

A review of the benefits of using hypermedia manuals

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ABSTRACT

The acceptance of a hypermedia system to support maintenance applications is to a large extent dependant on the ability to convince management that the system will prove beneficial. This paper reviews the assessment criteria used by a number of authors, with the objective of providing a common set of criteria that can be applied to very large industrial applications.

KEYWORDS: Hypermedia, Maintenance, industrial applications, electronic manuals.

INTRODUCTION

The importance of maintenance has long been underestimated within manufacturing industry. This can be blamed on a poor appreciation of the strategic importance of maintenance in the boardroom, which itself stems from a misunderstanding of the true cost of maintenance. It is common to evaluate the cost of maintenance as the cost of labour and materials only, without including the opportunity costs of lost production caused by downtime. In many of factories where there is little spare capacity, the cost of lost production may be as much as 15 times the direct cost of maintenance.

There are two current trends in the use of computers to support maintenance, the use of Computerised Maintenance Management Systems (CMMS) and the development of electronic manuals, normally hypertext based.. The former will support the management of the maintenance process, which includes the management of spare parts inventories, work orders, repair histories and the generation of management reports. The latter may be seen as task support tools for the maintainers themselves. This paper identifies the benefits of such manuals within the current industrial environment.

It has been shown that prior to the wide spread acceptance of such hypermedia applications a number of questions have to be resolved in particular, interoperability, linking, navigation, configuration control, and concurrency.

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With the ever-increasing volume and diversity of interrelated information within manufacturing industry, a number of difficulties arise in particular:

- Physical volume of information can be a problem.
- Referencing is both time consuming and error-prone.
- Issuing of updates and modification may not be rigorous.
- Information recorded in an individual's log book needs to be integrated into the overall information structure.

For information systems to be successfully introduced into all areas of the manufacturing plant the engineering information management strategy must enable personnel with different and varying computer skills effective and controlled access to the required information. A review of the published solution reveals a range of perceived benefits which are presented in this paper.

ANALYSIS OF ELECTRONIC MANUALS

In this paper we have reviewed a number of electronic manuals, as summarised in Table 1, and identified a number of key areas including standards, knowledge handling and user perception.

Domain	Environment
Automotive ²	Acrobat/PDF
Cable manufacturing ¹	Microcosm
Dynamic machinery ³	Toolbook
Light electronics ⁴	HTML
Power generation ⁵	Special purpose
Robotic systems ⁶	Microcom+CBR

Table 1 : Applications reviewed

Standards

Many of the benefits of electronic manuals can be extended to the users and maintainers of manufacturing processes, but a standards-based approach is important to ensure that such documents are future proof. While initiatives such as CALS and STEP have in part alleviated this problem, a cost effective approach for small SMEs needs to be considered. One possible approach is through an extension of the metadata approach for learning material⁷.

Knowledge Management Considerations

In traditional paper based information system, factory floor users are treated as passive recipients of information. The

traditional systems are created by specialist or experts in the related field and then disseminates to workers as finished product at design time. Such approaches are top down in that they assume specialists create the system and that the users receive it.

Users participation is important in integrating hypermedia manuals into shop floor practise. Industrial strength hypermedia can relates working, learning and knowledge creation. In this framework, workers are reflective practitioners, who struggle to understand and solve problems. Learning is intrinsic to problem solving because problems are not given but must be framed and solved as a unique instance. This perspective has two essential aspects. First, users, not designers of system, create knowledge at use time, and second, knowledge is a side effect of work. Table 2 compares the traditional paper based perspective with the industrial strength hypermedia perspective.

	Paper based	Hypermedia
<i>Creation</i>	Specialists only	All users
<i>Integration</i>	At design time	At user time
<i>Dissemination</i>	Decontextualised	On demand
<i>Learning paradigm</i>	Knowledge transfer	Knowledge construction
<i>Working style</i>	Standardise	Improvise
<i>Information</i>	Closed, static	Open, dynamic

Table 2 Two perspectives on knowledge management Perceived befits

Feature	Perceived Benefits
Empowerment of semi-skilled users, allowing skilled users to focus complex tasks.	Increases maintenance productivity Increases motivation
Empowerment of users allows maintenance co-ordinator to focus on strategic issues	Better maintenance planning
Improves understanding of process through animations and easy access documents	Increases maintenance quality. Fewer breakdowns
Shared knowledge through repository of single point lessons and preventative maintenance procedures	Increases maintenance quality. Fewer breakdowns
A repository of preventative maintenance procedures	Better quality preventative maintenance tasks leading to reduced life-cycle costs
More effective revision control	Reduced overheads. Increased quality
Can be used as part of training programmes	Better knowledge retention through interactive media.

Table 3 Perceived Benefits

The perceived benefits of using hypertext manuals for maintenance are summarised in Table 3.

CONCLUDING COMMENTS

Several promising areas for further research can be identified from the project described above. The most immediate concern is the integration of the electronic manual into a global CMMS. The results of this work will have implications for all maintenance information systems. Another priority is an investigation into the ease with which process suppliers can supply electronic manuals. In practice it must be recognised that while a majority of the problems to be overcome are technical, some of the most difficult relate to the possible inertia of the management culture within the organisation.

As the requirement for managing and navigating large information spaces in an industrial environment increases, the demand for industrial hypermedia will also increase. Industrial hypermedia is not a panacea to all of industry's information management problems. It is, however, an effective weapon in the armoury for reducing information overload or information deprivation.

It is our view that the initial pressure for moving to hypermedia provision, must come from the user community. To be viable the hypermedia resource base must be incorporated into a company's overall information strategy. To fully benefit from the technology, a company's culture must and will change. For industrial strength hypermedia to be successfully implemented, strong project leadership from senior management is required.

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