Dynamism of managing projects with the (less-paper) virtual office

G. S Boughton[1] (email to : boughton_gs@compuserve.com)

R. H. Lloyd[2]**,** Highways Department, HKSAR (email to : pmmwhyd@hkstar.com)

M. A. McMahon[3] (email to : mam0003@ibm.net)

Abstract

This paper presents fresh directions currently being developed and implemented for project management of major works in the Highways Department of the Government of the Hong Kong Special Administrative Region (HKSAR). These techniques offer principles for computer aided office practices and procedures for office based and on-site professionals and technicians, who have traditionally been encumbered by outmoded traditional project information management processes.

The Government of the HKSAR gained considerable experience and immeasurable benefit from the use of IT, on what has been the world's largest infrastructure programme of the 1990's, namely the new Hong Kong International Airport with accompanying arterial express routes. Through economic necessity, the Government plans to promote significantly more construction within the territory in the next two decades, with programmes of comparable magnitude, commencing as the airport-core-programme reaches completion.

What has emerged in the course of construction works since 1993, is a striking departure from traditional administration-centred-office-operations. It has become clearly evident that project management processes must avoid being swamped by large volumes of project information and its dissemination. Disparate manual record keeping and paper document processing are a limitation and hindrance to collaborative tasking essential to any project. Computerised record keeping, status tracking and on-line project cost reporting are essential panacea of the first order. Ultimately, full relief must be gained by implementing professional-centred-office-operations, providing full office automation, through the virtual office.

---

[1] George Boughton is the Senior Engineer, Information Management (consultant) for Hong Kong SAR Government, Highways Department, Major Works Project Management Office He has set up information systems on large scale construction projects West Kowloon Expressway, Docklands Light Railway and for Kuwait Oil Co.

[2] Robert Lloyd currently heads the newly created Major Works Project Management Office of the Hong Kong SAR Government, Highways Department, which is responsible for the planning, design and construction of new strategic routes, and improvements to existing routes, throughout the HKSAR. In the past 8 years he has been involved in the procurement of 4 of the projects providing the road to the Hong Kong International Airport at Chek Lap Kok.

[3] Michael McMahon is the Senior Engineer, Information Management (consultant) for the Hong Kong SAR Government, Highways Department, Major Works Project Management Office. He has been proactive in setting up information systems on large scale construction projects including the Route 3 Airport Expressway, Westmead Children's Hospital and the New Parliament House for the Australian Federal Government.

Construction Informatics Digital Library http://itc.scix.net/
paper w78-1998-13.content

The research underpins the validity of these statements. The progression to fully enabled IT for project management is not only practicable and desirable, but is the only effective course.

Keywords: construction; project-management; information management-systems.

Background

The Highways Department of the Government of the Hong Kong Special Administrative Region (HKSAR), has established the Major Works Project Management Office (HyD, MWPMO), with effect from the 1st April 1998. Its function is to project manage all major capital works highways projects including some 7 new strategic expressway routes with 3 harbour crossings, and some 10 major highway improvements projects. The value of the works, announced by the HKSAR Chief Executive in his policy address in October 1997, totals in the order of US$ 25 billion, in Money Of the Day (MOD). It will also manage the remaining activities relating to the finalisation of contracts under the Airport Core Programme (ACP), previously managed by the Airport & Port Access Project Management Office (APAPMO).

The desire of the MWPMO is to optimise the deployment of Information Management Services in the project management for the new programme of works. The intent is to provide support within the same concepts of electronic planning, messaging, communications, processing and reporting, utilising a Project Information Management System (PIMS), as was proved to be of value on the ACP.

From the various reports and studies which followed the completion of the ACP projects, PIMS was found to have contributed to the successful management of the HyD projects most significantly. “The Way Forward” reports, commissioned by HyD at the completion of a number of the ACP projects, clearly recommended use be made of information management services using PIMS. As a consequence HyD is now looking to the early implementation of such services, even as early as the initial design phase. Through the greater use of electronic capture of documents, use of modeling techniques and the planning capabilities of the systems, it is hoped to centralise, streamline and secure the dissemination and sharing of all project information to all project participants.

Reviews of schedules and organisation charts for the programme of works to the year 2012 shows a gradual build up of resources engaged. In the short term, demand for the information management resources considered, are in the order of 300 users located at 20 sites. The peak, as currently projected, arises in 2004, and comprises some 2,500 users at 63 sites. Although present plans indicate a reducing level of users thereafter, it is considered likely that there will be a need and desire to maintain a consistent level of investment in HKSAR highways infrastructure. The establishment of a permanent PIMS within HyD recognises the need for appropriate information technology to support sustained levels of investment. The long range need for IT infrastructure is provided by strategies for scalability and upgrades.

Expanding PIMS

For greatest benefit, it is proposed to have the PIMS enabled information management service operational within the first financial year of the MWPMO (1998-1999) and to extend it to all types of project information, from inception, through design, construction and finally into handover. The requirement for this is endorsed by a study, to be completed by end June 1998, with an analysis of PIMS user needs, culminating in an implementation plan.

The PIMS Study, as it is called, is being undertaken by combined efforts of Information Management Consultants who were responsible for the development and implementation of PIMS on two of the ACP projects, namely; the Route 3-Tsing Yi and Kwai Chung Sections (R3), and the West Kowloon Expressway (WKE). Both of these projects formed a major part of the new road and rail link to the new Hong Kong International Airport (HKIA). The combined value of work under these two projects alone, was in excess of US$1 billion.

While these two projects successfully and clearly demonstrated the benefits of information management for the project management of major projects in the construction phase, the systems used and the approach of the two systems was subtly different. The HyD MWPMO, now intends to bring about a cultural change in the management of all its major projects, by introducing one system across all phases of the works. While it is envisaged that PIMS will initially be implemented on major projects, its application may well be applied to smaller projects in the future.

The PIMS Study

The PIMS Study commenced in early January 1998 and was scheduled to take six months, with all deliverables to be submitted by end June 1998. These deliverables, adjusted in the course off its undertaking, comprise:

- The PIMS Implementation Plan which includes:
    - PIMS architecture
    - resources for implementation and on-going operation
    - timing
    - budget costs; including hardware, software, staff and office accommodation
    - change management for upgrade and scalability strategies
- The Brief and Tender Document for the appointment of an “Information Management Support Services Consultant”
- A Brief document for inclusion of PIMS into Consultant Briefs
- A tender document for the acquisition of PIMS systems and equipment
- The contract clauses for inclusion of PIMS into Contract Tenders
- A technical evaluation check list with comprehensive requirements of PIMS functions and features
- PIMS Procedures

In addition, advice has been given to assist in the drafting of a HKSAR Works Bureau Technical Circular. The Technical Circular advocates the implementation of PIMS on all of Hong Kong’s major projects under the jurisdiction of the Works Bureau, not just those of HyD.

While the Study aims to review the ACP projects, to learn from the experiences of PIMS and related information systems, the future directions of technology and project management methodologies are also being taken into account. The topics include:

- Highlight benefits to users and experiences gained on the ACP projects
- Determine the "user needs" of management
- Formulate a hardware implementation strategy
- Assess the software requirements
- Identify types of specific PIMS user training
- PIMS support personnel staffing requirements
- Head Office and Site accommodation requirements for both equipment and support personnel
- Consider the impact of other project communication media such as:
    - INTERNET
    - Inter-office email
    - Fax machines

The Study Methodology

The underlying method has been to put the technology to work, wherever possible, to emulate that of the (less-paper) virtual office. Planning, communication, dissemination of documents and their retrieval has been done electronically. This has involved making use of the existing PIMS software, utilising the HyD office groupware for email communication, as well as the INTERNET for information gathering and external email.

Following HyD approval to proceed with the PIMS Study, a PIMS Study Inception Plan was prepared, including a broad outline defining the scope and deliverables. A progamme covering the period of the Study, highlighted its breakdown into three phases covering Enquiry, 'Review and Analysis' and final Documentation.

The Enquiry Phase commenced with the formation of the PIMS User Group (PUG), comprising professional staff and an executive officer representing various projects from within HyD and the PIMS Study Consultants. A draft questionnaire was developed and disseminated to the PUG for their comment.

Based around the Questionnaire, interviews were conducted with a broader region wide user group, comprising senior executives and professionals from within HyD, leading Consultants and major Contractors. Some had gained first hand experience of PIMS associated with the ACP. The interviews were reasonably 'free form', with interviewees expressing their views freely, with prompts for comments on specific PIMS experiences.

The results of the interviews were then consolidated and distributed to each of the Interviewees, firstly to confirm their individual contributions, and also to give each the opportunity to comment on points raised in other interviews. The feedback was then analysed and summarised.

In the Review and Analysis Phase of the Study, a close review was undertaken of both systems used to date. The outcome of the Review and Analysis Phase will be the determination of the full user needs and PIMS functional requirements both now and for the foreseeable future. The objective being to ensure the future PIMS will endure

and develop in time, applying new hardware technologies and 'plug-in' applications to suit. Ultimately it will endeavour to align and mould the mindset of project participants to embrace the highest standards of PIMS enabled project management. At the time this paper was prepared the outcome of that review had not been completed.

Enquiry Phase Results

Results of the survey into the "user needs", opens the way quite firmly for now positioning electronic documents at the forefront of communications and of information management, taking project management into a much more IT enabled mode. The question it raises is how the hard copies (paper documents) will be positioned. All this can be seen in the following summary, of some most striking revelations:

- Elevating the status of electronic copy to that of the "document of record", is perceived as the prerogative of the Employer, subject to the viability of replacing the hand signed copy on paper. For that to be accepted, there will need to be due process for the authentication of electronic signatures and support by appropriate legal statutes and/or precedent. The stand of contracting parties will prevail, certainly in the short term.

- To meaningfully progress technical documents electronically, e.g. CAD drawings and scanned sketches, version controls must be tightly exercised, transmittals must be tracked and work flows must link comments, correspondence, site instructions, cost estimates and any other live data, including other cost sheets, to them.

- For electronic systems to be really effective, they must be developed to a level of performance and ease-of-use approaching or rivaling that of paper based operations, especially in the areas of browsing and viewing, essentially optimising on the use of those integrated applications that are most familiar (generally) to users.

- It must be possible to place actions and file subject references onto electronic documents, as easily as writing on paper documents, while equally enabling internal actions to be discreet to organisations.

- Sending documents under cover of (as attachments to) email messages is a most beneficial facility, particularly for communicating with remote organisations. Email messages must otherwise be taken just as off-the-record dialogues, akin to telephone conversations, not to be encouraged with contractors.

- Information Management operations stand a greater chance of being fully electronic, with all the performance implied, where they extend to all project participants, including the Contractors; provided always that tight security can be maintained, to safeguard the integrity of information, including sensitive cost estimates and confidential documents.

- Information Management practices, services and systems, must be established well ahead of the start of construction and preferably even in the course of the earliest study and design phases.

With these results, the task ahead is clearly for all project participants to actively produce and acquire all their information electronically, preferably at source and to also address all their outgoing communications through electronic channels, with

automated processes wherever practicable. Essentially, data on cost budgets, commitments and changes are best processed live within the same integration of systems, for documents such as payment certificates and site instructions to be linked with all other information and managed to the same standards of quality and access security. These processes form the core of truly IT enabled project management. The project must then retain all such information uniquely, for precise reference by those concerned.

This position, enabled by PIMS, then in effect provides for the management of projects through the (less-paper) virtual office.

Review

The study tested attitudes both of individuals in the construction industry and of their organisations, through the five year period of the ACP construction phase. The picture that emerged fits well with the global situation in the industry.

Except for processing technical documents and producing correspondence most staff, certainly executives and most professional managers, started off having no direct involvement with computers. Literally all project information was routed to managers in hard copy, for them to sign or append actions. They never saw anything in electronic form.

Tried-and-tested practices were passionately cultivated by managers, specifically to control hard copy processes. By that means they maintained standards of quality and also kept themselves “best informed”. Little or no attention was given to preserving, or controlling, the electronic copy.

The introduction of office machines - faxes, printers and photocopiers – enabled a greater audience to be addressed, though often with immense duplication. Friendlier operating systems and software packages, more powerful desk top computers and faster communications, all helped professionals to work more diligently in expressing their thoughts. That increased, and enriched, the content of information, notably in the communications between contractors and the engineers.

As information content multiplied, employers were encouraged to get better informed. The Highways Department of the HKSAR did so when adopting a more active project management role on the ACP projects, instructing construction management consultants to tap into the new sources of information and report to them on detailed project management issues.

Interest in project information was heightened, but management remained aloof of getting directly involved with computers. However, when electronic mail (email) was introduced, it was immediately accepted as a high level activity. The take-up of internet services and facilities further reinforced that trend.

By all these means, more and more assignment work was vested in electronic activities and processes, producing large (though neither preserved nor controlled) inventories of information. In response, organisations engaged specialists to manage their systems for them and committed funds for purchasing high-end equipment.

These developments certainly furthered the effectiveness of individuals and of individual organisations.

Taking a further step, to enhance the effectiveness of the whole project, the Highways Department of the HKSAR introduced PIMS facilities specifically targeted at promoting collaborative working practices, involving all the organisations acting together:

- sharing in processing live project information
- sharing electronic document registers, file structures and links to documents
- exchanging email and action messages about documents

Still, except where professionals were involved in validating technical documents, the emphasis was for organisations to check the quality and to retain in files, just the hard copy of all communications.

The Highways Department changed that position too, with the introduction of PIMS integrated software packages and procedures that tightly controlled the production, acquiring (including scanning) and retention of documents in electronic format. Steps were taken to ensure equal quality in both soft and hard copies, to unify the content of information available to all project participants electronically (eliminating inconsistencies in copies) and to distribute information equally, faster and with greater security.

The study underscored these initiatives, noting benefits and successes derived on the ACP projects. Forward looking strategies then also addressed how the project could improve the electronic acquisition and dissemination of communications with outside parties and agencies, free of the imponderables of software incompatibilities, even to the extent of automating these operations with PIMS integrated packages.

A corollary to all the foregoing, is that the government Works Bureau is now issuing a policy statement to encourage all government works departments within its jurisdiction, to follow the lead shown by the Highways Department, to utilise PIMS enabled information management services for all major works throughout Hong Kong.

Conclusions

The construction industry in Hong Kong, is ready and willing to conduct its business electronically, certainly for major works projects.

Substantial benefits are realisable with PIMS aided project management. The technology to support it has been proven.

The overriding consideration is that, where such project support is to be coordinated across a large number of projects, the engagement of information management services has proved to be of paramount importance. The need for project based managers, taking on the twin tasks of information management and quality assurance, and also for associated technical support has been endorsed by the experience to date in the use of PIMS and by the research undertaken. This reflects the high level of liaison, in relation to the organisational practices and procedures, that is demanded.

REFERENCES

[1] Archer, G.O.; Futcher, K.G.; McMahon, M.A.. “Multi-particiant Project Information Management System”. Information Technology Support for Construction Process Re-Engineering". July, 1997. Paper CIB W78, 1997

[2] Boughton, G.O.; Futcher, K.G.; Torbet, E. “Project-Information-Management-Systems Deployed in Anticipation of Disputes on Multi-Contract, Non-Traditional Infrastructure Procurement”. Information Technology Support for Construction Process Re-Engineering". July, 1997. Paper CIB W78, 1997