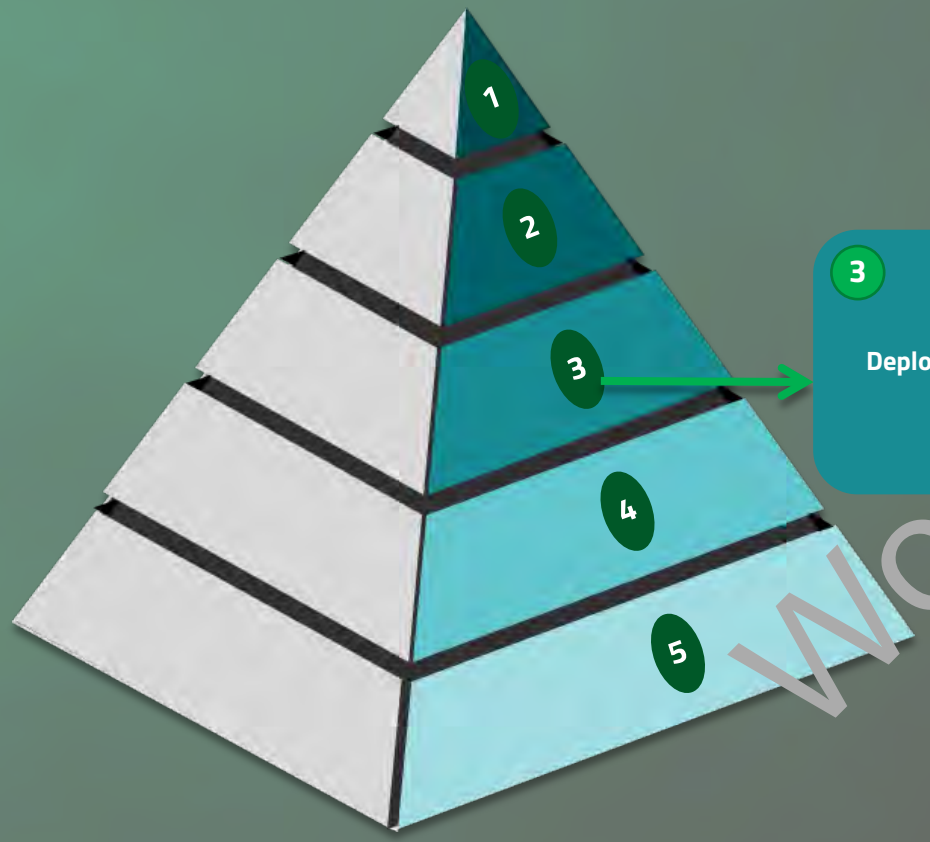
Focus on: Layer 3

SNAP Layered Structure



3

Deployment roadmap

This layer describes the deployment programs and roadmaps of SNAP Projects, grouped per Stakeholder's class and articulated in waves. As part of the deployment roadmaps, the core needs for Capacity building and human development are identified.

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LAYER 3

3. DEPLOYMENT ROADMAP

3.1 SNAP Roadmaps Implementation

3.2 Capacity building and development

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3. DEPLOYMENT ROADMAP

3.2 Capacity building and development | Overview (1/4)

Air traffic volume is expected to triple over the next 15 years in the KSA, with a **clear impact on the need for qualified employees, supervisors and managers** in various positions to keep the pace with such an increase. Hence, it is imperative to guarantee the **availability and the recruitment of highly skilled personnel** for airlines, airports, ANS-related Service Providers and the Regulatory Authority, as well as **trainings and human capital development for professionals** in the aviation sector to manage the increasing traffic volumes and the introduction of cutting-edge technologies.

The KSA aviation sector needs to develop its own Capacity Building and Training Roadmap to provide a **structured plan of actions** aimed at implementing a comprehensive and consistent set of competencies and (technical) qualifications needed to meet the KSA strategic directions and development goals.

The development of an aviation training and capacity-building roadmap should duly consider **international standard guidelines** (i.e. ICAO 2015 Off-site Council "*Training and Capacity-Building in Civil Aviation*").

NEEDS & CHALLENGES

- **Mapping of current skills and competencies** to define AS IS and spot actual deficiencies in ANS
- Identification of **new ANS jobs, competencies and qualification requirements** related to SNAP ("*gap analysis*")
- **Training needs** for each **new ANS areas** and per **category of ANS personnel**
- **ANS training capabilities** identification related to KSA ANS modernization
- **KSA ANS educational programs framework definition**

RESPONSES

1. Development of **methodologies for capacity building**
2. Identification and definition of **specific training plans** (e.g., technical personnel qualification and training, technical guidance & tools)
3. Development of **skills and competencies** in the ANS sector through **higher education programs**
4. Creation of **partnership for ANS Training, Research, Development and Innovation**

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3. DEPLOYMENT ROADMAP

3.2 Capacity building and development | Overview (2/4)

To address the demands and challenges of capacity building and development, GACA HR department has defined **initiatives aligned with strategic pillars*,** aimed at addressing the gaps identified within the ANS sector.

Strategic pillars	*Main Gaps Identified*	*Main initiatives to address the gaps*
Critical Moves	• KSA dependency on international partnership • Mismatch in training supply vs. demand	A: Invest in training infrastructure expansion (i.e. ATC Academy, Pilot & Cabin crew academy , Airport Ops academy, etc.)
Temporary remedies	• Limited training capacity for critical roles	B: Activate temporary remedies (i.e. leverage on international partnerships)
Structural interventions	• Not structured approaches towards Human Capital development	C: Position GACA as ecosystem coordinator D: Create dedicated funds for Human Capital dev.
Long term plays	• Limited sector promotion initiatives • Siloed technology adoption across ecosystem operators	E: Foster future aviation programs F: Leverage technology to enhance productivity across ecosystem operators

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***Reference document** : "Human Capital Development Strategy, Deliverable 4 & 5: Report On Priority Skills & Human Capital Development Plan" (GACA HR Department, January 2024)*

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3. DEPLOYMENT ROADMAP

3.2 Capacity building and development | Overview (3/4)

In alignment with these strategic pillars, GACA HR department categorized the identified gaps and assigned them to specific **Development Areas**.

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Strategic pillars	*Development Areas*
Critical Moves	**Sector Promotion**
Temporary remedies	**Attraction & Retention**
Structural interventions	**Capability Development**
Long term plays	**Productivity Enhancement**

***Reference document** : "Human Capital Development Strategy, Deliverable 4 & 5: Report On Priority Skills & Human Capital Development Plan" (GACA HR Department, January 2024)*

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3. DEPLOYMENT ROADMAP

3.2 Capacity building and development | Overview (4/4)

Each area is targeted to address **Key Challenges** and highlight **Development Solutions** for capacity building.

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Key challenges

Sector Promotion

- **No significant measures** to promote the aviation sector among students/young professionals
- **Limited events/collaborations** between schools and Air-Transportation

Attraction & Retention

- **Lack of innovative methods of recruitment** to address immediate resources requirements
- **Low recruitment rate** to address vacancies
- **Basic talent retention initiatives**

Capability Development

Although in-country training infrastructure is being enhanced, KSA is still **dependent on international partnerships** due to:

- Narrow course selection availability
- Persistent infrastructure limitations (i.e. simulators)

Productivity Enhancement

- **Dispersed investments for technology adaptation** to optimize current and future headcount demand
- **Limited training support** to enable widespread adoption of technology tools

Development solutions

*Consider developing a **robust sector promotion strategy***

*Introduce **programs and incentives** to enhance attraction & retention.*
*Improve the **advertising of job vacancies***

*Consider the **development of an end-to-end capability program** to enhance capacity, availability and infrastructure*

*Develop a **strategy** to make the workforce familiar with tech enhancements*
*Launch **"train-the-trainers" programs** to upskill instructors on new technologies*

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3.2 Capacity building and development | 3.2.1 Methodologies for capacity building and development (1/2)

The definition of a Capacity building and development roadmap springs from the **link** between **SNAP Projects and Training Needs Assessment (TNAs).**

It will be structured into **three phases**:

- **Preparation** is the most crucial phase as it consists of **designing capacity and development plans** to be used in the Implementation and Evaluation Phases.
- **Implementation** is the longest phase and requires intense coordination and focus to **ensure appropriate and timely implementation** of the plans.
- **Evaluation** assesses the **results of the implementation** and whether training and capacity-building ambitions have been met.

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	PREPARATION	IMPLEMENTATION	EVALUATION
Objectives	Development of operational plans, leveraging on the results of TNA assessments, and addressing: 1. HR development; 2. Sourcing strategy; 3. Resources' upskilling / reskilling strategy; 4. Capacity building evaluation.	Implementation of roadmap operational plans developed in Phase 1 – Preparation, according to the coordinated implementation plans, using project management methods. Requires strong coordination between teams to ensure all activities are planned, coordinated, executed and monitored correctly.	Evaluation and measurement of the results achieved. Validate and ensure that goals and Descriptions defined in the roadmap operational plans have been met. Validate and ensure objectives of the strategic master plan are met.
Inputs	• SNAP • TNA results	"Preparation" phase's outputs: • Stakeholders & Resources • Needs/requirements for education & technology • Capacity and development plans	"Preparation" and "Implementation" phases' outputs
Outputs	• Stakeholders' map • Sourcing plan • Needs/requirements for education & technologies • Capacity & development plans • Evaluation plans	• Education and training programs • Talent and Succession management	• Capacity Building & Training gains • HR KPIs monitoring

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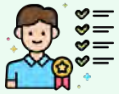
3.2 Capacity building and development | 3.2.1 Methodologies for capacity building and development (2/2)



Arranging capacity building initiatives is essential for ensuring a **skilled and adaptable workforce** in the ANS and to apply the methodology illustrated.

Human capital development activities are organized into **4 clusters**:

A RECRUITING

- **Talent Identification**: processes for identifying individuals with the right skills and potential for the future ANS needs.
- **Talent Attraction**: attract high-skilled workforce also from abroad.
- **Collaboration with Educational Institutions**: Build partnerships with educational institutions to create pipelines for recruiting talent. (e.g. Framework for higher education system)

B TRAINING

- **Needs Assessment**: Conduct thorough needs assessments to identify specific skill gaps and training requirements.
- **Technical Training Programs**: Develop comprehensive training programs covering technical aspects including aircrafts, maintenance, air traffic control, meteorological services, etc.
- **Soft Skills Training**: soft skills training to enhance communication, teamwork, leadership.
- **Simulator Training**: Invest in advanced simulator training for pilots, ATCOs, ANS operators and other critical roles to provide realistic and hands-on experience in a controlled environment.

C LICENSING

- **Regulatory Compliance**: Ensure that licensing processes align with regulatory requirements and international standards.
- **Continuous update**: Implement ongoing education and training programs to support license renovation and to keep professionals updated on the latest developments. (i.e. ICAO certifications)
- **Cross-Certification**: Facilitate cross-certification programs for individuals to acquire additional qualifications, enabling them to perform multiple roles within the sector.

D MONITORING AND CONTINUOUS IMPROVEMENT

- **Change Readiness Assessment**: Assess the organization's readiness for change and identify potential resistance points or criticalities.
- **Communication Strategies**: Develop effective communication strategies and plans to convey the reasons for change, the benefits and expected impact on employees.
- **Training on New Systems and Processes**: Provide training on new technologies, systems, and processes to ensure a smooth transition.
- **Employee Engagement**: Engage employees in the change process, encouraging their participation and feedback to foster commitment.

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ANS training and learning programs are divided into **9 training categories.**

ANS TRAINING CATEGORIES

- *FIS/FIC*
- *Airspace Design*
- *Air Traffic Control*
- *ATSEP*
- *CNS & ATFM*
- *Instructor's Training*
- *Assessor's Training*
- *Meteorological Services*
- *Safety*

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – FIS/FIC

Within the first training category, it is necessary to develop **operational skills** required **for Flight Information Services / Flight Information Centre**

OBJECTIVES

- Management of VFR/IFR traffic
- Management of unusual situations
- Management and dissemination of MET information
- Flight Information Services (FIS), Aerodrome Flight Information Services (AFIS), Alerting Services (ALRS)
- Airspace classification, Rules of the Air, Navigation
- Aircraft Performance, Flight planning, ATFM

TARGET POPULATION

- Tailored for ANSPs whose countries have implemented or intend to implement AFIUs and/or FICs
- National Regulators and/or entities (private or public) that issue FISO licenses
- Private citizens looking for professional courses

CORE CONTENTS

- Theory includes ATM (ATS, ATFM, ASM), NAV, Aircraft Performance, CNS, MET
- The simulation phase includes FIC simulation environments.
- MET Lab for meteorological scenario simulations

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Airspace Design

Within the second training category, it is necessary to develop **procedures' definition** and **operational skills** as the **re-design of existing airspace** represents the pivotal enabler to meet the ANS changing needs in terms of capacity, safety, predictability, environmental sustainability and technological advancement.

OBJECTIVES

- Design classic IFPs or segments
- Design PBN procedures

TARGET POPULATION

- Personnel involved in design, validation, revision of IFPs.

CORE CONTENTS

- Precision/Non-Precision Approach
- Departure procedures
- Conventional Routes, STAR and Holding
- PBN
- GNSS

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Air Traffic Control

Within the third training category, it is necessary to provide single modules or integrated courses for **ATCOs training**

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OBJECTIVES

- Competency for ADI with a radar endorsement
- Competency for APS or ACS with a Terminal Control endorsement
- Competency for ADV, ADI/TWR, ADI/AIR, ADI/GMC/GMS ratings
- SATCO license or a certificate of competency for an APP rating
- SATCO license or a certificate of competency for APS rating
- SATCO license or a certificate of competency for ACS rating

TARGET POPULATION

- Future air traffic controllers (for skilling purposes)
- Air traffic controllers who want to obtain a different rating or endorsement (for reskilling / upskilling purposes)
- Human performance consultants

CORE CONTENTS

- Radar Endorsement
- Terminal Control Endorsement
- Aerodrome Control Instruments
- Approach Control Procedures
- Approach Control Surveillance
- Area Control Surveillance

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – ATSEP

Within the fourth training category, it is necessary to provide knowledge and skills to **Air Traffic Safety Electronic Personnel** in one or more domains and/or streams for CNS/MET system qualification

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OBJECTIVES

- Knowledge and understanding of Air Traffic Safety Electronic Personnel related subjects
- Knowledge and skills in one or more domain and/or streams, such as Data processing, CNS, System Monitoring and Control, Meteorology

TARGET POPULATION

- Air Traffic Safety Electronic Personnel

CORE CONTENTS

- ATF Air Traffic familiarization
- AIS Aeronautical Information
- MET Meteorology
- COM Communication
- NAV Navigation
- SUR Surveillance
- DAT Data Processing
- SMC System Monitoring and Control
- MTN Maintenance Procedures
- FAC Facilities

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Instructor Training

Within the fifth training category, it is necessary to develop **in-house training capabilities and skills for instructors**, in order to progressively reach full independency in capacity building.

OBJECTIVES

- Recognition of principal factors connected to human performance in training and the relationship between learning, competency and motivation of trainees.
- Conduct of training sessions using briefing, monitoring, debriefing, connected techniques such as demonstration and talk through.
- Comparing of individual practices with new methodologies and tools used for training process evaluation
- Consolidation of knowledge and best practices to improve the briefing, monitoring and debriefing activities.
- Emphasis on the importance of being in line with methodologies and best practices for On-the-Job training

TARGET POPULATION

- Personnel that want to / is designed to become instructor
- Instructors that want specializations / skilling refresh

CORE CONTENTS

- Motivation and competency in the training process
- Training process and roles
- Interpersonal communication
- Organizational and regulatory context
- The training process
- Questioning techniques
- Preparation and briefing
- Methodologies and instruments for monitoring
- Debriefing
- Performance evaluation

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Assessors Training

Within the sixth training category, it is necessary to develop **in-house training capabilities and skills for Assessors** who have the responsibility of assessing ATCOs training effectiveness

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OBJECTIVES

- Develop knowledge of unit competence schemes and regulation
- Understand responsibilities and requirements for the role of assessor
- Be able to measure and evaluate the operational competence, and take related appropriate actions

TARGET POPULATION

- ATCOs

CORE CONTENTS

- Introduction
- Regulations (ICAO, MID Region, etc.)
- Unit Competence Scheme and Unit Training Plan
- Competence
- Assessment techniques
- Communication
- Role of the Assessor and possible issues

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Meteorological Services

Within the seventh training category, it is necessary to provide knowledge in **general meteorology** and **aviation meteorology** ensuring the acquisition of the **competencies** and **skills** of an aeronautical weather forecaster.

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OBJECTIVES

- General meteorology
- Main aeronautical reports
- Coding of METAR/SPECI and MET-Reports/SPECIAL
- Basic observation techniques
- Co-ordination procedures
- Identification of aviation weather hazards
- Code and issue of the main aeronautical messages
- Interpretation of tephigrams
- Interpretation of satellite and radar images

TARGET POPULATION

- Aeronautical meteorological professionals who need to reinforce, update or rebuild their skills

CORE CONTENTS

- Synoptic meteorology and climatology
- Meteo instruments and methods of observation
- Coding and dissemination of weather information
- Aviation weather hazards (turbulence, wind shear, icing, severe convection, obscuration phenomena, volcanic ash, tropical cyclones, etc.)
- Standards and skills required for a forecaster services.
- Satellite image interpretation
- Radar image interpretation
- Atmospheric models

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Within the eighth training category, it is necessary to convey **CNS and ATFM concepts**, by providing basic and advanced **theorical knowledge** and **real-case simulations**

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OBJECTIVES

- Understand the principle of CNS (Communication, Navigation and Surveillance)
- Acquire knowledge in aa/cc capabilities and flight operations
- Understand ATC procedures related to CNS performance requirements
- Provide ATC services in airspace where CNS is implemented
- How an ATFM service operates, is structured, organized and implemented
- How the capacity of an airspace sector and airport can be determined
- Which and how ATFM measures are applied
- What data is exchanged in the ATFM service

TARGET POPULATION

- Air Traffic Controllers
- ANSP's head of training and training-related personnel
- Employees working in Air Traffic Management
- ATC providers
- Other professionals engaged in Air Traffic Services (ATS), like flight dispatchers and airlines operators

CORE CONTENTS

- Understand CNS principles
- ATC Procedures in a CNS environment
- Communications (e.g., phraseology, flight plan,, radar screen, radar label.)
- ATFM general concepts: organization and use
- ATFM and CDM (Collaborative Decision Making): a close co-operation
- ATFM output: messages, web-based conferences, tools and manuals

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3.2 Capacity building and development | 3.2.2 ANS training and learning programs – Safety

Within the ninth category, it is necessary to **consolidate the skills of professionals who contribute to safety**, letting them fully understand the importance for aeronautical entities to develop a safe working environment as well as the impact on safety generated by the attempts to enhance the overall system efficiency.

OBJECTIVES

- Learn potential improvements based on lesson learned and lesson dissemination.
- Use regulations and best practices of the aviation sector to garner basic methodology and management skills
- Train people who will be able to coordinate and/or manage a team of experts to deal with analysis, safety management, investigations and risk assessment

TARGET POPULATION

- Operational and productive management
- Teaching HR personnel
- Safety Manager
- Systems management
- Risk Assessment teams

CORE CONTENTS

- General concepts of Safety
- Development of Just Culture and Safety Culture in national and international companies
- Classifications of Variations and variations of System
- Risk Assessment
- Proactive safety
- Human factors in safety
- Guided investigative activities
- Typical event (case studies based on aviation experience)
- Variation in ATM system cycle
- Investigation of risk activities
- Practical activities

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3.2 Capacity building and development | 3.2.3 National framework for ANS higher education programs (1/2)

Given the importance to create a pool of resources for the future of the ANS sector, the development of aeronautical competencies and skills should start from **higher education** (high-school level and above). This can be achieved through different higher education institutes/programs, such as:

Academies

Curriculum: Specialized courses in aeronautics, covering subjects such as aviation technology, aircraft systems, and aerodynamics.

Facilities: Establish well-equipped labs for hands-on training, flight simulators, and workshops in collaboration with industry experts.

Partnerships: Forge partnerships with aviation companies for internships, practical experiences, and real-world exposure.

Partners: Saudia, SGS, SACA, IATC Riyadh, Tayaran, and others.

Aerospace Colleges / Universities

Double-Degree Programs: Collaborate with renowned international universities for double-degree programs to provide students with a broader perspective.

Comprehensive Programs: Develop comprehensive aeronautical programs that encompass engineering, management and research.

Research Centres: Establish research facilities focusing on cutting-edge advancements in aviation technology.

Partners: Universities (e.g. Prince Sultan).

Aeronautical Masters

Introduction: Introduce master's degree programs in advanced aeronautical engineering, aviation technology and management.

Industry Collaboration: Collaborate with international aviation institutions and companies to bring global expertise and opportunities to graduated students.

Global Accreditation: Seek accreditation from international aviation bodies to ensure quality and recognition of programs.

Partners examples: SACA, Universities, and others.

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Curricular Alignment

Align high school curricula with universities pre-requisites, ensuring a smooth progression for interested students

Articulation Agreements

Establish agreements between high schools, and universities to facilitate credit transfers.

Programme Development

Develop comprehensive aeronautical programs at university level, addressing technical, managerial, and research aspects.

Research Integration

Integrate research components into both undergraduate and master's programs, fostering a culture of innovation.

Faculty Collaboration

Encourage collaboration among faculties at different level to share expertise and foster a cohesive educational ecosystem.

Industry Advisory Boards

Form industry advisory boards for each level of education to ensure programs stay up-to-date with industrial needs.

Marketing and Recruitment

Develop strategies to attract students on each level of the educational framework

Resource Allocation

Allocate resources for the development of laboratories, research centres, and faculty training at each educational framework level.

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3.2 Capacity building and development | 3.2.3 National framework for ANS higher education programs (2/2)

Hereby summarized the **Targets, Objectives, Approach** and **Interaction Model** related to for ANS higher education framework

Target	**Pre-University Students**	**University Students & Fresh Graduates**	**Mid-Career Professionals**
Objective	**CREATE INTEREST**	**PREPARE**	**ENABLE CAREER TRANSITION**
Approach	**Career Workshop** Tailored workshops and seminars led by industry experts	**Site Field Trips** Worksite visits to learn about daily operations and career opportunities	**Internship Programs** Opportunities aimed at young aspiring professionals	**Aviation Education** Workshops, seminars and dedicated courses	**Awareness Campaigns** Multimedia efforts showcasing the impact of career opportunities	**Career Switch Programs** Reskilling opportunities for professionals to enter in the industry
	Expos and Open Days Large events that spotlight industry	**Mentorship Programs** On site programs connecting talent with seasoned professionals	**Career Fairs** Educational events to provide overview of the professional opportunities	**Aviation Competitions** Aviation-related competitions allowing students to apply their knowledge	**Job Platforms** Online repository of aviation opportunities and learning resources	

Interaction model	**Ministries and Government Agencies**	• Provide endorsement of programs • Provide financial support for the initiative • Promotee collaboration between stakeholders
	Educational Entities	• Establish curricula to deliver trainings for high-skilled roles (e.g. Maintenance Diplomas) • Advertise programs to engaging students • Introduce aviation themed curriculum options
	Ecosystem Players & Aviation Academies	• Provide financial support in curricula development provide requisite training for skilling people outside of aviation industry
	International Partners	• Provide support in curricula development • Provide requisite training for skilling people outside of the aviation industry

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3.2 Capacity building and development | 3.2.4 Partnership for ANS Training, Research, Development and Innovation

Aspiring to achieve a higher degree of aviation skills and capabilities at national level, **the KSA shall pursue strategic collaborations and partnerships**, thus developing ANS know-how through training, research, development and innovation. This approach involves **collaborative efforts among key stakeholders**, including government entities, academic institutions, aviation industry companies, research organizations and external collaborators.

Such process should follow a stepwise approach as described below:

01 **Context Analysis**: in-depth analysis of the aviation landscape in the KSA, identifying specific needs in the field of Air Navigation Services. This includes assessing the increasing demand for specialized skills, existing operational challenges, and opportunities for innovation in the sector.

02 **Stakeholder Engagement**: Establish partnerships with key stakeholders, including civil aviation authorities, training institutes, universities, aviation companies and external collaborators. These collaborations aim to pool resources, share knowledge, and establish a common framework for the development of ANS.

03 **Training and Development**: Implement advanced training programs for personnel in the realm of ANS, integrating theoretical courses with practical simulations. The objective is to cultivate specialized skills in air traffic management, operational safety, and the implementation of advanced technologies.

04 **Research and Innovation**: Promote collaborative research between academic institutions and industry companies to address specific challenges and develop innovative solutions in the field of ANS. This component aims to enhance operational efficiency, safety, and adaptability to technological advancements.

05 **Technology Advancement**: Encourage the adoption of cutting-edge technologies in the ANS sector, including AI-based systems, big data analytics, and satellite communications. This contributes to positioning the KSA as a technological hub in the domain of air traffic management.

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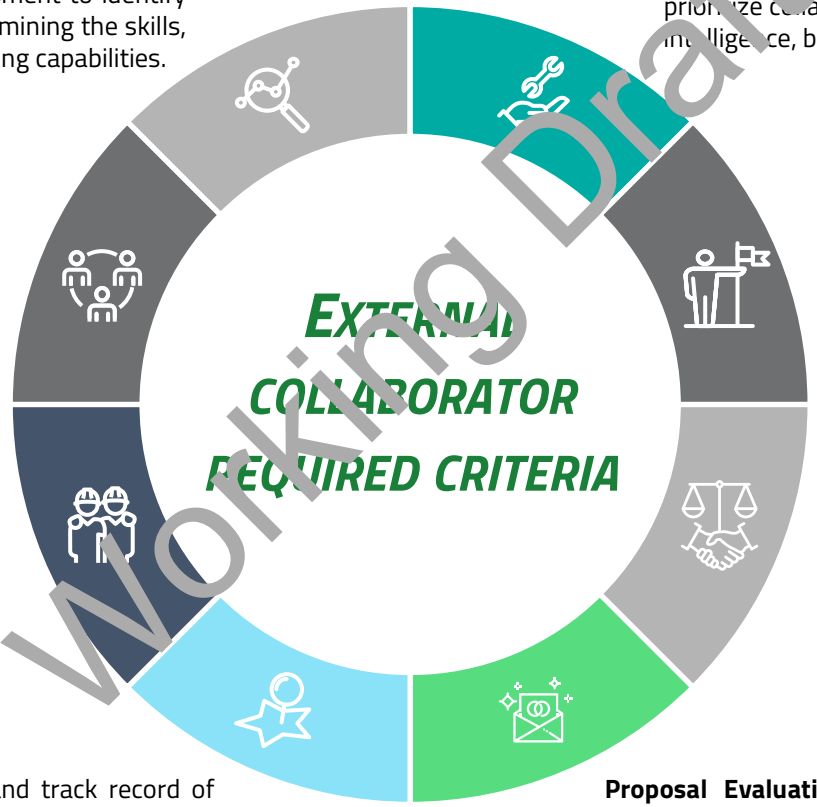
3. DEPLOYMENT ROADMAP

3.2 Capacity building and development | 3.2.4 Partnership for ANS Training, Research, Development and Innovation

In order to **identify the best-matching external collaborator** to increase ANS Training, Research, Development and Innovation capabilities, different aspects must be taken into consideration:

Needs Assessment: Conduct a comprehensive needs assessment to identify specific areas requiring external expertise. This involves determining the skills, knowledge, and resources necessary to complement the existing capabilities.

Expertise in Technology: Given the emphasis on technological advancements, prioritize collaborators with expertise in relevant technologies such as artificial intelligence, big data analytics, and satellite communications.



Stakeholder Criteria: Establish clear criteria for selecting external collaborators, considering factors such as their experience in aviation, expertise in ANS, track record in research and development, and the ability to contribute to innovation within the KSA aviation sector.

Alignment with Objectives: Ensure that external collaborators align with the overarching objectives of the partnership, particularly in terms of fostering training, research, development, and innovation in the aviation sector specific to Saudi Arabia.

Collaborative Capacity: Evaluate the collaborative capacity of potential collaborators, ensuring they possess the willingness and ability to work cohesively with other stakeholders. This includes assessing their communication skills, flexibility, and commitment to shared objectives.

Ethical and Regulatory Compliance: Verify that potential collaborators adhere to ethical standards and regulatory requirements in the aviation industry. This includes compliance with safety regulations, data protection, and any other relevant legal considerations.

Reputation and Track Record: Examine the reputation and track record of potential collaborators in similar projects or initiatives. This involves reviewing past performance, successful collaborations, and contributions to advancements in the field of air navigation services.

Proposal Evaluation: If applicable, request proposals from potential collaborators, detailing their approach, methodologies, and proposed contributions to the partnership. Evaluate these proposals based on alignment with project goals, feasibility, and added value.

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