CONSTRUCTION PLANNING SOFTWARE SELECTION FOR IMPROVING THE PLANNING PROCESS

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The findings of a preliminary investigation into the selection criteria applied by practising UK construction professionals and managers when purchasing project management software is reported upon. The need to reduce project duration, and to work in a more efficient and co-ordinated manner has been mirrored by an increased use of, and reliance upon, project management software. The increased sophistication of this software, together with the massive growth in computer power has resulted in some highly complex packages being available on the market. Faced with this situation, pilot study interviews into the extent of applications and use of planning software by planners and professionals involved in construction have been carried out and are intended to be continued over a period of twelve months. The findings of this research are intended to inform both the construction planners and professionals involved in the use of the software and the software programmers who produce the packages.

Keywords: construction planning, package applications, programming process, selection criteria, software evaluation.

INTRODUCTION

Purpose

The main purpose of the applied research is to produce a criteria for planning software selection which is useful to both suppliers and consumers in the light of enhanced applications.

Introduction - Background

The main aims of the research relates to one of the key issues raised in the Egan report (1998) which identifies the scope for improving the efficiency of UK construction. The report refers to the target of reducing construction time by 10% and the need to improve management and supervisory skills at all levels. It could be argued that improved planning and programming of work at all stages could greatly assist in achieving this (Faniran *et al.* 1994).

Aims

1. To establish the extent of software application within the construction industry, including its role in integrating the construction process on and off site
2. To determine the extent to which the use of planning software addresses the key factors noted in the report at the present time, particularly the achievement of continuous improvement in planning practice.
3. To enable the realization and promotion of “best practice” within the construction planning software evaluation and selection process.

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Objectives

1. To measure the existing extent of construction planning software applications within a cross-section of the construction industry.
2. To investigate the nature of the construction planning software user (evaluation and selection) criteria and its developments. This will enable the modelling of the evaluation and selection processes.

In the development of the above process model, to contribute to the enabling best practice in planning software selection.

3. To research the extent to which the further application of construction planning software can help to achieve reduced construction time and improved project implementation.

Reflective thoughts - background to research

The research view of software evaluation and selection - a qualitative perspective.

- The "value" of a software package is not intrinsic to the package - it is not an isolated objective attribute.
- The "value" of a software package is in the *fusion* of the package with the user.
- The concept of "software value" cannot be isolated from the user-software fusion.
- Software packages provide *"value-potential" for the user*.
- The *nature* of the value of a fusion can be fundamentally expressed as being *"enabling"* and *"satisfying"*,

so producing an integrated construction planning system which is object orientated to the process (Yamazaki 1995)

Research Methodology

Initially, pilot studies in the form of a preliminary survey of 70 planning software users have been carried-out to develop the framework within which the research is to be executed. It was used to ascertain the priority of selection criteria.

The "in-depth" interviews revealed the relatively wide scope of use and application of the planning software, so as to encourage the benefit of pursuing applied research in this field, as evidenced in previous project management application models (Froese T *et al.* 1997).

Although considerable research has been carried-out on performance related aspects of production such as productivity - measure and effectiveness of planning methods (Boussabaine 1995, Boussabaine and Duff 1996), little work has investigated the extent to which the better choice of appropriate planning software, and its more extensive application such as to better integrate the design and use of more prefabricated components off-site, could enhance the planning, monitoring and feedback communication of all aspects of production management to achieve time savings (Aouad and Price 1994).

The research team is well aware of previous and current research in the production management area through the following, as examples, together with the specific references included at the end of this paper.

- EPSRC's, CRISP's, DETR's, Universities of Reading, Salford and Loughborough construction management research web pages.
- Construction Computing viz. Planning for major projects - No 57 (July/Aug. 1997)
- Construction Manager viz. Review of Planning software - (July/Aug. 1998)

The approach to this research is grounded in a qualitative framework. Nevertheless, it is recognized that for the research aims to be achieved appropriate consideration must be given to the processes of *data collection* and *data analysis.*

Data collection
In undertaking data collection consideration is demanded as to how to obtain information of relevance to the research.

Such requisite information relates to, for instance:

- How construction planning software users establish criteria for evaluation and selection, If indeed they consciously do?
- What the nature of such criteria is?
- How do the planning software providers respond to criteria requirements?
- Do users actively review and reflect upon the effectiveness and appropriateness of:

  a) the software package - against its evaluated perceived demand satisfaction?

  b) the criteria itself - and, if so, how?

With regard to such questions, a combination of *case studies, interviews and targeted questionnaires* will be utilized.

Data analysis
The data collected and collated from both users and providers/developers will be critically analysed, appraised and utilized to produce a *criteria - development best practice model* (Sawhney and AbouRizk 1995).

It will also be used to elucidate the originally perceived extent of use and application of the planning software compared with the actual extent of use and application together with investigating in which ways further applications can assist the Construction Industry to achieve reduced construction time and improved project planning (Tighe 1995 and 1997).

Pilot studies, discussions and "in-depth" interviews have been carried out with industrialists who supported the formation of an Industrial Liaison/Project Management Group. The Industrial Liaison Group is made up of eight senior construction planners, six planning software house writers/specialists and a senior project manager, who act as partners, contribute time and participate in the research so that a link funded research project has been developed.

The contribution of the industrial partners through their own evolved experience of the design, evaluation of selection and application/use of the appropriate planning software is of paramount importance to the success of this research project. However, this is not a limiting factor, but guaranteed by the strong links already established. Indeed, all are personally known by the project team professionally and some have participated in the initial pilot studies.

Pilot Studies

This has taken the form of a preliminary survey to ascertain the priority of selection criteria by analysis of the questionnaire returns from 70 planning software users over two years. Each user was asked to rank the following criteria in order of importance:

1. Value for money
2. Training needs and associated costs
3. User friendliness
4. Compatibility with existing systems
5. Import/Export specifications
6. Hardware requirements
7. Standard of graphics
8. Update/expansion facilities and costs
9. Maintenance arrangements and costs
10. Scope and capacity
11. Peripheral requirements

The Findings

The top five criteria for each survey year were:

	1997/1998		1998/1999
1.	User friendliness	1.	User friendliness
2.	Value for money	2.	Value for money
3.	Scope and capacity	3.	Compatibility
4.	Training costs and compatibility	4.	Training costs
		5.	Updates and expansion

Interviews

1. Four "in-depth" interviews have been carried out with members of the industrial liaison group.
2. A contract manager/senior planner of a large national contracting group referred to the fact that they rarely used the resource allocation facility with the planning software but manually pre-calculated activity duration. He used a standard computer aided project management assessment sheet to evaluate planning software.
3. A senior contract planner of an international contractor highlighted the importance of the planning software's ability to accurately programme by network logic more complex projects for them to be clearly presented in bar/Gantt chart format with the facility to record progress and update regularly to save and retrieve for potential claims preparation.
4. A senior partner of construction project management consultants in supplying and discussing his evaluation report on specific project management software referred to a project management software evaluation report (Welcom 1997).
5. A leading construction industry software consultant who is a strong supporter of the research supplied his specification of software criteria. He also posed the thought as to whether the liaison group could adopt a strategy as a brainstorming forum, or whether it would be more productive for outline framework ideas to be tabled as a basis for discussion and progress.

The Welcom report contains a sample requirement list for evaluation software for project management application. It is a constructive starting point to use as a theoretical criteria against which to benchmark user/supplier priorities:

a) System Features

Mandatory features:

- Operate in Windows NT environment
- Allow multiple users access to project files and data
- Allow project data to be accessed across a Windows NT network

Desirable features:

- Allow multiple users simultaneous access to project files and data
- Include context-sensitive help
- Support password security at file level
- Object-oriented C/S design

Optional features:

- Support the manipulation of data at the database level

b) Time Analysis

Mandatory features:

- Incorporate full critical path management
- Support all standard logical relationships
- Allow duration in months, weeks, days and hours
- Allow activity duration to be effort-driven

c) Resource Analysis

Mandatory features:

- Support both labour and non-labour resources
- Support resource calendars
- Support scheduling based on resource skills
- Support resource smoothing

Desirable features:

- Allow multiple resource availability levels
- Allow for the selection of an alternative resource during scheduling

Allows hierarchy of resources

Optional features:

- Support the automatic splitting or re-profiling of an activity during resource scheduling

d) Multi-Project Features

Mandatory features:

- Provide for the simultaneous scheduling of 500 projects
- Allow project prioritization

- Allow resources to be scheduled over multiple projects
- Support multi-project reporting
- Allow for unlimited number of activities in a project
- Allow for unlimited number of calendars in a project
- Supports rollup summarization and drill down detail

e) Project Tracking

Mandatory features:

- Allow tracking by activity, cost and time
- Provide actual start/finish dates
- Track actual resource usage
- Allow the calculation of remaining duration, cost and resource usage
- Supports physical percent complete for earned value reporting

f) Cost Analysis

Mandatory features:

- Compute activity costs
- Compute resource costs
- Provide the ability to compare different time and cost trade-off scenarios

Desirable features:

- Displays cost information in periodic or cumulative reports

g) Performance Analysis

Mandatory features:

- Provide the ability to track and report committed costs

Desirable features:

- Support the calculation of earned value

Optional features:

- Report earned value on elements of project WBS

h) Reporting

Mandatory features:

- Provide interactive bar-chart, network and spreadsheet views of project data
- Support outlining features in spreadsheet and bar-chart views
- Display and highlight project critical path
- Display free and total float
- Provide the ability to print activity notes

Desirable features:

- Allow the filtering of activities by status, resource assignments, or functional areas of responsibility
- Reporting to Internet/Intranet supported

Optional features:

- Display resource data in a histogram

i) Vendor Issues

Mandatory features:

- Provide comprehensive support service via telephone and e-mail
- Provide an annual maintenance agreement that allows upgrade to successive product releases and continuing support
- Provide on-site training courses for users
- Provide consulting services

CONCLUSION

From the initial pilot studies, it is clear that there is a definite priority of criteria for planning software selection by the users.

However, from preliminary interviews, it is apparent that there is a diversity of requirements, applications and provision.

From further research it is planned that the following outcomes will be achieved.

1. The main benefit of the applied research will be to produce a criteria for planning software selection and specification which is useful to both suppliers and consumers to enhance production planning in the light of better and more extensive applications.
2. A further benefit will be enhanced consultancy opportunities to better advise industrial partners and construction industry planners on best practice in the criteria for planning software choice.
3. Improved feedback to the construction planning software providers to be able to continuously improve and up-date to better meet construction industry planners needs.
4. It is intended to clearly demonstrate by applied planning example how the enhancement of the construction process through the more extensive incorporation of off-site prefabricated components can save project time.

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