliance
- Pragmatic Institute's Product Management Certification
- Professional Scrum Product Owner (PSPO)
- SAFe Product Owner/Product Manager (POPM)
- Certified Product Manager (CPM) – AIPMM
- Certified Digital Product Manager
- Oracle Certified Professional, Java SE Developer
- Microsoft Certified: Azure Developer Associate
- AWS Certified Developer – Associate
- Google Associate Android Developer
- Apple App Development with Swift Certification
- Certified Kubernetes Application Developer (CKAD)
- Unity Certified Associate: Game Developer
- Google Mobile Web Specialist
- Certified Web Professional – Web Developer (CIW)
- Certified Internet Web (CIW) Web Application Developer
- Salesforce Platform App Builder
- AWS Certified Solutions Architect – Professional
- Microsoft Certified: Azure Solutions Architect Expert
- Google Professional Cloud Architect
- TOGAF 9 Certified
- CISSP
- Oracle Certified Professional: Java SE
- Docker Certified Associate
- Certified Kubernetes Administrator (CKA)
- Google UX Design Professional Certificate
- Adobe Certified Professional (ACP) in Design Tools
- Certified Usability Analyst (CUA)
- Figma Professional Certification
- Microsoft Certified: Power Platform Developer Associate
- React Developer Certification

# Job family profiles and career pathway maps:

## (5) Data & AI

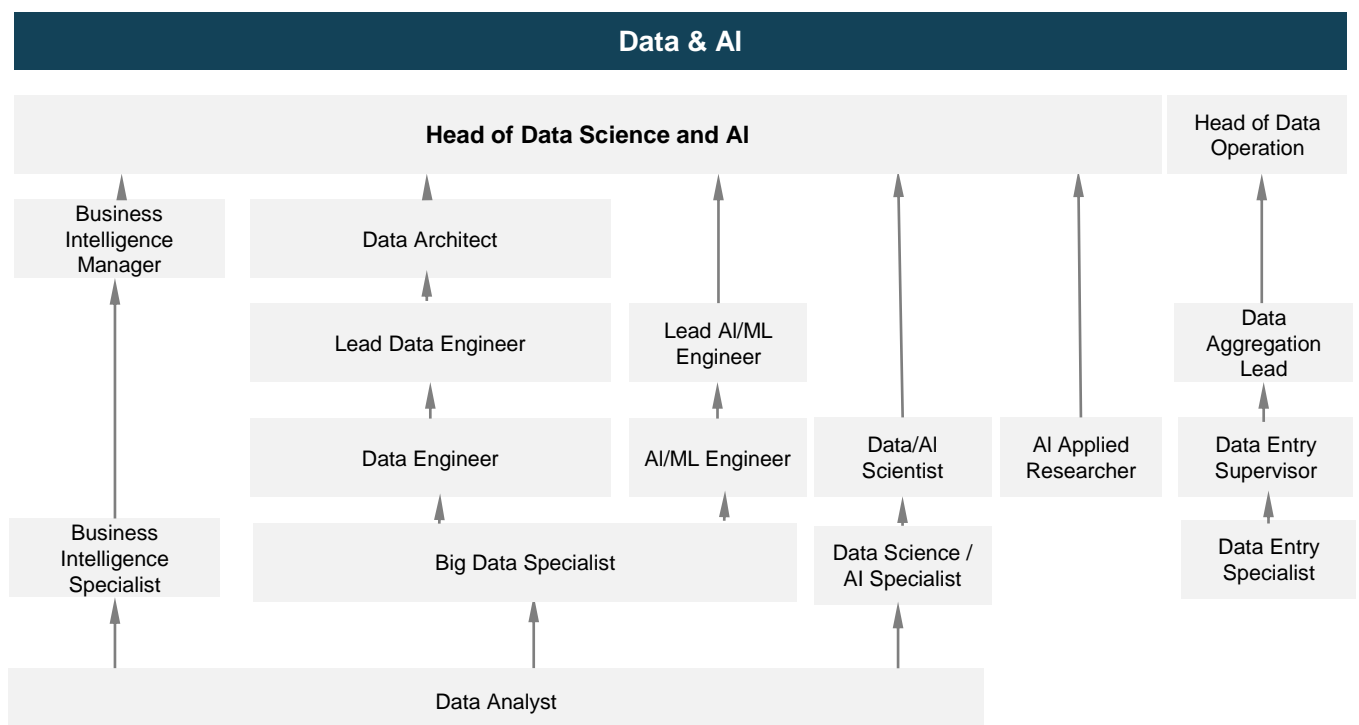
### Job family overview

The job family clusters roles that deal with **analyzing, processing and transforming data to be leveraged for application development** (including AI applications).

**Key tasks/ activities** include:

- Collecting and integrating data
- Processing and transforming data
- Developing and training AI models
- Optimizing algorithms
- Deploying models
- Coding AI applications
- Performing exploratory data analysis

The family **has 17 key job roles**: Head of data science and AI, Head of data operations, Business intelligence manager, Business intelligence specialist, Data architect, Lead data engineer, Data aggregation lead, Data engineer, Big data specialist, Data entry supervisor, Data entry specialist, Lead AI/ ML engineer, AI/ ML engineer, Data/ AI scientist, Data science/ AI specialist, AI applied researcher, Data analyst.



**Relevant USOC unit-tier codes for the job family:** 2529 Database and network professionals not elsewhere classified, 4413 Coding, Proofreading and Related Clerks, 4132 Data entry clerks, 3341 Office supervisors, 2421 Management and organization analysts, 2120 Mathematicians, actuaries and statisticians

# Job family profiles and career pathway maps:

## (5) Data & AI

### Skills requirements

The listed job roles require skills related mainly to manipulation of data and optimization of algorithms for application development. The core skills include artificial intelligence, machine learning and deep learning application, data analytics, data cleaning, data collection and analysis, ML, NLP, etc.

Full list of key skills is present in the table below providing a detailed view on job family skills needs.

#### Key relevant skills

- |   |   |
|---|---|
| • Artificial intelligence, machine learning & deep learning application | • Data processing                           |
| • Data analytics  | • Data visualization and storyboarding      |
| • Data cleaning   | • Data warehousing                          |
| • Data collection and analysis  | • Database mgt & configuration              |
| • Data design   | • Database modelling                        |
| • Data engineering  | • Knowledge of big data tools and platforms |
| • Data management   | • ML  |
| • Data preparation  | • NLP                                       |

### Relevant certifications/ licenses (non-exhaustive)

Data and AI roles are heavy on engineering skills, the jobs are dominated by data, software and AI engineers and data scientists. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page), that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (5) Data & AI

### Certifications

- Microsoft Certified: Azure Data Engineer Associate
- Google Professional Data Engineer
- AWS Certified Machine Learning – Specialty
- Databricks Certified Data Engineer Associate
- Databricks Certified Data Engineer Professional
- Tableau Desktop Specialist
- Microsoft Certified: Power BI Data Analyst Associate
- Certified Business Intelligence Professional (CBIP)
- Google Professional Cloud Architect
- AWS Certified Solutions Architect – Professional
- Microsoft Certified: Azure Solutions Architect Expert
- TOGAF 9 Certification
- Google Professional Machine Learning Engineer
- TensorFlow Developer Certificate
- Microsoft Certified: Azure AI Engineer Associate
- Certified Data Science Practitioner (CDSP)
- Certified Data Scientist SAS
- AWS Certified Data Analytics – Specialty
- CompTIA Data+ Certification
- AWS Certified Machine Learning Specialty
- Artificial Intelligence Foundation
- Google Cloud Professional ML Engineer Certification
- Huawei Certified ICT Associate - AI
- Google Data Analytics Certificate
- Tableau Certified Data Analyst
- Certified Analytics Professional (CAP)
- Associate Big Data Analyst (ABDA)
- Senior Big Data Analyst (SBDA)
- Cloudera Certified Associate (CCA) Data Analyst
- AWS Certified Big Data – Specialty
- Associate Big Data Engineer (ABDE)
- DAMA
- Senior Big Data Engineer (SBDE)
- Microsoft Office Specialist (MOS)
- CompTIA Data+
- Certified Data Management Professional (CDMP)
- PI 300: Power BI analyst
- Big Data Foundation
- Professional Data Engineer

# Job family profiles and career pathway maps:

## (6) Data Protection and Cybersecurity

### Job family overview

The job family clusters roles that deal with **performing security and risk assessments, enhancing regulatory and compliance processes and protecting data** to mitigate cyber crimes and threats.

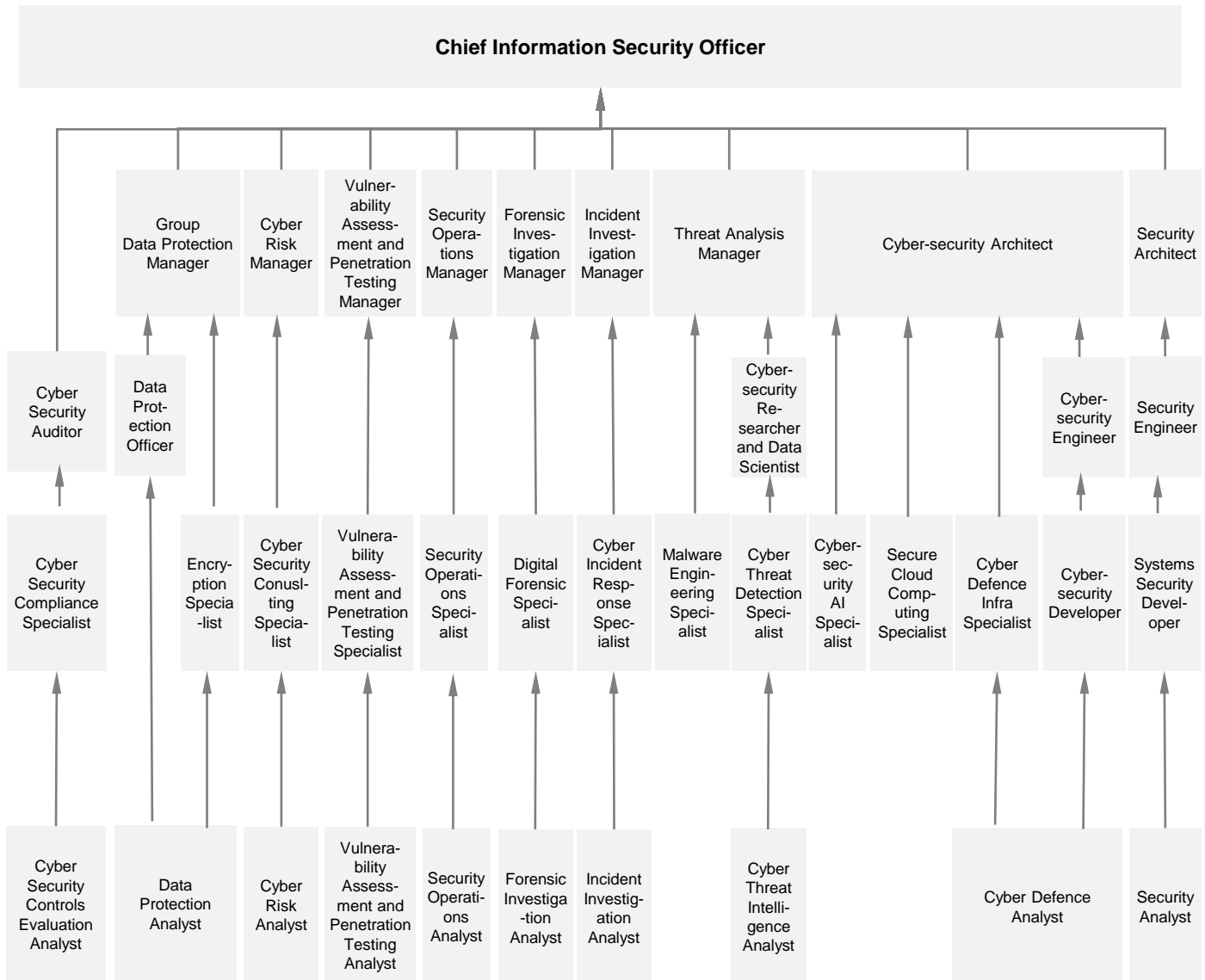
**Key tasks/ activities** include:

- Conducting security and risk assessments
- Enhancing compliance measures
- Managing cyber risks
- Performing security penetration tests
- Deploying data protection solutions
- Responding to and managing incidents
- Providing security awareness and training

The family **has 39 key job roles**: Chief information security officer, Group data protection manager, Data protection officer, Data protection analyst, Encryption specialist, Cyber risk manager, Cybersecurity consulting specialist, Malware engineering specialist, Cyber risk analyst, Vulnerability assessment and penetration testing manager, Vulnerability assessment and penetration testing specialist, Vulnerability assessment and penetration testing analyst, Security operations manager, Cyber security AI specialist, Security operations specialist, Security operations analyst, Forensic investigation manager, Forensic investigation analyst, Digital forensic specialist, Incident investigator manager, Incident investigation analyst, Cyber incident response specialist, Threat Analysis Manager, Cyber threat detection specialist, Cybersecurity researcher and data scientist, Cyber threat intelligence analyst, Cyber security auditor, Cyber security compliance specialist, Cybersecurity controls evaluation analyst, Cybersecurity architect, Cybersecurity engineer, Cybersecurity developer, Cyber defense infra specialist, Cyber defense analyst, Secure cloud computing specialist, Security architect, Security engineer, Systems security developer, Security analyst

# Job family profiles and career pathway maps: (6) Data Protection and Cybersecurity

## Data protection and cyber security



**Relevant USOC unit-tier codes for the job family:** 1120 Managing directors and chief executives, 1330 Information and communications technology service managers, 2421 Management and organization analysts, 2512 Software developers, 2511 Systems analysts, 2529 Database and network professionals not elsewhere classified, 2519 Software and applications developers and analysts not elsewhere classified, 2521 Database designers and administrators, 2422 Policy administration professionals, 2522 Systems administrators

# Job family profiles and career pathway maps:

## (6) Data Protection and Cybersecurity

### Skills requirements

The listed job roles require highly specialized knowledge in terms of cybersecurity systems, software and incident management. The core skills include cyber and data breach incident management, cyber forensics, cyber incident management, cyber risk, governance and compliance, cyber security incident response planning, etc.

Full list of key skills is present in the table below providing a detailed view on job family skills needs.

#### Key relevant skills

- Cyber and data breach incident management
- Cyber forensics
- Cyber incident management
- Cyber risk, governance and compliance
- Cyber security incident response planning
- Cyber security threat assessment
- Forensic investigator manager
- Forensic investigator
- Incident investigation manager
- Incident investigator
- Threat analysis manager
- Security architect
- Security engineer

### Relevant certifications/ licenses (non-exhaustive)

Data protection and cybersecurity roles are specialized and require cybersecurity systems and IT engineers and technicians. **Membership with the Saudi Council of Engineers** is mandatory for all practicing engineers and technicians in the Kingdom and the requirement is therefore also applicable to the roles under this job family. This is a **highly sensitive field given the data regulations and cybersecurity requirements** for organization in the Kingdom; hence, field-specific certifications are highly valued and are a norm in the industry. Prevalent certifications in Kingdom are given on the next page.

# Job family profiles and career pathway maps:

## (6) Data Protection and Cybersecurity

### Certifications

- CompTIA Security+
- CompTIA – Cybersecurity Analyst (CySA+)
- Certified SOC Analyst (CSA)
- Security Blue Team
- OffSec Defense Analyst (OSDA)
- Certified Defensive Security Analyst (CDSA)
- Microsoft Certified: Security Operations Analyst Associate
- GIAC Security Essentials (GSEC)
- Certified Information Systems Security Professional (CISSP)
- CEH (Certified Ethical Hacker)
- CompTIA Advanced Security Practitioner (CASP+)
- GIAC Certified Incident Handler (GCIH)
- Certified Information Privacy Professional (CIPP)
- Certified Information Privacy Manager (CIPM)
- Certified Information Privacy Technologist (CIPT)
- HealthCare Information Security and Privacy Practitioner (HCISPP)
- GDPR - Certified Data Protection Officer
- Certified Data Privacy Solutions Engineer (CDPSE)
- Certified in Data Protection (CDP)
- Certificate of Completion in Cybersecurity
- Cyber Criminology and Cyber Security Graduate Certificate
- Microsoft Certified: Information Protection Administrator
- Certified Data Management Professional – CDMP
- CYSA+ CompTIA Cybersecurity Analyst
- Registered Intrusion Analyst (RIA)
- CompTIA Network+ Certification
- CompTIA PenTest+ Certification
- CREST Certified Incident Manager (CCIM)
- GDPR Practitioner
- ISACA Certified Information Security Manager (CISM)
- Certified Risk and Information Systems Control (CRISC)
- FAIR Risk Analyst
- ISO 27005 Risk Manager Certification
- Offensive Security Certified Professional (OSCP)
- CREST Registered Penetration Tester (CRT)
- eLearnSecurity Certified Professional Penetration Tester (eCPPT)
- EnCase Certified Examiner
- AccessData Certified Examiner (ACE)
- Certified Cyber Forensics Professional (CCFP)
- Certified Threat Intelligence Analyst (CTIA)
- MITRE ATT&CK Defender™ (MAD) Certification
- Certified Cloud Security Professional (CCSP)
- TOGAF Certified Architect
- AWS Certified Solutions Architect - Professional
- Certified Application Security Engineer (CASE)
- Offensive Security Certified Expert (OSCE)
- Cisco Certified CyberOps Professional
- Certified Encryption Specialist (CES)
- Certified Data Scientist (CDS)
- Certified Artificial Intelligence Security Specialist (CAISS)
- Certified Machine Learning Security Expert (CMLSE)
- Certified Malware Analyst (CMA)
- GIAC Reverse Engineering Malware (GREM)
- AWS Certified Security - Specialty
- ISO 27001 Lead Auditor
- Certificate In Information Security Management Principles
- ISO 27001
- Red Hat Certified Specialist in Security (EX-415)
- Cybersecurity Practitioner Certification (CSX-P)

# Job family profiles and career pathway maps:

## (7) Design and Animation

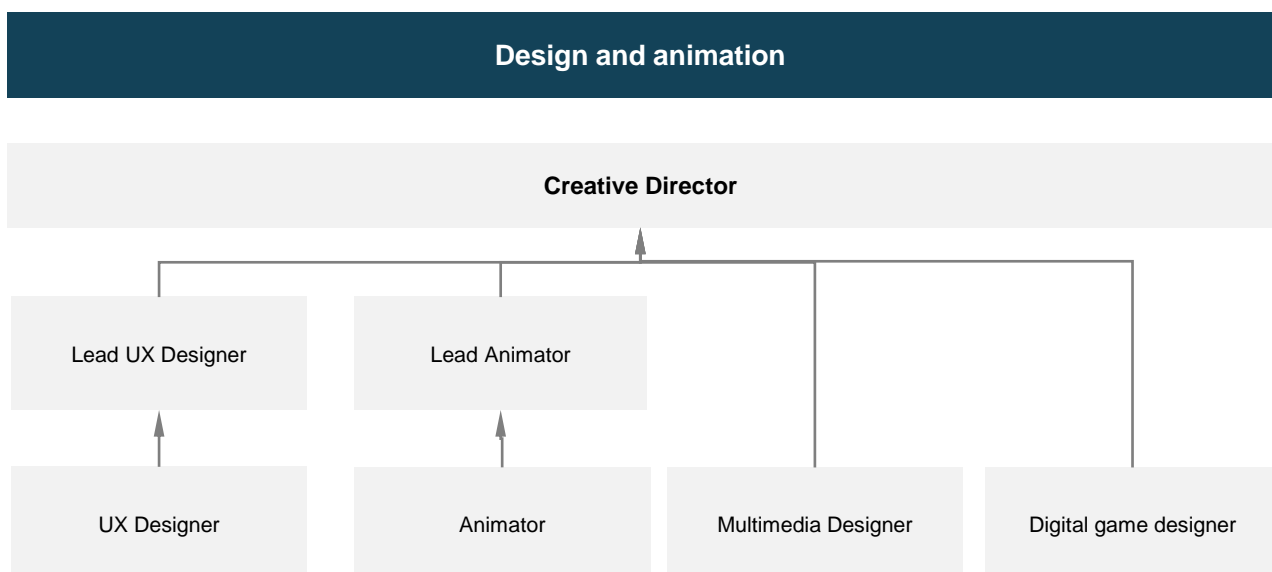
### Job family overview

The job family clusters roles that deal with **creating visual effects and animations for a variety of multimedia, including games, videos, and digital assets** like websites and applications.

**Key tasks/ activities** include:

- Creating 2D/3D animations
- Rigging characters and models
- Developing CG models
- Creating visual effects (VFX)
- Rendering animations and visuals
- Developing storyboards
- Compositing visuals
- Designing visual characters
- Editing visuals and media

The family **has 7 key job roles** Creative director, Lead animator, Animator, Multimedia designer, Digital game designer, Lead UX designer, UX designer



**Relevant USOC unit-tier codes for the job family:** 2166 Graphic and multimedia designers,

# Job family profiles and career pathway maps:

## (7) Design and Animation

### Skills requirements

The listed job roles require specialized skills in terms of usage of specific design software and creative knowledge for visualizing/ animating content. The core skills include 3D modelling, 3D software development, animation development, style guide and specifications design, UI and UX design, etc.

Full list of key skills is present in the table below providing a detailed view on job family skills needs.

#### Key relevant skills

- 3D modelling
- 3D software development
- Animation development
- Game programming, development, and testing
- Style guide and specifications design
- UI and UX design
- Virtual, augmented and mixed reality application
- Web content management
- Rigging
- Understanding of game balance, economics, and user motivations

### Relevant certifications/ licenses (non-exhaustive)

Design and animation roles require application of web-page design, application graphics, character animation, etc. and, therefore, **graphics certifications are valued** in the industry. Prevalent certification in Kingdom are listed below.

#### Certifications

- Adobe Certified Professional (Illustrator, Photoshop, InDesign)
- Google UX Design Professional Certificate
- CIW User Interface Designer
- Digital Marketing Professional Certificate (Meta, Google)
- Advanced Graphic Design Specialization
- CPUX (Certified Professional for Usability and User Experience)
- Autodesk Certified Professional: Maya
- Toon Boom Harmony Certification
- Autodesk Certified User (Maya, 3ds Max)
- Adobe After Effects Certification
- Nielsen Norman Group UX Certification
- Interaction Design Foundation (Certified UX Designer)
- Adobe Certified Professional in Visual Design
- Adobe Certified Professional (After Effects, Premiere Pro)
- Certified Digital Media Designer (CDMD)
- Adobe Certified Professional in Video Design
- Unity Certified Associate: Game Developer
- Unreal Engine Certification
- Certified Game Designer
- Unity Certified User: Artist
- Unity Certified Associate: Artist
- Unity Certified professional: Artist

# Job family profiles and career pathway maps: (8) Pre-sales (9) Sales and Marketing (10) Partnerships

## Job family overview

Pre-sales, Sales and Marketing and Partnerships job families have common **job roles that contribute majorly to sales and marketing activities across** organizations in the sector. Given the synergies, the **three families are presented on a single career pathway map.**

### Pre-sales

Pre-sales clusters roles that deal with **understanding customer needs and presenting product solutions**, showcasing the value and benefits of products or services

**Key tasks/ activities** include:

- Assessing customer needs
- Designing and architecting marketing solutions
- Developing product demos and presentations
- Planning sales strategies
- Conducting business negotiations

The family **has 4 key job roles:** Head of sales and marketing, Pre-sales manager, Pre-sales lead, Pre-sales specialist

### Sales and marketing

Sales and Marketing clusters roles that deal with **expanding brand reach, sales channels and customer engagement** leveraging digital methods and tools.

**Key tasks/ activities** include:

- Developing digital marketing strategies
- Managing and optimizing SEO
- Writing content
- Prospecting and qualifying potential leads through sales development
- Supervising CRM systems

The family **has 11 key job roles:** Head of sales and marketing, Sales manager, Sales account lead, Channel sales lead, Sales analyst, Customer success manager, Customer success lead, Marketing manager, Marketing lead, Marketing analyst, IT systems sales specialist

### Partnerships

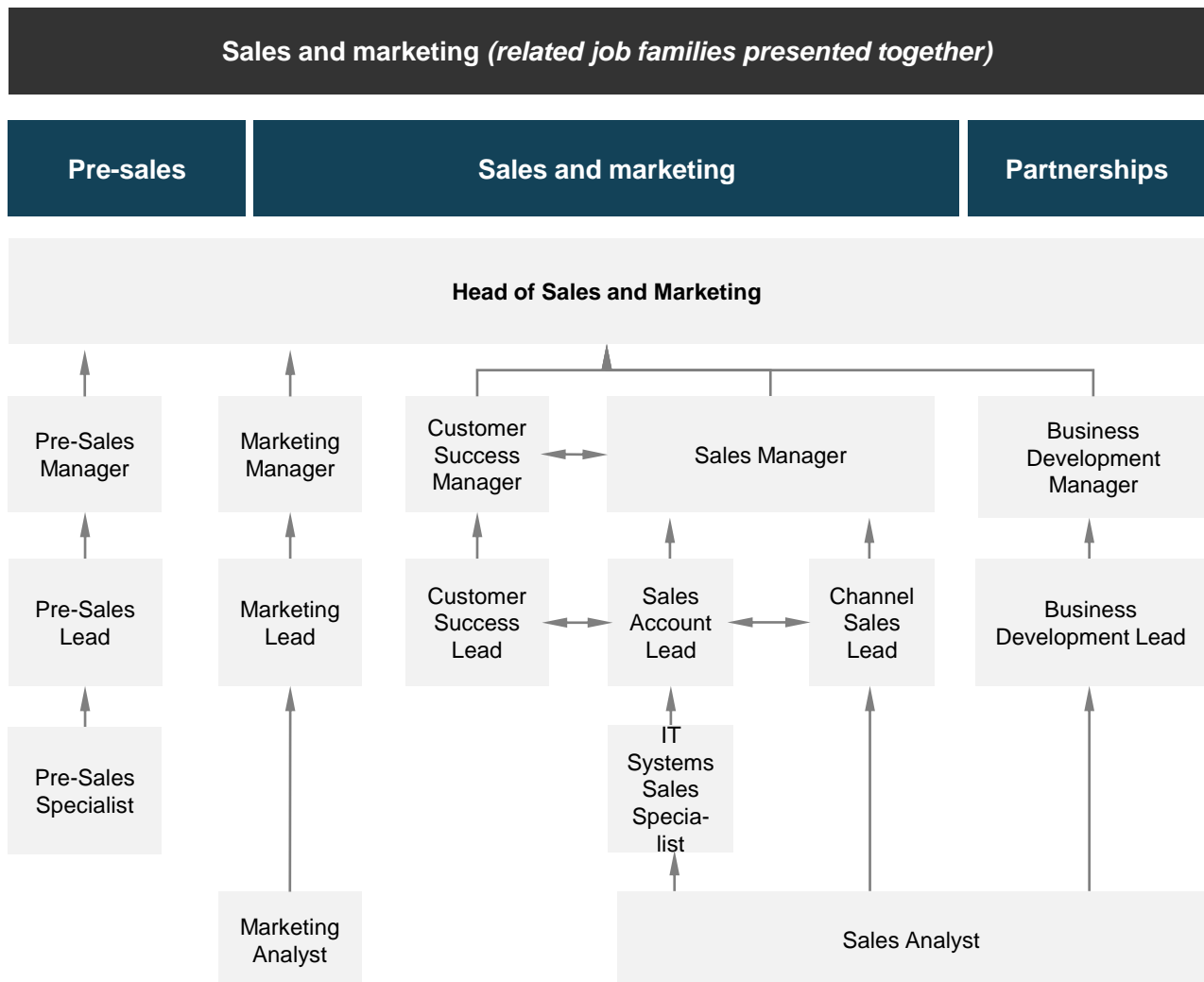
Partnerships clusters roles that deal with **development of strategic partnerships** to provide access to new markets, locally unattainable resources, and technologies.

**Key tasks/ activities** include:

- Conducting market research and assessments
- Identifying opportunities, assessing resources
- Developing strategic alliances
- Evaluating risks and feasibility
- Executing outreach efforts
- Managing partnerships

The family **has 4 key job roles:** Head of sales and marketing, Business development manager, Business development lead, Sales analyst

# Job family profiles and career pathway maps: (8) Pre-sales (9) Sales and Marketing (10) Partnerships



**Relevant USOC unit-tier codes for the job family:** 1221 Sales and marketing managers, 2431 Advertising and marketing professionals, 2434 Information and communications technology sales professionals

## Skills requirements

The listed job roles require specialized skills in marketing, branding, and customer acquisition disciplines. The core skills for Pre-sales job family include business innovation, business development, business needs analysis, etc. Similarly, the core skills for Sales and Marketing include market trend analysis, web content management, website traffic monitoring, etc. The main skills for Partnerships include business development, business environment analysis, strategic planning, etc.

Full list of key skills is present in the following tables (see next page) providing a detailed view on job families' skills needs.

## Job family profiles and career pathway maps: (8) Pre-sales (9) Sales and Marketing (10) Partnerships

### Key relevant skills: Pre-sales

- Business development
- Business innovation
- Business negotiation
- Customer experience management
- Business needs analysis
- Problem management
- Sales strategy
- Market research
- Customer data analysis
- Performance management

### Key relevant skills: Sales and marketing

- Business innovation
- Business development
- Business needs analysis
- Market trend analysis
- Web content management
- Website traffic monitoring
- Networking
- Problem management
- Project management
- Business agility

### Key relevant skills: Partnerships

- Business development
- Business environment analysis
- Business negotiation
- Networking
- Stakeholder management
- Partnership management
- Strategic planning
- Channel management
- Customer acquisition management
- Product advisory

### Relevant certifications/ licenses (non-exhaustive)

Roles in these three job families require specialization mainly in **marketing analytics, branding and networking disciplines**. Prevalent certifications in the Kingdom are given on the next page.

## Job family profiles and career pathway maps: (8) Pre-sales (9) Sales and Marketing (10) Partnerships

<b>Certifications: Pre-sales</b>	<b>Certifications: Sales and marketing</b>	<b>Certifications: Partnerships</b>
<ul style="list-style-type: none"> <li>• AWS Certified Solutions Architect</li> <li>• Google Professional Cloud Architect</li> <li>• Microsoft Certified: Azure Solutions Architect Expert</li> <li>• Microsoft Certified: Azure Fundamentals</li> <li>• Certified Pre-Sales Professional (CPSP)</li> </ul>	<ul style="list-style-type: none"> <li>• Certified Sales Professional (CSP)</li> <li>• HubSpot Inbound Sales Certification</li> <li>• Salesforce Certified Sales Cloud Consultant</li> <li>• AWS Certified Solutions Architect</li> <li>• Google Professional Cloud Architect</li> <li>• Microsoft Certified: Azure Solutions Architect Expert</li> <li>• Google Ads Certification</li> <li>• Meta Certified Digital Marketing Associate</li> <li>• HubSpot Content Marketing Certification</li> <li>• Certified Customer Success Manager (CCSM)</li> <li>• Salesforce Certified Administrator</li> <li>• HubSpot Service Hub Certification</li> <li>• Microsoft Certified: Azure Fundamentals</li> <li>• Certified Pre-Sales Professional (CPSP)</li> <li>• Google Analytics Certification</li> <li>• Meta Certified Marketing Science Professional</li> <li>• Hootsuite Social Media Marketing Certification</li> <li>• Salesforce Certified Advanced Administrator</li> <li>• Zendesk Certified Professional</li> <li>• Certified Professional Sales Leader (CPSL)</li> <li>• LinkedIn Learning Sales Management Certification</li> <li>• Certified Channel Sales Professional (CCSP)</li> <li>• Certified Business Development Professional (CBDP)</li> <li>• LinkedIn Learning Business Development and Sales Certification</li> <li>• Tableau Desktop Specialist</li> <li>• Meta Marketing Analytics Professional Certificate</li> <li>• HubSpot Sales Enablement Certification</li> </ul>	<ul style="list-style-type: none"> <li>• Certified Business Development Professional (CBDP)</li> <li>• HubSpot Sales Hub Certification</li> <li>• LinkedIn Learning Business Development and Sales Certification</li> <li>• Salesforce Certified Sales Cloud Consultant</li> <li>• AWS Certified Solutions Architect</li> </ul>

# Job family profiles and career pathway maps:

## (11) Operations

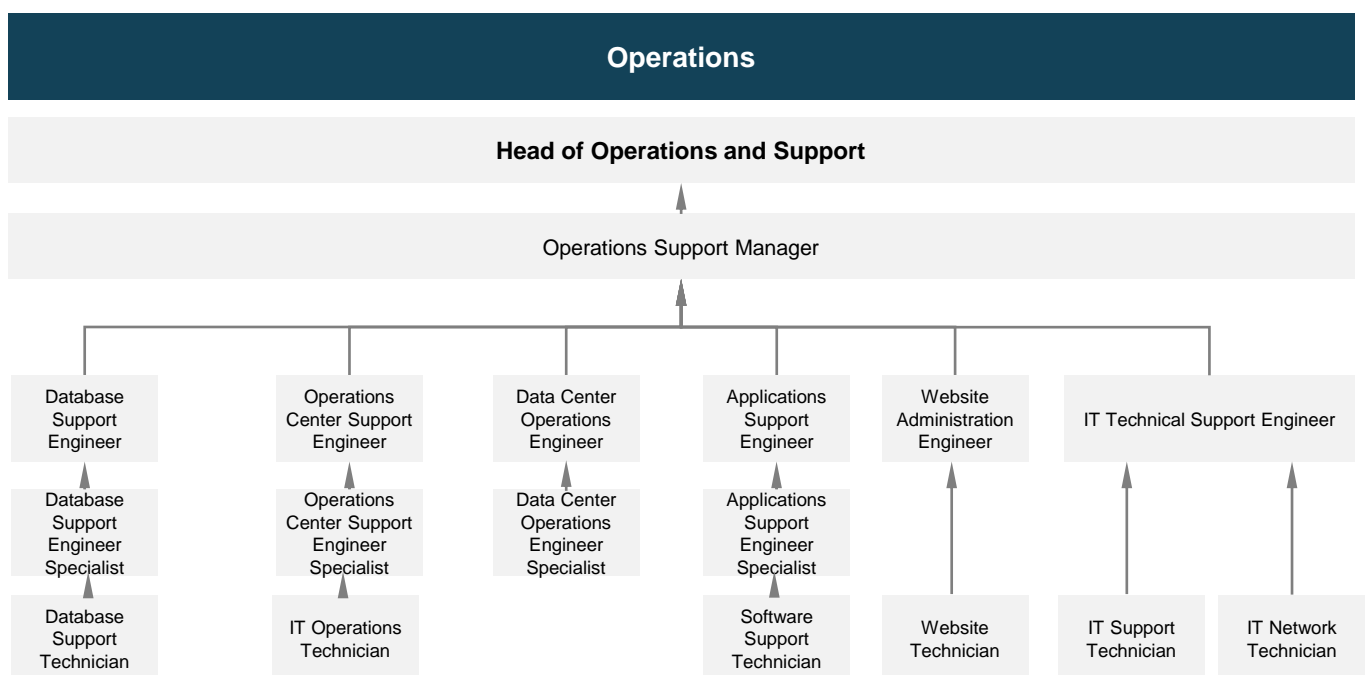
### Job family overview

The job family clusters roles that deal with **providing support for deploying organization-wide digital solutions and enabling digital transformation.**

**Key tasks/ activities** include:

- Performing deployment services such as installing and deploying IT and digital products
- Providing IT support services such as system tech support
- Conducting IT maintenance including updating systems
- Monitoring system performance
- Deploying internal coordination platforms/tools

The family **has 18 key job roles:** Head of operations and support, Operations support manager, Database support engineer specialist, Database support engineer, Database support technician, Data center Operations engineer specialist, Data center operations engineer, Operations center support engineer specialist, Operations center support engineer, IT operations technician, Applications support engineer specialist, Applications support engineer, Software support technician, Website administration engineer, Website technician, IT technical support Engineer, IT support technician, IT network technician.



**Relevant USOC unit-tier codes for the job family:** 3511 Information and communications technology operations technicians, 3512 Information and communications technology user support technicians, 2522 Systems administrators, 3513 Computer network and systems technicians, 1330 Information and communications technology service managers, 2521 Database designers and administrators, 3514 Web technicians, 2529 Database and network professionals not elsewhere classified

# Job family profiles and career pathway maps:

## (11) Operations

### Skills requirements

The listed job roles require highly specialized skills related to IT systems/ infrastructure management and integration. The core skills include emerging technology synthesis, enterprise and business architecture, IoT tech design and development, problem management, etc.

**Full list of key skills is present in the table below** providing a detailed view on job family skills needs.

#### Key relevant skills

- Emerging technology synthesis
- Enterprise and business architecture
- IoT tech design and development
- Problem management
- Applications integration
- Applications support and enhancement
- Project management
- Stakeholder management
- Infrastructure deployment
- Service management
- Solution architecture

### Relevant certifications/ licenses (non-exhaustive)

Operations roles are specialized and require IT engineers and technicians. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page), that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (11) Operations

### Certifications

- PMP (Project Management Professional)
- ITIL 4 Managing Professional
- ITIL 4 Strategic Leader
- Lean Six Sigma Green Belt
- Lean Six Sigma Black Belt
- Certified Operations Manager (COM)
- Certified Manager (CM)
- Certified Manager of Quality/Organizational Excellence (CMQ/OE)
- TOGAF 9 Certified
- Certified ScrumMaster (CSM)
- Certified Service Management Professional (CSMP)
- Microsoft Certified: Azure Solutions Architect Expert
- AWS Certified Solutions Architect – Associate
- Red Hat Certified Engineer (RHCE)
- VMware Certified Professional – Data Center Virtualization (VCP-DCV)
- Microsoft Certified: Azure Administrator Associate
- CompTIA Server+
- Cisco Certified Network Associate (CCNA)
- Microsoft Certified: Azure Database Administrator Associate
- Oracle Database Administrator Certified Professional (OCP)
- AWS Certified Database Specialty
- MongoDB Certified DBA
- ITIL 4 Foundation
- CompTIA Network+
- Certified Ethical Hacker (CEH)
- Cisco Certified Network Professional (CCNP) Data Center
- Microsoft Certified: Azure Network Engineer Associate
- Microsoft Certified: Power Platform Developer Associate
- AWS Certified Developer – Associate
- Oracle Certified Professional: Java SE Developer
- Microsoft Office Specialist
- Oracle Database Administration 2019 Certified Professional
- CompTIA Linux+
- VMware Certified Design Expert (VCDX)
- Microsoft Certified: Windows Server Hybrid Administrator Associate
- Red Hat Certified Specialist in Ansible Automation
- VMware Certified Technical Associate (VCTA)
- Oracle Certified Master (OCM) Database Administrator
- VMware Certified Advanced Professional (VCAP)
- Certified Kubernetes Administrator (CKA)
- Microsoft Certified: DevOps Engineer Expert
- CIW Web Foundations Associate
- CIW Web Design Specialist
- CompTIA A+
- CompTIA IT Fundamentals (ITF+)
- Adobe Certified Professional (ACP)
- Oracle Certified Associate (OCA)
- CompTIA Data+
- Microsoft Certified: Azure Data Fundamentals
- MongoDB Certified Associate
- AWS Certified Cloud Practitioner
- Microsoft Certified: Modern Desktop Administrator Associate
- Google IT Support Professional Certificate
- Juniper Networks Certified Associate (JNCIA)
- Salesforce Administrator
- Salesforce Business Analyst
- Salesforce Advanced Administrator
- Salesforce Platform App Builder
- CBP Computer technology specialist
- Certified in the Governance of Enterprise IT (CGEIT)
- CISA Certified Information Systems Auditor
- Cisco Certified Internetwork Expert (CCIE)
- CompTIA Certified Technical Trainer (CTT)
- Internet & Computing Core Certification (IC3)
- Oracle Database Security OCE
- Red Hat Certified OpenShift Administration (EX-280)

# Job family profiles and career pathway maps:

## (12) Quality (13) Governance, Risk and Compliance

### Job family overview

Quality and Governance, Risk and Compliance job families have closely related job roles **contributing to the overall regulations and standards compliance**. Given the synergies, the **two families are presented on a single career pathway map**.

#### Quality

Quality clusters roles that deal with **testing quality and effective functioning of software, applications and hardware** to ensure that quality/ product standards are met.

**Key tasks/ activities** include:

- Designing and planning tests
- Conducting digital testing
- Performing performance testing
- Inspecting product quality control
- Testing user experience
- Tracking and reporting

The family **has 4 key job roles**: Head of quality, Quality assurance engineer, Software testing engineer, Quality assurance manager.

#### Governance, risk and compliance

Governance, Risk and Compliance job family roles deal with **establishing frameworks and policies for effective governance, compliance, and ethical practices**, including defining roles, setting decision-making guidelines, setting capital allocations, managing portfolio, and ensuring accountability and transparency in digital operations.

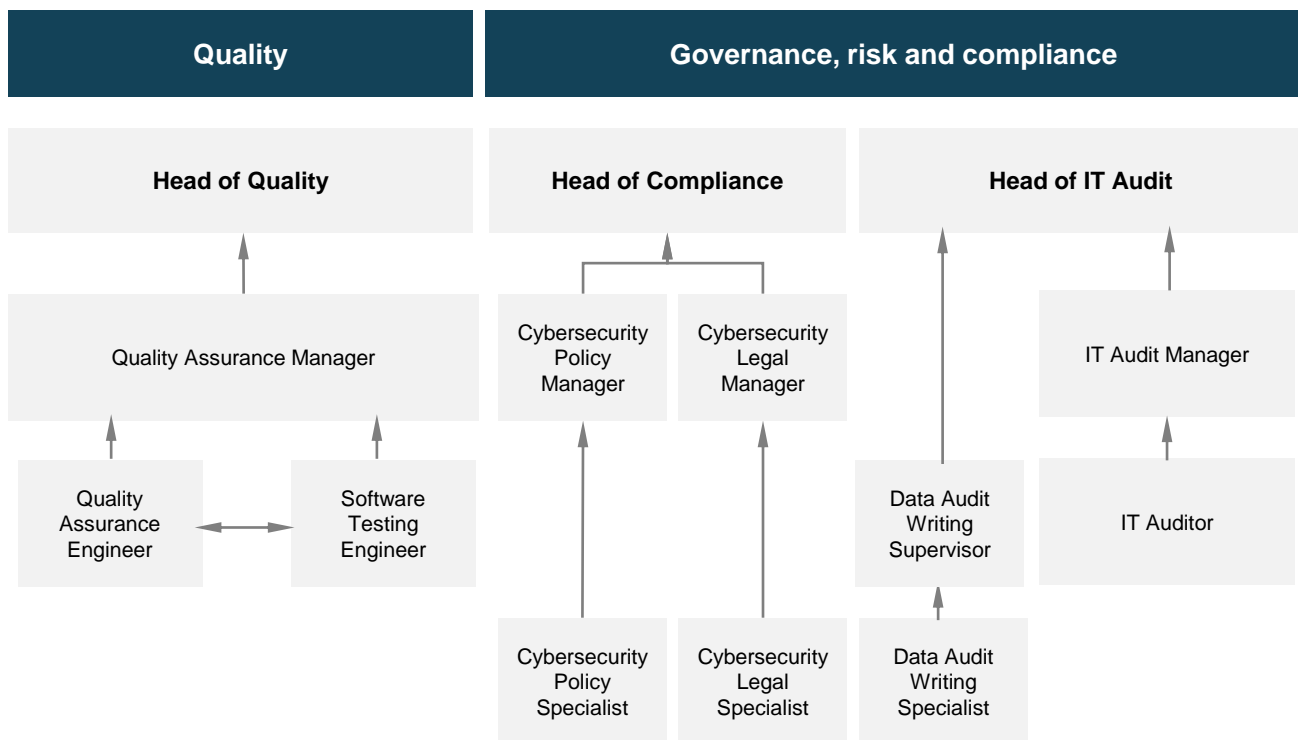
**Key tasks/ activities** include:

- Developing governance frameworks
- Assessing and managing risks
- Monitoring and auditing compliance
- Conducting IT audits
- Managing ethics and accountability
- Maintaining internal control systems

The family **has 10 key job roles**: Head of IT audit, Head of compliance, IT audit manager, IT auditor, Data audit writing supervisor, Data audit writing specialist, Cybersecurity policy manager, Cybersecurity legal manager, Cybersecurity policy specialist, Cybersecurity legal specialist.

## Job family profiles and career pathway maps: (12) Quality (13) Governance, Risk and Compliance

Governance and quality assurance (*related job families presented together*)



**Relevant USOC unit-tier codes for the job family:** 2519 Software and applications developers and analysts not elsewhere classified, 2421 Management and organization analysts, 1213 Policy and planning managers, 4413 Coding, Proofreading and Related Clerks, 2422 Policy administration professionals, 2611 Lawyers

### Skills requirements

Roles under Quality require specialized skills related to product quality assurance. The core skills include quality assurance, quality engineering, software applications test design, software testing, test planning, testing, etc. While the roles under Governance, Risk and Compliance family are more focused on developing compliance policies and their implementation and hence require skills such as audit and compliance, cyber risk, governance and compliance, risk management, legal compliance, regulatory compliance, etc.

Full list of key skills is present in the following tables (see next page) providing a detailed view on job families' skills needs.

## Job family profiles and career pathway maps: (12) Quality (13) Governance, Risk and Compliance

### Key relevant skills: Quality

- Quality assurance
- Quality engineering
- Software applications test design
- Software testing
- Test planning
- Testing
- Problem management
- Data ethics
- Security assessment and testing
- Applications development
- Agile software development

### Key relevant skills: Governance, risk and compliance

- Audit and compliance
- Cyber risk, governance and compliance
- Risk Management
- Legal compliance
- Regulatory compliance
- Business needs analysis
- Troubleshooting and risk analysis
- Data governance
- Security governance
- Emerging technology synthesis

### Relevant certifications/ licenses (non-exhaustive)

Quality job family requires **specialized quality engineers for the roles**, and therefore, membership with **Saudi Council of Engineers** is mandatory for professional engineers and technicians holding these roles. There are **legal professionals required** for the roles as well, which are legally required to have the **membership with Saudi Bar Association in the Kingdom**. Along with this, for Quality and Governance, Risk and Compliance roles certain certifications **are good-to-have to ensure credibility of professionals**. Prevalent certification for the job families are given on the next page.

## Job family profiles and career pathway maps: (12) Quality (13) Governance, Risk and Compliance

### Certifications: Quality

- Certified Manager of Quality/Organizational Excellence (CMQ/OE)
- Lean Six Sigma Black Belt
- ISO 9001 Lead Auditor
- Certified Quality Engineer (CQE)
- Project Management Professional (PMP)
- ISTQB Certified Tester Advanced Level
- Lean Six Sigma Green Belt
- Certified Software Quality Analyst (CSQA)

### Certifications: Governance, risk and compliance

- Certified in the Governance of Enterprise IT (CGEIT)
- COBIT 2019 Foundation
- ISO/IEC 38500 IT Governance Certification
- ITIL 4 Foundation
- Certified Risk Management Professional (CRMP)
- ISO 9001 Lead Auditor
- Six Sigma Black Belt
- Project Management Professional (PMP)
- Certified Information Systems Auditor (CISA)
- Certified Internal Auditor (CIA)
- Certified Risk and Information Systems Control (CRISC)
- ISO 27001 Lead Auditor
- Certified Quality Engineer (CQE)
- ISTQB Certified Tester Advanced Level
- Certified Compliance & Ethics Professional (CCEP)
- Certified Risk and Compliance Management Professional (CRCMP)
- Certified Information Privacy Professional (CIPP)
- Certified Information Security Manager (CISM)
- Certified Data Privacy Solutions Engineer (CDPSE)
- Certified Information Privacy Professional/United States (CIPP/US)
- Selenium WebDriver Certification
- Agile Tester Certification
- Data Science Council of America (DASCA) Certifications
- Certified Data Management Professional (CDMP)

# Job family profiles and career pathway maps: (14) Business Processes (15) Project Management

## Job family overview

Business Processes and Project Management job families have closely related job roles **contributing to change management and digital transformation**. Given the synergies, the **two families are presented on a single career pathway map**.

### Business processes

Business Processes clusters roles that **deal with design, improvement, and management of business process automation** while facilitating cultural and behavioral changes necessary for adoption.

**Key tasks/ activities** include:

- Designing and implementing business process automation
- Optimizing processes
- Managing change
- Facilitating agility and scrum practices
- Supporting the adoption of DevOps tools

The family **has 4 key job roles**: Head of business process, Business process manager, Digital transformation specialist, Business process analyst.

### Project management

Project Management job family roles deal with **planning, execution and PMO for target programs/ initiatives** to help achieve specific business objectives

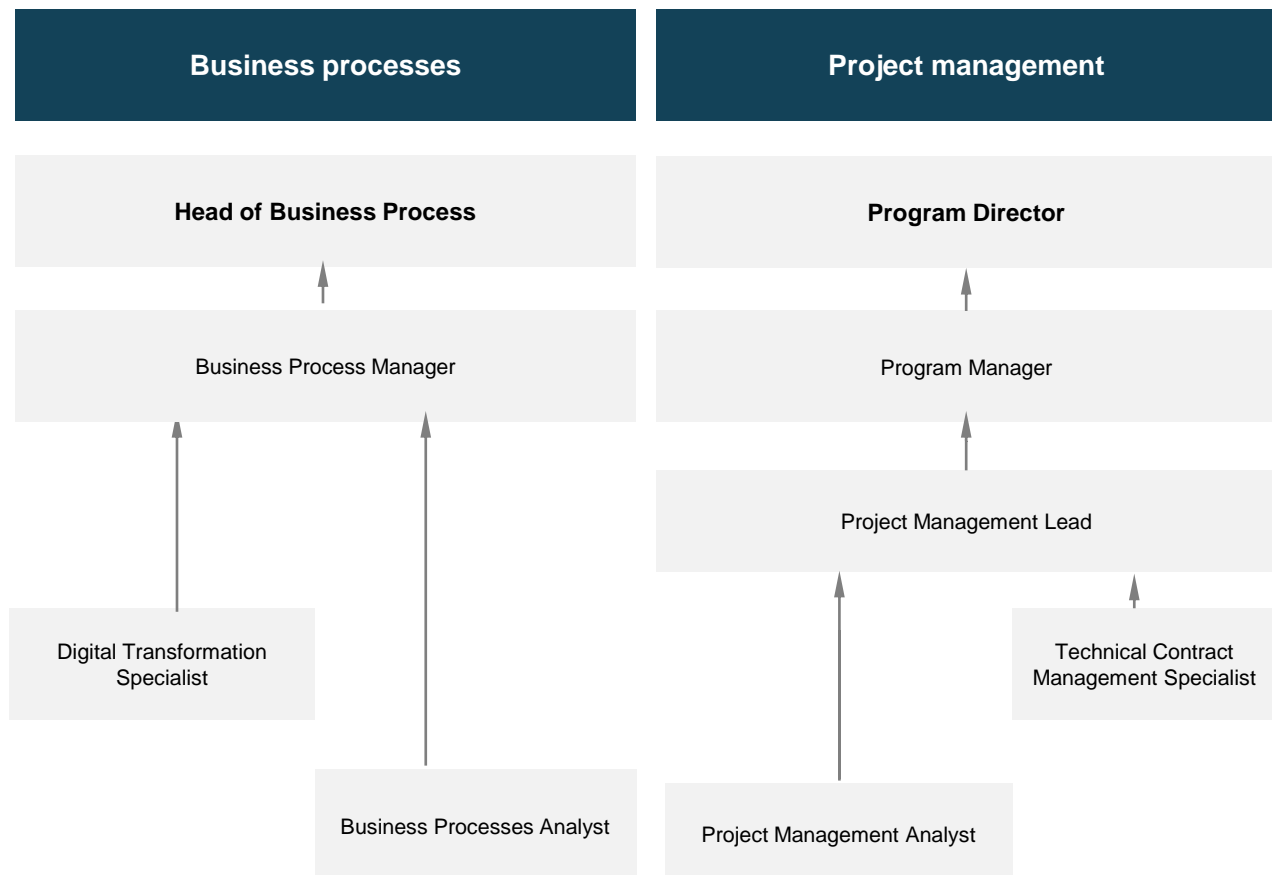
**Key tasks/ activities** include:

- Planning projects
- Executing projects
- Establishing PMO (Project Management Office)
- Defining project timelines
- Planning manpower resources
- Managing project portfolios

The family **has 5 key job roles**: Program director, Program manager, Project management lead, Technical contract management specialist, Project management analyst.

## Job family profiles and career pathway maps: (14) Business Processes (15) Project Management

Processes and project delivery (*related job families presented together*)



**Relevant USOC unit-tier codes for the job family:** 2421 Management and organization analysts, 1213 Policy and planning managers, 2511 Systems analysts, 2529 Database and network professionals not elsewhere classified

### Skills requirements

The listed job roles require specialized skills for process automation, development, project management and change management. For Business Processes job roles, the core skills include key analysis techniques, automation tool proficiency, processes design, workflow automation, etc., Similarly for Project Management, core skills include business needs analysis, business agility, data analytics, etc.

Full list of key skills is present in the following tables (see next page) providing a detailed view on job families' skills needs .

## Job family profiles and career pathway maps: (14) Business Processes (15) Project Management

### Key relevant skills: Business processes

- Key analysis techniques
- Automation tool proficiency
- Processes design
- Workflow automation
- RPA subject matter expert
- Conflict management
- Risk management
- Robotic and automation technology application
- Customer experience management

### Key relevant skills: Project management

- Portfolio management
- Program management
- Business needs analysis
- Stakeholder management
- Business agility
- Business requirements mapping
- Problem management
- Data analytics
- Agile coaching
- Budgeting

### Relevant certifications/ licenses (non-exhaustive)

Both the job families require IT and digital specialists. Engineering professionals in these job families **are obligated to have membership with Saudi Council of Engineers (mandated by law)** for practicing these job roles in Saudi Arabia. Other than the SCE membership, there are **specialized certifications (see next page) well-recognized in the Kingdom** for the listed job roles

# Job family profiles and career pathway maps:

## (14) Business Processes (15) Project Management

### Certifications: Business processes

- Business Process Management Professional (BPMP)
- Lean Six Sigma Green Belt
- Lean Six Sigma Black Belt
- Certified Business Process Leader (CBPL)
- ITIL 4 Managing Professional
- Project Management Professional (PMP)
- Certified Digital Transformation Professional (CDTP)
- TOGAF 9 Certified
- Certified Information Systems Security Professional (CISSP)
- ITIL 4 Strategic Leader
- AWS Certified Solutions Architect - Professional
- Certified Business Analysis Professional (CBAP)
- Agile Business Analyst (IIBA)
- ITIL 4 Foundation

### Certifications: Project management

- Project Management Professional (PMP)
- Program Management Professional (PgMP)
- ITIL 4 Strategic Leader
- Certified ScrumMaster (CSM)
- Certified Change Management Professional (CCMP)
- Lean Six Sigma Black Belt
- PRINCE2 Practitioner
- Agile Certified Practitioner (PMI-ACP)
- ITIL 4 Managing Professional
- SAFe Agilist Certification
- SAFe Program Consultant (SPC)
- Certified Professional Contract Manager (CPCM)
- Certified Federal Contracts Manager (CFCM)
- Lean Six Sigma Green Belt
- ITIL 4 Foundation
- TOGAF 9 Foundation
- Agile Scrum Foundation
- Agile Scrum Product Owner
- Certified Digital Product Manager
- Certified Product Manager
- CompTIA Project + Certification

# Job family profiles and career pathway maps: (16) Consultation (17) Hardware

## Job family overview

Consultation and Hardware job families have closely related job roles **contributing to deployment of IT and digital solutions in organizations**. Given the synergies, the **two families are presented on a single career pathway map**.

### Consultation

Consultation clusters roles that focus on **providing subject-matter expertise** to the organization for deployment and adoption of required digital/ AI solutions.

**Key tasks/ activities** include:

- Providing emerging tech and AI consulting
- Advising on IT and digital strategy
- Evaluating vendors and technology solutions
- Conducting risk assessments

The family **has 4 key job roles**: IT consulting manager, IT business analysis Specialist, IT operations management specialist, IT strategy specialist

### Hardware

Hardware job family roles deal with **designing and engineering hardware systems and mechanical solutions** with a focus on interrelationships between components (such as routers and switches).

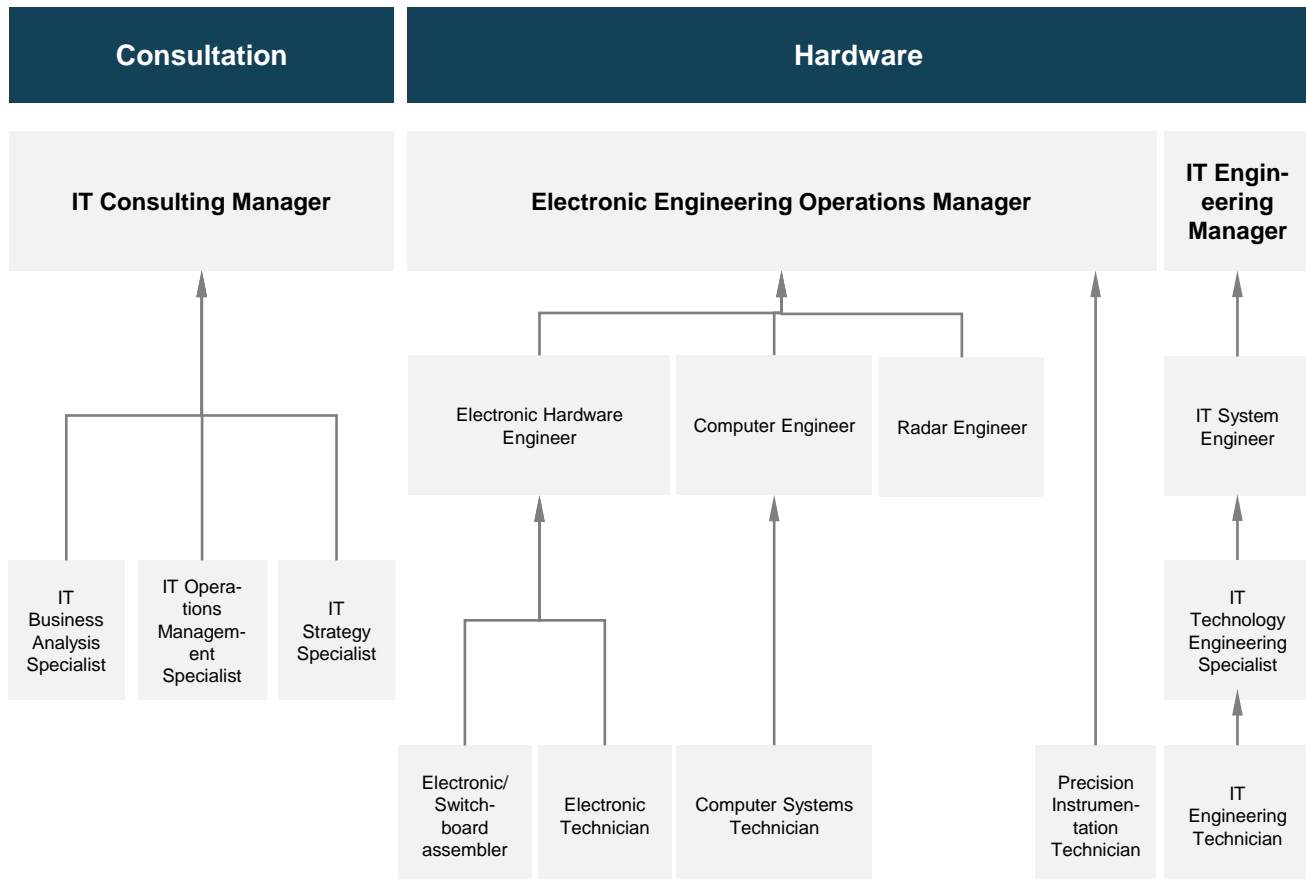
**Key tasks/ activities** include:

- Designing systems
- Configuring IP/MPLS networks
- Developing mechanical components
- Designing and prototyping circuits
- Integrating components and conducting tests

The family **has 12 key job roles**: IT engineer manager, IT system engineer, IT technology engineer specialist, IT engineering technician, Electronic engineering operations manager, Electronic hardware engineer, Computer engineer, Radar engineer, Electronic technician, Electronic/ switchboard assembler, Computer systems technician, Precision instrumentation technician

# Job family profiles and career pathway maps: (16) Consultation (17) Hardware

## Consultation and hardware services (related job families presented together)



**Relevant USOC unit-tier codes for the job family:** 2152 Electronics engineers, 1330 Information and communications technology service managers, 2511 Systems analysts, 2149 Engineering professionals not elsewhere classified, 1321 Manufacturing managers, 3114 Electronics engineering technicians, 8212 Electrical and electronic equipment assemblers, 2153 Telecommunications engineers

## Skills requirements

The listed job roles require specialized skills related to electronics and IT/ Digital engineering. For Consultation, the core skills include IT consulting, computer operating systems and hardware usage, embedded systems design, etc., while for Hardware, core skills include electronic circuit boards design and integration, system design, quantum mechanics, electronic and mechanical designs validation, embedded firmware development, etc.

Full list of key skills is present in the following tables (see next page) providing a detailed view on job families' skills needs .

## Job family profiles and career pathway maps: (16) Consultation (17) Hardware

### Key relevant skills: Consultation

- IT consulting
- Computer operating systems and hardware usage
- Embedded systems design
- Network and data security
- Stakeholder management
- Data management
- IoT tech design and development
- ICT project management
- Work planning and management
- Solution architecture

### Key relevant skills: Hardware

- Electronic circuit boards design and integration
- System design
- Quantum mechanics
- Electronic and mechanical designs validation
- Embedded firmware development
- Electronic circuit boards design and integration
- Hardware design for IoT solutions
- Solution architecture

### Relevant certifications/ licenses (non-exhaustive)

Both the job families require engineers and technicians in the field of IT/ digital and electronics engineering. In the Kingdom, practicing engineers and technicians are required by law to hold **membership with the Saudi Council of Engineers (SCE)**, ensuring that professionals meet national standards and adhere to engineering regulations. In addition to this, there are also various highly acknowledged certifications for roles (see next page), that are prevalent in the Kingdom.

# Job family profiles and career pathway maps:

## (16) Consultation (17) Hardware

### Certifications: Consultation

- Certified Management Consultant (CMC)
- AWS Certified Cloud Practitioner
- ITIL 4 Strategic Leader
- Google Cloud Professional Cloud Architect
- PRINCE2 Practitioner
- ITIL 4 Managing Professional
- Certified in the Governance of Enterprise IT (CGEIT)
- Microsoft Certified: Azure Administrator Associate
- AWS Certified Solutions Architect – Associate
- TOGAF 9 Certified
- Certified Information Systems Auditor (CISA)
- Certified Business Analysis Professional (CBAP)
- PMI Professional in Business Analysis (PMI-PBA)
- Agile Business Analyst (IIBA)
- ITIL 4 Foundation
- Lean Six Sigma Green Belt
- AWS Certified Solutions Architect – Professional

### Certifications: Hardware

- Project Management Professional (PMP)
- Certified Information Systems Security Professional (CISSP)
- Certified ScrumMaster (CSM)
- TOGAF 9 Certified
- ITIL 4 Managing Professional
- AWS Certified Solutions Architect – Professional
- Microsoft Certified: Azure Solutions Architect Expert
- AWS Certified SysOps Administrator
- Red Hat Certified Engineer (RHCE)
- VMware Certified Professional - Data Center Virtualization (VCP-DCV)
- CompTIA Server+
- Cisco Certified Network Professional (CCNP)
- CompTIA Network+
- Certified Ethical Hacker (CEH)
- AWS Certified Developer – Associate
- IPC Certified Interconnect Designer (CID)
- Certified Engineering Technician (CET)
- Six Sigma Green Belt
- Autodesk Certified Professional in Electronics Engineering
- Six Sigma Black Belt
- Certified Manager of Quality/Organizational Excellence (CMQ/OE)
- IPC-A-610 Specialist Certification
- CompTIA A+
- Cisco Certified Technician (CCT)
- Microsoft Certified: Azure Fundamentals
- IPC/WHMA-A-620 Certification
- IPC J-STD-001 Certification
- OSHA Safety Certification
- CompTIA IT Fundamentals (ITF+)
- IEEE Radar Systems Certification
- MATLAB Onramp Certification
- Instrumentation Systems and Automation Society (ISA) Certification

# 05

## Appendix

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## Detailed view on skills needs emerging from sector transformations: Technological enablers

Transformation	Skill identified	Skill definition and relevance
Internet of Things applications and services	IoT tech design and development	<ul style="list-style-type: none"> <li>• Program, design and test of IoT devices and networks</li> <li>• Install IoT devices and networks</li> </ul>
	Embedded systems design	<ul style="list-style-type: none"> <li>• Design and implement a compact, efficient, and secure hardware and software solutions for Internet of Things devices, involving aspects such as hardware integration, real-time systems, communication protocols, and power management</li> </ul>
	Cybersecurity of emerging tech	<ul style="list-style-type: none"> <li>• Evaluate threats and vulnerabilities of emerging tech such as IoT devices and metaverse</li> </ul>
Augmented and Virtual Reality applications	3D modeling	<ul style="list-style-type: none"> <li>• Generate 3D models using a variety of modelling software to represent characteristics of a real-world system</li> </ul>
	VR/ AR/MR application	<ul style="list-style-type: none"> <li>• Apply virtual, augmented, and mixed reality solutions in organizations</li> </ul>
	UI and UX design	<ul style="list-style-type: none"> <li>• Conceptualize, project and make enhancements to the user's interaction and engagement with an IT product and/or service based on analysis and understanding of the product and/or service's performance vis-a-vis the user's desired experience and outcomes</li> <li>• Create wire frames to adequately guide and inform subsequent planning and development processes, and making enhancements to optimize the user's experience of the product and/or service</li> <li>• Design user interfaces for machines and software, incorporating visual, technical and functional elements that facilitate ease of access, understanding and usage including adding, removing, modifying or enhancing elements to make the user's interaction with the product as seamless as possible</li> </ul>

## Detailed view on skills needs emerging from sector transformations: Technological enablers

Transformation	Skill identified	Skill definition and relevance
Robotic process automation	Programming	<ul style="list-style-type: none"> <li>Leverage proficiency in coding and algorithm implementation, utilizing languages like Python, Java, or others, to develop, optimize, and deploy artificial intelligence models. Automate tasks and streamline processes for enhanced efficiency</li> </ul>
	Robotic and automation technology application	<ul style="list-style-type: none"> <li>Apply and integrate evaluated technologies into organization operations or processes, and identifying processes that are applicable to automation to achieve desired outcomes and reduce reliance on manual tasks</li> </ul>
	Risk management	<ul style="list-style-type: none"> <li>Identify, assess and prioritize risks and apply resources to mitigate risks and impact of incidents</li> </ul>
Artificial Intelligence	Computer vision	<ul style="list-style-type: none"> <li>Develop algorithms and models to enable machines to acquire, process, analyze, and make decisions based on visual data incl. image acquisition, pre-processing, and segmentation; object recognition and tracking; feature extraction; and scene understanding</li> </ul>
	Natural language Processing (NLP)	<ul style="list-style-type: none"> <li>Design algorithms that enable computers to understand, interpret, and generate human language, utilizing linguistic analysis</li> </ul>
	Machine Learning (ML)	<ul style="list-style-type: none"> <li>Develop, implement, and optimize algorithms for automated learning and decision-making utilizing tools such as deep learning (DL), supervised and unsupervised learning, and reinforcement learning</li> </ul>
Advanced connectivity	Wireless network planning and optimization	<ul style="list-style-type: none"> <li>Design and optimize wireless networks through small cells RAN studies, spectrum analysis, and RF measurement.</li> <li>Ensures RAN efficiency with expertise in accessibility, retainability, availability, and mobility management.</li> </ul>
	Network architecture	<ul style="list-style-type: none"> <li>Design and plan network structures to ensure optimal performance, scalability, and reliability, also understanding different architectures, such as client-server, peer-to-peer, and distributed systems</li> </ul>
	Network security	<ul style="list-style-type: none"> <li>Design and configure network systems to ensure the integrity of network infrastructure through the use of appropriate protection, detection and response mechanisms</li> </ul>

# Detailed view on skills needs emerging from sector transformations: Technological enablers

Transformation	Skill identified	Skill definition and relevance
Quantum computing	Quantum mechanics	<ul style="list-style-type: none"> <li>Understand the behavior of matter and energy at the smallest scales as the quantum computing is based on the principles of quantum mechanics</li> </ul>
	Linear algebra and quantum algorithms	<ul style="list-style-type: none"> <li>Apply proficiency in linear algebra for manipulating quantum states represented as vectors and matrices, while cultivating a deep understanding of quantum algorithms, specialized methods leveraging quantum properties to solve problems more efficiently than classical counterparts</li> </ul>
	Error correction and fault tolerance	<ul style="list-style-type: none"> <li>Analyze and address noise and decoherence in quantum systems through error correction and fault tolerance mechanisms ensuring the reliability and stability of quantum computations</li> </ul>
Investments in digital innovations	Financial analysis	<ul style="list-style-type: none"> <li>Analyze financial data, such as financial statements, industry trends, and market information, to evaluate potential investment opportunities, assess risks, and make informed investment decisions</li> </ul>
	Portfolio management	<ul style="list-style-type: none"> <li>Manage systematically the IT investments, projects, services and activities within a company, in line with business objectives and priorities. This involves the development of a framework to evaluate potential costs and benefits and make key decisions about IT investments, internal allocation and utilization of IT resources and/or assets and any changes to IT processes or services offered</li> </ul>
	Risk management	<ul style="list-style-type: none"> <li>Identify, assess and prioritize risks and apply resources to mitigate risks and impact of incidents</li> </ul>
E-Commerce	Data analytics and business intelligence	<ul style="list-style-type: none"> <li>Analyze e-commerce data, incl. utilizing SEO techniques, to gain insights into customer behavior, sales trends, and website performance using analytical tools (e.g., Google Analytics, etc.) or specialized e-commerce analytics platforms</li> </ul>
	Database management	<ul style="list-style-type: none"> <li>Manage databases that store customer, product, and transaction data. This includes knowledge of database management systems like MySQL, PostgreSQL, or MongoDB</li> </ul>
	Payment Gateway Integration	<ul style="list-style-type: none"> <li>Integrate various payment gateways and systems into e-commerce platforms for secure transaction processing</li> <li>Understand payment processing protocols and security standards like PCI DSS (Payment Card Industry Data Security Standard)</li> </ul>

# Detailed view on skills needs emerging from sector transformations: Technological enablers

Transformation	Skill identified	Skill definition and relevance
<b>Metaverse integration</b>	Data analytics	<ul style="list-style-type: none"> <li>Implement data analytics within the organization to generate business insights and intelligence through the use of statistical and computational techniques and tools, algorithms, predictive data modelling and data visualization</li> </ul>
	VR/AR/MR application	<ul style="list-style-type: none"> <li>Apply virtual, augmented, and mixed reality solutions in organizations</li> </ul>
	Cybersecurity of emerging tech	<ul style="list-style-type: none"> <li>Evaluate threats and vulnerabilities of emerging tech such as IoT devices and metaverse</li> </ul>
<b>Gaming development</b>	Game analysis and design	<ul style="list-style-type: none"> <li>Understand gameplay mechanics, design levels, balance challenges and rewards, and prototype to refine concepts before full-scale development</li> </ul>
	Game programming, development, and testing	<ul style="list-style-type: none"> <li>Optimize gaming experience by proficiently programming, utilizing game engines, employing 3D modeling, animation tools, implementing realistic physics, ensuring multiplatform compatibility, conducting QA testing, using version control, and optimizing performance</li> </ul>
	Ethical game design	<ul style="list-style-type: none"> <li>Understand and integrate ethical considerations into game design ensuring content and mechanics align with ethical standards</li> </ul>
<b>Remote work and digital collaboration</b>	Cloud computing integration	<ul style="list-style-type: none"> <li>Integrate and optimize cloud computing solutions to enable secure and scalable remote work environments</li> </ul>
	File management	<ul style="list-style-type: none"> <li>Utilize and manage file management systems to facilitate seamless collaboration and access to resources</li> </ul>
	Troubleshooting	<ul style="list-style-type: none"> <li>Identify and resolve technical issues promptly to ensure uninterrupted workflow for remote teams</li> </ul>
<b>Big data and advanced analytics utilization</b>	Data preparation and processing	<ul style="list-style-type: none"> <li>Collect and clean data as well as data extraction, transformation, and loading (ETL) and creating comprehensive data warehouses for analytical purposes</li> </ul>
	Machine Learning (ML)	<ul style="list-style-type: none"> <li>Develop, implement, and optimize algorithms for automated learning and decision-making utilizing tools such as deep learning (DL), supervised and unsupervised learning, and reinforcement learning</li> </ul>
	Data visualization and communication	<ul style="list-style-type: none"> <li>Present complex data in a clear, accessible manner to inform decision-making across departments</li> </ul>

# Detailed view on skills needs emerging from sector transformations: Infrastructure and security

Transformation	Skill identified	Skill definition and relevance
<b>Cybersecurity</b>	Cybercrime, data breach incident management, and cyber forensics	<ul style="list-style-type: none"> <li>• Detect and report cyber and data-related incidents, identify affected systems and user groups, trigger alerts and announcements to relevant stakeholders and efficient resolution of the situation</li> <li>• Develop and manage digital forensic investigation and reporting plan which specifies the tools, methods, procedures and practices to be used. This includes the collection, analysis and preservation of digital evidence in line with standard procedures and reporting of findings for legal proceedings</li> </ul>
	Cryptography and encryption	<ul style="list-style-type: none"> <li>• Create and implement cryptographic algorithms, secure encryption protocols, and authentication techniques to protect data</li> </ul>
	Cyber risk management	<ul style="list-style-type: none"> <li>• Develop cyber risk assessment and treatment techniques that can effectively pre-empt and identify significant security loopholes and weaknesses, demonstration of the business risks associated with these loopholes and provision of risk treatment and prioritization of strategies to effectively address the cyber-related risks, threats and vulnerabilities identified to ensure appropriate levels of protection, confidentiality, integrity and privacy in alignment with the security framework</li> </ul>
<b>Blockchain</b>	Cryptography and encryption	<ul style="list-style-type: none"> <li>• Create and implement cryptographic algorithms, secure encryption protocols, and authentication techniques to protect data</li> </ul>
	Data structures	<ul style="list-style-type: none"> <li>• Implement data structures such as linked lists, hash tables, binary trees and graphs in a distributed ledger system to facilitate secure, rapidly verified and immutable transactions</li> </ul>
	Smart contract writing	<ul style="list-style-type: none"> <li>• Write code for distributed ledger systems that are used to facilitate, verify, and enforce the negotiation or performance of a contract between two parties, ensure the uptake of blockchain technology and foster trust and transparency in transactions</li> </ul>

## Detailed view on skills needs emerging from sector transformations: Infrastructure and security

Transformation	Skill identified	Skill definition and relevance
<b>Cloud computing</b>	Cloud platforms	<ul style="list-style-type: none"> <li>Utilize proficiency in major cloud platforms, understanding core services, management interfaces, and resource provisioning, such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), or others</li> </ul>
	Cloud development and operations management (DevOps)	<ul style="list-style-type: none"> <li>Integrate development and operations for efficient and collaborative cloud deployment, e.g., CI/CD pipelines, version control (e.g., Git), and infrastructure as code (IaC)</li> </ul>
	Cloud security	<ul style="list-style-type: none"> <li>Ensure that cloud infrastructure and data are secure from malicious attacks and unauthorized access, monitor and audit access control measures and secure configuration settings, and develop strategies and solutions to prevent data leakage and other security threats</li> </ul>
<b>Open Radio Access Network (ORAN)</b>	RAN architecture	<ul style="list-style-type: none"> <li>Understand various RAN architecture and Open RAN standards (Split-0, Split-2, Split-6, Split-7.2)</li> <li>Acquire in-depth knowledge of Open RAN components (O-RU, o-DU, O-CU)</li> </ul>
	Communication systems and protocols design	<ul style="list-style-type: none"> <li>Familiarize with communication protocols (e.g., DPD, CFR, DUC, DDC)</li> <li>Utilize AI algorithms for the analysis and management of the RAN</li> </ul>
	Software development and integration	<ul style="list-style-type: none"> <li>Utilize languages such as C++, Python, Java, .NET, and version control tool like Git. Proficient in deploying solutions across diverse platforms</li> </ul>

## Detailed view on skills needs emerging from sector transformations: Infrastructure and security

Transformation	Skill identified	Skill definition and relevance
<b>Multi Access Edge Computing (MEC)</b>	Cloud architecture	<ul style="list-style-type: none"> <li>Design, deploy, and manage cloud-based applications and services across diverse platforms and devices to optimize resource utilization and enhance scalability (incl. virtualization and orchestration)</li> </ul>
	MEC automation	<ul style="list-style-type: none"> <li>Implement automation for the efficient, secure, and intelligent operation of MEC applications and services</li> </ul>
	Interoperability testing	<ul style="list-style-type: none"> <li>Conduct interoperability testing to ensure the compatibility and seamless functionality of MEC devices and networks</li> </ul>
<b>Next generation transmission network</b>	FTTX design	<ul style="list-style-type: none"> <li>Design Fiber-to-the-X (FTTX) solutions to optimize data transmission, incl. last-mile connectivity, scalable network architecture, reliability, and integration with emerging technologies</li> </ul>
	OTN design	<ul style="list-style-type: none"> <li>Design and implement Optical Transport Network (OTN) solutions to optimize high-capacity data transport over optical fiber networks</li> </ul>
	Network security	<ul style="list-style-type: none"> <li>Design and configure network systems to ensure the integrity of network infrastructure through the use of appropriate protection, detection and response mechanisms</li> </ul>




























## Detailed view on skills needs emerging from sector transformations: Customer centricity

Transformation	Skill identified	Skill definition and relevance
<b>Omnichannel</b>	Customer experience management	<ul style="list-style-type: none"> <li>Manage organizational service performance through service performance audits, service improvement plans and the establishment of a desired customer experience framework to enhance customer experience</li> </ul>
	Customer data analysis	<ul style="list-style-type: none"> <li>Devise frameworks for customer data analysis to develop an understanding of customer knowledge and behavior from various customer touchpoints</li> </ul>
	Risk management	<ul style="list-style-type: none"> <li>Identify and mitigate potential disruptions in the seamless flow of goods and services across multiple channels, while maintaining data security, compliance, and customer satisfaction</li> </ul>
<b>Customer digital personalization</b>	Data analysis	<ul style="list-style-type: none"> <li>Implement data analytics within the organization to generate business insights and intelligence through the use of statistical and computational techniques and tools, algorithms, predictive data modelling and data visualization</li> </ul>
	UX design	<ul style="list-style-type: none"> <li>Conceptualize, project and make enhancement of the user's interaction and engagement with an IT product and/or service based on a robust analysis and understanding of the product and/or service's performance vis-a-vis the user's desired experience and outcomes. This involves creating wire frames to adequately guide and inform subsequent planning and development processes, and making enhancements to optimize the user's experience of the product and/or service</li> </ul>
	Data protection management	<ul style="list-style-type: none"> <li>Develop and implement a data protection management program to comply with relevant regulations</li> </ul>

## Detailed view on skills needs emerging from sector transformations: ESG

Transformation	Skill identified	Skill definition and relevance
<b>Sustainable and Green IT</b>	Energy management and efficiency	<ul style="list-style-type: none"> <li>Optimize energy usage in IT systems and data centers, including proficiency in energy-efficient hardware and software solutions</li> </ul>
	Green software engineering	<ul style="list-style-type: none"> <li>Design and develop software that is resource-efficient and minimizes energy consumption</li> </ul>
	Virtualization and cloud computing utilization	<ul style="list-style-type: none"> <li>Enhance use of virtualization technologies and cloud computing which can lead to reduced physical IT infrastructure and energy consumption</li> </ul>
<b>Data and AI Ethics</b>	Ethical decision-making	<ul style="list-style-type: none"> <li>Make ethical decisions when confronted with dilemmas related to data usage or AI development while considering the social potential impact</li> </ul>
	Privacy protection	<ul style="list-style-type: none"> <li>Implement measures to protect personal data, obtain consent for data processing, and be aware of data breaches implications</li> </ul>
	Fairness and bias mitigation	<ul style="list-style-type: none"> <li>Identify and rectify biases in data sets and algorithms to prevent discriminatory outcomes</li> </ul>

# Sources

Category	Sources
<b>Reports</b>	Top 10 Trends in Tech 2023, World Economic Forum 
	Technology Book, WIPO Green 
	Digital Skills Insight, International Telecommunication Union 
	Saudi Job Market Needs Assessment Study 
	Trends in Telecom 2023 
	Latest Telecom Industry Trends 2023: A Look into the Future 
<b>National strategies</b>	Vision 2030 National Transformation Program 
	Digital Government Strategy 2023-2030 
	ICT Strategy 2019-23 by MCIT 
	Smart Government Strategy (2020-24) 
	National Strategy for Data & AI 
<b>Key players' strategies</b>	Digital Government Capacity Development Program (Quodrat-Tech) 
	Saudi Digital Academy strategy 
	Saudi Digital & AI Authority 
	Center of Digital Entrepreneurship (CODE) 
	Saudi Digital Investment Frontier 
	STC company strategy 
	Zain company strategy 
	Mobily company strategy 
<b>Benchmarks</b>	Saudi Cybersecurity Workforce Framework 
	Skills Framework for Information Age 
	Skills Future 
	Training Packages 
	National Skill Development Corporation 
	HRDCorp. IndSF 
	Institute for Apprenticeships and Technical Education 
	European Skills, Competences, Qualifications and Occupations 

# Glossary

Term	Definition
<b>Artificial Intelligence (AI)</b>	Artificial Intelligence, a field of computer science dedicated to creating systems capable of performing tasks that usually require human intelligence
<b>Big data</b>	The collection and analysis of large volumes of diverse and complex data sets to uncover patterns, trends, and insights
<b>Cloud security</b>	A comprehensive set of policies, technologies, and controls deployed to protect data, applications, and infrastructure in cloud environments. It ensures data privacy, compliance, and protection against cyber threats
<b>Customer Experience (CX)</b>	Refers to a customer's holistic perception of their experience with a business or brand
<b>Data Center and Cloud Services</b>	Critical infrastructure providing centralized storage, management, and distribution of data and applications. Cloud services enable scalable, on-demand access to computing resources over the internet, streamlining IT operations
<b>Data visualization</b>	The representation of data through graphical formats such as charts, graphs, and maps. It aids in understanding complex datasets, uncovering patterns, and making informed decisions through intuitive visual insights
<b>Distributed Ledger Technology</b>	A decentralized database managed by multiple participants, known for underpinning blockchain technology. It enhances transparency, security, and efficiency in transactions and data sharing across networks
<b>Internet of Things (IoT)</b>	The network of physical objects embedded with software, sensors, and other technology to connect and exchange data
<b>Labor productivity</b>	Labor productivity, also known as workforce productivity, is defined as real economic output per labor hour
<b>Machine Learning (ML)</b>	A subset of AI, where machines are given the ability to learn and improve from experiences without being explicitly programmed

# Glossary

Term	Definition
<b>Metaverse integration</b>	The convergence of physical and virtual worlds, enabling immersive digital experiences and interactions. It involves the integration of VR, AR, and blockchain technologies to create interconnected, interactive digital environments
<b>Multi Access Edge Computing (MEC)</b>	A network architecture concept bringing computation and data storage closer to the location where it is needed, improving latency and bandwidth efficiency. MEC supports real-time applications like IoT and augmented reality
<b>Open Radio Access Network (ORAN)</b>	An initiative to redefine RAN architecture using open interfaces and standard hardware and software components. ORAN promotes interoperability, innovation, and flexibility in deploying 5G networks
<b>Robotic process automation</b>	Automation of repetitive, rule-based tasks using software bots, enhancing efficiency and accuracy in business processes. It's extensively used to streamline and automate workflow in various industries
<b>Sector intelligence</b>	Sector intelligence refers to analyzing a large group of companies operating similar businesses, to gain insights into economic transformations and patterns
<b>Sector Skills Council</b>	Sector Skills Councils are employer-led national entities that undertake functions in skills training, education and workforce development
<b>Skills gap</b>	Skills gap refers to the disparity between the skills an employer expects their employees to have, and the actual skills employees possess
<b>Software as a Service (SaaS)</b>	A software distribution model where applications are hosted by a service provider and accessed over the internet. SaaS eliminates the need for local installation and simplifies software maintenance and updates
<b>Sustainability</b>	The maintenance and preservation of environmental, social, and economic resources to ensure long-term viability and welfare
<b>The International Standard Industrial Classification (ISIC)</b>	International Standard Industrial Classification of all economic activities is a United Nations industry classification system. Wide use has been made of ISIC in classifying data according to kind of economic activity in the fields of employment and health data

# Abbreviations

## List of abbreviations

<b>AR</b>	Augmented Reality
<b>ESG</b>	Environmental, Social, Governance
<b>G&amp;A</b>	General & Administrative
<b>IBM</b>	International Business Machines Corporation
<b>ICT</b>	Information and Communication Technology
<b>IT</b>	Information and Technology
<b>MCIT</b>	Ministry of Communications and Information Technology
<b>MHRSD</b>	Ministry of Human Resources and Social Development
<b>ML</b>	Machine Learning
<b>MR</b>	Mixed Reality
<b>SSC</b>	Sector Skills Council
<b>SSF</b>	Sector Skills Framework
<b>STC</b>	Saudi Telecom Company
<b>SysOps.</b>	System Operations
<b>UI</b>	User Interface
<b>UX</b>	User Experience
<b>VR</b>	Virtual Reality

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