HOLISTIC PERFORMANCE SUPPORT - APPLYING EPSS TO THE TYPE 45 DESTROYER

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ABSTRACT

Electronic Performance Support Systems (EPSS) have been demonstrated to reduce training time while increasing on-the-job performance in a number of different application areas. This paper describes a major study, carried out by BAE SYSTEMS Prime Contract Office for the Royal Navy s Type 45 Air Defence Destroyer, into the potential of EPSS techniques to provide a holistic whole-ship support environment for the ship s company. The study includes consideration of the applicability of EPSS to the variety of tasks carried out on board, the data structures required to provide seamless integration between varying types of material while maintaining their context, and the technical standards which are required to underpin this approach. The paper will also discuss the prototype EPSS being developed for a major ship equipment in support of the study, and includes some early lessons learnt from the development process.

ABOUT THE AUTHORS

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Ms. Janet Cichelli has spent the past ten years at SI International, Inc., building one of the industry s premiere electronic performance support practices. Under Ms. Cichelli s direction, her award-winning group develops embedded learning and performance support solutions for a wide range of government organizations worldwide, including the U.S. Air Force, U.S. Navy, National Security Agency, Defense Intelligence Agency, U.S. Department of Education, the U.S. Immigration and Naturalization Service and others. Ms. Cichelli brings unique insights and extensive experience in the human performance and adult learning areas. She currently leads pioneering research activities and provide strategic consulting on EPSS, knowledge management, user interface design, and human performance technologies.

The contributions of David Woollard and John Havill (BAE SYSTEMS), Bill Shook (Boeing) and Roger Laplante (EER Systems) are also gratefully acknowledged.

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INTRODUCTION

In the last few years, interest in the use of Electronic Performance Support Systems (EPSS) has been growing in both the US and UK militaries. Given the promise of reduced training time (and hence cost) and increased on-the-job performance that the concept offers, this is hardly surprising. During previous I/ITSEC conferences, a number of papers, tutorials and special events have focussed on the benefits of the approach, often presenting case studies where individual projects have achieved notable successes. On the basis of this growing body of research, the Integrated Project Team for the Type 45 Destroyer, the Royal Navy s next-generation Air Defence Ship, has agreed to fund a major technology demonstrator to ascertain whether performance support can be applied widely throughout the ship. The study has already examined the feasibility of exploiting source equipment data provided by original equipment manufacturers (OEMs) and managing it through-life to provide effective just-in-time performance support, and at the time of writing is moving into the implementation phase. This paper presents the approach that BAE SYSTEMS Prime Contract Office has taken to this task, the architecture and standards that have been developed to support such a concept and some early lessons learnt from the process.

THE TYPE 45 DESTROYER

Scheduled to enter service in 2007, HMS DARING will be the first of up to 12 Type 45 Destroyers that will form the core of the Royal Navy s air defence capability in the 21st century. The ship will incorporate a number of innovative technologies, including the Sampson active phased array radar, the Aster 30 active-homing missile and full electric drive. Central to the build, and through-life operation of the ship will be the Support Data Management System, or SDMS. SDMS is essentially a shared data environment that will contain live versions of all the technical data relating to every system on board the ship. Accessed correctly, this system should provide the staff on board with a seamless repository of information to allow the ship s systems to be maintained in an optimum way. However, in such a data-rich environment there is a significant risk of information overload or data being used for the wrong purpose. Training may not be the answer to this problem, as it is likely that much of the data will only be required at infrequent intervals. However, such occasions may well represent significant decision points which will impact on the ship s availability or even survivability. In order to allow the user to make the right decision at the right time, the SDMS should ideally be configured to present data, by filtering and focusing it, in the context in which it is needed and thus directly support users performance.

ELECTRONIC PERFORMANCE SUPPORT SYSTEMS

In the early 1990s the idea of *Performance Support* — the provision of training and information during, rather than before task execution, began to be explored in the commercial world. Early pioneers, such as Raybould (1990) and Gery (1991) foresaw that the promise of Performance Support, which had last been realised in the one-to-one environment of the bonded apprentice and his master, could be revived in the modern era through the power of modern computers. Such a computer, acting as a combination of information repository and expert mentor, would form an Electronic Performance Support System, or EPSS, and allow an employee to perform to the required standard without the need for prior training. Early EPSS work has now evolved into the concept of Performance-Centred Design, an approach that is particularly relevant in the context of this paper.

Adoption of Performance Support in the military has thus far been confined to some initial small-scale projects, mostly under the banner of the US DoD

Advanced Distributed Learning (ADL) initiative. Such work, much of which has been reported at I/ITSEC (Cichelli, 2000, Joyce, 2001), has achieved very promising results both in terms of effectiveness and return on investment. Perhaps the most advanced military user of EPSS is the US Coast Guard, whose Performance Technology Center has deployed a variety of systems in support of a wide variety of tasks (Arnold & Brandt, 2000, I/ITSEC Special Event on EPSS, 2001).

A number of different definitions of EPSS exist. The author s own, which distils elements from these, is as follows:

An EPSS is an electronic device which provides information, software tools and procedural knowledge, already available within the organisation, to an employee at their moment of need, in order to enhance their performance of the task in hand.

The key phrase in the majority of EPSS definitions is *at the moment of need*. The concept of Performance Support recognises that the key to successful performance is having access to resources, whether these are tools, information or knowledge, at the point in time where they are actually needed.

EPSS is a very different approach from traditional training, and is not applicable to every work performance area. An excellent set of criteria is given by Banerji (1999), which considers an organisation s characteristics and goals before discussing the details of the particular task. The organisation criteria (such as geographically dispersed, rotated staff) and objectives (reduce training time, increase worker flexibility) are ones that can be taken to apply to any military organisation. The task characteristics that would indicate that Performance Support is applicable are reproduced in Table 1:

Task Characteristics
Infrequently-performed or one-off task
Involves multiple steps
Extensive complexity or functionality
Requires diverse knowledge
Requires large amount of supporting information
Outcome is critical
Time is available for Performance Support

Table 1: Banerji Task Characteristic Criteria

Applying these criteria, the various tasks involved in managing the availability of Type 45 equipments through the information-rich environment provided by SDMS would appear to be suitable candidates for performance support. However, SDMS, a shared data environment supporting the entire ship s systems, is a significantly more complex target than the majority of previous EPSS implementations, which have tended to focus on discrete tasks. By default, SDMS will provide a user-centred view of the data within it, but in order to fully exploit the benefits of electronic performance support, a holistic viewpoint must be taken, making maximum use of the current trends in the discipline.

EPSS TRENDS

As technologies have emerged and matured, the capabilities, cost effectiveness and ability to impact job performance have increased. Three primary trends are driving the continuing maturity of the EPSS concept:

- Object-oriented development.
- Emerging industry standards.
- Content management influence.

Object-Oriented Development

The delivery of EPSS is evolving from large, static support systems to database-driven, reusable content objects that promise a new generation of easily accessible and individualised performance support. An object-oriented approach benefits users by allowing support content to be delivered in small chunks, designed not to overload the user or require them to sift through screens of content.

An EPSS object may be defined as a small, reusable digital component that can be selectively applied - alone or in combination - to meet individual needs for on-the-job support. An EPSS object — simulation, schematic, technical information, procedure - can stand alone, or can be combined to form other EPSS tools and support structures. The aggregation of such diverse content is made possible by the tagging of individual content objects, which precisely describes its contents, the form it takes, its origin, applicability, and contextual relationship to other objects. Tagging can be accomplished either internally or externally. Internal tagging is self-describing, as used with SGML (Standard Generalised Mark-up Language) and its derivatives such as HTML and XML. Conversely, a video file would need to be externally tagged with metadata. A more detailed discussion of the level of granularity required of such objects is presented later in the paper.

Emerging Industry Standards

Worldwide standards for object-oriented training, support objects and metadata have recently emerged and have begun to be adopted by commercial and government organisations. The SCORM (Sharable Content Object Reference Model) is a set of technical specifications and guidelines designed to meet the US DoD s high-level requirements for web-based learning content, supporting content reusability, accessibility, durability, and interoperability. SCORM defines a model for aggregating content, as well as a runtime environment for content objects. Adopters of SCORM predict that an object-oriented development approach will reduce development costs by 50-80%, compared to traditional linear development of electronic courseware (Dodds, 1999). The SCORM specification, which at the time of writing is at version 1.2, continues to evolve and is not yet fully comprehensive.

The European Association of Aerospace Industries, AECMA, has produced the AECMA S1000D specification. This is an international specification for technical data publications (such as Interactive Electronic Technical Manuals or Publications — IETMs or IETPs) that utilise a common source database. Documentation is produced to AECMA S1000D in the form of units of information called Data Modules. All the Data Modules required to produce a technical publication are held in a common source database. AECMA proponents claim the benefits of a non-proprietary environment that allows neutral delivery and management of data.

The US Military has defined the MIL-STD-87269 specification for IETMs. This specification defines an IETMDB, which is a complete collection of database elements relating to a weapon system or other equipment that is stored in a revisable source database and constructed in a standardised manner. A two-layered approach is used to define technical information and individual content objects are stored as logically connected but randomly accessible IETM data elements.

Efforts are currently underway to merge the AECMA S1000D and MIL-STD-87269. Additionally, each of these three standards — SCORM, AECMA S1000D, and MIL-D-87269 - support the concept of create once, use many times .

Content Management Influence

As organisations collect larger and larger repositories of unstructured content, simple search engines have failed to meet the information retrieval needs of users. Content Management Systems (CMS) have become increasingly popular and sophisticated as a way to manage data and organise it into a meaningful, context-appropriate presentation. By using presentation templates, a CMS allows raw data to be poured into a template and delivered to a broad range of devices without having to be reformatted. After the template is developed, back-end information can be transformed, re-formatted, and published to the user in real time.

In the e-Learning field, Learning Management Systems (LMS) have emerged over the past several years to handle the software services necessary to manage delivery and administration of electronic courses. More recently, it has been acknowledged that software systems are needed that can assemble granular chunks of learning content into larger aggregates such as course modules and entire courses. Such Learning Content Management Systems (LCMS), although relatively immature, focus on controlling and organising the work flows and content resources required by the learner (Singh, 2001). They thus have significant synergy with the approach necessary for performance support.

As these trends appear to indicate, future EPSS efforts should focus squarely on providing a delivery environment that includes content management functionality, a repository of granular, reusable objects and a dynamic delivery mechanism. This will make it possible to finally provide users with a highly personalised, just-in-time, adaptive support experience.

EPSS IMPLEMENTATION MATURITY MODEL

As a way to determine the current capability and maturity of an electronic performance support system (EPSS), SI International, Inc. has developed the following *EPSS Implementation Maturity Model*. The model defines five distinct levels of technical and functional maturity. This model is primarily focused on extrinsic and standalone EPSS systems, not on intrinsic (performance-centred design) EPSS. Increasing levels of capability will result in closer integration into the workplace, higher levels of content re-use and more individualised support. The model is intended to help differentiate among implementation types and help organisations create a path forward to improved EPSS functionality, efficiency, and job impact.

Level 1 — Static: EPSS is comprised of content embedded within structures.

Key Characteristics:

- Static structure and content.
- No reuse.
- Pre-defined navigation paths.

- Personalization requires separate development effort.
- Typically large runtime files and burdensome maintenance.

Level 2 — Maintained: EPSS content resides separate from structure, but is not universally reusable.
Key Characteristics:

- Content resides separate from structure.
- Limited reuse within same tool structure or authoring tool.
- Separating content facilitates content maintenance
- Pre-defined navigation paths.
- Personalization supported through pre-defined alternate presentation.

Level 3 — Standardised: EPSS content retrieved from a repository of tagged objects according to accepted industry standard (ADL/SCORM, AECMA 1000D).
Key Characteristics:

- Content resides as meta-data tagged content objects.
- Extensive reuse within a common LMS/LCMS/CMS and set of data standards.
- Content pre-aggregated into task-level objects.
- Navigation paths and personalization controlled by LMS/LCMS/CMS.

Level 4 — Dynamic: EPSS content is dynamically retrieved from common repository, with limited content pre-organisation.
Key Characteristics:

- EPSS content dynamically translated and tagged from multi-use repository.
- Complete content reuse in other EPSS, courseware, or reference systems.
- Task-level pre-organisation and structuring occurs in LMS/LCMS/CMS.
- Multiple data standards supported.
- Basic filtering techniques and defined user profiling performed by middleware.

Level 5 — Intelligent: EPSS with intelligent architecture providing highly granular and comprehensively adaptive content.
Key Characteristics:

- Intelligent browser performs dynamic on-the-fly filtering and content aggregation.
- Advanced comparison techniques (e.g. thematic analysis) utilised during filtering and aggregation process.
- Data Relationships and interdependencies with other objects analysed for possible relevance and applicability.
- Usage history as well as potential implications (such as safety constraints) considered during filtering and aggregation process.

The vast majority of EPSS pilot projects and case studies have thus far operated between level 1-2 on this maturity model. In order to apply performance support to the Type 45 SDMS, it would be necessary to design and implement a system operating at level 4 or 5. This presents a significant amount of technical risk, partly due to the immature state of SDMS itself, but also because the standards underpinning such an approach are themselves evolving relatively quickly.

THE TECHNOLOGY DEMONSTRATOR

Given the technical risks noted above, a major technology demonstrator programme has been launched by BAE SYSTEMS in order to mitigate the risk in including advanced electronic performance support techniques within SDMS. The demonstrator would draw on the latest work in the area, but, as a research activity in its own right, would also inform the community as to the viability of a level 4-5 implementation. To achieve this, it was necessary to bring together a wide community of expertise from across industry. The key players in the programme are thus:

BAE SYSTEMS — The Prime Contractor for the Type 45 warship, including SDMS.

SI International Inc. — A founding member of the industry s EPSS Leadership Council with significant experience in the practical implementation of EPSS techniques. SI provided overall coordination for the initial Type 45 EPSS study.

EER (an L3 Communications Company) — Responsible for the Royal Navy s EPSS pilot study on Radar 1007, EER have particular expertise in the use of EPSS to support maintenance tasks.

The Boeing Company — Boeing has particular expertise in the development and application of the AECMA S1000D and MIL-STD-87269 standards, and has been leading in the drive to integrate these with the SCORM specification (Shook, 2002).

For the purposes of the EPSS Technology Demonstrator, it was necessary to populate a small portion of the prototype SDMS with representative data. A full data set for a relatively complex ship equipment was therefore required. The Rolls-Royce WR21 gas turbine engine, which will be the prime mover for Type 45, was selected for this purpose, and

Rolls-Royce are thus the final participant in the programme.

OPERATIONAL CONCEPT

The Type 45 EPSS will be a robust support system that will augment the SDMS environment and draw upon its massive repository of content. It will initially be designed as a hybrid Level 4/5 EPSS, but is expected to fully transition to Level 5 as technologies mature. The EPSS will comprise a managed portal and an intelligent EPSS end-user interface that will deliver information to users at the precise granularity required for optimal task performance. In effect the Type 45 EPSS will shape information residing in the SDMS and deliver this through the browser to the user.

This Type 45 EPSS concept brings the implementation of EPSS forward in the lifecycle to initial development and provides the ability for the EPSS to influence the design and content of the SDMS knowledge base. Ultimately, the Type 45 EPSS will interact with the SDMS to access all of the information required to support the operation and maintenance of all warship systems. This information will include step-by-step task and operational procedures, detailed parts information, maintenance history and schedules, as well as job aids and training information.

Five principles have been identified that need to drive the design and development of the Type 45 EPSS:

- Implement EPSS as a *Managed Portal.*
- Employ SDMS as the EPSS Content Repository.
- Maximise Automation through Content Management.
- Leverage Multiple Industry Data Standards.
- Define a Flexible EPSS Object Hierarchy.

Implement EPSS as a Managed Portal

A managed portal is a browser-based gateway that can provide access to multiple support, operational and learning functions through a single interface. Implementing the Type 45 EPSS as a managed portal will play a critical role in the ability to manage and dynamically present EPSS data. The managed portal will filter and sort content based on the users assessed profile/skill/proficiency level that is maintained in the Logistics Support Analysis Record (LSAR) and will ensure efficient enterprise-wide use of data resources. The LSAR identifies the skill level required to perform a task, ideally based on a training needs analysis.

The managed portal will enable context filtering, whereby the user is presented the most relevant data at all times. Nearly any part of the data may be context filtered: complete tasks, sub tasks, the data within tasks such as steps and sub steps, all the way down to actual characters in the step text or pieces of a graphic may be chosen based on the specific context. The user will interact with the EPSS managed portal via an intelligent user interface. This interface will allow users to assemble, recombine and reuse information readily and easily.

It is important to note that managed portal implementations can provide the capability to dynamically alter the interface view based on work habits and navigation paths (less frequently used items are eliminated from the view). These capabilities will need to be very carefully analysed for the Type 45 EPSS to ensure that critical work paths, policy and safety warnings are not filtered out.

Employ SDMS as the EPSS Content Repository

The Support Data Management System (SDMS) will act as a knowledge base, making excellent data management services available to the EPSS. All information required for warship operations and support processes will be contained in the SDMS. Much of this information is created during the design, build and acceptance of the warship. Other information is created and captured in-service. However, SDMS information can only have a positive impact on job performance when presented in a meaningful work context. Therefore, the EPSS will provide a way to access, filter, aggregate and display data from the SDMS as contextually appropriate job support. This provides the ability to exploit and reuse source data already residing in the SDMS.

Maximise Automation through Content Management

Content Management Systems (CMS) and related technologies will provide the control mechanism through which all the data contained within the repository can be continually reviewed, analysed and modified. In conjunction with the EPSS Managed Portal, the CMS ensures that the right data (current and accurate) is provided to the right people at the right time. Such content will relate to the physical or functional configuration of a product and is, therefore, a configured data item.

Ultimately, the use of an Intelligent Browser may provide the features and capabilities required to intelligently aggregate information on a real-time basis.

This provides the framework for a Level 5 EPSS implementation based on the model discussed previously. However, these technologies are early in their lifecycle and, as such, are not yet ready for wide-scale implementation in mission critical applications. As these technologies mature, their inherent features and capabilities can be leveraged by both the managed portal and content management components to increase the level of support beyond what is possible today.

Build on Multiple Industry Data Standards

The entire EPSS concept relies upon the ability to analyse source data to derive content relationships. These relationships are represented by metadata that will be associated with each content element. The Type 45 EPSS will not change the physical data, but will create a mapping which allows the EPSS to interpret the data.

To help ensure success, the SDMS must not require cumbersome manual manipulation or labour-intensive content tagging. The SDMS/EPSS environment will have the ability to recognise and classify incoming data conforming to multiple industry standards into the format needed by the EPSS. This will be accomplished by building on work already completed by Boeing for exploiting source data and content standardisation. The SDMS will require some level of data standardisation to streamline the management of electronic data and make it available to the EPSS environment, but flexibility in this area will ensure faster adoption by Original Equipment Manufacturers (OEMs). While no single standard is totally sufficient to adopt as the Type 45 EPSS standard, AECMA S1000D, ADL/SCORM 1.2, and MIL-STD-87269 are complementary in the types of learning and support content they address and provide data definitions at a sufficient level of granularity for the Type 45 EPSS.

Each of the three specifications supports a minimum number of required tags that would provide the EPSS with sufficient granularity and information about the relationship of the content. However, in their current definitions, each specification leaves some room for interpretation by a content author. Therefore, the Type 45 EPSS operational concept will define a short-term approach to working with these variations and a long-term plan to reduce or eliminate them. It may be necessary to extend the format of a standard and request OEMs comply by providing additional descriptive information. For example, some *optional* content tags may have to become *mandatory* for the purposes of the demonstrator. The lessons learnt in this area will be one of the major benefits of the demonstrator programme to the wider industry community.

A primary challenge in defining the Type 45 EPSS lies with identifying the lowest level of granularity of content that is necessary to provide effective task mentoring and decision aiding. A definitive answer to this would require a comprehensive analysis of all job tasks and performers within the task domain. Potential barriers to optimal task performance would be defined, resulting in the identification of the EPSS support (information, advice, or learning experience) needed to enable and sustain optimal task performance. A careful review of representative maintenance scenarios makes it possible to extrapolate three levels of EPSS content that would be required: an EPSS *Asset*, *Content Object* and *Task Object*. Each object is represented in the following diagram:

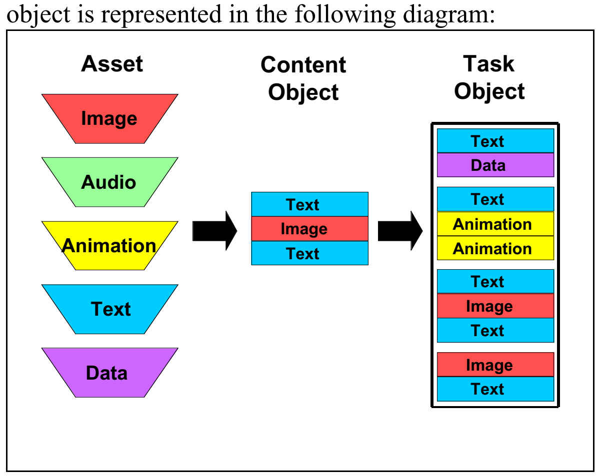

Figure 1: EPSS Object Hierarchy.

EPSS Asset

EPSS assets are electronic representations of individual images, sound, or text. An example of an EPSS asset would be a graphic of a fuel cap, a .wav file of the noise made by a malfunctioning component, a glossary definition or an animation of the flow of fuel through an engine. EPSS assets can be accessed individually or they can be aggregated into a larger contextual grouping.

EPSS Content Object

An EPSS Content Object is a meaningful, first-level aggregation of one or more assets. To be reusable, each EPSS Content Object should be independent of a specific context. This will allow the Content Object to be reused in different task contexts. One or more EPSS Content Objects can be aggregated to form a higher-level object (the EPSS Task Object). An example of an EPSS content object would be a list of procedural steps, a conceptual description on applying torque (including a description and example), or a safety precaution for removing a fuel cap (including principal, process, images).

EPSS Task Object

An EPSS Task Object is a collection of EPSS Content Objects that is organised to support the performance outcome of an identified job task. For the technology demonstrator, two types of reusable task objects have been identified: an *explicit task* and a *problem-solving task*. Further task objects may need to be defined during the course of the programme.

Explicit Task Object — In the maintenance context, these are recurring tasks that include both planned (preventive maintenance) as well as unplanned repair tasks (which are really just unscheduled recurring tasks with a verification test at the end). The more generic term explicit task will be used in order to accommodate other, non-maintenance, tasks in the future as the Type 45 EPSS is scaled to support additional operational and training activities.

Problem-Solving Task Object — In the maintenance context, these are fault-isolation tasks. The fault-isolation task should always lead to a repair task (an Explicit Task).

EPSS ARCHITECTURE

To support the functional requirements and business goals of the Type 45 EPSS, an intelligent EPSS architecture is needed that will be able to achieve the following tasks:

- Efficiently manage back-end data.
- Understand the context in which the user is operating.
- Recognise tagged data elements.
- Collect and aggregate content display to user skill level.
- Collect data in a non-imposing way (employ the EPSS to help close the maintenance loop by collecting feedback and user input)(Zolper, 1999).

These requirements clearly define the Type 45 EPSS at a Level 5 implementation on the EPSS Implementation Maturity Model presented earlier. However, many of the technologies and approaches required for Level 5 are as yet untested or are at best immature. Accordingly, a feasible Type 45 EPSS development strategy that is neither too technically risky nor too expensive will need to focus on a hybrid Level 4/5 implementation. An initial schematic of the desired architecture is presented in the figures below. There are two core interfaces to the SDMS EPSS architecture, each comprised of several distinct processes. The first interface, **OEM Data Interchange and Analysis**, is depicted in Figure 2 and includes the necessary data interchange with the OEM, as well as the processes utilised to analyse, transform, and categorise this data.

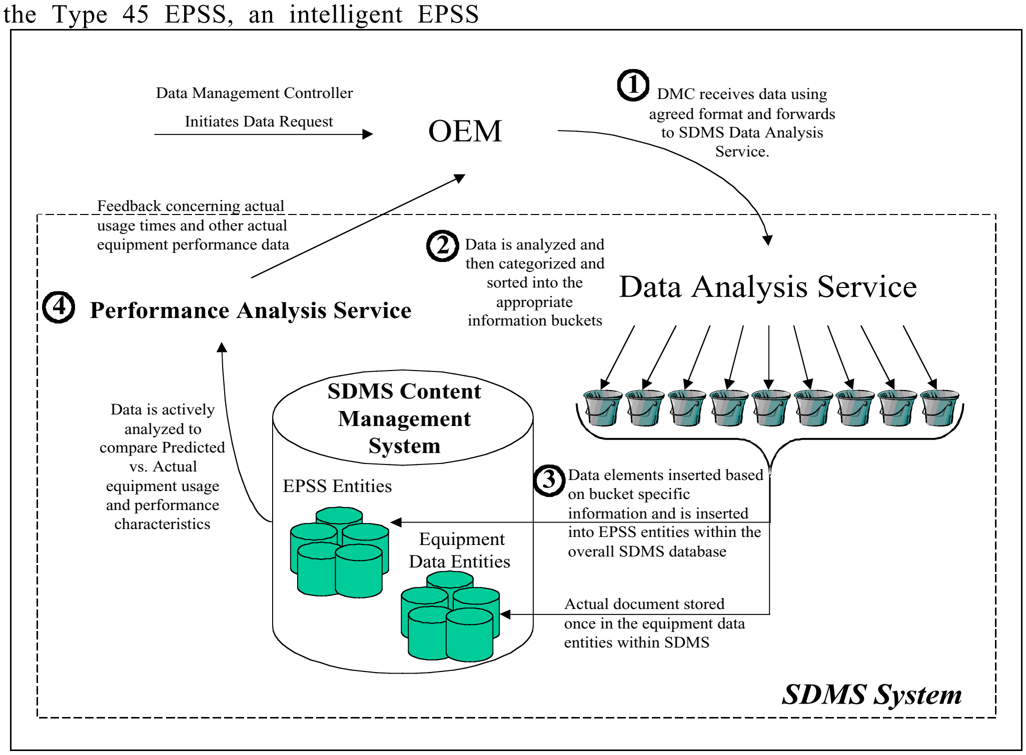

Figure 2: *OEM Data Interchange and Analysis.*

The second interface, **Intelligent End-User Interaction**, includes the interaction with the end-users (Equipment Maintainers) and the processes required to intelligently provide the desired content. As indicated in Figure 3, the intelligent end-user interface (browser) will go and collect content against a query, and then aggregate that content into a meaningful and contextually appropriate display.

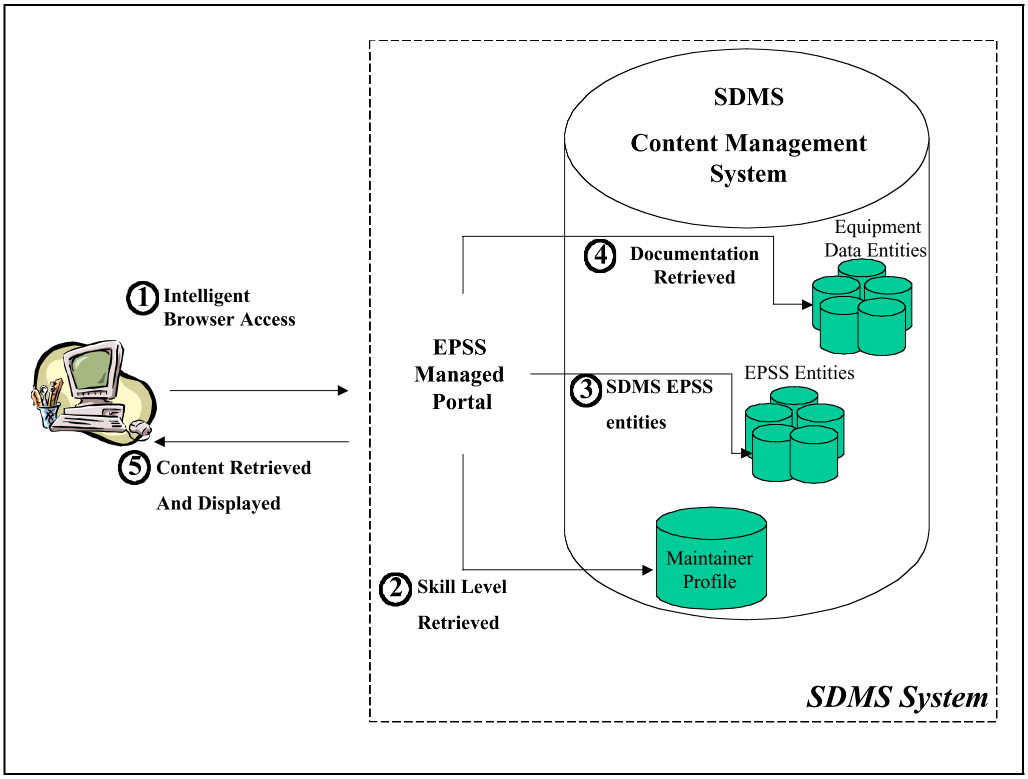

Figure 3: Intelligent End-User Interaction.

These two figures depict the architecture of the T45 EPSS and show how the Managed Portal interacts with the various entity subsets of SDMS acting as the brains of the EPSS system. The EPSS acts as a subsystem of the overall SDMS, consisting of a series of entities and processes that interact with the other SDMS subsystem components.

IMPLEMENTATION

Objectives

The overall objectives of the implementation phase are to:

- Validate the Business and System Requirements of the T45 Support Data Management System.
- Build and prove the data architecture and structures designed to deliver the accessibility and connectivity of information required by users for support activity and analysis.
- Test and demonstrate a selected range of system capability and functionality.

The EPSS element of this work will focus specifically on building a prototype EPSS application from source data to prove the concept of the 'Managed Portal' for delivering job performance information to meet maintenance support and training needs. The baseline of content management and contextual presentation of information envisaged for the Type 45 SDMS is already equivalent to Level 2 of the Maturity Model described earlier, so the key outputs from the demonstrator will be:

- Validation of the task selection criteria.
- Demonstration of the potential for performance improvement at an affordable cost.
- Identification of tasks and activities most likely to justify the additional investment of uplift to Level 4 of the Maturity Model.

Joint evaluation of this work in later phases of the programme will determine the scope and cost of the recommended warship-level EPSS solution and establish the business case for the necessary investment.

Work Streams

Three interactive work streams are now moving forward in the implementation phase of the programme. BAE SYSTEMS Type 45 PCO is building and populating the data repository with data from Rolls-Royce. Boeing is evaluating the AECMA and ADL SCORM data standards to determine the optimum approach and schema to achieve the most cost effective re-use of source data for technical support and training. EER is developing the prototype EPSS application using the business rules proposed by SI International and the data-tagging schema proposed by Boeing.

The build activity is progressing well and is planned to complete in September when the output will be rigorously tested prior to a programme of demonstrations starting in December. Demonstration will run in parallel with the technical and commercial evaluation in the later phases of the programme.

CONCLUSION

This paper has described a ground-breaking programme of work that is expanding the concept of Electronic Performance Support from one-off, stand-alone applications to a holistic approach to the operation and maintenance of the Royal Navy s next major warship. The technology demonstrator programme has already brought benefit to the industry by bringing together a team of leading innovators with a common goal. As a result, evolution and application of the non-proprietary standards used in the demonstrator will be of benefit to all. From the Royal Navy s perspective, the successful demonstration of a holistic environment which provides performance support at the point of need will have major benefits in terms of reducing the whole-life costs of the Type 45, increasing its availability and reducing the costs associated with just-in-case training.

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