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**HFI CMM Study
Reference material**

Bibliography, Terminology

March 2001

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1 Summary

This note provides the background reference material to the HFI CMM project. Some brief reference material is put in other working papers, but this comprises the principal source of items such as references, contacts, abbreviations and definitions

Document Details

Format - Internal Working Paper.
Author Brian Sherwood Jones,
v1 29 April 2001

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2 Bibliography

2.1 MoD Documents

In addition to the AMS Handbook, and HFI material in the AMS (on HFIWeb), the following were used:

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'A Practical Guide to Human Factors Integration', DERA CHS, Version 1.2 16 August 2000.

'Early Human Factors Analysis user Guide' DERA CHS

AMS Additional Information. Managing Risk v1.1 December 99

Through Life Management Plan Model Version 2.0 – Dec 00

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3 Definitions

Acquisition **Capability** Framework, in the form of a functional competence set provides the basis for selection to IPTs as well as determining the development needs of individuals and teams in the new IPT environment. Note that capability is not used in this sense in this document.

(process) **Capability** (in the context of capability maturity) The ability of a (system life cycle) process to achieve a required goal. Note that this differs from military or operational capability (see below).

(process) **Category** A set of processes addressing the same general area of activity.

NOTE 1 - The process categories for software process modelling address five general areas of activity: customer-supplier, engineering, support, management, and organization.

Central Customer The customer prior to the point when equipment becomes available to the user and for upgrades to in- service equipment that reflect a change to the user's requirement.

Collective Performance The ability of units or formations to function as cohesive entities and to operate their equipment to the limit of its capability.

Context of use The users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a system is used.

Customer The body to which the IPT is answerable for meeting agreed cost and performance targets within agreed and approved resources. In the early project phases the customer is the Central Customer, in the in- service phases it is the Second Customer.

Enabling system A system that complements the product system q.v. during its life cycle stages, but does not contribute directly to its functionality

Enterprise A business unit, company, corporation or other organisation with a set of goals and objectives to offer products and/or services.. This is usually the collection of organisations involved in a system project.

Ergonomics The study of human capabilities and limitations, human interaction with technologies and environments, and the application of this knowledge to products, processes and environments.

NOTE 2 - The new word "Ergonomics" was originally created from a combination of the Greek words "ergos" and "nomos" to mean literally "laws of work".

Formative evaluation Evaluation designed and used to improve the object of evaluation, especially when it is still being developed.

Human/user-centred Approaches which have as their primary intention or focus the consideration of the interests or needs of the individuals and/or groups which will work with or use the output from a system.

HF data Information about users and other stakeholders that is generated and maintained by the Human Sciences. This includes, for example, anthropometric data, health and safety data, psychometric measurements, ergonomics standards, and expert knowledge in all human sciences

(i.e. psychology, sociology, medicine, human computer interaction, behavioural science, anthropology, management science, education, personnel and staffing management, and codifications of this information and knowledge (e.g. international standards, legislative requirements, existing patents, good practice, style guides and project standards).

Human-system issue An issue (for example, a need, want, constraint, limit, concern, factor or consideration) relating to the people (users and other stakeholders) and their involvement in or interaction with a system at any time in the life cycle of that system.

Indicator An indirect measure that gives supporting information about input, output or performance (e. g. staff skill levels). Indicators provide warning of potential problems or risks.

Lifecycle The stages and activities spanning the life of the system from the definition of its requirements to the termination of its use covering its conception, development, operation, maintenance support and disposal.

Military capability The general capability of forces, measured by the extent to which they meet specified standards of Manning, Equipment Availability, Collective Performance (CP) and Sustainability.

Operational Capability An operational outcome or effect that users of equipment need to achieve.

Operability The military application of Quality In Use i.e. the ability of specified users under specified contexts of use to achieve specified goals with effectiveness, productivity, safety and satisfaction with the product system under consideration.

Operational effectiveness The final defence output: the probability of achieving a Military Task in a defined operational context.

Organisational This document uses the term 'organisational requirements' to refer to the needs of the client organisation. In this document 'organisational' should be taken to refer to the client, not the developer organisation. To avoid confusion the term 'enterprise' q.v. is used when referring to the organisation(s) which are developing a system for use by the client organisation. Apart from in this clause the term 'organisation' is used to refer to any other organisation, including the client organisation.

Practice A technical or management activity that contributes to the creation of the output (work products) of a process or enhances the capability of a process.

Process A set of interrelated activities, which transform inputs into outputs.

NOTE 3 - In this model nearly the equivalent of a Capability Maturity Model key process area (KPA).

Process assessment A disciplined evaluation of an enterprise's software processes against a model.

Process category A set of processes addressing the same general area of activity.

Process Improvement Action taken to change an enterprise's processes so that they meet the enterprise's business needs and achieve its business goals more effectively.

Product system A type of system q.v. In ISO nnnn the term "product system" is used to indicate

the system of interest, i.e. the system that is under development or in operation. Any product system will have a number of enabling systems q.v. which are developed in concert with the product system.

Prototype Refers to any artefact created for the purpose of demonstration to users in order to elicit or test user feedback. This includes inter alia demonstrators, mock-ups, paper prototypes, simulations, role-plays, dummy systems or documents, scenarios etc.

Project stakeholder A type of Stakeholder q.v. This term is used in ISO nnnn to refer to the members of an organisation who have a stake in a project. This includes, for example, the project manager, task leaders, technical staff, administrative staff, quality assurance.

Project An undertaking with pre-specified objectives, magnitude and duration. (ISO 2382-20)
NOTE The term 'project' is not intended to be exclusive to the development of a product system. Projects include long-term activities related to a product system, such as training, maintenance and support.

Quality in use The capability of a product system to enable specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in specified contexts of use.

NOTE 4 - The user is not just the operator of the system.

Stakeholder All persons or organisations affected by the system. This includes the user, the customer, the employer, developers, regulatory bodies, maintenance staff, support desk, etc.

NOTE 5 - The "employer" includes people suppliers, manpower planners, training authority

Second Customer The customer responsible for in- service aspects of the programme, normally part of the organisation of an appropriate front- line Commander in Chief, who will make a Customer Supplier Agreement for the in- service phase specifying the outputs required.

Stakeholder Those who have an interest in the system. Includes operational stakeholders (users) and systems development and support stakeholders.

Summative evaluation Evaluation designed to present conclusions about the merit or worth of the object of evaluation and recommendations about whether it should be retained, altered or eliminated.

System A discrete, distinguishable entity with a physical existence and a defined purpose completely composed of integrated and interacting components, each of which does not individually comply with the overall purpose.

NOTE 6 - In this document the term system is used to describe a product q.v., implemented in any combination of physical equipment, computer software, documentation, human tasks and organisational or management procedures.

NOTE 7 - The term 'system' is used in this document to mean large and small systems and also equipment and other products. A system can range from an entire outsourced information provision service, to a worksystem, to a consumer item such as a lawnmower.

Systems Engineering The set of activities which control the overall design, implementation and integration of a complete set of interacting components or systems in order to meet the needs of all users and other stakeholders.

System Requirements Document (SRD) A complete set of individual systems requirements supported by a general description. Can be either a document or a database.

Target A quantified objective for a given performance measure to be attained at a specified future date, and against which performance will be compared. Targets set for the DPA by its Owner are called Key Targets. IPT Targets can be steady state targets or, as part of the breakthrough process, hard or stretch objectives

Target Audience Description A specification of the characteristics of the intended users of the product system, including physical and cognitive aspects and their training and background. It states the likely characteristics needed to fulfil key job requirements, including: rank and branch, knowledge and skills, personal attributes, training and career objectives.

Task An activity required to achieve an intended outcome of a worksystem. The word task in this document is not used in the sense of a military tasking.

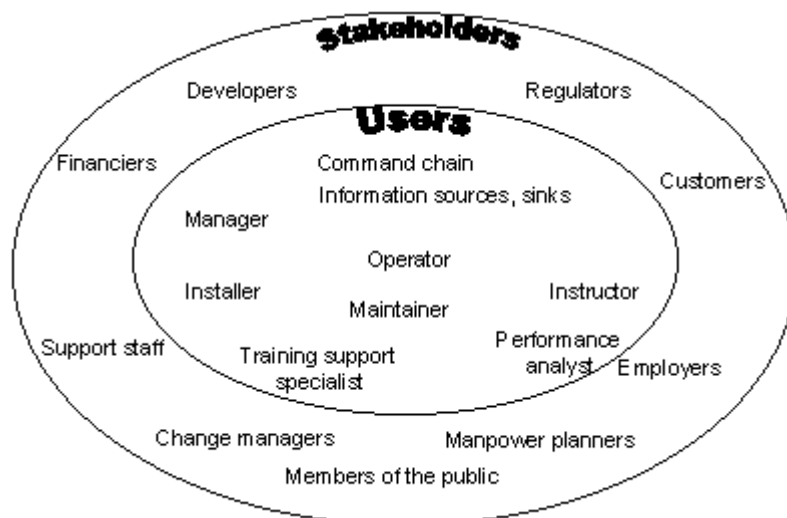
Through Life Management Plan (TLMP) The TLMP brings together three key themes of SPI: IPTs, Systems Engineering and improved commercial practices. An outline TLMP is produced in the concept stage and is maintained throughout all the CADMID stages of the project's life cycle. It shows the full resources needed to meet the objectives of the project and is recognised by all stakeholders.

User Any individual who is affected by the output from, provides the input to, maintains, uses or manages the use of a system.

NOTE 8 - A user is a stakeholder.

NOTE 9 - Since systems are hierarchical and this process model is intended to cover all types of system. From theatre response to system-of-systems across to squaddie putting on socks down to rating pressing button there are user-related issues requiring HFI.

The relationship between stakeholders and users is shown in the figure below, with examples of each included.



User Requirement An expression of a single and unique user need. HFI understands that user requirements can be decomposed from organisation to role to duty to task to activity, but that this is not a strict hierarchical decomposition and that the requirements differ in nature at each level

(and that new requirements are introduced at each level). Furthermore, requirements are not seen as pre-existing and just needing to be 'captured', but are seen as needing to be constructed. System Engineering models vary considerably in their approach to user requirements. The degree of difference with the HFI understanding poses an interface that needs to be bridged. The inclusion of information on the context of use is seen as vital to successful User Requirements; System Engineering approaches that make extensive use of scenarios to support requirements can go a long way to meeting this specific need.

User Requirements Document (URD) An all- embracing, structural expression of the user needs for a bounded operational capability. It is generated from the single statement of need identified through the equipment capability strategy process. The URD is owned by the Capability Manager and consists of a complete set of individual user requirements supported by other documents.

Usability The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in specified context of use.

Worksystem The work system comprises a combination of people and working equipment, acting together in the work process, to perform the work task, at the work space, in the work environment, under the conditions imposed by the work task. The work system is the complete package of operating procedures, user training, documentation, hardware, software, support services and the organisational and physical environment required to carry out an operational or business objective. It should be noted that Health and Safety at Work Regulations require the employer (e.g. the Services) to provide safe work systems and also require suppliers to ensure that their systems provide safe work systems for those affected by the use of the system.

(associated) **Work product** A document, piece of information, product or other item which acts as input to or output from a process.

4 Abbreviations

AMS	Acquisition Management System
ATC	Air Traffic Control
BCHF	Board of Chartered Human Factors
BCS	British Computer Society
BPS	British Psychological Society
CAA	Civil Aviation Authority
CADMID	An aide- memoire for the New Acquisition Cycle, comprising Concept, Assessment, Demonstration, Manufacture, In- Service and Disposal.
CASS	CASS Scheme Ltd - an organisation to promote and support the use of IEC 61508 in the UK
CBA	Cost Benefit Analysis or Capability Based Appraisal
CCTA	Central Computers and Telecommunications Agency
CDRL	Contract Deliverable Requirements List
CE	Capability Evaluation
CEA	Cost Effectiveness Analysis
CI	Continuous Improvement
CMM	Capability Maturity Model
COEIA	Combined Operational Effectiveness and Investment Appraisal
CP	Collective Performance
CSA	Customer Supplier Agreement
DCIS	Defence Computers and Information Systems
DEC	Defence Equipment Capability
DERA	Defence Evaluation and Research Agency
DPA	Defence Procurement Agency
DPG	Defence Procurement Group
DPMG	Defence Procurement Management Guide
ECA	Early Comparability Analysis

EHFA	Early Human Factors Analysis
ESSI	European Software Systems Institute
EUSC	European Usability Support Centres
FAA	Federal Aviation Authority
GAO	General Accounting Office (US)
HCD	Human-Centred Design
HCI	Human Computer Interface
HF	Human Factors
HFSC	Human Factors Support to COEIA
HFE	Human Factors Engineering
HFI	Human Factors Integration
HFIP	Human Factors Integration Plan
HSL	Human-System Lifecycle
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers
ILS	Integrated Logistics Support
IPI	Initial Process Improvement
IPT	Integrated Project (Management) Team
ISO	International Standards Organisation
ITEA	Integrated Test, Evaluation and Acceptance
JAR	Joint Airworthiness Regulations
KPA	Key Process Area (in Software CMM)
KUR	Key User Requirement (in URD)
LFE	Learning From Experience
LR	Lloyd's Register of Shipping
MPT	Manpower, Personnel and Training (HFI domains)
MoD	Ministry of Defence
MoE	Measure of Effectiveness

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NAO	National Audit Office
PAIS	Process Appraisal Information System (at SEI)
PCAE	Pre Contract Award Evaluation
PI	Process Improvement
PDS	Professional Development Scheme
PPO	Principal Personnel Officer
PPP	Public Private Partnership
PQQ	Pre-Qualification Questionnaire
QIU	Quality In Use
ROI	Return On Investment
SAT	Systems Approach to Training
SCE	Software Capability Evaluation
SEA	Systems Engineering and Assessment Ltd
SEC	Systems Engineering Centre at DERA Malvern
SEI CMM and others	Software Engineering Institute at Carnegie Mellon University, source of Software
SMIR	Statement of Management Information Required
SPI	Smart Procurement Initiative, Software Process Improvement
SPICE	Software Process Improvement and Capability Evaluation
SQEP	Suitably Qualified and Experienced Personnel
SRD	System Requirements Document
SSA	Sea Systems Agency
SSADM	Structured System Analysis and Design Methodology
SSMO	Ship Safety Management Office
SSP	Sea Systems Publication
TAD	Target Audience Description
TLMP	Through Life Management Plan
TNA	Training Needs Analysis

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UI	User interface
URD	User Requirements Document
VFM	Value For Money
WLC	Whole Life Cost

5 Contacts and web links

DPA

Mel Forster, HFI_1, Walnut 2b, MoD Abbey Wood #68, ext. 31663

FBG-HFI-1@dpa.mod.uk

DERA

Roger Harvey CHS Farnborough (01252 39 2709)

rharvey@dera.gov.uk

Yvonne Bowler CHS Farnborough (moving to Boscombe Down) (01252 39 3910)

ybowler@dera.gov.uk

John Hamilton SEC Malvern (0168 489 6292)

JMHamilton@dera.gov.uk

Alan Cutler SEC Malvern (0168 489 6107)

ACutler@dera.gov.uk

Human Centred Process Improvement Group:

Jonathan Earthy, Lloyd's Register of Shipping (0207 423 2304) jonathan.earthly@lr.org

Brian Sherwood Jones, Process Contracting Limited (01292 678598) brian@sherwood-jones.sol.co.uk .

There is also related HF material at:

<http://www.lboro.ac.uk/research/husat/eusc/index.htm>

<http://www.bestpractices.org.uk>

Material on software process-based risk assessment can be found at:

<http://www.sei.cmu.edu>

<http://www.sqi.gu.edu.au/>