EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

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Personnel Development: Identification of Human Potential

HUM ET1.ST03.1000-REP-04

Edition	**:**	**1.0**
Edition Date	**:**	**16/12/1998**
Status	**:**	**Released Issue**
Class	**:**	**EATCHIP**

EUROPEAN AIR TRAFFIC CONTROL HARMONISATION AND INTEGRATION PROGRAMME

DOCUMENT IDENTIFICATION SHEET

DOCUMENT DESCRIPTION

Document Title
Personnel Development: Identification of Human Potential

EWP DELIVERABLE REFERENCE NUMBER: HUM.ET1.ST03.1000-DEL04

PROGRAMME REFERENCE INDEX	**EDITION :** 1.0
HUM ET1.ST03.1000-REP-04	**EDITION DATE :** 16/12/1998

Abstract

Staff development and potential identification are part of Air Traffic Management Organisations' Service Quality and Safety Management Systems. This deliverable describes how potential identification can be achieved through performance appraisal on past and current work. This deliverable also describes that for assessing the potential for some future work, some more exploratory methods need to be used. The iteration for maintaining and developing staff quality includes the different steps in establishing criteria, the use of performance appraisal and more exploratory methods.

Keywords

Appraisal Interview	Assessment Centre	Career Development	Competency Check
Database	Evaluation Criteria	Excellence	Information Technology
Mastery Assessment	Performance Appraisal	Personal Feedback	Potential Identification

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DOCUMENT STATUS AND TYPE

STATUS		CATEGORY		CLASSIFICATION	
Working Draft	☐	Executive Task	☐	General Public	☐
Draft	☐	Specialist Task	☐	EATCHIP	☑
Proposed Issue	☐	Lower Layer Task	☑	Restricted	☐
Released Issue	☑				

ELECTRONIC BACKUP

INTERNAL REFERENCE NAME : x:\current\planning\potenti.doc

HOST SYSTEM	MEDIA	SOFTWARE(S)
Microsoft Windows	Type : Hard disk	Word 6, PowerPoint 4
	Media Identification :	

DOCUMENT APPROVAL

The following table identifies all management authorities who have successively approved the present issue of this document.

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DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION	DATE	REASON FOR CHANGE	SECTIONS PAGES AFFECTED
0.1	02/03/1998	Original Version	All
0.2	05/06/1998	Working Draft	All
0.3	06/07/1998	Draft	All
0.4	23/07/1998	Proposed Issue	All
1.0	16/12/1998	Released Issue	All

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EXECUTIVE SUMMARY

This document is part of the work done in HUM.ET1.ST03, a Specialist Task (ST) within the European Air Traffic Control Harmonisation and Implementation Programme (EATCHIP) concerned with planning and development programmes for Air Traffic Services (ATS) staff.

This project concentrates on the development of professional Human Resources Management (HRM) methodology conforming to best practices and includes concepts, methods and tools for Manpower Planning (MP) and personnel development.

This document is the first deliverable on personnel development issues and focuses on the principle ways and means of identifying and appraising the potential of individuals in Air Traffic Management Organisations (ATMOs) working as Air Traffic Controllers (ATCOs), Managers or in Support Services and Administration. Human Resources (HR) managers managing these practices do this with the aim to increase and maintain the adaptability and flexibility within the workforce, to achieve the level of human performance that is required in the future and to meet the challenges which stem from organisational and technological changes that are introduced. The identification of human potential is the first step towards developing this further.

The document describes the concepts, methods and some of the tools and practices available. It is stressed that these practices need to form part of an integrated and coherent HRM system, not as isolated ‘stand alone’ pieces.

Chapter 1, “Introduction” describes the background, purpose and scope of this document and how it is related to human performance.

Chapter 2, “Description of the Organisation” gives an illustrative example of a fictitious ATMO and some organisational problems that relate to human potential.

Chapter 3, “Description of Potential Identification Systems” outlines the information needed by the organisation, management, and individual staff members for potential identification.

Chapter 4, “Establishing the Evaluation Criteria” describes the principles of excellence required to establish performance criteria against which human performance may be measured in Air Traffic Control (ATC), in Management and in Support Services.

Chapter 5, “Assessing and Comparing Performance” describes some methods of performance assessment.

Chapter 6, “Performance Appraisal” details the approaches to performance appraisal and the means of doing it.

Chapter 7, “Exploring the Potential for Future Work” describes mainly the Assessment Centre approach in identifying the potential for managerial work.

Chapter 8, “Evaluation of Appraisal Systems” describes the organisational, external and environmental factors that should be considered to evaluate the relevance of any appraisal system.

Chapter 9, “Appraisal, Development and Skills Database” outlines the purpose, scope and content of a database specifically designed to hold important appraisal data with a view to using it for potential identification.

Annex A, “Requirements of Effective Assessment” addresses some of the major sources for bias and invalidity in performance assessment.

Annex B, “In Search of Excellence in HRM” shows how HRM practices themselves can be assessed with regard to their contribution to overall organisational and system performance and how the overall validation and refinement of HRM practices can in principle be achieved.

Annex C, “Air Traffic Controller Proficiency“ provides a practical example of a Performance Appraisal Scale regarding the work of ATCOs. This work was contributed by Prof. Brehmer, Sweden.

A list of references, a glossary of terms and a list of abbreviations and acronyms used in this document are provided.

1. INTRODUCTION

The world of aviation industry is changing rapidly due to traffic growth and new markets. What was earlier considered as safe, efficient and effective organisational structures, working procedures and working practices are now being challenged.

New concepts, technology and organisational structures are being rapidly introduced into the aviation industry. These changes are part of the challenges for ATMOs. Many aviation disciplines will change in the future as a result of the introduction of new technology in the global air navigation system.

Within these changes it is important to remember to adopt an approach to technology which is 'human-centred'. There is little point in having the most sophisticated of electronic ATC systems if it is not user-friendly.

"The main function of human resource development is to help organizations meet the challenges created by change and to adapt to new requirements and achieve levels of human performance needed" (ICAO, 1998 p. 10-7).

HRM is more and more integrated into strategic planning systems and has led towards higher level issues such as, for example, managing the organisational culture and resourcing the organisation with appropriate sets of competencies at all levels and in all functions.

It is therefore vital for organisations to identify, develop and use the competencies of humans (abilities, knowledge, skills) throughout their lifecycle within an organisation. Thus, human potential is a strategic resource which should be managed by appropriate, well integrated, and coherent HRM practices that are geared towards better human performance.

1.1 Background

This document is part of the work of HUM.ET1.ST03, a ST concerned with Planning and Development Programmes for ATS Staff. This project concentrates on the development of professional HRM methodology conforming to best practice (including concepts and tools) for MP and staff development in ATMOs.

At its eighth meeting, the Human Resources Team (HRT) within EATCHIP established a Manpower Planning Study Group (MPSG) to be led by the HRT Chairman. The current document was put forward for consideration by the MPSG and is part of the work done by this group.

1.2 Purpose

This document is considered to be of purpose after selection and initial training of a member of staff has been completed and the person is working normally in the ATMO.

The purpose of this document is to outline how ATMOs may, within their own HRM practices, develop HR and better identify human potential by employing a systematic approach.

The systematic approach has as its objectives:

- fulfilment of the demand for expertise;
- creation of persistent motivation over time;
- to minimise costly manpower turnover;
- to enhance mobility both within and between departments or units or external organisations;
- to enhance the planning and budgeting of HR.

The document intends to promote further discussion and an exchange of ideas on the subject.

1.3 Scope

The scope of this document is to:

- present models and best practices already being applied within some European Civil Aviation Conference (ECAC) States in the frame of human potential identification;
- build upon these best practices and to offer suggestions for their improvement and / or wider adoption;
- describe new or alternate models on how to integrate these best practices with information processing and decision making systems;
- show that the quality of human interactions provide the main source for identifying human potential and managing human performance.

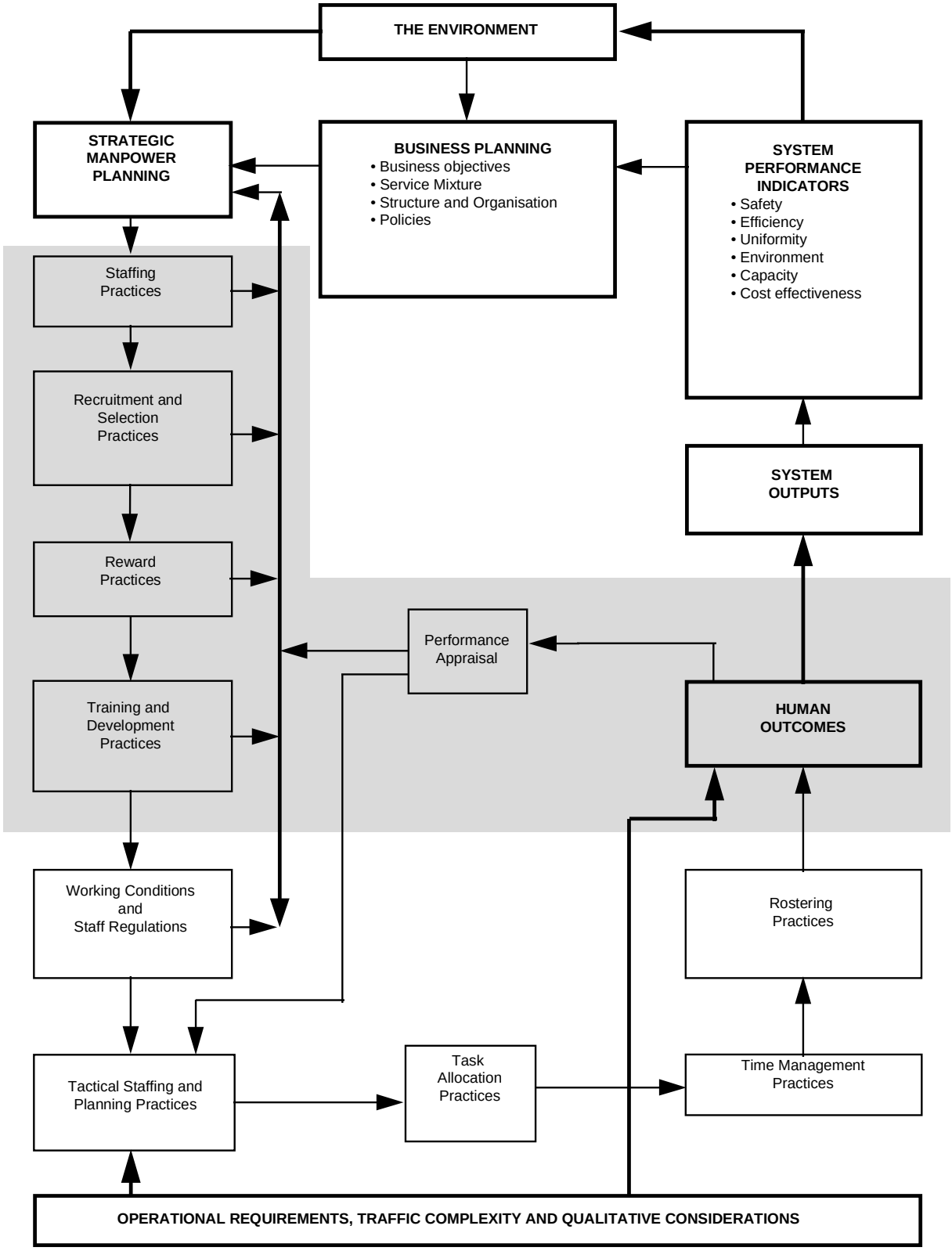

Figure 1: Application of the closed loop principle

1.4 Human Performance

The closed loop system description in Figure 1 shows that human performance is the final output of best practices when exercised in HRM and MP.

Human performance is also the one input that interacts with work methods, technology and environmental factors to create Air Traffic Management (ATM) system outputs. One can define human **performance** as the level of expertise with which an individual executes behaviour that has relevance to one or more organisational goals. One can similarly define human **potential** as the level of expertise with which an individual **can** execute behaviour that has relevance to one or more organisational goals.

Best practices within each HRM subsystem should therefore be geared towards maintaining, improving or re-directing human performance. This is true for both individuals and the more collective human performance.

Intervention practices are generally intended to improve harmonisation of human performance with organisational needs, existing or proposed work methods, technology and / or the environment.

It is therefore of paramount importance for HR managers that:

- their intervention practices have performance criteria as an outcome;
- they have clearly defined the determinants of the performance criteria;
- assure confidentiality of sensitive data;
- they have access to appraisal procedures and assessment methods for evaluation.

It is also important to be able to apply a consistent, systematic approach to the factors that contribute to these objectives, such as:

- being able to successfully store and retrieve records;
- having methods to process performance-related records;
- having a good description of the problems to be solved by the practices applied;
- understanding how these problems are perceived by different staff categories;
- having a detailed outline of the applicable systems used for the identification of human performance;
- knowing the objectives to be met by each of the systems;

- understanding the constraints imposed by each of the systems;
- having methods of formulating performance measures for each system;
- having methods of modelling and testing each system;
- using tried and tested methods of evaluating the results of the modelling and testing;
- making decisions concerning their implementation.

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2. DESCRIPTION OF THE ORGANISATION

For a better understanding of the philosophy behind the outlined processes for the further development of identified human potential, a **fictitious** ATMO is used as an illustration. This ATMO has an organisation and structure as follows:

- Civil and military ATS are provided from independent ATS units. These units may vary from small Aerodrome Control Towers (TWRs) to Terminal Control Centres (TMCs) to Area Control Centres (ACCs).

- The headquarters (HQ) has different departments which issue policies and regulations on safety, airspace management, environmental protection, unitary work procedures, finance and HRM.

- Independent engineering departments exist for development and maintenance of telecommunication, radar and associated technical systems.

- Independent departments and units exist for general administrative services.

- An independent organisation exists for management of larger projects.

- The ATMO has its own ATS Academy with different training units.

As in many organisations (for control purposes), the entire organisation is divided into core production units, general management staff and support functions.

Each department and unit has its own general manager and staff, each of different expertise level. Salaries and working conditions are generally set on an individual basis after negotiation between the general manager, the staff member and perhaps his or her labour union.

ATMOs generally seek to have a performance and market oriented approach to salaries and working conditions. This is also applied (as far as possible) to ATCOs.

Staff may be contracted to an organisation on a permanent basis as employees but specific staff promoted to a higher post within the organisation may hold their posts for only a specific, time-limited period before another change is implemented by the management.

2.1 Problems

According to Guest (1997), no clear theory exists today on how HRM practices are related to organisational performance, which can be described as best practices. Instead, HRM practices must be valued according to how well (or poorly) a specified set of criteria fits or overlays the organisation.

The best fits can be described in terms of:

- the organisation's strategic management approach;
- external and environmental factors, such as market and benchmarks;
- an ideal set of practices;
- a *gestalt* so the number of practices and the combination of these form a coherent *gestalt*;
- the most effective practices can be outlined among the many that are principally available.

2.2 The Decision Makers

The HRM manager within the ATMO is responsible for developing, implementing and maintaining HRM practices. Decisions on HRM practices are usually negotiated with staff and / or their labour unions. Execution of HRM practices are normally made by general managers or possibly lower level managers, such as supervisors or team leaders.

2.3 Identified Organisational Problems

For the sake of demonstration, it is assumed that this fictitious ATMO is facing the following HR problems:

- The turnover of managers for the coming 15 years has been calculated. As from today and within the next 15 years, most managers will go into retirement and hence leave the organisation.
- Many young engineers tend to leave the ATMO between three and five years after joining for 'better positions' within the general electronic industry. One explanation from some of those leaving has been that they want more 'hands on engineering' experience than they have dealt with hitherto.
- A task force was formed to investigate the ATCOs perception of how the ATMO dealt with their professional development. A survey was sent out to the ATCOs. Nearly all the ATCOs answered the questionnaire.

The results of the survey showed that only 19% of all operational staff had participated in some kind of personal development programme compared to 65% of the promoted staff working at HQ or at the ATS Training Academy.

The reasons behind this were given as too high workload, lack of professional development programmes, lack of effective personal feedback and career development systems. Only a minority of the ATCOs had participated in any formal performance appraisal with their managers.

Consensus among ATCOs is that they should be able to remain working at an operational level until retirement, but 33% of ATCOs were not prepared to move from their current units. Instead they favour a system with shorter job rotation between ATS units and other functions.

Most ATCOs are also in favour of Regular Proficiency Training (RPT), particularly those that are already participating in some form of RPT.

The overall attitudes from the ATCOs were that:

- their development needs are not satisfied by the organisation;
- the performance appraisal system must be improved;
- specific career plans must be developed for ATCOs which enhance their possibilities of working as operational ATCOs until they reach retirement.

This scenario describes the situation which asks for intervention practices to be identified and developed by management. The following Chapters describe all the activities to be carried out in the process.

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3. DESCRIPTION OF POTENTIAL IDENTIFICATION SYSTEMS

3.1 Information Needs

Information is needed by general managers in ATMOs on an individual basis concerning available skills etc. within their workforce. Information is also needed for making decisions concerning promotion, salary and working conditions of staff. Finally managers need information for in-house recruitment in order to fill anticipated vacancies or new posts as the organisation will almost certainly need to recruit managers during the next few years.

The organisation also needs information to make decisions regarding staff development programmes, including their content and the programme objectives.

The individuals need information on their current job situation, their impact on the organisation and any changes anticipated for the future.

To provide this information and to make decisions as effectively as possible, four systems have to be developed, which are capable of:

- establishing the evaluative criteria (against which individual performance may be measured) (see Chapter 4);
- appraising employee performance on current work, and differentiating between individuals (see Chapter 5);
- planning future work and discussing how to bridge current work to future work (see Chapter 6);
- providing an in-depth exploration of the potentials, objectives and constraints for future work (e.g. managerial work) (see Chapter 7);
- evaluating the effectiveness of the subsystems and the HRM systems as a whole (see Chapter 8).

Figure 2 provides an outline of the systems and their interlinks.

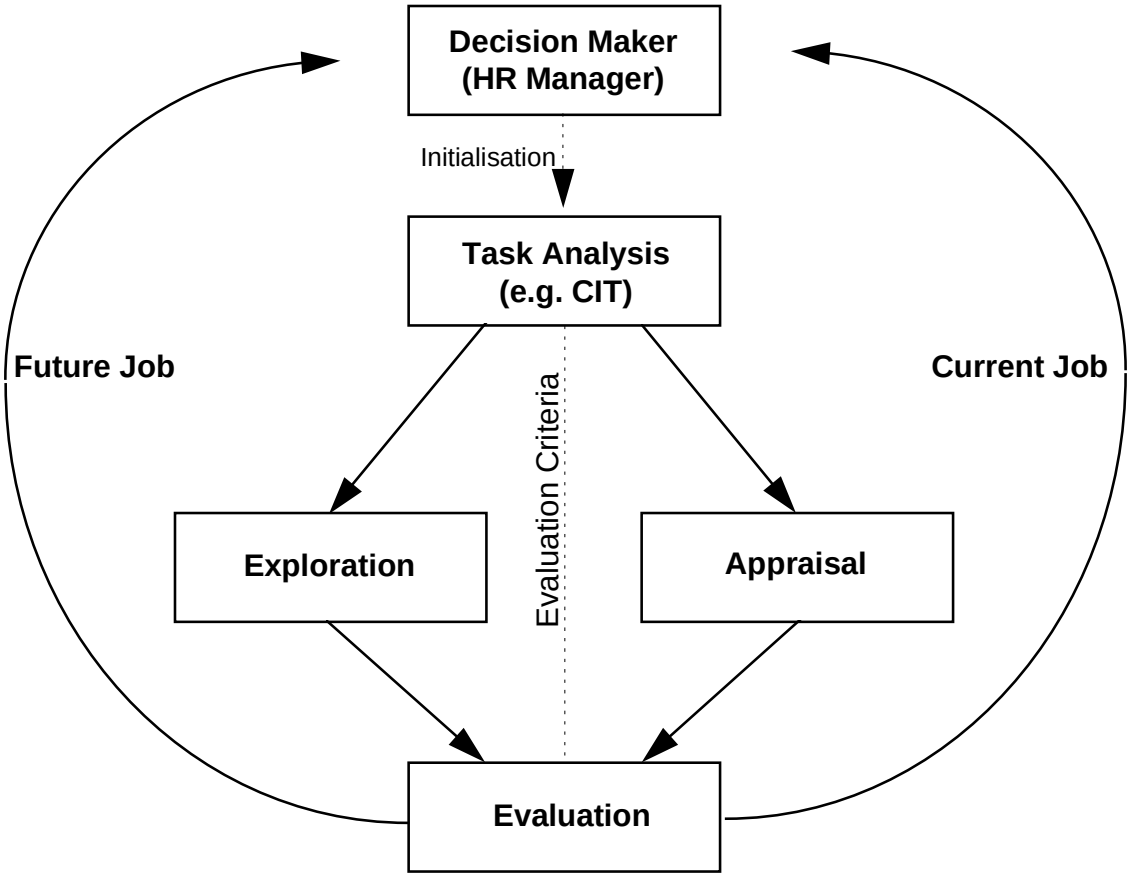

Figure 2: Potential identification diagram

4. ESTABLISHING THE EVALUATION CRITERIA

Schuler and Huber (1993) stress that one of the most important issues in designing performance appraisal systems are the evaluative dimensions against which the performance may be measured.

These evaluative dimensions are the criteria. In performance appraisal there are basically three forms of criteria:

- **trait-based criteria** or personal characteristics such as:
    - ◊ loyalty,
    - ◊ autonomy,
    - ◊ conciseness,
    - ◊ sociability,
    - ◊ decisiveness,
    - ◊ adaptability,
    - ◊ flexibility;
- **behaviour-based criteria**, e.g. operating equipment, search for information, sharing information - all behaviour considered critical for a particular job;
- **outcome-based criteria**, e.g. work targets and goals to achieve.

Other considerations that have to be taken into account when designing performance appraisal systems include topics such as how human performance will be presented. For example, will it be based on manager-employee communication about past, current and future achievements, without reference to a formal standard, or will standardised quantitative assessments be used during the appraisal ?

Current performance appraisal systems seem to have a tendency to include both the free form discussion and a more formal assessment on some norm related scale.

The reason behind this is to establish some kind of quantitative base-line for the evaluation of set goals. The important thing though is that the established criteria contain such information and that they are understandable and possible to communicate.

It should be stressed here that human performance should be expressed in both qualitative and quantitative terms.

4.1 Choice of Evaluation Criteria

In the fictitious ATMO, it is decided by the HR manager that evaluation criteria should be expressed in a standard format across the whole ATMO and that excellence is to be used as the basis for the assessment.

The reason behind this decision is that comparison to excellence can be achieved with regard to:

- current performance appraisal;
- future performance exploration.

Excellence can also serve as a job description for future career choices or to:

- select employees for development programmes;
- diagnose training needs;
- evaluate training adequacy;
- use as a criterion for selection test result validation.

4.2 Excellence

Excellence - or mastery - is something outstanding and is applied constantly. Errors might occur, but they are rare and unevenly distributed. Excellence in performance is something so outstanding that if everybody behaved in that manner, the output of the organisation (and possibly the organisation itself) would change towards a high level. The following Sub-chapters provide examples for sets of performances in three staff categories in ATMOs.

4.2.1 Excellence In Management

It is difficult to describe management as a uniform set of tasks and responsibilities as they vary widely across functions and between management levels. For example, a commonly allocated managerial task is to lead and direct the functions of other people, although the actual numbers of people to direct will vary, as does the level of responsibility with differing levels of management.

Usually at the lower levels of management, the main responsibility is primarily the supervision of people and / or some production process. The number of people directly managed usually decreases at higher levels of management, but the financial and corporate strategic responsibility increases.

Many organisations create guidelines on management and leadership in order to establish a corporate culture and to harmonise the various managerial styles.

Such guidelines might be geared towards:

- management levels;
- specialist levels;
- supervisor levels.

An ATMO may adopt an overall managerial style known as Management by Objectives (MBO) in its guidelines. In the first instance, the Management Handbook of the fictitious ATMO will define this term and then continue with the managerial responsibilities for each of the above levels. These may be defined as, for example:

- representing the employer and the organisation;
- responsibility for production and quality;
- responsibility for financial resources;
- responsibility for personnel and its resources.

In the fictitious ATMO, the manager is expected to perform in several different ways:

- act in the interest of the organisation (think and act like an owner);
- keep to budgeted financial targets;
- set realistic goals for staff;
- maintain an open dialogue with staff;
- make informed decisions, even if they are unpopular;
- evaluate work performance fairly;
- inform in all directions;
- hold regular staff meetings;
- conduct appraisal interviews;
- develop the staff;
- foster job satisfaction and participation among the staff.

4.2.2 Excellence In Air Traffic Control (ATC)

Brehmer (1996) analysed a questionnaire about the importance and frequency of behaviours of ATCOs that were collected by the Critical Incident Technique (CIT).

The general finding was that behaviours that support the creation of mental models, which allow ATCOs to be at least one step ahead of the evolution of air traffic, are the most important.

Brehmer (1998, see Aneex C) expanded his Task Analysis (TA) to excellence in ATC. 60 ATCOs participated in focus group interviews. Their tasks were to analyse what behaviour dimensions corresponded to excellence in ATC.

The results from this exercise show, according to Brehmer (1998), that the main differences between excellence and less excellence are mainly **not** in the fields of knowledge, operational skills and cognitive abilities.

The major differences between ATCOs adjudged to be 'excellent' and those found to be 'less excellent' may be summarised as:

- valid perception of one's own level of performance and limitations;
- flexibility and adaptability to extraneous factors;
- specific ability in directing air traffic;
- commitment and loyalty to the profession;
- supportive attitude toward colleagues.

The results from this study show that the differences between personnel perceived as 'excellent' and personnel perceived as 'less excellent' are not so much in what the excellent ones **do**, but more in **how** they do it to avoid disturbances for other ATCOs.

4.2.3 Excellence in Support Services and in Administrative Work

A TA conducted by CIT in support service shows a total of seven dimensions:

1. The work process:
    - ◊ deliver services on time;
    - ◊ have a professional quality of content;
    - ◊ maintain and develop a professional body of knowledge.
2. Marketing and promotion - informing customers:
    - ◊ about additional services;
    - ◊ about the service organisation.

3. Attitudes toward customers:
    - ◊ listen to the customer;
    - ◊ co-operate with the customer regarding design;
    - ◊ adapt to the customer's view.
4. Customer communication:
    - ◊ keep the customer informed;
    - ◊ give the customer progress reports.
5. Relations to external contractors:
    - ◊ co-operate with external contractors to ensure on time delivery;
    - ◊ keep to written agreements.
6. Co-operation with work peers:
    - ◊ when requested help work peers outside their own responsibility;
    - ◊ allocate own work during absentees;
    - ◊ share professional information with work peers.
7. Service development and creativity:
    - ◊ take own initiative on renewal and modification;
    - ◊ use current knowledge in a new way;
    - ◊ look for potentials and new technology.

4.2.4 Summary

The examples from the three different TAs (management, ATC and admin / support) show that there are different sets of criteria to be used in performance assessment for different staff categories. There is, however, a commonality across all categories. In order to be excellent there is a need to integrate professional knowledge and skills with social and communication skills.

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5. ASSESSING AND COMPARING PERFORMANCE

5.1 Mastery Assessment

The primary purpose of this chapter is to draw attention to the assessment of mastery. The chapter will also introduce behavioural oriented assessment techniques such as Behavioural Observational Scales, (BOS), Behavioural Anchored Rating Scale, (BARS) and the Situational Interview (SI) as supplemental to the more traditional knowledge tests.

5.2 Methods of Mastery Skill Assessment

The degree of mastery of a specific skill (or set of skills) is often be measured in terms of errors, rule violations, or deviations from norms and / or standards.

The problem with such a definition (and measurement) is that all individuals would be measured on a categorical scale (e.g. whether it occurred or not). In addition to this, the focus is only on errors and deviations from rules while positive resolutions, solutions and actions would be excluded.

It is therefore proposed to use a different method to assess critical behaviours that indicate the level of mastery skills.

5.2.1 The Design of Scales for Performance Assessment

As described in Chapter 4, critical behaviour dimensions can be deduced using the CIT (Flannagan, 1954). The specific behaviours sampled by the CIT are the very foundation for the construction of BARS.

“An incident” in the context of CIT is defined as any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the task(s). All these activities can be categorised into different behaviour dimensions that demand a certain level of expertise and / or skills.

It is then possible to describe a task or job by this technique in terms of what demands excellence and what can create failure, so that the examination of the differences between excellent and poor performance becomes easier.

The disadvantage of using the CIT to develop assessment scales for job / task behaviour is the difficulty encountered in capturing the average performance because the method itself is focused on exceptional performance - be it exceptionally good or exceptionally bad - (see Schuler and Huber, 1993).

5.2.2 Scaling

The collected performances are transferred into scales, which are used to assess / rate the frequency as well as the importance of a certain observed

behaviour. BARS identify a range, within which a certain behaviour / skill is considered adequate to the task being assessed.

5.2.3 Training Assessors - Appraisers

There is strong evidence that people who use the BARS need specific training, otherwise their assessment will be biased and will lack reliability.

The training to use BARS focuses on calibrating the appraisers' rating of the behavioural dimensions that are relevant to assess an observed behaviour. Video films can be used for training in observing behaviours and calibrating appraisers. Such a film will show the stated behaviours as they are carried out in a normal work environment. The training objectives are to identify the behaviours involved and to use the scales in a reliable way.

5.2.4 The HRM Manager's Approach

The manager of HRM decides to use the data collected during the study of 'Excellence in ATC and Support Services'. These BARS will be used in the performance assessment of individuals in the light of further development.

The scale to be used for assessing managers is constructed from the performance dimensions in the management guidelines.

The HR manager also decides that additional assessment techniques will be used to assess the need for further development and career planning.

This decision is taken because in the world of ATMOs, there are many occasions when the completion of development programmes or training courses has a direct bearing on the participants' career. Factors such as salary and when competency checks are done will be affected. One example is when an ATCO has applied (and has qualified) for a post as an On-the-Job Training Instructor (OJTI).

5.3 Situational Interview

The following is an example of how the SI can be used to make assessments of behaviour criteria.

Brehmer (1995) used the SI to evaluate an advanced training course designed for OJTIs. The reason behind designing such an advanced OJTIs course was purely for MP reasons. By improving the skills of the OJTIs themselves, it was expected that the attrition rate from ATC training should decrease resulting in a higher number of successful ATCOs being produced.

Brehmer (1995) showed that subjects do tend to behave according to their attitudes, and that the SI is an innovative way to measure the subjects' behaviour intentions in specific situations. (For more details on this method see EATCHIP, 1998a). The general aim of the advanced training course was

to implement new attitudes to the effect that the ATCO student training was indeed student training and **not** selection by other means.

The course is aimed at conveying the following eight attitude aspects and the OJTIs should:

- accept that they are able to influence the behaviour of the trainee, i.e. that it will pay off to try different methods until the trainee exhibits the desired behaviour;
- be aware of the need to create a “training contract” with the trainee, i.e. coach sets the rules that have to be followed;
- be aware of the importance of communicating in a concrete and clear way, i.e. specific instructions instead of general statements like “shape up”, “work faster”, etc.;
- be aware of how expectation influences training outcome;
- be aware of the trainee’s self-confidence and how this can affect the trainee’s performance;
- be aware of the need to adapt training methods to the situation, e.g. being sufficiently flexible to change training methods according to the learning task and the traffic situation;
- be aware that the trainee’s behaviour is affected by their state of mind, i.e. temporary states of mind do have an impact on trainee’s performance. The coach should know how to change a state of mind in their students positively;
- feel that they have the knowledge and skills required to have a positive effect on the trainee’s performance.

The purpose of using the SI was to evaluate whether an advanced training programme for OJTIs had reached its overall goals, (e.g. changing the employees' attitudes and generalised coaching behaviour).

The SI for evaluating the advanced OJTIs training is composed of 6 constructed complex situations for each attitude, to a total of 48 situations. For each situation, good and bad answers are constructed.

5.3.1 Results

The results of this study showed the suitability of the SI for evaluation of general training goals.

The method discriminated between a random sample of those who had participated in the training and a random sample of OJTIs who had not yet participated in the training. The OJTIs who had participated in the training

answered the questions differently and in the desired direction than those in the control group.

The reliability of the method was found to be acceptable. In the first version only two scales needed to be revised.

The conclusion was that the SI is a promising technique for evaluation of training programmes. The technique demands that interviewers are trained in order to make reliable assessments on the basis of behavioural data.

6. PERFORMANCE APPRAISAL

Promotion and salary decisions are generally based on achievements as measured against the overall business plan. This may also be referred to as an individual's track record. These track records can be based on either formal or informal appraisals.

Schuler and Huber (1993) write that formal performance appraisal should have the characteristics of being:

- systematic,
- evaluative,
- job-related,
- future oriented (toward an individual's potential).

A formal appraisal system should also have the characteristics of any system, as outlined in EATCHIP (1998b) such that it has:

- defined inputs and outputs,
- a decision making subsystem,
- a transformation (or process conducting) subsystem,
- a performance-monitoring subsystem.

Commonly defined output objectives for any performance appraisal system are that it should enable:

- reward practices,
- promotion decisions,
- performance recognition and feedback,
- determination of transfers and assignments,
- identification of training and development needs,
- mutual understanding between managers and employees.

In ATMOs, performance appraisals are usually in use for three different reasons:

- system quality control (performance evaluation),
- performance feedback (personal feedback),
- HR development (career development).

As can be seen in Figure 3, these performance appraisal systems might be administered separately or integrated.

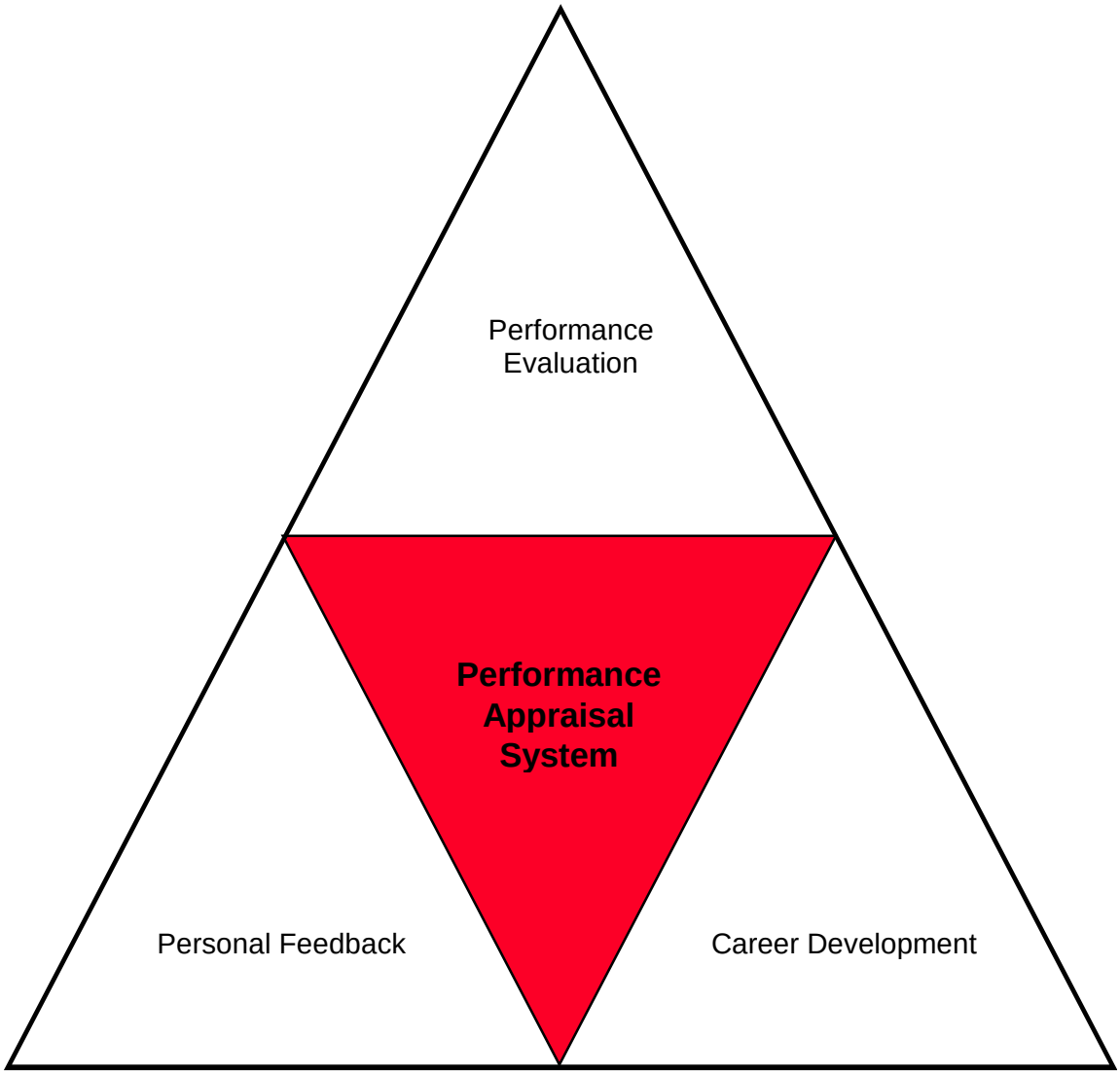


Figure 3: The central role of the performance appraisal

6.1 Performance Evaluation

Quality management is of paramount importance for an ATMO. Of particular relevance is the chapter from ISO 9004-2 entitled, Quality management and Quality system elements - Part 2: Guidelines for services. ISO 9004-2 (EN 29004- Part 2) examines in detail quality management for services within a service organisation.

In the chapter concerning personnel and the following sub-chapters on motivation and training, ISO 9004-2 stresses that for internal quality management where the behaviour and performance of individuals have a direct impact on quality service, management action should be taken in every area that spurs the motivation, development, communication and performance of personnel. This is why the entire performance appraisal system is considered an essential part of internal quality management of services.

The management of service quality is complex and covers all aspects from the quality of management to the quality of systems. The quality control involves checks for deviations and malpractices and are part of the techniques used in performance evaluation.

Quality Assurance includes all other planned and systematic activities implemented within an ATMO to ensure that the stated service quality is maintained at all stages in the process of service provision

Performance evaluation when performed in a systematic manner, is one way for the ATMO to identify and establish planned actions for updating and monitoring the skills of personnel. It is a way, *inter alia*, of verifying that personnel have received suitable training. Examples of this kind of performance evaluation are given in the previous chapter regarding the evaluation of coaches / instructors in ATC. Another example of performance evaluation is the control of reliability of the selectors used in the selection system of *ab initio* trainee controllers.(For further details refer to EATCHIP, 1998b sub-chapter 8.2.6 and 8.3.9). The purpose is to assure the general public as well as the managerial levels that the ATMO is behaving at a professional standard, which means that staff are conducting their professional practices at a standardised level.

If deviation from standardised working practices is detected, the performance evaluation should go beyond personalised blame, and examine the weaknesses of the entire ATM System with a view to corrective actions.

When the performance evaluation is based on published, established standards and procedures that have been communicated to staff, the contents of the performance evaluation supports the creation of a confidence-culture and reliability to ATMO staff and customers.

The fictitious ATMO, as in other ATMOs, is also trying to avoid any threatening influences and instead, gains commitment from its staff to performance evaluation. It is important to get staff to perceive the performance evaluation as a means of assuring the general public, customers, management and other staff that there is real concern for quality issues and that such matters are being addressed in a systematic and professional manner.

Unlike personal feedback and career development, which are more part of the HRM systems, performance evaluation is part of the ATMO's internal quality control systems which are embedded in Service Management and Total Quality Management.

6.2 Personal Feedback and Career Development Systems

These performance appraisal systems are part of the organisation's HRM and MP systems. They are also part of the general managers' overall responsibility.

In some organisations, performance appraisal is delegated to the immediate superior of the individual being assessed which can lead to team leaders, watch supervisors or managers carrying out these assessments.

What is considered more important is the 360 degree approach, which means that feedback on performance is provided by both parties. The manager receives feedback on his / her managerial style by the employee as well as the employee receiving feedback on past and current performance. Agreements are made on future performance and behaviour concerning both parties, as in the behaviour contract approach.

As has already been mentioned, performance evaluation is very often separated from the more general performance appraisal and is being adopted by many ATMOs, for example, Germany's Air Navigation Service Provider (DFS). However, the DFS comments that this approach is still being evaluated against their own HRM criteria.

6.2.1 Career Paths and Career Planning

To start identifying individual's potential and discussing career planning without any organisational preparation might cause disturbances and loss of credibility on the part of the ATMO. Suitable preparations might consist of identified career paths, arrangements with training institutes and training centres, changes in working conditions and staff regulations, etc.

6.2.2 The ATCO Career

From the identified domain of expertise suitable for an ATCO's career, a task force has outlined career path prerequisites, such as minimum level of work experience, minimum number of training courses attended, etc.

The purpose is to establish long and medium-term career goals that can be transformed into personal development plans. Each personal development plan should contain as a minimum:

- training courses / development programmes to attend;
- level of participation in projects;
- participation in job rotation and job exchange programmes.

The objectives for the career paths are:

- increase knowledge and competence so current work can be improved;
- prepare staff for more responsibility and complex work;
- create possibilities for personal development;
- stimulate professional development in time off.

6.2.3 The Expert Career

Many organisations also have formal definitions of experts that separates them from other skilled employees. The fictitious ATMO as some other ATMOs use the following definitions:

To be a specialist in this Organisation means to have a special competence and experience that the Organisation wants to exploit and develop.

To be a specialist means also to have the main responsibility for, and lead the development of the domain without having the responsibility for staff and management.

6.2.4 The Management Career

To avoid a ceiling effect when establishing career paths and career development it might, at some time, be more important to concentrate all efforts on existing candidates and their individual development plans rather than selecting more candidates.

Each individual's plan consists of supplementary job experiences, formal management courses to attend, temporary management positions to hold and projects to lead. The management of the cross department careers (high flyers) will be one of the main HRM issues during the coming years for the managers of HR and the board of managers.

6.3 The Appraisal Interview

General managers have the responsibility to ensure that the performance appraisal is carried out for all staff members within the fiscal year. It is also the general managers' responsibility to provide the employees with information regarding their:

- performance objectives;
- level of performance;
- areas worthy of improvement.

During the performance appraisal it is also a suitable time to approach and discuss issues such as:

- salary;
- promotion;
- general career development;
- job satisfaction;
- organisational efficiency and effectiveness improvements. (See also EATCHIP, 1998b)

6.3.1 Employee and Manager Preparation (Inputs)

In the fictitious ATMO, the first step in preparing inputs for the performance appraisal is self-assessment. In their initial preparation, employees would assess themselves on the BARS.

Managers have to review previous employee self-assessments as inputs to the process and are supposed to compare the results of the present self-assessment from the employee with their own perception of any change from previously recorded results.

The managers also have to compare details of the work domain, core tasks and activities against the requirements of the current business plan to see if any changes will affect the employee.

For reasons of career development, the managers themselves are supposed to make up their own plans. In addition, they need to assess where each individual employee will best fit in and be of most benefit to the organisation.

The managers are also supposed to fill in their own specific Management Assessment Scale, which will be discussed with each employee. Careful preparation in advance needs to be done from **both** sides.

6.3.2 The Performance Appraisal Interview (Process)

A suitable date and time for the performance appraisal interviews should be set well in advance. Sufficient time should be allowed for each interview.

During the interview the managers and the employees are reviewing their self-assessments. Discussions are about whether the individual's self-assessment actually reflects tasks and activities recently undertaken. Comparisons can also be made on the quantitative assessments.

After discussing present tasks and activities, the interview progresses towards the future, both from the manager's organisational point of view and from the individual's point of view. Particular attention should be paid to the realism of the employee's plan, as well as the financial aspects or implications. One major question is whether the plan is achievable.

6.3.3 Performance Appraisal Outcome (Output)

When agreements and consensus are made on areas of change (which should not usually number more than three, including interpersonal behaviour), these areas are documented on the agreements form.

Mutual decisions may be taken on actions that should lead to performance improvements and development. These decisions should also be documented on the same form. The agreements might include topics such as:

- training courses to attend;
- job experience from other areas or departments;
- projects to participate in;
- off time studies.

Agreements concerning shared responsibilities and who shall initiate specific actions are also documented on the same agreement form.

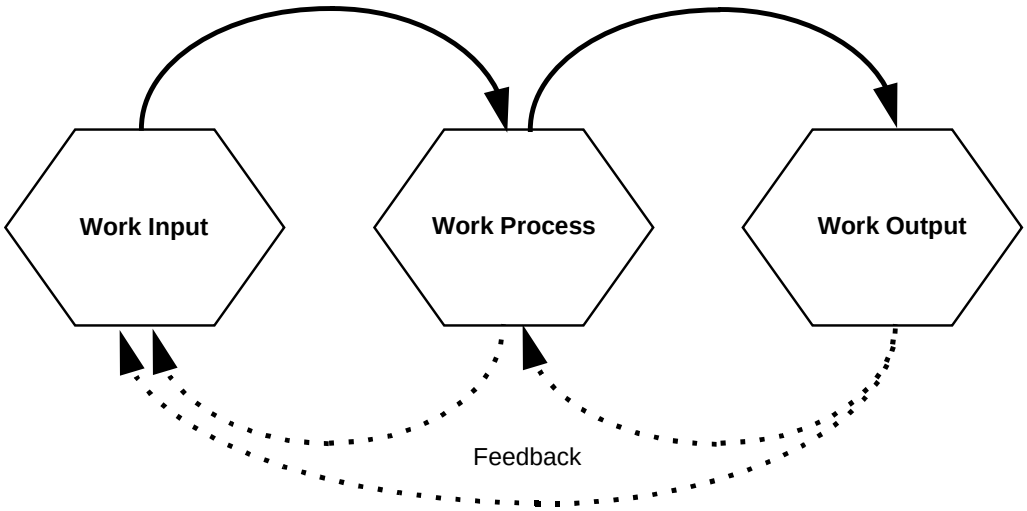
The final agreement to document is how to evaluate and follow up the outcomes of the appraisal interview. Specific time lines are set on evaluation and follow-up of the action plan, for example every month, every third month or when a specific action is completed.

6.3.4 Evaluation and Follow-Up

During the evaluation and follow-up meeting, the individual's action plan is discussed and revised as necessary. The self-assessment is also reviewed and updated as and when particular targets are met.

When all improvement goals are met, and all agreed actions are completed, a specific time for the next performance appraisal interview is set.

Figure 4 describes the scope of most performance appraisal systems as seen from a system point of view. The figure describes how performance appraisal systems usually cover the input, the transformation and the output of human performance. Feedback is usually given on all three components as well as development goals.



• Knowledge • Abilities • Motivation	• Time spent • Task sequentiality • Work behaviour	• Customer satisfaction • Standards conformity • Organisational conformity

Figure 4: Information feedback during performance appraisal

6.4 Performance Review and Performance Change

The basic assumption is that regularly feeding back information about individuals' past and current performance, described in some kind of evaluative dimension, will improve the employees' future performance.

Lee and Son (1998) studied whether feedback on past and current performance really improves future performance.

They conducted a longitudinal study in a petrochemical company (of process control workers) over several performance review periods and compared the trends in performance.

What Lee and Son (1998) postulated was that feedback alone is not sufficient for performance improvement. For performance improvement to occur it must be mediated by the employees to ensure:

- a level of satisfaction with the review;
- a perception of the utility of the review.

These attitudes are affected by:

- employees having the opportunity to participate in discussions;
- goals being clearly set;
- career issues being discussed.

When the employees are satisfied with the review and have positive attitudes toward the utility of the review, one will see an effect on their performance.

Particularly important is that employees feel they have had the opportunity to express their feelings toward the review (for example fair, unfair etc.).

It is equally important that goals are set clearly, so the employees understand how they may accomplish the goals during the review, and that career and personal development issues are discussed during the appraisal.

Lee and Son (1998) found in their study no clear correlation between performance review and performance improvements. Although they did find clear correlation between:

- goal setting, career discussion and the employees' satisfaction with the review;
- goal setting and the employees' attitudes toward the utility of the review;
- salary discussions, career discussions and feelings of satisfaction with the review.

6.5 Obstacles to Effective Performance Appraisal

Many ATMOs might experience that it is difficult to actually put the performance appraisal systems into practice. Even if it is a mandatory exercise for both managers and staff, its status might be low due to managers and staff perceiving themselves already discussing professional matters in another forum.

ATCOs might also perceive themselves already having a career related to their licensing and rating, and being continuously monitored by watch supervisors.

Operational Requirements (ORs) and limited budget funding might also diminish the opportunity for ATCOs to participate in personal development programmes.

While the performance appraisal system is basically a feedback system on past and current performance aiming at future achievements, the feedback information itself comes into focus. The accuracy and the reliability of the feedback information might be questioned by one of the parties. Even the capability of the feedback provider might be questioned.

With these kinds of discrepancies between the involved parties, anticipated animosity or hostility can hamper the application of performance appraisal systems. Both managers and staff find the easiest solution is simply not to use any performance appraisal system.

For the above mentioned reasons, training on how to best use performance appraisal systems and information is one way to overcome this kind of resistance.

In many organisations it is also common that a senior level manager is required to countersign the performance appraisal report, in order to moderate any bias judgements.

For many groups within an ATMO, the actual work outcome is difficult to measure and even more difficult to connect to a specific individual's performance while the work itself is carried out as teamwork. Team performance appraisal can, in such a case, be adequate when combined with individual discussion on career development.

For many careers within an ATMO, it is required to have an International Civil Aviation Organisation (ICAO) licence. However, staff within a suitable age range have been accepted for ATCO training whilst other career possibilities are more open to all staff categories.

For those holding, for example, an ATCO licence, for the purpose of potential identification, shorter or longer periods of familiarisation training are usually arranged.

7. EXPLORING THE POTENTIAL FOR FUTURE WORK

An inventory of current career possibilities within the fictitious ATMO might show that staff can progress through the following careers:

1. ATC-related:
   - ◊ operational ATCO (ratings within ACC, TMC and TWR);
   - ◊ OJTI;
   - ◊ ATM specialist (for example airspace management, safety management, system development, etc.);
   - ◊ watch supervisor.
2. Company-related:
   - ◊ finance or HRM;
   - ◊ teacher / training manager;
   - ◊ general manager.

In the following Sub-chapters, an example is given with regard to management potential by using the Assessment Centre (AC) approach.

7.1 Assessment Centres to Assess Management Potential

The nursing of each employee's professional career is always the responsibility of the employee themselves and their immediate manager, but in many organisations there are formal alternative careers to management. The reason behind this is the experience from many organisations that good specialists or experts do not necessarily become good managers.

The specific characteristics of management work as earlier outlined make the recruitment of managers and subsequent career decisions difficult. This is because the information from performance appraisals might indicate an interest for managerial work, but job performance might be more generalised towards personal traits like ambition, decisiveness, sociability, etc.

There is usually only a weak link between an individual's current job content and a managers job content which will create a selection and prediction problem.

For in-house management recruitment, there is a need for more valid information regarding future management performance in order to better predict suitability. This also applies to the individual's own career decision.

Some ATMOs have chosen to administer their own ACs. Their purpose is to enhance in-house recruitment and advancement and to let individuals make career decisions with greater insight than they would otherwise have.

7.1.1 Practical Application of Assessment Centre

A common example of how an AC works is for the centre staff to mix short manager job sample exercises such as:

- negotiations;
- teamwork;
- business games;
- presentations;
- handling staff problems;

with personality inventories and leaderless discussions.

The reactions of the individuals are monitored by experienced managers who act as mentors during the assessment period. Feedback from the experienced managers and career counsellors is an essential and integral part of the AC exercises.

The AC is constructed to be aviation business specific and management candidates will be recruited from across the entire organisational spectrum. One of the prerequisites is that potential successors shall currently be in the age range of 30 to 35. Each manager shall suggest suitable candidates.

A preliminary discussion with each candidate is conducted during the appraisal interview when both parties agree about the meaningfulness of identifying the future potential for managerial work and the candidate is then scheduled to participate in an AC exercise.

The outcome of the AC exercises are evaluated by both the candidate and by experienced managers.

The whole AC session might last several days and ends with a decision by the experienced managers on the candidates potential for management work and a recommendation for that individual to be employed at a suitable level within the management framework of the ATMO.

These statements are fed back to the candidates, the responsible directors and the local managers (including HRM). The final outcome for each candidate is an individual development plan that covers the whole period of development. The development plans for “high flyers” are presented and monitored directly by the Chief Executive Officer (CEO).

7.1.2 Experience of Assessment Centres

ACs give an input for management development programmes, supplemented with other recruitment and selection tools. It depicts the true potential of individuals for subsequent management work.

ACs have helped in the identification of a very limited pool of particularly talented candidates for future development towards the highest management positions. These individuals are known as ‘high flyers’.

7.1.3 Identified Problems with Assessment Centres

Management development programmes need to be designed in advance before introducing ACs, otherwise there will be a time lag between potential identification and actions. When a candidate has been identified as possessing the potential for management work, he or she will (of course) have high expectations of a fast promotion.

There are difficulties in designing AC exercises that are challenging enough (and which have valid content) for both higher, middle, and lower levels of management.

Rather soon after introducing assessment centres, there is a saturation effect when more than enough candidates have been identified to cover all future expected vacancies across all management positions.

The cost of using ACs for each individual’s potential identification is high. One particular ECAC state estimate it to be about 10,000 ECU for each candidate, but usually it varies between 4,000 and 6,000 ECU.

Responsibilities must be clarified and divided within the organisation regarding monitoring, evaluation and enabling candidates who are designated for cross department careers, as well as for those designated for within department careers.

7.2 Expert Potential Identification

Expert knowledge is something relative to the state-of-the-art that exists at a certain moment. DeSio (1987) talks about 2 - 3 years' half-life for electrical engineering and computer science. Expert knowledge in terms of half-life might today be about 1 - 2 years in the domain of electronics and computer science, due to the rapid rate of change in those domains.

Another environmental factor is the competition between various industries to employ electronic engineers and computer scientists. Many electronic engineers and computer scientists are getting job offers while they are still at university and they are not always fully trained before taking up a position.

A third environmental factor is the tendency for expert domains to be specialised as well as interdisciplinary. This is true particularly in technology and academic science. Problems are approached from a multi-disciplinary angle.

7.2.1 Expert Development Programmes

In ATM system development, it is not enough to think or act as a controller or as an engineer, but to have a thorough understanding of both views. The same is true of HRM and Finance. Most development projects are staffed by multi-disciplinary personnel and with the passage of time, the team members improve their multi-disciplinary skill areas.

Because of international competition, most development and innovations are today done within industry. The laboratories of some business organisations are many times more advanced than research done at some universities.

What has also become apparent for many advanced, technology-based industries is the need to have close alliances with universities and independent research institutes.

The particular closeness enjoyed by universities and research institutes frequently means an open border for the expert when operating between the ATMO and the university. The expert is sometimes part of the university's lecturing staff or perhaps attending day courses or classes.

8. EVALUATION OF APPRAISAL SYSTEMS

Performance Appraisal Systems can be valued according to their fits.

8.1 Fits the Organisation's Strategic Approach

Our fictitious ATMO profiles itself as a modern high technology organisation with high expectancies of expertise among its employees. In a competitive international market it not only markets ATS, but also provides administrative and HRM services.

Before performance appraisal systems and potential identification systems can be implemented, the following critical factors should be considered:

- organisational structure (distribution of formal responsibilities);
- organisational culture (existing salary promotion and career promotion practices);
- uniformity over the whole organisation, or diversified over departments;
- evaluative dimensions (personal traits, critical behaviour or work outcome);
- multiple sources or single source (manager rating, self-rating, peers rating, customer rating, etc., or a combination of all sources);
- forms of presenting feedback information (quantitative or qualitative);
- regularity (annual, bi-annual or often);
- documentation (manual and rating scales);
- staff training;
- report systems within the organisation (distribution of outcome information);
- storing of information;
- quality control (evaluation of the systems' functionality).

8.2 Fits External and Environmental Factors

The ATMO benchmarks HRM practices and monitors the national airline carrier and other airlines. The electronics industry is also monitored closely because of its links in technological development. The defence organisation is also monitored closely regarding HRM practices, as there exists a close liaison between the two organisations.

Any redesign of performance appraisal systems and identification of potentials cannot deviate too much from the existing systems within these organisations.

8.2.1 The Need for More Generic Skills

What has currently come more and more into focus as an important factor is the identification of generic skills that make different professions able to work together and produce utilities for the organisation.

The European Commission's Industrial Research and Development Agency recently held a seminar on "The rationale for benchmarking human resources" (Fundacion Tomillo Centre for Economic Studies,1998).

The scope of that seminar was to address the demands of a rapidly changing international economy now that lifelong learning and skills development are required by almost everybody in order to keep abreast of change and to guarantee flexibility and adaptability for the future.

New generic skills arising from industrial change and new technologies are completing existing general education, technical knowledge and professional competence of those just entering and those already in the workforce.

The European Commission's Industrial Research and Development Advisory Committee identified certain key skills in professional life, particularly:

- social skills (the capacity for teamwork and co-operation);
- communications skills, including the ability to give presentations;
- the capacity for creativity, flexibility and initiative;
- an ability for problem solving and memory training;
- the ability to acquire new skills;
- professionalism and a natural desire for quality;
- a wide span of scientific and technological knowledge;
- a capacity for processing information;
- environmental sensitivity;
- an understanding of the principles of business organisations and economic activity.

During this recently attended seminar, the difference between in-house development of general skills that are applicable to many different work environments (for example the ability to use computer programs) and specific skills such as the ability to use highly specialised equipment unique to that particular organisation was emphasised.

When developing staff, the pay-off is obvious - a very high return can be gained from firm-specific training, but on the other hand, the pay-off for society (and the individual) might also be very high in terms of developing the more generic skills.

The key factors leading to business success are considered to be:

- people with the ability to learn;
- people with a generic interest and knowledge of the technology;
- people with good social skills.

Supplement this with the right mixture of specific and generic skill training.

8.3 Fits an Ideal Set of Practices

An ideal set of practices is very closely linked to the concept of construct validity. For the performance appraisal systems or AC to have any construct validity, they must fit completely (or at least partly) the following determinants of human performance.

8.3.1 Cognitive Abilities

Cognitive abilities, e.g. numeric ability, is one of the determinants that differentiate people. Cognitive abilities set a kind of frame for a single individual's potential. The importance of cognitive abilities as determinants of performance are particularly accentuated in performing complex tasks.

Carroll's (1993) studies of the structure of human cognitive abilities show that each specific individual ability is associated with other abilities in a hierarchy.

The higher level abilities, particularly:

- visualisation;
- quantitative reasoning;
- verbal ability;
- flexibility of closure;
- numerical facility (the ability to handle simple problems in addition, subtraction multiplication or division with speed as well with accuracy);
- associative memory as well as memory span,

are all correlated with a third factor called G or general intelligence.

The G factor is, according to Jensen (1984), a general information processing capacity which varies in a population among individuals the distribution of which follows the bell shaped curve of a normal distribution.

When an organisation already at entrance level selects its staff by cognitive ability assessment, the distribution of G within the staff is said to be restricted. This restriction of range decreases the calculated association between G and later performance and career development.

Russel and Kuhnert (1992) report that G might be the determinant for early performance on a complex job (management work), but this association decreases over time. They also report that performance in early management work does not predict performance at a later stage in life and career development. They conclude that G might be the determinant of early performance in complex tasks, but as a career develops and changes, specific skills and abilities might determine more of the performance on managerial functions.

8.3.2 Goal Setting

A basic management activity is to assign employees a specific amount of work to be accomplished - a specific task, quota or deadline.

The goal setting paradigm (depicted in Figure 5) contains research in line with research on participation and commitment, particularly on goal acceptance. There is strong evidence that goal setting determines performance in a number of different ways (Latham and Locke, 1990):

- by participation if the goal is set high and specific;
- by reducing absenteeism;
- by goal acceptance when the goal is perceived as challenging and attainable.

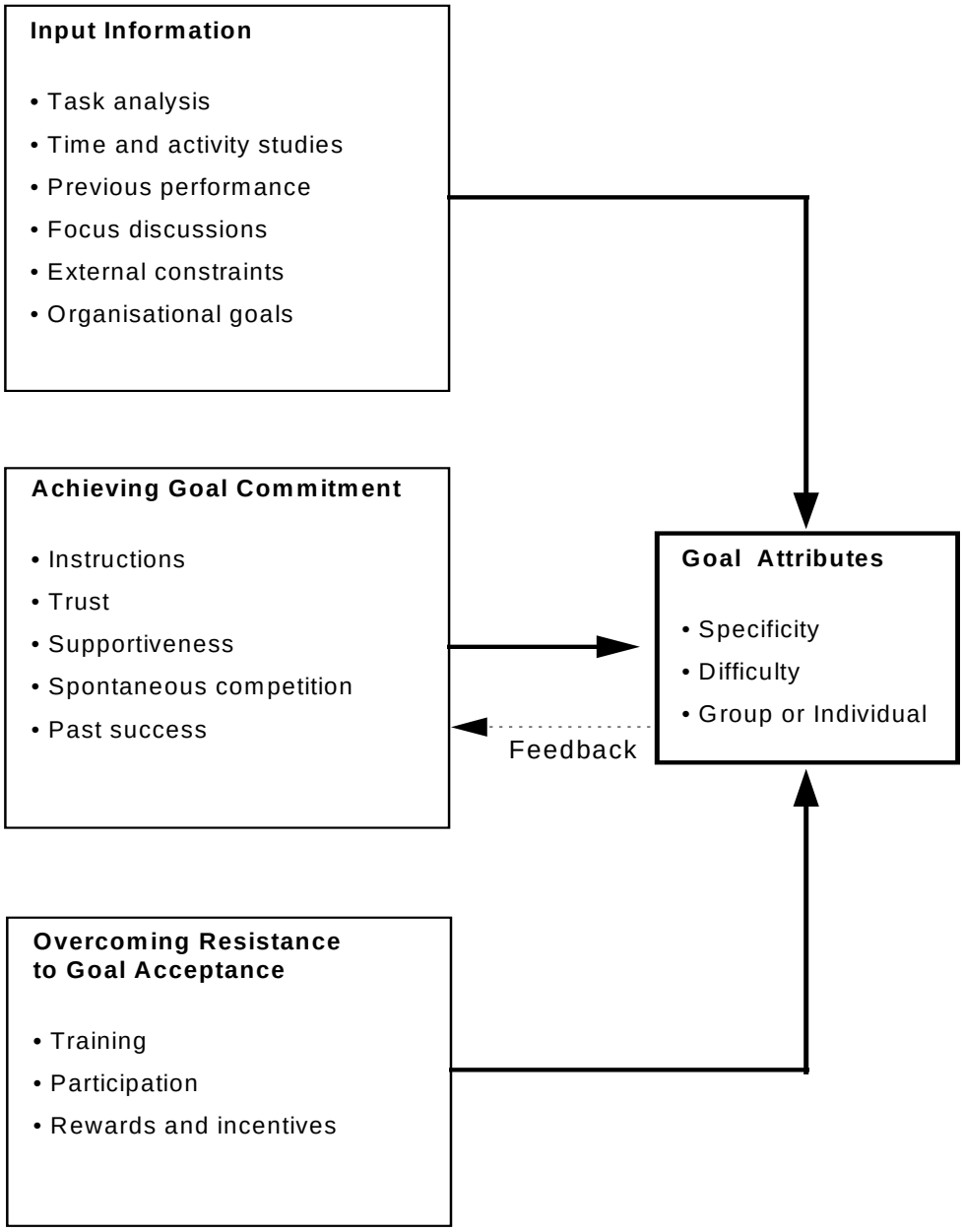


Figure 5: The goal setting paradigm

8.3.3 Commitment

The level of commitment explains the persistency and efforts people expend in performing tasks. Commitment, in the sense of strongly engaging in an activity or choosing one alternative over another, has the following prerequisites:

- the choice is voluntary;
- the choice has been made public by statements;

- a feeling of responsibility exists;
- there are efforts involved, but not of such magnitude that it hampers performance;
- there are limited financial rewards for engaging in the activity or taking on that attitude.

Commitments are by definition, resistant to change. Fostering commitment can hence work two ways, it can either enhance performance or enhance resistance to performance. The latter is true when behaviours included in the performance are contradicting an individual's committed attitudes, beliefs and behaviours, e.g. brings the individual into a state of dissonance.

8.3.4 Practice

In a changing work environment more people are being exposed to solve complex problems or work with complex systems. Routine tasks are being more and more automated and a lot of procedural and manual work has now disappeared.

The demand to acquire new knowledge and new skills is becoming more and more accentuated, not only when one is moving from one position to another but also within the same position. What to learn and how to learn is a challenging issue for every employee and employer alike.

Any employee can be seen as an active agent of knowledge acquisition. The employees are regularly exposed to new information, new situations and new contexts. This puts demands on them to identify variables and parameters, generate hypothesis, experiment, predict outcomes and consequences, interpret data and draw conclusions.

Learning principles are known to help the learner to acquire information about complex domains. Particular research is being conducted into secondary and tertiary education. One contemporary learning theory called 'Exploratory Learning' or 'Discovery Learning' is commonly in use within such higher education.

8.3.4.1 Exploratory Learning

Exploratory or discovery learning is an instructional approach that fits comfortably with the notion that the learner is an active agent of knowledge acquisition. It encourages the learner to integrate new material with what is already within his / her knowledge structure.

The knowledge domains of complex tasks demand procedural skills. The scope of these range from the use of Management Information Systems (MIS) to ATC (Njoo and Jong, 1993).

Consensus exists among researchers that in learning complex tasks, it is necessary to practice, collect information, reflect upon ones actions and to further explore the domain.

In the modern context, learning complex tasks is achieved through simulation. New domains, procedures and / or practices are being simulated, either by role-play or by computerised simulations. These help the learner to:

- gain a complete overview of the domain;
- encourage the learner to find analogical transfer between the new domain and previous, or more familiar domains;
- better understand exploratory learning;
- encourage such exploration and experimentation.

8.3.5 Feedback

Feedback can be information on human performance and achievements, actually worked hours or on the work process itself. Hence it is possible to differentiate between human outcome feedback and process feedback. The former is information about the end result fed back to the individual and the latter is information fed back to the individual on how the work is being done.

8.3.6 Knowledge of Result (KR)

Knowledge of result (KR) is information fed back to the individual on a regular basis regarding their effectiveness. KR is regarded as information enhancing the individuals' understanding of their work. When it is possible to feed back information about the result to individuals on a regular basis, this helps to develop their own knowledge of their work.

Hackman (1983) in his recommendations on job design for individuals and groups, emphasises that if possible there should be a direct link between information about work results and the employees activities.

For ATCOs, KR feedback is not a problem because their information channels are directly linked to their work.

For other staff in an ATMO this is not so obvious, either for people working in general support services or in general management. Their activities are more dynamically linked to a direct work result. In these cases, the solution is to open feedback channels.

The following recommendations are sensible (see Hackman, 1983):

- feedback provided by the work itself is more effective than feedback provided by supervisors;
- let employees regularly do the quality control themselves, meet the customers, etc.;

- let the employees participate in error analysis, etc.

When feedback is provided and enabled learning is still considered insufficient for increased performance, it is important to discover what employees do with the feedback. There is evidence for the fact that feedback might not be sufficient on its own to enhance performance but that it is a necessity when combined with set goals (see Erez, 1977).

8.3.7 Knowledge of Process

There is usually a discrepancy between what employees say they do at work and what they actually do. Feedback originating from the process is aimed at reducing this discrepancy and bring about improved awareness. People are unaware of their automated behaviour and the impact they have on others.

Tape recorders, snap shots, video films, behaviour protocols, etc. are all information devices suitable to provide feedback on automated behaviours. Within ATMOs, this kind of feedback is usually provided by:

- regular listening to recorded radio communication;
- regular replaying of recorded radar screens to observe the flow of traffic;
- recorded simulator exercises.

For nearly all staff categories, some performance feedback on behaviour can be arranged in a systematic way and fed back to the individual. Feedback can, for example, be given on:

- responsiveness,
- accessibility,
- courtesy,
- competence,
- dependability,
- credibility,
- accuracy,
- completeness,
- effective communication.

This kind of feedback from the actual work process can increase awareness of malpractices. Even video filmed role plays provide important feedback on interpersonal behaviours in customer relations, teamwork, etc.

8.3.8 Rewards as Reinforcements

From a behaviourist point of view, rewards such as merit pay clearly increases performance. Many private companies have therefore implemented some kind of merit pay scheme, bonus system or profit sharing scheme, although history has proved that these changes have not always been successful.

According to the behaviourists view, there should be a direct link between performance and rewards:

work input ➔ work process ➔ result ➔ reward

However, in an organisation's culture the links between work input, work process, result and rewards are indirect and governed by cultural rules. Often, the employees do not associate a merit pay scheme to some specific performance they did because the direct links are missing.

Organisations tend to be so complex so the connection between human input and organisational output are more or less dynamically related. Instead organisational behaviours are governed by the organisational culture.

The cultural rules that governed behaviours are, according to Mawhinney (1992), the patterns of values, beliefs, and expectations shared by the organisations' members. It is the unconscious assumptions about how work should be done and evaluated and how individuals should relate to each other, their customers and government agencies that set the scene.

What are perceived as rewards or punishment must, according to Mawhinney (1992), be seen in the context of the existing organisational culture. It is easy to list why so many reward schemes have failed in organisations.

If a reward scheme will work, it must contain (see Lawler, 1983):

- complete and accurate performance measures;
- good communication and trust between managers and employees;
- an effective delivery system;
- good management;
- compensation for inflation;
- integration within the organisation's value system;
- decentralisation of power and structure;
- openness / participation and peer group participation.

8.3.9 Managerial Work

Besides the very firm specific performance demands expressed in management policies and guidelines, there are also generic management tasks conditioned by the characteristics of management work itself that differentiate it from other tasks and responsibilities within an organisation (Mintzberg, 1983).

Managers' tasks are best described as roles to perform and within each role there are a set of behaviours to execute.

Within the formal authority and status domain there are the roles of:

- figurehead;
- leader;
- liaison.

By having the role of figurehead, leader and liaison mean dealing with people. A time study conducted of middle managers by Mintzberg shows that managers spend most of their time with peers, outside people, and a lot less of their time with subordinates or superior directors.

Mintzberg describes the managers' information processing role as "the ones who have access to most information", partly delivered from subordinates, partly delivered from other managers and partly delivered from outside contacts. These information sources give managers a powerful database of information to store, distribute or take actions on. Time spent on transmission of information greatly exceeds requests for action.

The domain of decision making role contains:

- entrepreneur;
- disturbance handler;
- resource allocator;
- negotiator.

Managers simultaneously have to initiate change and improvements, while at the same time, coping with change due to unexpected events taking place and affecting the organisation.

The resource allocation role comes from the authority to make real time decisions and from being the most informed. The negotiator role is therefore almost a routine of executing and implementing decisions.

There is always a risk of a manager tending to maintain their gained knowledge on an exclusive basis rather than sharing it with other managers

who ‘need to know’. This action would tend to preclude the sharing of responsibility and competency.

8.4 Fits as a *Gestalt*

In our fictitious ATMO, most staff categories have their salary set on an individual basis. The salary systems are supposed to reflect the employees level of expertise, a degree of job evaluation and their job performance. The department of staff training may issue programmes for staff development. Recruitment is regularly done, sometimes by internal HRM staff and sometimes by external contractors.

The following three different systems should all be linked and such links should be established with the performance appraisal and potential identification system:

- promotion systems;
- staff development systems;
- recruitment systems.

8.5 Outlining Effective Practices

The performance appraisal systems may contain identification of critical work behaviour, assessment scales, decisions on improvements and development, future career possibilities and outcomes such as promotions.

All these subsystems should be evaluated regarding their content validity as well as their criteria related validity. These validation studies demand modern information technology to be applied (see Chapter 9).

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9. APPRAISAL, DEVELOPMENT AND SKILLS DATABASE

There may well be instances where one or more databases already exist for other HR purposes and a decision should be reached whether or not to integrate existing databases with that proposed in this document.

This chapter will discuss and address, at a fairly high level:

- the rationale behind using a database;
- data security issues;
- information technology issues;
- some database principles;

whilst keeping clearly in mind the requirements related to performance appraisal and the identification of potential in individuals.

Some of the major points of using a database as a **tool** to assist both HRM departments in general and MPs in particular, together with some of the more topical issues surrounding the subject in general are also discussed.

9.1 Rationale and Purpose of a Database

By definition, a database is a systemised collection of data that can be accessed immediately and manipulated by a data-processing system for a specific purpose (Collins English Dictionary).

The general purpose of having a database is to:

- retain (collected) data in an easily retrievable format;
- facilitate a form of skilled work (manipulation) with that data;
- provide an inquirer with some information that can be extracted from the data (or a subset of it);
- present the information in a specific format applicable to the inquiry.

As outlined earlier, the identification of potential in a human is a first step in the process of developing that potential. This is done with the aim of increasing and maintaining the adaptability and flexibility within the workforce and achieving the level of human performance that is required in the future to meet the challenges which stem from organisational and technological changes that are introduced in ATMOs.

Managing the organisational culture and resourcing the ATMO with an appropriate set of competencies at all levels is one of the core tasks of HR managers. Appropriate concepts, practices and tools need to be developed and implemented that help managers and staff to do this task and to arrive at valid decisions e.g. in task and job allocation with regard to a better use of the potential that ATMOs already possess.

There is a need for tools that would facilitate the administration of the practices themselves as well as permitting access to relevant, integrated and valid information that is crucial to this kind of decision making.

There is a strong need to improve understanding of the practices themselves and to control, validate and improve them on a continual basis. A database is a very powerful tool, which can be used to help improve performance appraisal practices and therefore to arrive at sound decisions in HRM.

Depending on the internal policies adopted regarding data usage, an integrated database intended for use with performance appraisal systems could also be used to provide:

- reports on past achievements and records;
- information on maintaining and improving the methods and tools applied;
- validation of the appraisal systems;
- input to important management decisions;
- internal job centre allocation of HR.

9.1.1 Policies on Electronic Data Storage

Generally speaking, it will be easier (and in some instances, the only legally permitted way), for an assessor to complete a standard performance appraisal report while conducting an individual's annual performance appraisal review rather than trying to complete an on-screen or electronic variant of the form.

Errors can be easily corrected and, in a worst case scenario, the paper form can be completely rewritten. A hard copy also acts as insurance against computer storage media failure and will generally be felt to be less intimidating by either one or both persons present at the appraisal interview.

Depending on the policies adopted concerning personnel information in each ATMO, it may be prohibited to store the information from appraisals electronically.

A decision concerning potential identification information may have already been made which stipulates that this information should only be made available to the participants of the appraisal assessment and the direct reporting managers, all in hard copy form.

9.1.2 Data Transfer onto Computer

Upon completion of the form to the satisfaction of the two parties concerned, the information may be transferred onto a computer system using a program specifically designed to maintain a large number of records, sub-divided into separate fields for the different types of information.

The program used may be either a dedicated database handler (e.g. dBase, Foxpro or Access) or it may be a more generic application (e.g. Excel, which although a spreadsheet program by design does allow databases to be created and maintained).

9.2 Data Security

It is clearly understood that the potential for deliberate and malicious destruction of data is always with us in an information technology age. But there is also the potential for corruption or inadvertent destruction of data as well, due to malfunction or human error. With careful planning and implementation of robust data security policies and procedures in an organisation such as the ATMO, such risks can be moderated.

With sensitive data, such as that proposed in the current document, the policies adopted by the ATMO and the handling procedures to be employed by authorised staff become even more critical to the success of the project.

It is generally considered best practice for just one person to be authorised to make changes to the database (the Primary Authorised User, PAU) and for all other authorised users to be granted ‘read only’ access.

9.2.1 Some Sensible Physical Security Measures

Several levels of physical security are possible:

- the building is a secure area with restricted personal access;
- the database computer is located in a normally locked room;
- the database computer requires a start-up password;
- the computer network requires the authorised individual to enter (possibly several different) passwords;
- the database itself is only accessible from the one machine above;
- the database itself is password protected;
- the number of persons having access to both the room keys and passwords is kept to the absolute minimum.

The actual database should not be retained on a local hard drive unless the hard drive can be removed and locked away in a fire safe when not in use, thus providing yet another level of physical security. Some consider it better to locate the database on a secure portion of a Local Area Network (LAN).

9.2.2 Some Software Security Measures

The LAN (if used) can be programmed by the LAN administrator to allow only the one machine mentioned in Sub-chapter 9.2.1 write access to the database and then only if the LAN login is by the PAU.

Modern database handling software is considered to be quite user friendly and has a familiar 'feel' to it thanks largely to the graphical user interface provided by computer operating systems (e.g. Windows®).

Database designers have long recognised that sometimes it is necessary to hold sensitive data and to carry out certain special tasks on, with or using that data (known as manipulation). To this end, database handlers tend to have several levels of security built in to their normal functions.

All staff with access to the data in any form should be fully conversant with the policies and regulations in force that govern the handling and use of data.

9.2.3 Other Security Measures

All authorised HR personnel granted access to the database must have undergone a period of formal training in:

- the use of computers for recording and extracting data;
- the use of the specific database handling software itself;
- the local rules and regulations for handling sensitive material.

Good practice would dictate that a number of accessory items be available at the PAUs workstation as a matter of course, such as:

- a printer, suitable for the size and style of the desired output;
- a high density paper shredder in order to destroy any unnecessary or surplus printouts;
- any other equipment necessary for the function, determined by local operating arrangements.

The PAU should always use the same workstation when making changes to the database in order to adhere to the physical security procedures outlined above.

The restriction of hard copy circulation is one obvious preventative measure that should be taken with any data, and more so when that data is sensitive.

Hard copy could be issued and signed for on a case by case basis in the most sensitive areas.

Special arrangements for the collection and subsequent incineration of the shredded papers can be put in place, thus adding a further degree of security to the overall hard copy issue.

But one issue remains difficult to overcome in terms of security: that of the human. Humans speak to each other, become complacent over procedures and make mistakes, all of which can compromise the security of the database.

9.3 Creating the Database

Once the tool or application has been selected, the database programmers in co-operation with the HR department, will have to design the framework for the new database. This will call for the columns (fields) in the database to be tailored for certain specific **types** of data such as integer or decimal numerical values, date, alphabetical characters or logical 'true / false' entries.

Each field will also require a unique name and these field names should be both meaningful and representative of the field content to facilitate the understanding of, and use by, humans.

Consideration will need to be given to the width of each field in order to prevent any truncation from happening, especially if combining data as outlined in Sub-chapter 9.5.2. Specific rules will apply to each database handler.

9.3.1 Some Common Problems with Databases

A common problem is in the definition of data types for the individual fields when one is first constructing the database framework.

Although uniqueness **is** required for the naming of the individual fields, it is **not** generally required in entered data, except when attempting to **index** the data contained in the database. Clearly, if one field in ten different records all contain the data 'Smith' then the application has little chance of differentiating between them, let alone sorting them into any order as they all contain identical information.

It is therefore completely permissible to have ten entries for the same individual, with the same employee number but with a different entry date per record and a different appraisal date per record. Together, these ten records represent the entire ten year period the employee has been with the ATMO. The only criteria needed to sort or index the entries into chronological order is the appraisal date to be specified in the sort or indexing pattern.

Even if there are several employees with the same family name, they are unlikely to have identical given names or dates of birth. They will certainly

have different employee numbers, so these unique factors will need to be used in the sorting and indexing routines.

9.3.2 Some Common Solutions

It may appear that an 80- or 100-field database is simply too cumbersome for everyday use and may well demand too much in the way of resources on some computers to be of much practical use.

One solution to this problem is to create not one big database, but several smaller databases that can be related to each other using the power of the modern database handler.

As long as each small database contains one field of information that is unique to each record entry (e.g. an employee Identification (ID) number or record number), many small databases can be kept 'in step' with one another. The suite then become 'relational databases'.

For example, this approach might include databases dedicated to:

- personal information;
- recruitment information;
- assessment appraisal information;
- salary information;
- training, development and / or qualifications information;
- individual knowledge and skills.

For example, in the business world, there exist several large companies which may employ many personnel, both permanent employees and fixed-term contract staff.

In order to keep track of **who** is doing **what** and on **which** project, a number of databases are likely to be employed in which data such as individual task codes, hours expended on each task, project costings and even payment to staff are recorded. Everything will have a code, from the individual project task to the individual person.

A distillation of the data will provide senior management with a useful tool to help them keep track of the overall health of the company and to maintain effective control over individual projects that may be running into problems.

As another example, a University may have several thousand students enrolled, taking a variety of courses. It is desired to keep the details of the students, their courses and results on computer for administrative purposes and to ensure the timely payment of course fees and to check the effectiveness of individual courses being delivered. It would be almost

impossible to keep track of everything in one huge database, so the related database concept is adopted. Each student and each course has a unique identifier by which they are normally known when one of the many small databases is being updated by an authorised user.

In either example, very few people will have sufficient rights on the LAN to access **all** the data on any one individual or topic area, although many people may have access to some part of the database on a 'need to know' basis.

Essentially, the relational database concept presented here follows the general precepts of the subsystem view presented in EATCHIP (1998b).

One other major advantage of this decentralisation process is the ability to run **anonymous** statistical routines to provide feedback to management on the success (or lack of it) they are having in sourcing the right calibre of person for the organisation. It can also provide reports on past achievements and / or validate the performance appraisal practices that have been adopted (see Annex B).

9.3.3 Programming the Database

Manually typing the complex instructions to manipulate a database is tedious in the extreme, so database designers tend to create small programs that may be run by the PAU to facilitate the day-to-day manipulations. These small programs may call several other small programs in the course of their execution. These standard functions are often called program modules.

As well as the program modules, there are a large number of built-in standard functions which the experienced programmer may call upon to make the database operate as fast and as seamlessly as possible to the user.

This may well include the design and implementation of input 'masks' (specific screens for specific HR functions) where the data is required to be input in a particular style. For example, there would be different masks for a new hire and for annual appraisal recording.

The ATMO management may well decide that there is a need for a printout of some of the data on a monthly basis (e.g. the names of all newly hired personnel or the names of persons per unit to be appraised within the next time period). The database can be programmed to run these functions automatically on particular dates.

9.4 Using the Database

Once the database is established, there is likely to be a requirement for the data contained in it to be accessible by authorised HR personnel for different purposes. One of the primary uses of the database in Sub-chapter 9.3.2 is intended to be performance determination and potential identification.

In order to assess this, Figure 6 and Figure 7 are depicting some of the fields that might be found in a typical database of the type discussed.

Last Name	First Name	ID Nbr	DOB	Joined	Post Held
Aldyn	John	61558	16 Apr 62	01 Apr 96	ATCO
Brown	Barry	44173	20 Oct 51	14 Feb 96	ATCO
Digweed	Andy	51446	16 Aug 53	11 Nov 95	Supervisor
Jones	Michael	51157	25 Apr 50	11 Nov 95	Manager
Searle	Allison	61558	13 May 60	02 Jan 91	Supervisor
White	Jason	51416	16 Sep 57	03 Sep 95	Supervisor

Figure 6: Personal information section of database

ID Nbr	Date Last Appraisal	Current Appraisal	T1	S1	T2	S2	T3	S3
61558	30 Mar 97	30 Mar 98	C1	5.80	A1	6.20	I1	6.20
44173	27 Feb 97	27 Feb 98	C1	6.50	A1	7.30	I1	7.40
51446	30 Nov 96	30 Nov 97	C4	6.50	A3	7.35	I3	7.55
51157	30 Nov 96	30 Nov 97	M5	6.70	A5	6.90	I4	7.50
61558	30 Jan 97	30 Jan 98	C2	6.25	A2	6.25	I3	7.50
51416	30 Sep 96	30 Sep 97	C3	7.15	A2	7.25	I4	6.80

Figure 7: Part of the appraisal interview section of the database

Although only a small selection of tasks and scores is shown in Figure 7, there may be as many as required to accurately record the individual tasks. T1 may represent Core Tasks, T2 may represent Customer Orientated Attitude and T3 may represent Interpersonal Communications.

9.4.1 Performance Determination

Using the mass of data that will be available in the database and assuming the performance-related indicators are of numeric format, it should be possible to draw direct comparisons between a suitably framed paradigm and the recorded performance figures for either:

- an individual or
- a specific task.

Once the recorded performance has been measured against the established criteria, it will become clearer whether or not there is a general pattern of correlation between the actual performance and the paradigm. If a general pattern of correlation **is** established, then it may be said that the general performance of the staff is determined to be sufficient to meet the needs of

the organisation. This may be further refined to establish whether an individual member of staff is meeting or exceeding the established criteria.

9.4.2 Potential Identification and Data Correlation Opportunities

If a general pattern of correlation is established (as in Sub-chapter 9.4.1) then it is a logical extension of that correlation to look for those individuals who are exceeding the expectations and needs established by the paradigm's criteria and this may be said to represent **potential**.

The identification (and use) of that potential can only lead to an improvement in the level of service provided by the ATMO to its customers.

As a simple example the outcome of a performance appraisal for our fictitious ATMO members, with each having a total and an average score, together with a standard deviation figure and the identified **potential** of each person for promotion is shown in Figure 8.

The crossover figures for the average selected as being reasonably representative of the performance potential regarding promotion could be, for example:

0.00 to 4.0 Low

4.05 to 7.0 Medium

7.05 to 10.0 High

Note that the second decimal place may only be occupied by a zero or a five (e.g. 7.00 or 7.05). The mathematical function of the database handler will ensure correct scaling of the results.

ID Nbr	Total Figure	Average Figure	Standard Deviation Figure	Promotion Potential
61558	37.85	6.31	0.31	M
44173	42.35	7.06	0.35	H
51446	42.30	7.05	0.87	H
51157	21.10	7.03	3.86	M
61558	43.80	7.30	0.83	H
51416	39.70	6.62	0.84	M

Figure 8: Promotion potential identification derived from appraisal

It must be mentioned here that some database handlers will not be able to calculate a standard deviation figure based purely on the input from the interview appraisal report form. Standard deviation is going to need to either be programmed into the database as a specific function or the PAU is going to need to use another tool to provide this figure separately before entering it manually into the database.

The identification of potential (e.g. for another job or task in the ATMO) will follow a similar approach but will normally take into account more detailed information on task performance, qualifications, skills and knowledge as well.

As a general rule, assessors of the appraisal interview procedure (e.g. the countersigning managers or other senior staff within the ATMO) may be seeking some sort of positive correlation or comparison between individual 'selection and training' results and individual 'performance review' results.

With data such as this, an analysis of the overall performance of the ATMO and after suitable distillation, be presented to the senior ATMO management in a format similar to the that depicted in Figure 8.

A detailed description of recruitment, selection and training database requirements is given in EATCHIP (1998a).

9.5 Database Management and Maintenance

Whatever tools are used to create and manipulate the database, there is going to be a need for management of the data as an on-going activity within the ATMO.

Once the database is established and running on a regular basis, the maintenance and update of it becomes simple, especially if the programming mentioned in Sub-chapter 9.3.3 is applied.

What is often found useful by data entry operators is a small number of 'cue cards' or a 'quick reference guide' which act as a memory jogger.

Each card will detail briefly the name of a program which has to be typed in manually, what it does and perhaps any notes specific to that program or command that a newly-appointed PAU would find useful in their daily administration of the database.

9.5.1 Keeping the Data Up-to-Date

One of the more difficult jobs is to keep the contents of the database current and up-to-date.

New personnel arrive and older personnel retire from service on an irregular basis, so one person in the HR department should normally be tasked with keeping the PAU fully up-to-date with these movements, so that the database may be kept current.

The appraisal, development and skills database may be quite separate from the other databases in the HR department and only accessed as the need arises to add another record or as an appraisal form reaches the department, some time after an individual appraisal interview is completed.

9.5.2 Data Combining

One of the most common functions in databasing is the combination of data from several different sources into one cohesive whole. With modern dedicated database handlers, this is a relatively easy task, providing the database programmer and / or PAU follows the rules set down for the operation by the application writers and provided that any legal constraints are met.

Generally this involves ensuring that the field names and data types of the two databases match (for at least the fields of specific interest).

Data combination is then achieved by using a single internal command to the database handler with the appropriate syntax.

9.5.3 Data Backup

Without doubt, the most important of all routines is the regular and routine backup of the database to prevent total loss of data due to hardware or software crashes.

It is possible that the data becomes of such importance to the ATMO management that a twice-daily backup routine is run to accommodate changes. Data backups should always be kept in a fire-proof safe and preferably, in a different geographic location.

Backup routines, fire safes, and other technical matters are all amongst the issues to be addressed in the forthcoming standalone document referred to in the beginning of this chapter.

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ANNEX A: REQUIREMENTS OF EFFECTIVE ASSESSMENT

The objective examination is a necessary corrective against the subjectivity and impressionistic manner of more informal methods of evaluation. Informal evaluations are frequently contaminated by halo effects, such as a tendency to constantly rate the subject in the general direction of impression instead of rating the “true” performance as it occurs.

The Halo Effect

Examples of the halo effect are when the assessor may rate:

- the answers given in a written test with open questions (more to the liking of the participant) than rating the quality of the answers given;
- the second, third and fourth questions higher or lower than they should be because the first question was well answered;
- compared to previous assessments;
- based on previous knowledge of the testee.

Different Quality Aspects of Excellence Assessment

In order to construct a mastery assessment, one has to deal with quality aspects of assessments such as:

- different kinds of validity;
- different kinds of reliability;
- the representativness of the items in relation to the material to be learned;
- the discriminative power of the test (e.g. does the test discriminate between the excellent ones and the poor learner ?);
- does it give information about the teaching and learning conditions as well as the individual differences between the learners ?

When an achievement test impacts upon the employees career, the question of whether the test predicts job or training performance becomes paramount. In other words, the validity of the test as well as the reliability of the test are both most important issues to consider and evaluate.

Validity of Achievement Tests

The validity of a test refers to the extent to which it measures what it is designed to measure. An achievement test merely assumes that the ability to answer correctly a particular set of subject-matter items, or perform a

particular skill, is reflective of a degree of mastery of a designated discipline or sub-discipline.

A problem occurs when attempts are made to measure mastery of a skill or a specific subject and administer a mastery assessment within a very short time period after instruction. Such a short retentional interval cannot adequately test the strength and viability of newly acquired knowledge because of the contaminating influence of rote memory over short term intervals.

Another problem concerning validity is the subject domain and its objectives. The subject domain is the total content of the training as actually delivered. The validity of a mastery assessment has also to do with the validity of the training in comparison with the tasks to be learned. No mastery assessment can have any validity if the job analyses, the training need, and the training methods are invalid.

The recommended way to deal with the problem of rote learning is to divide the training sessions into units. Assessment is done on time intervals between training session together with extensive feedback. The final mastery assessment will then be a confirmation of the employees' learning progress and serve as a true value of the employees' abilities. (For further discussion on achievement tests see Sub-chapter 7.3 in EATCHIP (1998a)).

Content Validity

The content validity has to do with sampling of tasks or items. The tasks to be performed in the assessment have to be representative for the task to be performed in the job itself and the content of the work. All assessments in work performance and training are based on sampling. (For further discussion on content validity see Sub-chapter 4.2.2 in EATCHIP (1998c)).

Sampling

It is virtually impossible to assess employees on all conditions, facts, concepts and principles in a given work or training. The assessment must rely on sampling from the world of knowledge and skills needed in work. Sampling in mastery assessment contains the following elements;

- domain specific regulations, rules, policies and procedures that must be followed;
- domain specific complexities and relationships to take into account;
- specific tasks and practices to carry out.

The second step is to sample from the work / training domain the knowledge, the skills, or abilities that are to be the basis for the actual test. Developing a test that reflects differences in criticality of content is usually best achieved by sampling heavily from more critical areas and less heavily from those areas of lesser importance.

The goal of all sampling is to establish a representative result that is likely to be applicable across an even distribution of the population which will be sufficiently accurate in most cases to be applicable.

Test Outline

Some experts recommend that all content sampling should be summarised in document called “Test Outline” or “Test Budget”. For organisational training this “Test Outline” should contain:

- course objectives that reflect what has been taught;
- description of every step taken in the test construction;
- factor or component analysis.

In assessment of mastery, the content of the assessment is one of the most crucial issues. Another crucial issue is of course if the results of the assessment have any direct relationship to actual job performance.

Criterion Related Validity

When the test score is related to some future measure of job performance, this relationship is said to be ‘criterion related’.

If there is a relationship between the mastery assessment score attained by employees and later job performance, the relationship is said to have ‘predictive validity’.

If there is an association between test score on the mastery assessment and some performance rating on the job and the relationship is calculated concurrently in time, the relationship is said to have ‘concurrent validity’. (For further details see EATCHIP (1998c) Sub-chapters 4.2.4 and 4.2.5).

Construct Validity

Construct Validity refers to the psychological characteristics of interest. The judgement of this kind of validity comes from empirical research and science.

If for example findings from research within HRM show a relationship between performance exercises at ACs and the results on personality tests, the concept measured by the AC is said to have a ‘construct validity’. (For further details see EATCHIP (1998c) Sub-chapter 4.2.6).

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ANNEX B: IN SEARCH OF EXCELLENCE IN HRM

The systematic approach to potential identification for further development has, as objectives to:

- fulfil the availability of expertise;
- create motivation and persistency over time;
- avoid costly manpower turnover;
- enhance mobility within (and between) departments and / or units;
- enhance the planning and the budgeting of HR.

The systems view on Strategic HRM (EATCHIP 1998b) define the subsystems within Strategic HRM to be:

- staffing;
- recruitment and selection;
- reward systems;
- personnel and career development;
- working conditions and regulations.

Secondly, at a more operational level, additional subsystems are defined as:

- staffing and planning practices;
- task allocations;
- time management;
- rostering practices and procedures.

It is assumed that all of these subsystems have an impact (separately or jointly) on Human Performance.

Furthermore, this document advocates that these subsystems, through their linkage to human performance, are related to ATM Organisational and ATM System Performance in a positive way.

The conclusion is that variations in best practices within these subsystems also, to some degree, reflect the variation in organisational and system performance.

Figure 9 depicts performance appraisals in action and compares them to the overall validation and refinement of HRM practices.

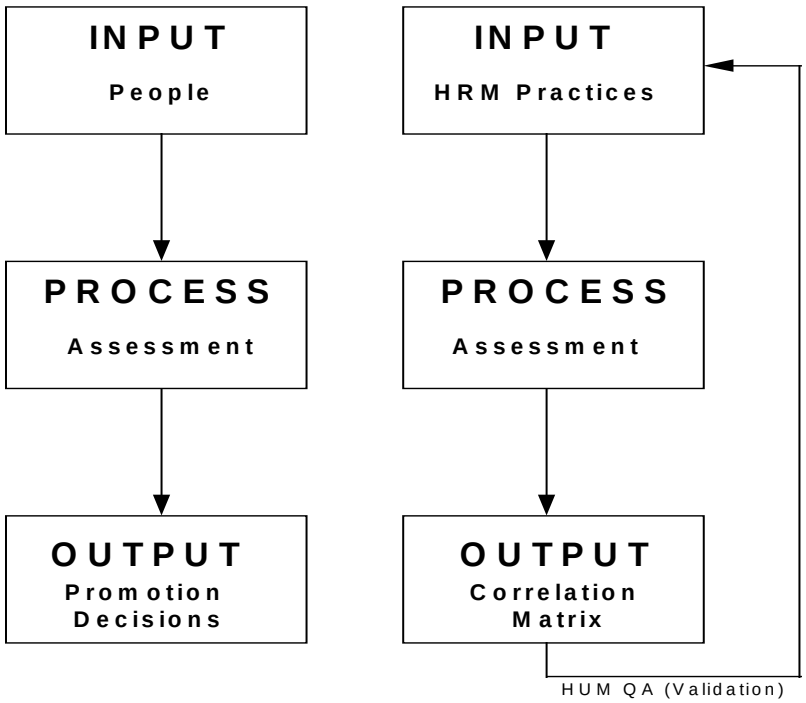

Figure 9: Performance appraisal as a means for overall validation of HRM practices (Note: HUM QA= Human Resource Systems Quality Assurance)

The following hypotheses can be adopted:

Hypothesis 1: *Progressive HRM practices (those affecting employee skills, motivation, and the structure of work) will be positively related to ATM Organisational Performance and ATM System Performance.*

Hypothesis 2: *Complementary synergy's among progressive HRM practices will be positively related to ATM Organisational Performance and ATM System Performance.*

This document concludes that the use of High Performance Work Practices, including comprehensive employee recruitment and selection procedures, incentive compensation and performance management systems, together with extensive employee involvement and training, can improve the knowledge, skills and abilities of ATMO employees (current and potential), increase their motivation, reduce work shyness and enhance the retention of quality employees.

It is further assumed that superior HRM practices will increase the effort employees put into their daily routines and would expect the use of such

practices to directly affect intermediate outcomes, such as turnover and productivity. It is also expected that the benefits of using superior HRM practices will exceed their costs in terms of lower employee turnover, reduced labour strikes and increased productivity. When combined together, these factors should enhance the financial performance as well as the system performance for ATMOs.

Research on Strategic Human Resources Management

With exactly the same reasoning and hypotheses as above, Huselid (1995) has conducted some very interesting research on the impact of HRM practices on organisational performance (see also Delaney and Huselid (1996).

One of his first findings is that this kind of research, (such as evaluating the impact of HRM practices on organisational performance), presents a number of data collection challenges. These are summarised as follows:

The Criteria Problem

The first problem is of course to define and measure the criteria for the dependent variables. Delaney and Huselid (1996) used subjective benchmarks as organisational performance indicators.

HRM 'Best Practice' Index as an Independent Variable

Delaney and Huselid (1996) constructed indicators on Superior HRM Practices for:

Staffing Selectivity. They used a number of applicants considered for each opening in the core area, in support services and managerial functions. From the selection ratio they constructed a *staffing selectivity index*.

Extent of employee training. This index was produced from three items:

- number of staff that were offered formal job training either on or off the premises;
- number of employees that were participating in formal job training;
- the effectiveness of the job training.

From these items they constructed a *training index*.

Performance-contingent incentive compensation was measured by the importance of job performance in determining the earnings of the three defined categories of employees. This produced the *incentive compensation index*.

For *equitable treatment* they indexed formal procedures for resolving disputes between employee and supervisors, producing a *grievance procedure.*

Employee involvement was indexed at the decision making level of:

Organisational Level	Final decisions being taken regarding the number of employees	Which new employee to hire	Use of contractor or temporary staff	Evaluation of worker performance	Worker promotions	Wage rates	Discharging or laying off workers	Overtime work
1								
2								
3								
4								
5								
6								

This created an index on *decentralised decision making*.

For the *internal labour market* they used an index of five items (concentrated here to three);

- opportunities for others within the organisation to fill core vacancies;
- opportunities for others within the organisation to fill vacancies in support services;
- opportunities to be promoted above ones own level of employment.

Vertical hierarchy was indexed as the number of levels between the lowest and the highest position at the organisation, including both the lowest and highest level.

What Delaney and Huselid (1996) emphasise is that their seven indexes provide a broad reflection of the progressive HRM practices that have been identified in the literature. However, they also emphasise that **HRM systems**, rather than individual practices are the appropriate level of analysis when an estimate of the effect of HRM practices is desired at an organisational level.

Benefits of a Systematic Approach

The primary benefit of a systematic approach is to be able to link the best HRM practices to ATM system performance. The feedback loops between (and within) each subsystem and their interrelationships and interdependencies can also be explored.

Huselid (1995) describes these interdependencies as 'complementary synergy' among progressive HRM practices. One example would be the increase in the returns from the adoption of an employee training program when it is matched with a rigorous selection system that identifies the personnel most likely to benefit from training.

Validation of HRM Practices

Variations between applications of HRM Practices can be matched with variations in system performance by correlation calculations. Inferences can be drawn on the individual and compounded effects of HRM subsystem performance, as well as inferences on their effects upon individual human performance.

One difficulty is to have enough material to make correlation studies meaningful (number of items -vs- number of respondents), but this obstacle can be overcome by having access to data or letting employees answer a questionnaire on their exposure to HRM practices within the ATMO.

Construction of the Independent Variables

In a system view, it is the outputs of each HRM subsystem that affect the other subsystems, either as feedback to the decision maker or as a direct input variable mediating the transformation process of other subsystems. In accordance with Huselid (1995) these outputs from the different HRM subsystems can be measured and indexed.

Development of Scales for HRM System Performance Indicators

To study the impact of Progressive HRM Practices on ATM System Performance demands regular surveys amongst the staff and recorded data which can be stored over any number of years. This data can then be compared with ATM System Performance for the same years thus providing a comparable base timeline.

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ANNEX C: AIR TRAFFIC CONTROLLER PROFICIENCY

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Abstract

This paper reports on the results of a study aimed at developing an instrument for judging the proficiency of ATCOs. Sixty-one ATCOs discussed in small groups what behaviour patterns characterise a good ATCO. The behaviour patterns reported were then used to construct an instrument consisting of five scales:

- attitude to own limitations;
- flexibility and ability to adapt to the demands of the situation in hand;
- the manner in which the control work is done;
- loyalty and Involvement in work;
- attitude to colleagues.

These results show that ATCO proficiency is more than the cognitive aspects required to actually control air traffic, which has been the focus of earlier job analyses. What needs to be done to judge the psychometric characteristics of the instrument is discussed.

Most job analyses of the ATCO profession have only been concerned with the cognitive aspects of an ATCOs role in controlling air traffic. However, being able to carry out this aspect of the job (which all ATCOs actually manage to do) is, of course only part of what makes a good ATCO. The aim of this paper is to try and develop an instrument that will give a more comprehensive picture of what makes a good ATCO.

To obtain the basic data for this instrument, we turned to those who should know most about what makes a good ATCO: the ATCOs themselves and their supervisors (who are also qualified ATCOs). Their opinions on this subject were elicited using group discussions. In these discussions, the ATCOs and their supervisors were asked to describe the behaviour patterns that characterise a good ATCO. On the basis of these descriptions, we then constructed a set of scales, which is presented below. As we shall see, these scales are not only concerned with cognitive aspects, but give a wider picture of ATCO proficiency.

Methodology

Sixty-one qualified Swedish ATCOs took part in the study, which represents about 10% of all qualified ATCOs in Sweden. They were selected so as to cover the three forms of ATC: TWR, TMA and ACC, as well as both large and small centres. Union representatives made up a special group in the study.

Procedure

The study was conducted as part of an attempt by the Swedish Civil Aviation Administration (CAA) to develop an instrument for assessing ATCO proficiency, which would serve as a basis for determining the salary of an ATCO. Hence, a comprehensive picture of proficiency was sought that could serve as a basis for an adequate picture of an ATCOs worth to the ATC system as a whole, and not only to the control aspect. As for the latter, this is, of course something that all ATCOs can do, and we cannot expect that there are wide inter-individual differences amongst ATCOs who work in the system. Most importantly, we could not really expect that there would be ATCOs who are unable to carry out this aspect of their job. Wider inter-individual differences might, on the other hand, be expected with respect to other tasks.

Data were collected during a two day session. Eight ATCOs were selected as group discussion leaders, and they were given instruction on the basics of how to conduct a group discussion. They were informed about the purpose of the project, and instructed how to conduct the group discussions in a generally non-directive style. Thus, they were told that their task was to make the group members talk, to make sure that all group members expressed their opinions, and to discourage (politely) those who talked too much and encourage those who did not talk. They were also instructed about the importance of focusing on behaviours, rather than traits, and they were given practice in carrying out the discussions with supervision by two psychologists.

All sixty-one ATCOs were first given a general introduction during which the purpose of the two days was explained. They were then divided into eight groups, three of these comprised TWR controllers, two TMA controllers, two ACC controllers and one Union representative.

The groups then generated examples of behaviour characterising “good” and “less good” ATCOs. In actual fact, most of the behaviour patterns that were generated were behaviour patterns characterising “good” ATCOs, the “bad” behaviour patterns were simply considered to be due to the absence of good behaviour.

After about four hours of discussion, each group reported on the results of their deliberations to the whole group. The reports were discussed to ensure that they were clearly understood by all participants, with any similarities and differences being noted. In actual fact there were few differences among the eight groups. Instead, the reports from the eight groups were in close agreement with respect to what characterises a good ATCO.

Results

The reports were analysed with respect to possible categories that could be used to reduce the reports to a limited set of scales. Five categories were found to account for most of the patterns of behaviours reported by the eight groups. These were:

- attitude to own limitations;
- flexibility and ability to adapt to the demands of the situation in hand;
- the manner in which the control work is done;
- loyalty and involvement in work;
- attitude to colleagues.

For each of these five categories “key behaviours” were selected.

The first, *attitude to own limitations*, refers to the extent to which ATCOs understand their own limitations and whether they adapt their way of carrying out their work to these limitations. Good ATCOs not only know their limitations but they understand and adapt their way of controlling air traffic so as to avoid overload. It is not a question of how many aircraft a controller can handle, but whether they know how many aircraft they can handle. Consequently, both an ATCO who can control many aircraft and an ATCO who can control few aircraft can receive a high score on this scale.

The five “key behaviours” defining this scale are:

- realises their own limitations;
- admits their own limitations;
- has a realistic aspiration level;
- is able to predict changes in workload;
- recognises and accepts help before and when the workload is too high.

The second scale is called *Flexibility*, and refers to the ATCOs ability to adjust their working methods to the demands of the current situation. The five “key behaviours” representing this scale are:

- ability to change tempo when the situation demands it;
- ability to make decisive actions when the situation demands it;
- ability to “think logically and rationally”;
- ability to adapt working methods to the demands of the situation;
- ability to adapt working methods to the current workload.

The third scale is called *Control ability*, and refers to the controller's ability to actually carry out the control work. A good ATCO is one who has good "situational awareness"[1], (i.e. a good picture of the situation in own sector), a good ability to predict what will happen, and a good ability to make correct decisions. There are also behaviours that are specific to TWR, TMA and ACC controllers respectively. Whether the scale here should comprise of only behaviour patterns that are shown by all controllers or whether behaviour patterns specific to different kinds of controller jobs should be included is a question for the future, and depends on the purpose for which the scales will used. The five general "key behaviours" are:

- ability to form a good mental picture of the traffic in own sector;
- ability to predict what will happen;
- ability to make the correct priorities;
- ability to resolve conflicts;
- directs traffic in a consistent manner, e.g. remains "cool" under pressure.

The fourth scale is called *Loyalty and involvement*. It refers to the extent to which the ATCO is involved in their job and shows loyalty to the demands made by the ATCO's employer, the extent to which the ATCO prioritises work and the extent to which the ATCO wants to improve his / her knowledge and abilities, and to be a resource for the ATC.

The five "key behaviours" here are:

- shows "service attitude", i.e., wants to help pilots even if it is inconvenient and means extra work;
- wants to be a resource for the centre;
- informs about problems and suggests solutions;
- wants to be a good ATCO and is willing to improve their ability to carry out the work;
- willingness to assume responsibility.

The fifth scale is *Attitude to colleagues* and refers to how the ATCO behaves towards colleagues. A good ATCO is loyal to fellow ATCOs, comes in time for changes, is willing to share the less interesting aspects of work, such as working at weekends and public holidays, is observant concerning the

[1] Within International Federation of Air Traffic Controllers' Association (IFATCA) it is currently being discussed whether "situational awareness" is the correct term for the ATCOs ability to "be in the picture".

situation of fellow colleagues and does not try to outperform colleagues at the expense of others, i.e. the ATCO does not choose a solution to a problem that makes him / herself look good, but which would create problems for other ATCOs in the system.

The five “key behaviours” are:

- shows respect for others and listens to them;
- helps colleagues;
- comes in time for changes in position;
- does not shine at the expense of others;
- shares the less popular work tasks.

The total questionnaire thus comprises 25 items. For each item, the subject will be asked to estimate the extent to which the ATCO exhibits this pattern of behaviour on a scale from 1 through 6. 1 means that the ATCO shows this behaviour at a very low extent compared to other ATCOs, 3 means that the ATCO exhibits this behaviour a little less than average, 4 a little more than the average ATCO, and 6 shows the behaviour exhibited is very high compared to other ATCOs.

Discussion

As expected, the results show that being a good ATCO means more than just being able to control air traffic. It also involves having good attitudes to own limitations, flexibility, loyalty and involvement in work, as well as a good attitude to colleagues.

Three aspects of the scales suggested here require discussion. The first pertains to the five scales, the second to the number of items for each scale and the third the six step scale. But first a few words about the nature of the items.

It should be obvious from the descriptions of the “key behaviours” above, that the items of the scales are not concrete behaviour patterns at a low level, but rather abstract, high level descriptions that summarise quite a number of behaviour patterns. They are not intended to be attribute descriptions. The reasons for choosing these high level characterisations is that they encompass a larger number of behaviour patterns and therefore increase the amount of information which can be used for judgement. If the items were at a more concrete level, there would have been a higher risk that the exercise would lack information due to the high number of missing values. In choosing the level of the items, care has been taken to find expressions at a level that corresponds to the way Swedish ATCOs actually talk about their work. Hopefully this is not lost in the translation, and corresponds to the way ATCOs from other countries talk about their work.

The five scales have been discussed with new sample groups of ATCOs on two occasions. On both of these occasions, the ATCOs agreed that these scales gave a representative view of the ATCOs work, and that they could be used to characterise a good ATCO.

In constructing a questionnaire, there must always be a compromise between the desire to cover everything of interest and the extent to which it will be possible to induce people to actually fill in the questionnaire, especially when the subject will have to fill in the questionnaire a number of times. In this case, the five items per scale seem to cover most of the important behaviour patterns defining each scale. No important behaviour patterns mentioned by the eight groups seem to fall outside the areas covered by these five scales. Thus, using these five scales should give a representative picture of the ATCO being judged.

The six step scale is chosen to avoid the tendency to be safe and to estimate everybody as average. The average is, of course, an abstraction, and there is no such thing as an average ATCO. Using six steps forces the assessor to actually decide whether the ATCO being assessed does not show the behaviour pattern in question at least a little more or less than other ATCOs. This increases the possibility that the resulting scales will have desirable psychometric properties, such as reliability.

What needs to be done

The scales presented here are, of course, only prototypes. Their psychometric properties have not yet been assessed. This must be done before the scales are used. Specifically, we need a study where the scales are used by a number of judges to assess a large number of ATCOs so that the reliability of the scales can be ascertained. When the scales have been shown to have acceptable reliability, we need a study where the ATCOs are judged, not only on the five scales, but where some overall judgement of their proficiency is also obtained. This might be a judgement based on some other form of data, such as their salaries, if salaries are set on an individual basis. Using this overall estimate as a criterion, it will be possible to obtain relative weights for the five scales to combine them into some overall estimate of the proficiency of the controller, using multiple regression to determine the weights.

AIR TRAFFIC CONTROLLER PROFICIENCY QUESTIONNAIRE

In this questionnaire, you will be asked to judge the extent to which your ATCO colleagues exhibit 25 behaviour patterns that describe ATCO work. The behaviour patterns are set at high level of abstraction, which means that there is a high chance that you will have seen your colleague perform at least some of these concrete behaviours.

You are asked to fill in one questionnaire for each colleague. Begin by entering the name of the colleague being judged and your own name. We need this information in order to analyse the data. The questionnaires will not be shown to anybody but the researchers, and before the data is entered in the computer, all names will be removed and a number will be substituted for the names. When the research is complete the questionnaires will be destroyed.

For each item, you are asked to give a number between 1 and 6. 1 means that the person you are judging shows this behaviour pattern to an extremely low extent compared to ATCOs in general. 6 means that the ATCO shows it to an extremely high extent compared to ATCOs in general. 3 means that the behaviour pattern shown is just a little less than the average ATCO, and 4 is just a little more than average.

The 25 items are divided into five categories. The items belonging to each category are described in a general way first, and then come the five items for which you are asked to make judgements.

AIR TRAFFIC CONTROLLER PROFICIENCY QUESTIONNAIRE

Person being judged: _____

Person making the judgements: _____

(A) Attitude to own Limitations

No air traffic controller can handle all situations equally well. It is important that ATCOs know their limitations and are able to adjust their work accordingly.

The following five items are concerned with this aspect of a controller's proficiency. For each item, please estimate the extent to which the controller you are judging shows behaviour in the category described by the item.

A-1 The ATCO realises his / her own limitations	_____
A-2 The ATCO works with a realistic aspiration level	_____
A-3 The ATCO recognises the need and calls for help before / when the workload is too high	_____
A-4 The ATCO admits his / her own limitations	_____
A-5 The ATCO can predict changes (particularly increases) in workload	_____

(B) Flexibility

The items in this part refers to the controllers' ability to adapt their working methods to the demands of the situation in hand, for example, to special traffic conditions and so on.

The following five items are concerned with this aspect of a controller's proficiency. For each item, please estimate the extent to which the controller you are judging shows behaviour patterns in the category described by the item.

B-1	The ATCO is able to change tempo when the situation demands it	_____
B-2	The ATCO is able to make decisive actions when the situation demands it	_____
B-3	The ATCO thinks logically and makes rational decisions	_____
B-4	The ATCO is able to adapt his/her working methods to the demands of the situation	_____
B-5	The ATCO is able to adapt his working methods to the current workload	_____

(C) Control Ability

These items are concerned with various aspects of the ATCO's ability to carry out the actual control work.

The following five items are concerned with this aspect of an ATCO's proficiency. For each item, please estimate the extent to which the controller you are judging shows behaviour patterns in the category described by the item.

C-1	The ATCO is able to form a good mental picture of the traffic situation in his / her sector	_____
C-2	The ATCO directs traffic in a consistent manner	_____
C-3	The ATCO is able to resolve conflicts	_____
C-4	The ATCO is able to predict what will happen in his/her sector	_____
C-5	The ATCO is able to set the correct priorities	_____

(D) Loyalty and Involvement

These five items are concerned with the extent to which the ATCO shows involvement in his/her work and loyalty to his/her employer. This is shown by the extent to which the controller wants to work well and improve his proficiency by taking part in courses being offered, whether they show ”service spirit”, wanting to help pilots also when this is inconvenient and thus meaning more work, and whether the ATCO wants to contribute and improve things at work.

The following five items are concerned with this aspect of a controller’s proficiency. For each item, please estimate the extent to which the controller you are judging shows behaviours in the category described by the item.

D-1 The ATCO shows “service attitude”	_____
D-2 The ATCO wants to be a resource at the centre	_____
D-3 The ATCO points out problems and suggests solutions	_____
D-4 The ATCO wants to perform well and improve his/her ability	_____
D-5 The ATCO is willing to assume responsibilities	_____

(E) Attitude to Colleagues

The items in this scale are concerned with how the controller behaves towards his / her colleagues. A good controller is loyal to his colleagues, comes in time for changes, and is willing to share the less pleasant aspects of work.

The following five items are concerned with this aspect of a controller’s proficiency. For each item, please estimate the extent to which the controller you are judging shows behaviours in the category described by the item.

E-1 The controller shows respect for colleagues and listens to what they have to say	_____
E-2 The controller comes in time for changes in position	_____
E-3 The controller shares also the less pleasant aspects of work, such as working holidays	_____
E-4 The controller helps colleagues when needed	_____
E-5 The controller does not shine at the expense of colleagues	_____

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GLOSSARY

For the purposes of this document, the following definitions shall apply:

***Ab Initio* Trainee Controllers:** Selected individuals, with no previous relevant qualifications, who are given basic instruction and training to re-enable them to obtain theoretical qualifications.

Action Plan: Individual or specific item plan derived from a business or strategic plan.

Air Traffic: All aircraft in flight or operating on the manoeuvring area of an aerodrome (ICAO Doc 9569 Definitions).

Air Traffic Management (ATM): The ground part of ATM comprises the functions of air traffic services, airspace management and air traffic flow management. The air traffic services are the primary components of ATM.

Air Traffic Management Organisation (ATMO): An organisation that has the management of aircraft either in flight or on the manoeuvring area of an aerodrome vested in it and which is the legitimate holder of that responsibility.

Air Traffic Services (ATS): A generic term meaning variously, flight information service, alerting service, air traffic advisory service (area control service, approach control service or aerodrome control service). (ICAO Doc 9569 Definitions).

Area Control Centre (ACC): A unit established to provide ATC service to controlled flights in control areas under its jurisdiction.

Aviation Safety: The entire issue of safety as applied to aircraft, on the ground and especially when airborne.

Behaviour Anchored Rating Scales BARS): Focus on the behavioural dimensions (both cognitive and overt) within the cluster representing a specific dimension. Used to measure Mastery of Performance.

Business Plan: A document or series of documents intended to determine the mission, goals and individual objectives of an organisation in preparation for implementation over some stated period of time.

Decision Maker: Person(s) responsible for a judgement, conclusion or resolution reached or given.

Decision Making Subsystem: Group of persons responsible for a judgement, conclusion or resolution within a system.

Feedback: The return of part of the output (as a signal or information) to the input in order to modify the output.

Gestalt: A perceptual pattern or structure possessing qualities as a whole that cannot be described merely as a sum of its parts.

Goal: The middle level in the organisational ambition plan. A goal will be considered achieved once a series of pre-determined objectives have been completed. May also be referred to as a milestone in a project or programme.

Goal Attainment: A measure of how well an ATMO is meeting its objectives, as compared with objectives stated in a previously published strategic management document or business plan.

Human Factors (HF): A multi-disciplinary effort to compile and generate knowledge about people at work and apply that knowledge to the functional relationships between people, tasks, technologies and environment in order to produce safe and efficient human performance.

Human Resource Allocation: The matching of people with activities or tasks as laid out in a business plan.

Human Resource Management (HRM): The conscious and specific direction of effort towards the quality and quantity of the workforce in the short and long term. It involves all processes and activities aimed at managing the human resources of an organisation: MP, recruitment, training and development, career management and human performance.

Inputs: A generic term meaning various components that are essential to any transformation process in order to produce an output**.**

Licence: An ATC licence indicates a controller's qualifications and includes a record of his competence at a particular unit together with his medical classification.

Management: Effective use and co-ordination of resources to achieve pre-defined objectives.

Management Hierarchy: The structure or organisational arrangements of the management within an organisation.

Manpower: The total supply of individuals available and qualified for service.

Manpower Modelling: A model used in conjunction with shift roster software in order to calculate the optimal number of shifts needed each day to provide adequate cover for the operational requirements.

Manpower Planning (MP): The inflow, throughflow and outflow of personnel in such a manner as to ensure a sufficient number of suitably qualified personnel are maintained at all levels throughout the organisation.

Mental Model: The picture or concept that is formed in the human mind when no other model is available**.**

Mission: A set of high level statements in an organisational ambition plan giving the ultimate reason for an organisation to exist. A mission is usually considered achieved once a set of pre-determined goals have been achieved.

Model: A description or analogy of a real or hypothetical situation, usually formal and simplified, which is used to develop understanding.

Objective: The lowest level in the organisational ambition plan. An objective will be considered achieved once a series of pre-determined tasks or work packages have been completed

Off Time: The hours a particular individual or group of individuals are not normality required to be at the workplace (Tepas and Monk,[2] 1987).

On-the-Job Training (OJT): The integration in practice of previously acquired job related routines and skills under the supervision of a qualified coach in a live traffic situation (EATCHIP Human Resources Team, (1995). *Air Traffic Controller Training at Operational Units,* HUM.ET1.STO5.4000-GUI-01. Brussels: EUROCONTROL). The training enables student controllers to check out as operational controllers at a specific operational unit.

Operating Position: Work area (workstation) equipped for providing ATC functions.

Operational Requirements (OR): ATC positions open and manned in accordance with varying air traffic demands.

Outputs: A generic term meaning various products or services that occur as a result of inputs being applied to a process (or processes) undertaken by an organisation or an individual.

Overtime: The time during which a person works at a job in addition to the regular (statutory) working hours.

Process: A series of logical and normally sequential actions which result in the transformation of an item from one state to another or some development.

Professional Development: The systematic maintenance, improvement and broadening of knowledge and skill together with the development of personal qualities necessary for the execution of professional, managerial and technical duties.

Project: A temporary endeavour undertaken to create a unique product or service.

[2] Tepas, D. I. and Monk, T. H. (1987). Work Schedules, in: G. Salvendy, (Ed.) *Handbook of Human Factors,* Chapter 7.3, p. 819-843. New York: John Wiley and Sons.

Rostering: The allocation of human resources in order to ensure services for the scheduled working hours in accordance with legal and local procedures.

Schedule: The sequence of consecutive shifts and off time assigned to a particular individual or group of individuals as their usual work schedule (Tepas and Monk, [1] 1987).

Shift Roster / Shift Schedule: The sequence of consecutive shifts and off time assigned to a particular individual or group of individuals as their usual work schedule.

Strategic Planning: The longest-range planning / goal setting / ambitions of the organisation.

System: A system tends to be a set of interconnected, interdependent parts, forming an identifiable, organised complex and dynamic whole. It may encompass elements, activities, people or ideas.

Task Analysis (TA): A group of analytical procedures directed at describing work activities in detail. A TA aims to provide a comprehensive breakdown of the content of tasks.

Task Mastery: The level of professional expertise expected of a person considered to be an expert in the field.

Training: The planned systematic development of the knowledge, understanding, skill, attitude and behaviour pattern required by an individual in order to perform adequately a given task or job.

Vision: The main conceptual mental picture containing the very broadest of guidelines as to where the project, programme or company is going and how is it likely to get there and how it will recognise when it has arrived there.

Work Package: A deliverable at the lowest level of the work breakdown structure. A work package may be divided into activities.

ABBREVIATIONS AND ACRONYMS

For the purposes of this document, the following abbreviations and acronyms shall apply:

AC	Assessment Centre
ACC	Area Control Centre
ATC	Air Traffic Control
ATCO	Air Traffic Controller / Air Traffic Control Officer
ATM	Air Traffic Management
ATMO	Air Traffic Management Organisation
ATS	Air Traffic Services
BARS	Behaviour Anchored Rating Scales
BOS	Behavioural Observational Scales
CAA	Civil Aviation Administration
CEO	Chief Executive Officer
CIP	Convergence and Implementation Programme
CIT	Critical Incidence Technique
ECAC	European Civil Aviation Conference
EATCHIP	European ATC Harmonisation and Integration Programme
ECU	European Currency Unit
EUROCONTROL	European Organisation for the Safety of Air Navigation
EWP	EATCHIP Work Programme
HF	Human Factors
HQ	Headquarters
HR	Human Resources
HRM	Human Resources Management

HRT	Human Resources Team
HUM	Human Resources Domain
ICAO	International Civil Aviation Organisation
ID	Identification
IFATCA	International Federation of Air Traffic Controllers' Association
KR	Knowledge of Result
LAN	Local Area Network
MBO	Management by Objectives
MIS	Management Information Systems
MP	Manpower Planning
MPSG	Manpower Planning Study Group
OJT	On-the-Job Training
OJTI	On-the-Job Training Instructor
OR	Operational Requirements
PAU	Primary Authorised User
RPT	Regular Proficiency Training
SDOE	Senior Director Operations and EATCHIP
SI	Situational Interview
ST	Specialist Task
TA	Task Analysis
TF	Task Force
TMA	Terminal Control Area
TMC	Terminal Control Centre
TWR	Aerodrome Control Tower
UAC	Upper Area Control Centre

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