A Study on the Site Management Applying Computer Software[*]

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<Abstract>

The construction industry in Ulsan seems to go backward rather than develop after the IMF stepped in to supervise Korean economy in 1997. Such inactivity is due to the decrease of the quantity of construction works and the fierce struggle to survive among contractors and construction companies. But one more important but often overlooked reason is that companies do not use scientific managing methods due to the lack of know-how and experience. A scientific construction method is urgently needed for small-size general contractors or construction companies in Ulsan. They generally use instinctive methods rather than formal scheduling. One alternative is to introduce CPM-based computer software. This study aims to evaluate the consequences of computerizing a construction project. A real project was selected, an As-Should-Have-Been CPM network was prepared and it was computerized using commercial software. The analyses and reports available from the computerization will greatly help the contractor and its field engineers.

컴퓨터 소프트웨어를 이용한 건설현장관리에 관한 연구

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<요 약>

최근 울산의 건설산업은 건설수주물량의 감소와 건설업체의 난립으로 매우 침체되어 있

으며, 많은 회사들이 경쟁력을 지니지 못하고 있는 실정이다. 현장관리에 있어서 과학적인 관리기법을 사용하지 않음으로 경쟁력을 갖추지 못한 회사가 대부분이다. 본 연구에서는 과학적 관리기법 중 하나인 CPM기반 컴퓨터 프로그램을 이용하여 현장을 관리할 수 있는 방법을 모색해 보고자 한다. 실제로 실행된 프로젝트를 하나 선정하여 그 공사의 공정을 전산화할 때의 효과를 평가해 보고자 하는 것이 본 연구의 목적이다. 울산소재 중소건설회사가 시공한 N중학교 강당신축공사가 연구대상으로 선정되었으며, 이 프로젝트의 CPM공정표가 작성되고 P 소프트웨어를 이용하여 전산화하고 이를 분석 평가하였다. 그 결과 건설현장관리를 위해 기존의 단순한 바챠트식의 공정관리를 떠나 CPM을 기반으로 한 소프트웨어를 도입한다면 많은 이익이 업체에 돌아갈 것으로 평가되었다.

1. Introduction

Contractors and construction companies of Ulsan do not use CPM software to manage their projects. Computer software run in a personal computer can assemble all the information to the project managing team and help make a good management.

In this study a real construction project was analyzed using commercial scheduling software, expecting many advantages of computer-applying management could be revealed. By doing this, introduction of CPM software to Ulsan can be expedited.

To carry out the study a sample project was selected. Interview of CEO and field engineer was carried out. An As-Should-Have-Been CPM network was made and computerized. Evaluation with analyses and reports led to conclusions.

2. Sample Project

The CEO of a contractor, SP CO. LTD., was interviewed. He recommended a sample project among those his company had successfully performed. And he also offered much information about the construction industry in Ulsan. CPM software was not introduced to his company, neither to other contractors in Ulsan. He was eager to import CPM software and practice it in his company. He would decide after he saw the result of this study. The field engineer of the sample project was also interviewed. He gave some information about the sample project.

The project was a construction work of a gymnasium building in a middle school in Ulsan. The owner was Ulsan provincial office of education and the contractor was SP co. ltd. The construction work would begin on August 24, 2001 and end on February 18, 2002 according to the contract. The duration is 6 months. The budget is 615 million won. The work was composed of 4 major parts, mobilization and preparation, main building construction, septic tank construction, and mechanical work.

The project was actually finished toward the end of February 2002 with some days delayed, but no penalty was charged.

3. Scheduling with computer software

All information about the project was submitted for review; main contract, sub-contract, drawings, specifications, bill of quantity, field diary, Ghant chart, and insurance contract. And utilizing these data an As-Should-Have-Been CPM schedule could be made. Then it was computerized using P scheduling software. P software is a very famous one in the market.

Time estimate of each activity was done with the help of the field engineer. Also every budgeted cost of activity was calculated by reorganizing the bill of quantity. Estimating costs by activity was newly calculated.

Since almost all parts of the work were given to sub-contractors resources are difficult to be input to the program. So resource planning was omitted. Completed CPM schedule had 61 activities in all and 59 task activities and 2 flag(milestone) activities of START and FINISH.

4. Analyses and Reports

Once the CPM network was completed with software it was very easy to manipulate the what-ifs of the project.

ADM network was shown in FIG 1 and 2. There were 27 activities in the critical path. Critical activities could be differentiated easily with color designation. Also PDM graph could be easily drawn from the computer.(FIG 3) In the opening screen many informations could be gathered such as activity ID, Activity Description, Duration, EST, EFT, LST, LFT, TF, Cost, Budget. And these data give valuable information to a field engineer.

From the computer program many reports could be drawn. A scheduling report could be obtained after the schedule is renewed.(FIG 4) The data-date was Dec. 3. 2001.

From the scheduling report also many informations such as start date, finish date and network logic could be obtained. If there is any inconsistency of logic as loop-forming it can be easily detected from the scheduling report.

Estimate of cost projection could be also obtained by computer manipulation.(Fig. 5)

Using data export function many other reports could be made in spread-sheet software such as Excel and arranged data could be easily imported to the CPM network by data import function.
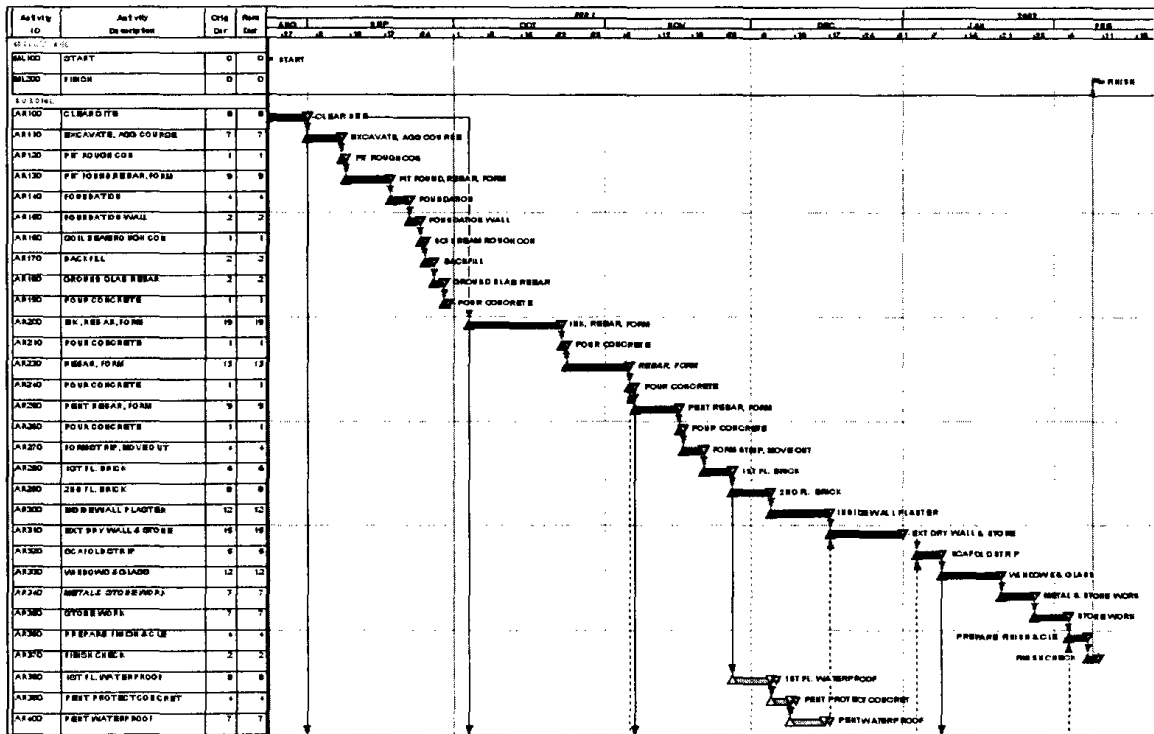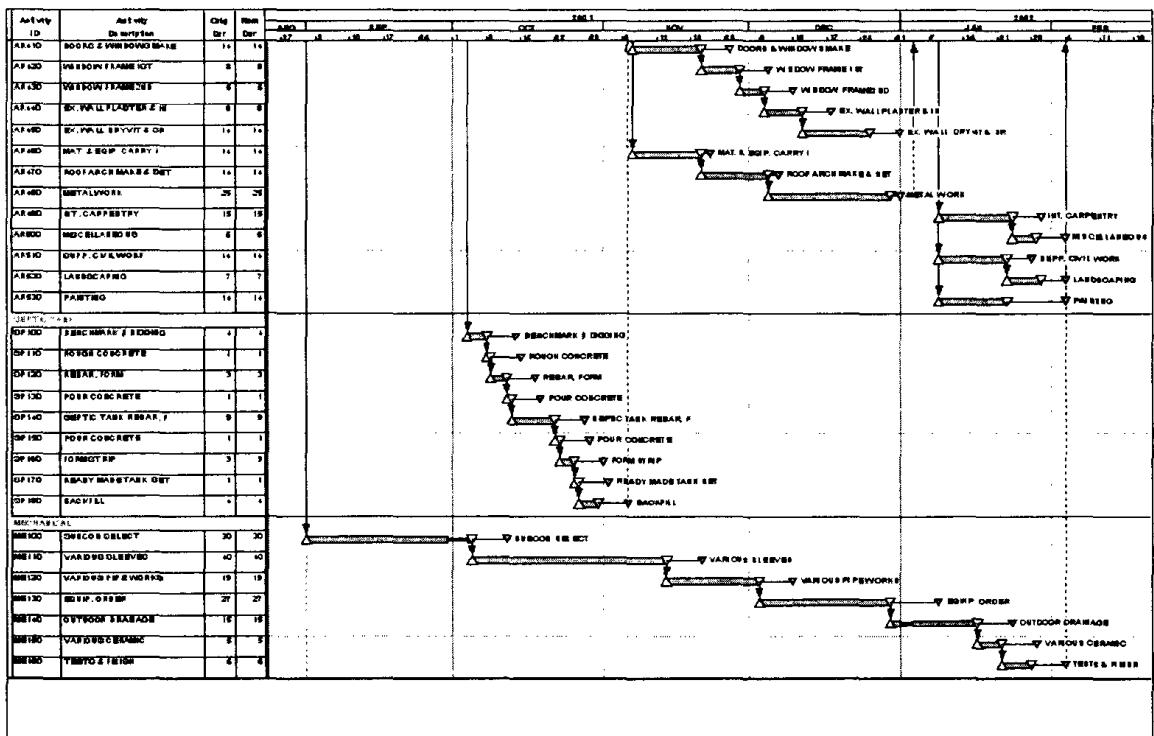
FIG 1. CPM Network by ADM

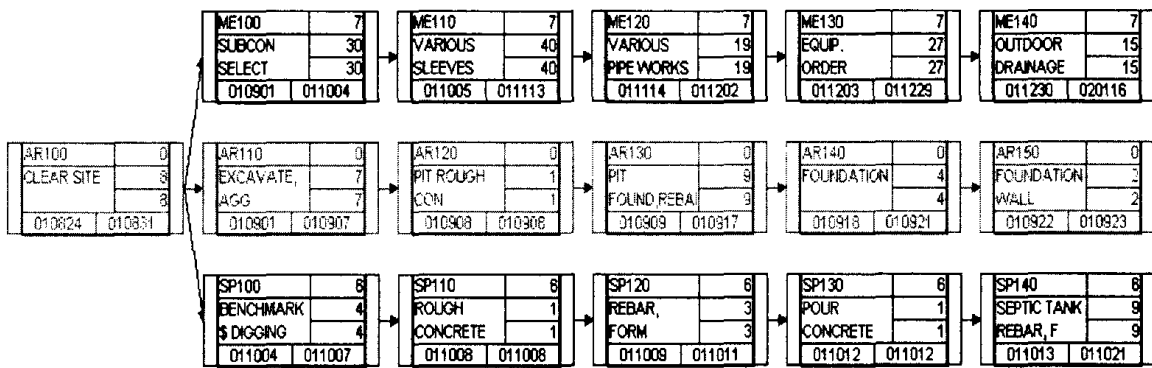FIG 2. CPM Network by ADM(Continued)

ME100	7
SUBCON	30
SELECT	30
010901	011004

ME110	7
VARIOUS	40
SLEEVES	40
011005	011113

ME120	7
VARIOUS	19
PIPE WORKS	19
011114	011202

ME130	7
EQUIP.	27
ORDER	27
011203	011229

ME140	7
OUTDOOR	15
DRAINAGE	15
011230	020116

AR100	0
CLEAR SITE	8
	8
010824	010831

AR110	0
EXCAVATE,	7
AGG	7
010901	010907

AR120	0
PIT ROUGH	1
CON	1
010908	010908

AR130	0
PIT	9
FOUND REBA	9
010909	010917

AR140	0
FOUNDATION	4
	4
010918	010921

AR150	0
FOUNDATION	2
WALL	2
010922	010923

SP100	6
BENCHMARK	4
$ DIGGING	4
011004	011007

SP110	6
ROUGH	1
CONCRETE	1
011008	011008

SP120	6
REBAR,	3
FORM	3
011009	011011

SP130	6
POUR	1
CONCRETE	1
011012	011012

SP140	6
SEPTIC TANK	9
REBAR, F	9
011013	011021

FIG 3. CPM Network by PDM(a part of the whole)

```
Constraint listing -- Scheduling Report Page: 2


 Activity   Date            Constraint
 ---------- -------  -----------------------------
ML100               Start Flag
ML200               Finish Flag


Open end listing -- Scheduling Report Page: 3
----------------
Activity AR100       has no predecessors
                               Activity AR370      has no successors
```

```
Scheduling Statistics for Project PR01:
Schedule calculation mode  - Retained logic
Schedule calculation mode  - Contiguous activities
Float calculation mode     - Use finish dates
SS relationships           - Use early start of predecessor


        Schedule run on Fri Apr 25 00:13:32 2003
                 Run Number  53.


     Number of activities...................     61
     Number of activities in longest path..      9
     Started activities.....................     37
     Completed activities...................     33
     Number of relationships................     66
     Percent complete.......................   52.0
     Number of flags........................      2


     Data date..............................  03DEC01
     Start date.............................  24AUG01
     Imposed finish date....................
     Latest calculated early finish.........  16FEB02
```

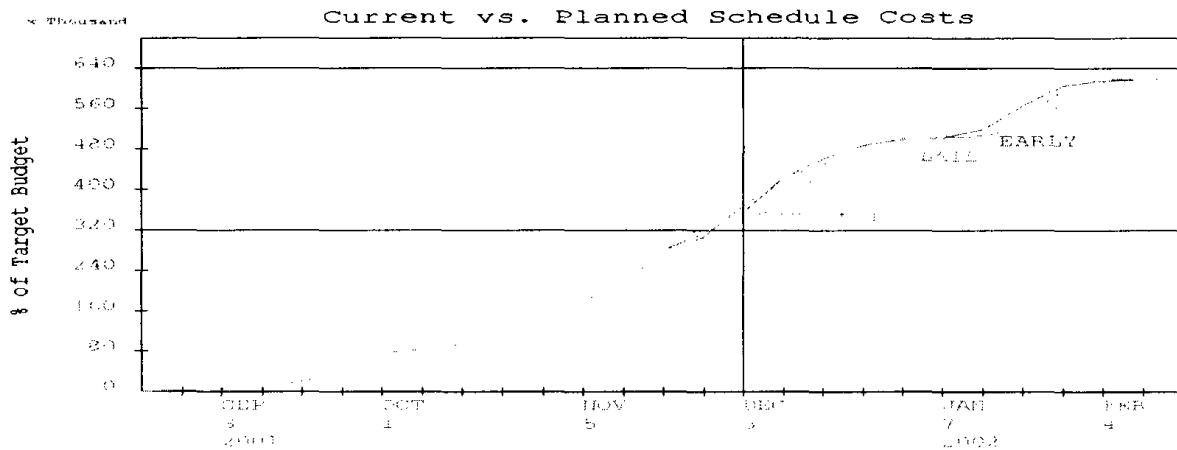FIG 4. Scheduling Report

Current vs. Planned Schedule Costs

FIG 5. Cost Projection Graphic Report

5. Conclusions

The CEO was interviewed again with the results. Reviewing various reports and manipulations he was satisfied. The following advantages could be stated.

1) When a prototype network is completed it can be easily manipulated to be used in varying occasions.
2) Even small companies can afford to purchase a CPM software and it will compensate for the investment.
3) Management can have definite and correct reports from the fields.

To make a software-using environment the following prerequisites are necessary.
1) People in the company should have knowledge about CPM and Software.
2) They should receive training to be accustomed to the software.
3) CEOs should have the will to introduce CPM software to their companies.
4) Modest budget is needed to train people and buy software.

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