Activity-Based Job Costing for Integrating Estimating, Scheduling, and Cost Control

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ABSTRACT: This article describes an activity-based approach to job costing and control that provides a simple yet effective method of integrating the four functions of estimating, scheduling, job costing, and accounting. This approach was developed for a medium-sized industrial and commercial building contractor that was attempting to diversify and expand its operations. The problems faced by the contractor and the solutions described in this article are reflective of the state of practice for many small- and medium-sized contractors. The basis of activity-based job costing is the reporting of costs against activities (i.e. activity codes), combined with the traditional cost codes used in accounting-based cost control. The tracking of change orders is discussed in light of the proposed approach. Sample data acquisition and job costing reports are presented and illustrated using an example based on the Masterformat cost codes. The proposed approach of activity-based job costing provides a simple yet effective method of tracking costs in the field and provides a natural link to estimating, scheduling, and accounting.

KEY WORDS: accounting, budget, cost control, data collection, estimating, job costing, and scheduling.

Effective monitoring of the progress of a construction project requires the integration of the estimating, scheduling, and job costing functions. Information is collected in the field and tracked against planned values to detect deviations in actual performance. Issues that always arise are in what form and to what level of detail should such data be collected.

A medium-sized industrial building contractor specializing in the petroleum industry in Alberta was attempting to diversify by becoming more active in the commercial and light industrial markets. The company was expanding its operations in other regions and increasing the number of projects it performed simultaneously. The need, therefore, had arisen for improved management information systems to enable the company to remain competitive and profitable [6].

The company had a number of objectives, including the following.

- To improve the flow and completeness of project-related data;
- To have access to timely information on project status at any given point in a project.
- To reduce the amount of paper work and rehandling of data; and,
- To develop better reporting methods to help management make more informed business decisions.

Work was done with the company to accomplish the following.

- document their existing business practices;
- identify areas for improvement;
- compare their practices to those of other similar companies;
- develop an improved method for field data acquisition and job costing; and,
- develop a prototype of a computerized field data acquisition and job costing system.

The company had in place a number of computerized systems for estimating, payroll, accounting, and job cost tracking, yet few of these systems were effectively integrated. The estimate was being used for bidding purposes only and was not being converted to a budget for job cost tracking. Better information on budgeted costs was required by superintendents running the jobs for effective tracking of actual costs. A feedback loop was required between job costing and estimating, which could be achieved by relating the estimating codes to the cost codes. Actual performance and costs of activities could then be tracked and used in developing future bids.

The cost code breakdown structure required improvement. Existing cost codes were representative of pay items, such as concrete, formwork, and reinforcing steel. Cost codes should be representative of actual activities that occur on site and at a level of detail that is feasible for reporting and monitoring costs. A clear distinction between cost codes is essential, so that each cost has a well-defined category and costs can not be allocated to more than one category. The cost codes should cover all aspects of the work and distinguish between operations that exhibit distinct productivities (e.g. manual methods of excavation should be tracked separately from mechanized methods). Furthermore, in order to accurately forecast costs at completion, a method was required for reporting the proportion of activities complete in a given time period and their associated costs. To achieve this, the costs recorded against cost codes on the daily reports needed to be associated with specific activities on site.

Many of these problems are common among construction companies and are a result of the limitations on the resources available for project management. An activity-based approach to job costing and control was developed to address some of these problems. The basis of activity-based job costing is the reporting of costs against activities (i.e. activity codes), combined with the traditional cost codes used in accounting-based cost control. It reflects the way in which costs are commonly tracked in the field. Activity codes are used to represent the activities defined in the estimate and the schedule, thus providing a link to these functions. The use of activity codes and cost codes provides a simple, yet effective, method of integrating the four functions of estimating, scheduling, job costing, and accounting. The activity-based

approach to job costing and control is described in this article.

TRADITIONAL JOB COSTING

Traditional job costing involves tracking the quantity complete and cost of each pay item, which is defined by a cost code. Masterformat [5] is an example of a cost code breakdown used in traditional job costing. The cost codes, however, do not represent a natural breakdown of the activities on site. For example, 03310 is the Masterformat cost code for structural cast-in-place concrete. This cost code may be associated with more than one activity on a project, each of which may occur at different times throughout the project. Estimating and scheduling are done on the basis of activities, which makes it difficult to track progress if reporting is done on the basis of cost codes only. Clearly, while the traditional approach to job costing may satisfy the needs of accounting, it does not match the way in which costs are tracked in the field. Furthermore, if costs are collected on the basis of cost codes, the costs associated with unrelated activities (e.g. footings and foundation walls) are lumped together. Budget variance is then made on the basis of each cost code rather than for each individual activity. This approach prevents any meaningful comparison of costs between similar activities on different projects.

ALTERNATIVE METHODS OF JOB COSTING

An alternative approach to job costing is required, which overcomes the deficiencies of traditional methods. Several researchers have proposed alternative methods for construction. D. W. Halpin [7] proposed a project configuration model (PCM) for organizing project information based on physical segments of the construction. W.J. Rasdorf and O.Y. Abudayyeh [12] discussed various models developed for integrating cost and schedule control. Amongst these is P.M. Teicholz's model [15], wherein a mapping mechanism is proposed between a given cost account in the cost breakdown structure (CBS) and one or more activities (tasks) in the work breakdown structure (WBS) that relate to that account. Each cost account is divided into percentages that are allocated to given tasks in the WBS. C.T. Hendrickson and T. Au [8] used work elements as a link between the WBS and the CBS, wherein a cost account can relate to one or more activities, and an activity can relate to one or more cost accounts. W.C. Ibbs and J.J. Kim [10] developed a model for integrating work packages in the WBS, cost accounts in the CBS, and design objects on the drawings. All of these proposed models maintain multiple views of the project, adding to the data acquisition and tracking tasks.

S.F. Abu-Hijleh and W.C. Ibbs [2] proposed a method of exception reporting that combines different reporting perspectives: the work breakdown structure (WBS), work classification breakdown structure (WCBS), organizational breakdown structure (OBS), and schedule activities. Actual performance data is captured at the level of work elements, which are the lowest elements in the WCBS. Reporting, however, can be done on the basis of any of the other perspectives by making use of different sort fields in the account code. While the system is flexible, it requires a long multiple-

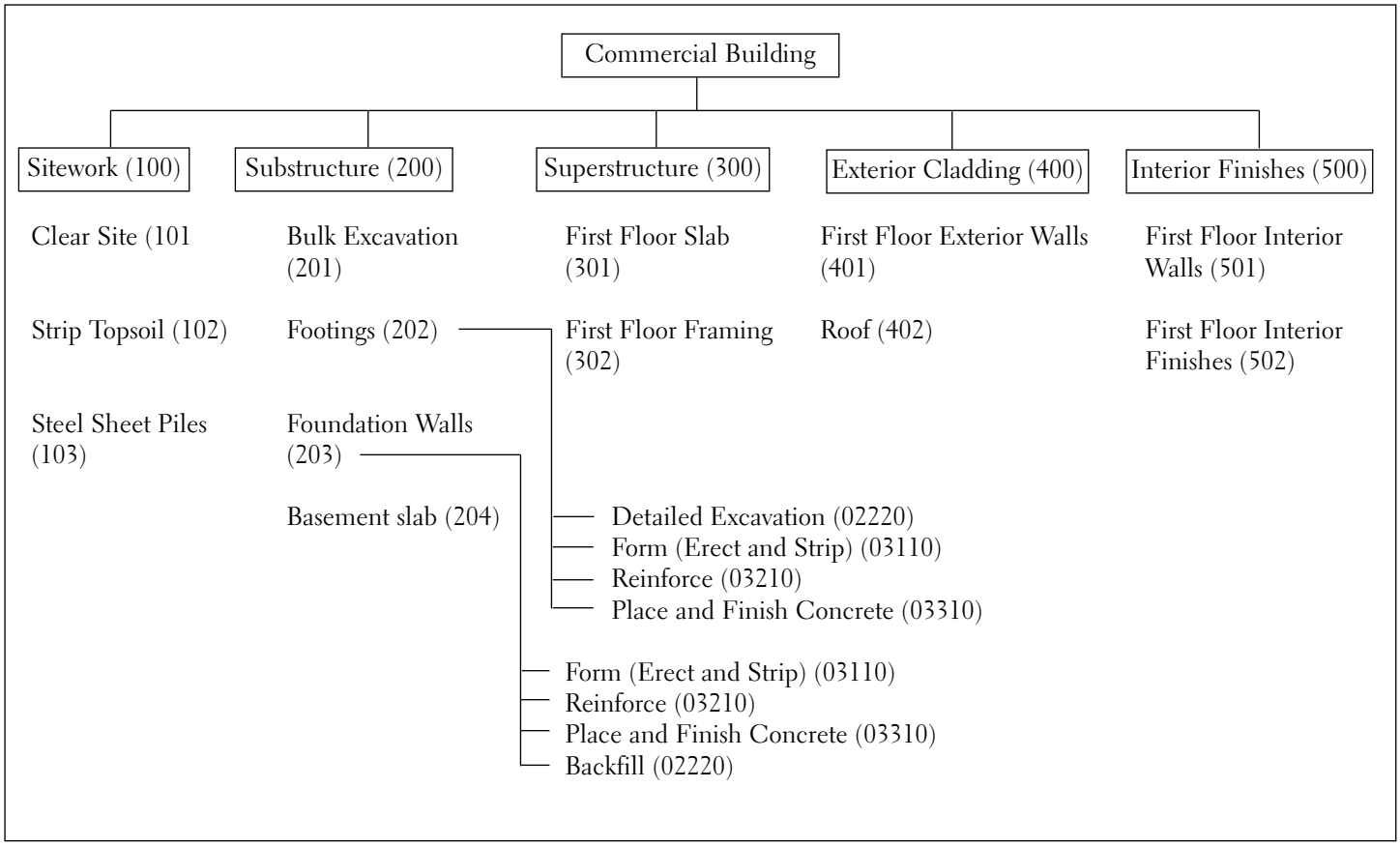

Figure 1—Partial Work Breakdown Structure of a Commercial Building

part account code to capture the different perspectives.

W.J. Rasdorf and O.Y. Abudayyeh [1, 12] presented an activity-based approach to cost control using work packages in the WBS as the basis for cost control. The model, called the cost/schedule control system criteria (C/SCSC), adds cost data to the WBS and eliminates the CBS. Costs are tracked at the work package level, which may be at a higher level than the activity level. W.J. Rasdorf and O.Y. Abudayyeh noted that the data-acquisition requirements of their model are so detailed and large that problems and resistance to the model have occurred.

Activity based costing (ABC) was developed in modern accounting practices, initially for the manufacturing industry. ABC is now also used by some service industries and engineering firms. It was primarily developed to address the allocation of overhead (indirect) costs. ABC breaks each product or service (i.e., a project) into a number of discrete activities. Each activity consumes resources, which carry costs. Activities can be direct or indirect activities that contribute to a product. A hierarchy of activities can be created to reflect different levels of product development. Activities are aggregated and applied to a specific product or service. The cost of that product or service is the sum of the costs of the resources consumed by all activities identified with that product or service. In this way, each product or service receives its actual share of indirect costs, which have been assigned to one or more activities associated with that product. An extensive literature exists on the topic of ABC. Recent references include [3, 4, 9, 11, 13, 14, 16]. The concepts of ABC, however, are rarely applied in construction.

The activity-based approach to job costing proposed in this article treats the traditional cost codes (e.g. Masterformat) as tasks in the WBS (i.e., activities at the lowest level in the WBS). Therefore, it does not impose

Table 1—Partial Work Breakdown Structure of a Commercial Building

Activity Code (1)	Activity (2)	Cost Code (3)	Task (4)
101	Clear Site	02110	Clear Site
102	Strip Topsoil	02115	Strip Topsoil
103	Steel Sheet Piles	02360	Steel Sheet Piles
201	Bulk Excavation	02220	Bulk Excavation
202	Footings	02220	Detailed Excavation
		03110	Form (Erect and Strip)
		03210	Reinforce
		03310	Place and Finish Concrete
203	Foundation Walls (Basement)	03110	Form (Erect and Strip)
		03210	Reinforce
		03310	Place and Finish Concrete
		02220	Backfill
204	Basement Slab	02220	Detailed Excavation
		02230	Gravel Fill
		03110	Form (Erect and Strip)
		03210	Reinforce
		03310	Place and Finish Concrete
301	First Floor Slab	03110	Form (Erect and Strip)
		03210	Reinforce
		03310	Place and Finish Concrete
302	First Floor Framing	05120	Structural Steel Framing
		05210	Steel Joists
		08510	Windows
		08110	Doors
401	First Floor Exterior Walls	07650	Fabric Flashing
		04220	Concrete Block
		04100	Mortar
		04210	Face Brick
402	Roof	05310	Steel Deck
		07192	Vapor Barrier
		07220	Insulation
		07520	Roofing Membrane
501	First Floor Interior Walls	09260	Gypsum Walls
		09920	Painting Walls
502	First Floor Interior Finishes	09310	Ceramic Tile
		09685	Carpet
		09510	Acoustic Suspended Ceiling

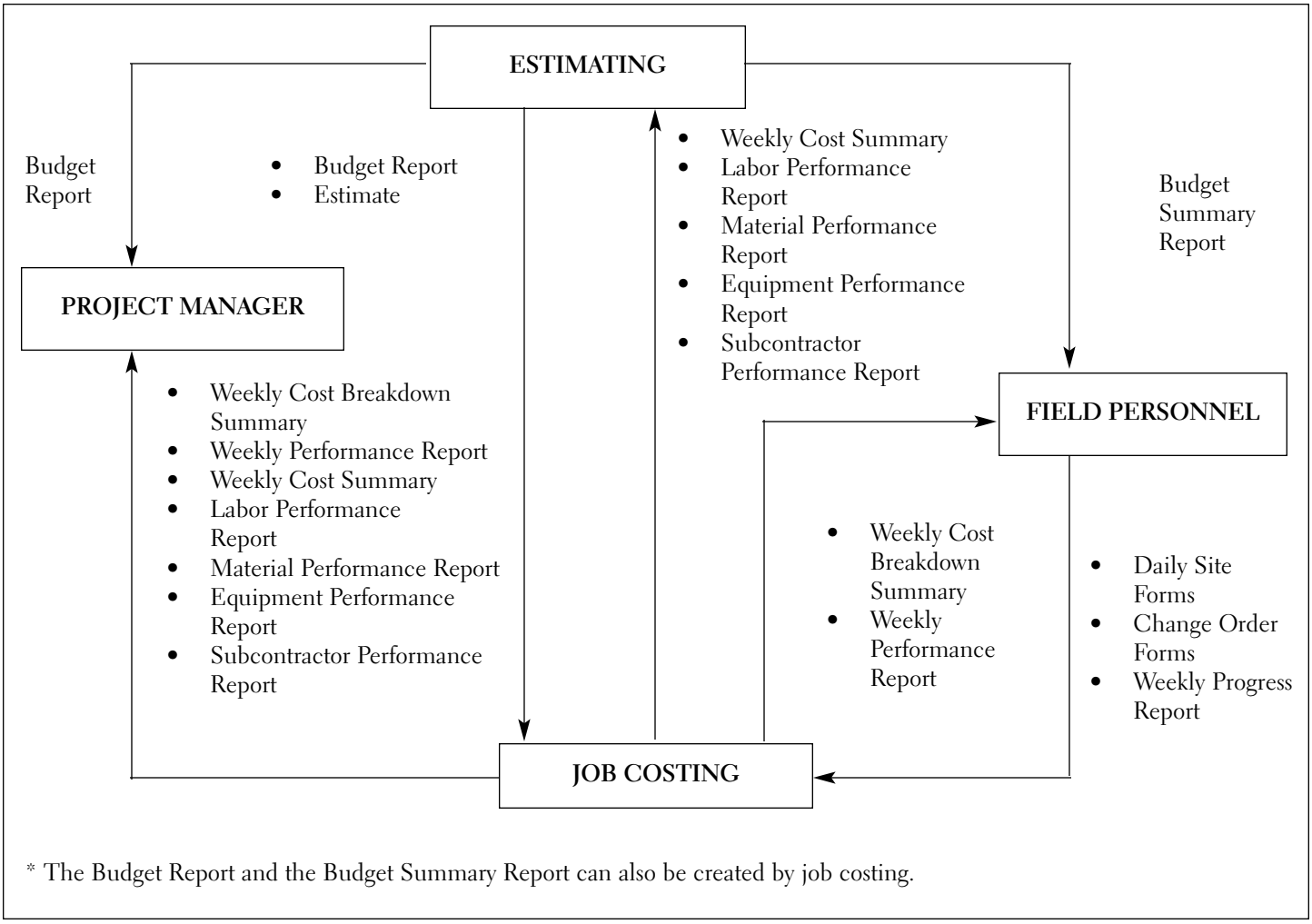

Figure 2—Flow of Data Acquisition and Job Costing Reports

additional nor unrealistic data collection requirements. Furthermore, it operates on the basis of the project WBS, which is shared by the estimate and the schedule. Costs can be summarized by cost code, enabling the same data to be used by accounting. This approach is described in the remainder of this article.

AN ACTIVITY-BASED APPROACH TO JOB COSTING AND CONTROL

The activity-based approach to job costing requires that costs be recorded against the lowest level activities in the project WBS (i.e., at the task level). Costs are coded against cost codes (which represent tasks) combined with activity codes, creating a unique code for each task. Traditional accounting cost codes, such as Masterformat or any other standard set of cost codes, can be used to represent lowest level activities (i.e., tasks) in the WBS (see figure 1 and table 1), providing a link to accounting. These tasks correspond to estimated and scheduled items, providing a link to estimating and scheduling. Scheduling may be done at the less detailed activity level (e.g., activity 201, 202, etc.) rather than at the task level.

Each project would have a list of activity codes and a list of cost codes, with a many-to-many relationship between these two lists (i.e., an activity code can have more than one cost code associated with it, and a cost code can have more than one activity code associated with it). Thus, the list of cost codes would not increase as the number of activities increases, since the same cost code can be used with any number of activity codes. Ideally, there should be a standard list of activity codes and a standard list of cost codes used for all projects. Standardization would enable the comparison of actual costs, productivities, etc..., across projects, which would be useful for future estimates. Standardization of activity codes can be done for each class or type of project that a company constructs, such as commercial buildings, industrial facilities, roadworks, etc.

For each reporting period, site personnel would report the quantity complete for each activity code, combined with each cost code. The advantage of this approach is that the quantity complete of each activity can be effectively determined and associated with the costs to date for that activity. If the quantity complete was reported only against each activity on the project (rather than breaking the activity down into its cost codes), it would be difficult to assess which portions of the activity have been completed. For example, if the footings are 50 percent complete, this may mean that all of the forming and reinforcing steel have been done, but that none of the concrete has been poured. This method would not give an accurate assessment of the proportion of the activity that is complete, nor would it be possible to assess if the actual costs are within the budgeted costs for each cost code category. Conversely, if quantities and costs were reported against cost codes

Act. Code	Activity Description	Cost Code	Cost Code Description	Quantity	Labor Quantity	Labor $	Material Quantity	Material $	Equip. Quantity	Equip. $	Sub. Quantity	Sub. $	Total $	Unit Cost
202	Footings			91 m									3346	$36.77/m
		02220	Excavate	13 m3	17 mhr	340							340	$26.15/m3
		03110	Form	55 m2	12 mhr	240	55 m2	149					389	$7.07/m2
		03210	Reinforce	0.234 ton	4 mhr	80	0.234 ton	127					207	$884.62/ton
		03310	Concrete	18 m3	8 mhr	160	18 m3	2250					2410	$133.89/m3
203	Foundation			66 m									13180	$199.70/m
		03110	Form	403 m2	87 mhr	1740	403 m2	1388					3128	$7.76/m2
		03210	Reinforce	1.914 ton	27 mhr	540	1.914 ton	1034					1574	$822.36/ton
		03310	Concrete	62 m3	21 mhr	420	62 m3	7750					8170	$131.77/m3
		02220	Backfill	171 m3	10 mhr	200			10 hr	108			308	$1.80/m3

Figure 3—Budget Report

only, it would be difficult to assess what proportion of each activity is complete and what proportion of the costs are associated with each activity. The proposed approach yields a more accurate assessment of the project's progress than the traditional accounting-based approach to cost control.

SITE DATA ACQUISITION AND JOB COSTING REPORTS

Sample site data acquisition and job costing reports are presented, using the example in figure 1 and table 1. They can be modified to suit any company's practices. The site data acquisition reports consist of daily site forms, change order forms, and weekly (or other periodic) progress reports. These are the only forms that need to be completed by site personnel, keeping the data collection demands on personnel to a minimum. The job costing reports are generated from the data collected in the site data acquisition reports. They include the budget report, the budget summary report, the weekly performance report, the weekly cost breakdown summary, the weekly cost summary, the labor performance report, the material performance report, the equipment performance report, and the subcontractor performance report. Figure 2 shows the flow of these reports.

Budget Report and Budget Summary Report

The estimate may need to be revised to incorporate changes made since the award of the contract. The revised estimate should then be summarized in the form of a budget report, which is used as a basis for controlling costs during construction (see figure 3). Activities must be defined in such a way that their budgeted costs and quantities are known and that field personnel can report actual costs and quantities complete for each activity. If approved changes are made during the construction phase, the quantity of changes and their budgeted costs should be added to the original budget. The budget report may be further summarized into a budget summary report for use by field personnel. The budget summary report would indicate only the budgeted quantity, budgeted total cost, and budgeted unit cost for each task. These two reports form the baseline against which actual performance is tracked.

Field Data Acquisition Reports

The field data acquisition reports include the following.

- daily site forms for collecting labor, material, equipment, and subcontractor quantities and costs;
- change order forms for recording change order quantities and costs; and,
- a weekly progress report for collecting quantities complete of each task.

Daily Site Forms

Figure 4 and figure 5 show partial daily site forms, for labor data only. A similar format can be used for collecting data on materials, equipment, and subcontractors. These forms can be modified to collect other relevant information that a company may require, such as living out allowance (subsistence pay), weather and site conditions, safety items, taxes, markup, etc. The basis of these forms is that costs are recorded against both an activity code and a cost code, which together make up a task. A field to record a change order code (see figure 4) or to indicate that a task includes changes (see figure 5) is also provided. Methods of tracking change orders are described next.

Methods of Tracking Change Orders

On any project, changes may occur, some of which are owner-approved and some of which require negotiation between the owner and the contractor. A contract should therefore contain a changes clause, which establishes a mechanism for handling changes. Changes may involve changes to existing contract items, or they may involve the addition of new items to the contract.

The recording of change orders can be handled in one of several ways. One approach is to record all costs associated with change order work separately from regular contract costs. This approach requires the repetition of activity codes and cost codes on the daily site forms, so that the costs associated with changes can be

Change Order No.			1	1			
Activity Code	203	203	203	203			
Cost Code	03110	03210	03110	03210			
Employee Name/No.	# Hrs	# Hrs	# Hrs	# Hrs	Total Mhrs	$/Mhr	Total $
Matt Robinson 42350	6		3		9	22.00	198.00
Jackie Brown 67589	6		2		8	20.00	160.00
Kelly Anderson 98056		3		1	4	20.00	80.00
Bill Bowie 03632		3		1	4	20.00	80.00

Total Mhrs Today	25.00
Total Mhrs Previous	220.00
Total Mhrs to Date	245.00
Total Labor $ Today	518.00
Total Labor $ Previous	4780.00
Total Labor $ To Date	5298.00

Figure 4—Labor Time Sheets

distinguished from the costs associated with the original scope of work. Each change order would have a change order number assigned to it, which would be recorded on the daily site forms (see figure 4). The total costs associated with change orders would be reported on a daily basis, in addition to the total contract costs to date. The advantage with this method is that all the information required for progress tracking is contained on the daily site forms.

It may be difficult, however, for site personnel to distinguish between contract costs and change order costs, especially if the change is minor and/or is on an existing activity. An alternative method for tracking change orders requires a field on the daily site forms that reads, "including change" (see figure 5). Field personnel would check that field if the costs they are reporting also include costs associated with a change order. The change order forms would have a field for the activity code and the cost code next to each cost item reported. The costs reported on the change order forms could then be deducted from the costs reported on the daily site forms to deduce regular contract costs. The disadvantage with this approach is that it is not possible on the daily site forms to distinguish between regular contract costs and change order costs. The daily site forms would simply reflect the total project costs to date.

Weekly Progress Report

In order to track the progress of work and to understand the status of the project, the quantity of work complete for each task is required, in addition to the cost of the work. The weekly progress report (see figure 6) captures the quantity of work complete for all tasks scheduled on a weekly basis, which is a more appropriate time interval for progress tracking than a daily interval. All fields on the weekly progress report are pre-filled, except for the "quantity complete this week" and the "change order number" (if applicable), which are entered by site personnel. The quantity complete can be expressed as a physical quantity (as shown in figure 6) or as a percentage complete. Ideally, the quantity associated with regular contract items should be tracked separately from the quantity associated with change order items.

Job Costing Reports

Based on the information collected in the field, a number of job costing reports can be generated, as outlined in figure 2. These reports can flag exceptionally poor or exceptionally good performance and help explain variations in activity costs. The formulae for these reports are contained in appendix I.

Weekly Performance Report and Weekly Cost Breakdown Summary

The weekly performance report (see figure 7) is generated from the daily site forms and the weekly progress report. A weekly cost breakdown summary can be prepared, similar to the weekly performance report but which separates the costs to date of each activity into individual resource categories (labor, materials, equipment, and subcontracts).

The variance and index on the weekly performance report are indicators of activity performance. If variance is less than zero (i.e., index is less than one), then the cost performance of the activity is good. Using the variance and index, the project manager can, at a glance, identify which activities are experiencing difficulty and therefore need attention. The project manager can also use the "percent complete" columns to determine progress. The percent complete by quantity should match (or ideally exceed) the percent complete by cost. At early stages of activity completion (i.e., low percent complete), a greater tolerance for cost variance may exist due to normal mobilization and learning curve effects.

If the data indicate that an activity is over budget and includes a change, the associated change order forms should be checked for change orders that may be contributing to cost overruns. The project manager can then judge whether the problem is a result of a change order (e.g., due to interruptions in the work, rework, learning curve effects, etc.) or if the activity is truly experiencing problems.

Weekly Cost Summary

The weekly cost summary provides a detailed status of the activities on the project and provides historical data for future estimating. There are two versions of the weekly cost summary, depending on whether or not change order costs are kept track of separately from regular contract costs (see figure 8 and figure 9). In both versions, budget parameters include approved change order quantities and costs.

Including Change	Yes	Yes			
Activity Code	203	203			
Cost Code	03110	03210			
Employee Name/No.	# Hrs	# Hrs	Total Mhrs	$/Mhr	Total $
Matt Robinson 42350	9		9	22.00	198.00
Jackie Brown 67589	8		8	20.00	160.00
Kelly Anderson 98056		4	4	20.00	80.00
Bill Bowie 03632		4	4	20.00	80.00
			Total Mhrs Today		25.00
			Total Mhrs Previous		220.00
			Total Mhrs to Date		245.00
			Total Labor $ Today		518.00
			Total Labor $ Previous		4780.00
			Total Labor $ To Date		5298.00

Figure 5—Alternative Labor Time Sheet

Resource Category Performance Reports

The labor performance report (see figure 10), material performance report, equipment performance report, and subcontractor performance report are detailed analysis reports that provide information on the status of individual resource categories. When the project experiences problems, these reports provide detailed information to help identify the sources of problems and to help determine a solution. They also provide information on actual costs, which can be used for future estimating.

FUTURE DEVELOPMENT

An activity-based approach to job costing and control is described in this article. Its basis is the reporting of costs against tasks in the project WBS, each of which is represented by a unique code, composed of an activity code paired with a cost code. The activity-based approach to job costing and control provides a simple yet effective method of linking the estimating, scheduling, and accounting functions with the job costing function. With the data acquisition and job costing reports described in this article, a closed loop for site data acquisition and cost control is formed. Field data are collected and used to assess project performance, which is compared to planned performance, and provided as feedback to site and management personnel.

There are a number of advantages associated with the job costing approach described in this article, including the following.

- It maintains realistic field data collection requirements, and suits the way in which actual costs and quantities are collected in the field.
- It provides a method of categorizing costs by activity or by cost category, providing useful information for future estimating purposes. Information on the actual productivity and cost of individual activities can be easily determined using this approach.
- It provides up-to-date information on activity status, enabling project personnel to quickly identify activities experiencing difficulty at any stage of their completion, so that timely corrective actions can be implemented.
- It provides a method of documenting changes to the work and distinguishing their quantities and costs from original contract items.

The ability to standardize activity codes and cost codes also provides a number of advantages:

- Site personnel need only be familiar with a relatively small set of codes.
- The many-to-many relationship between activity codes and cost codes yields a system with extensive flexibility to suit most projects.
- Standardization of codes enables comparisons to be made across projects, which are useful for future estimating purposes.
- The ability to incorporate any set of standard cost codes, such as Masterformat, provides a natural link to existing accounting practices.

It is, however, time consuming to manually complete all of the site data acquisition and job costing reports, particularly since they share much of the same data and require extensive calculations.

Computerized data acquisition and cost control, operating from a central database, are the only solution for efficient project control. The activity-based approach to job costing and the corresponding reports described in this article can be easily converted into an automated data acquisition and job costing system. Electronic versions of the field data acquisition reports can be developed to provide single-source data entry. Hand-held computers for field data collection may prove to be a viable option. A central database would receive field data on a daily basis, from which up-to-date job costing reports can be automatically generated. Multi-user access and data synchronization are essential to enable field data to be incorporated and used to immediately update job costing reports, and to enable these reports to be viewed instantaneously in the office and on site. The data acquisition and job costing system can be linked to the estimating, scheduling, and accounting systems via the central database and a common input/output file format. Common data can then be shared and used for progress tracking, billing, payments, and preparation of future bids.

The problems and solutions described in this article are reflective of the state of the practice for the construction industry, particularly for small and medium-sized contractors. Limitations posed by management resources, short project time frames, and computer literacy of field personnel make

Act. Code	Activity Description	Cost Code	Cost Code Description	Budgeted Quantity	Previous Quantity Complete	Quantity Complete This Week	Change Order Number
202	Footings			91 m	40 m	51 m	
		03310	Concrete	18 m3	0	18 m3	
203	Foundation Walls		66 m + 10 m extra		15 m	14 m	
		03110	Form	464 m2	92 m2	86 m2	1
		03210	Reinforce	2.204 ton	0.435 ton	0.406 ton	1

Figure 6—Weekly Progress Report

site data acquisition and job costing a challenge. This article has attempted to provide some practical solutions to this problem.

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APPENDIX I
FORMULA FOR JOB COSTING REPORTS

Weekly Performance Report (Figure 7)

Actual quantity to date = Total quantity from weekly progress reports

Actual cost to date = Total costs from daily site forms and change order forms

Percent complete to date (by quantity) = Actual quantity to date/budgeted quantity

Where budgeted quantity = "Revised" budgeted quantity

= Original budgeted quantity + Quantity associated with approved change orders.

If change orders are not approved, then Budgeted quantity = Original budgeted quantity.

Percent complete to date (by cost) = Actual cost to date/budgeted cost

Where Budgeted cost = "Revised" budgeted cost

= Original budgeted cost + Cost associated with approved change orders.

If change orders are not approved, then Budgeted cost = Original budgeted cost.

Forecast cost at completion = Actual cost to date/ percent complete to date (by quantity) (assuming actual unit cost to date will prevail for the remainder of the project)

Variance = Forecast cost at completion - Budgeted cost (<= 0 is good)

Index = Forecast cost at completion/budgeted cost (<= 1 is good)

Act. Code	Activity Description	Cost Code	Cost Code Description	Budgeted Quantity to Date	Actual Quantity $ (BC)	Budgeted Cost Date $ (AC)	Actual Cost to to Date % (QUAN.)	Percent Complete to Date % (COST)	Percent Complete Completion $(FC=AC/%)	Forecast Cost at good) (FC-BC)	Variance (<0 is good) (FC/BC)	Index (<1 is (Y or N)	Includes Changes
202	Footings			91 m	91 m	3346							
		03310	Concrete	18 m3	18 m3	2410	2680	100%	111%	2680	270	1.11	No
203	Found. Walls			76 m	29 m	15177							
		03110	Form	464 m2	178 m2	3600	1685	38%	47%	4393	793	1.22	Yes
		03210	Reinforce	2.204 ton	0.841 ton	1813	598	38%	33%	1567	-246	0.86	Yes
										Total Contract to Date ($)			4871
										Total Change Orders to Date ($)			1012
										Total Costs to Date ($)			5883

Figure 7—Weekly Performance Report

Act. Code	Activity Description	Cost Code	Cost Code Description	Actual			To Complete		Forecast	% Complete		Variance	Index	Includes Changes
				Actu.Quan To Date (AQ)	Actu.Cost To Date $ (AC)	Unit Cost To Date (AUC)	Quan. To Complete (CQ)	Cost To Complete $ (CC)	Cost $ (FC)	Quan.	Cost	(<0 is good) $	(<1 is good)	
						AC/AQ	BQ-AQ	CQ*AUC	AC+CC	AQ/BQ	AC/BC	FC-BC	FC/BC	Yes or No
202	Footings			91 m										
		03310	Concrete	18 m3	2680	148.89	0	0	2680	100%	111%	270	1.11	No
203	Found. Walls			29 m										
		03110	Form	178 m	1685	9.47	286 m	2708	4393	38%	47%	834	1.22	Yes
		03210	Reinforce	0.841 ton	598	711.06	1.363 ton	969	1567	38%	33%	-239	0.86	Yes
										Total Contract to Date ($)				4871
										Total Change Orders to Date ($)				1012
										Total Costs to Date ($)				5883

Figure 8—Weekly Cost Summary

Weekly Cost Summary (Figure 8)
Actual:
Actual quantity to date = AQ = Total quantity from weekly progress reports
Actual cost to date = AC = Total costs from daily site forms and change order forms
Unit cost to date = AUC = AC/AQ
To complete:
Quantity to complete = CQ = BQ-AQ, where BQ = Budgeted quantity
Cost to complete = CC = CQ * AUC
Forecast cost (at completion) = FC = AC + CC = AC/ percent complete
Where percent complete = AQ/BQ (assuming actual unit cost to date will prevail for the remainder of the project)
Percent complete:
Quantity = AQ/BQ, where BQ = Budgeted quantity
Cost = AC/BC, where BC = Budgeted cost
Variance = FC - BC (<=0 is good)
Index = FC/BC (<= 1 is good)

Weekly Cost Summary Showing Changes (Figure 9)

Same as weekly cost summary (figure 8), plus:
Quantity to date total = AQ = Quantity to date (original) + Quantity to date (changes),
obtained from weekly progress reports
Cost to date total = AC = Cost to date (original) + Cost to date (changes)
= Total costs from daily site forms and change order forms

Labor Performance Report (figure 10)
Quantity:
Week = Total weekly quantity, from weekly progress reports
Cum = Total quantity to date, from weekly progress reports
Budg = Total budgeted quantity from budget report
Labor Cost:
Week = Total weekly labor costs, from daily labor time sheets
Cum = Total labor costs to date, from daily labor time sheets
Budg = Total budgeted labor costs, from budget report
Cost per unit:
Week = Week cost/week quantity
Cum = Cum cost/cum quantity
Budget = Budget cost/budget quantity
Variance:

Act. Code	Activity Descrip.	Cost Code	Cost Code Description	Actual							To Complete		Forecast Cost $ (FC)	Percent Complete to Date % (QUAN.)	Percent Complete to Date % (COST)	Variance (<0 is good) $	Index (<1 is good)
				Quan. To Date Original	Quan. To Date Changes	Quan. To Date Total (AQ)	Cost To Date Original $	Cost To Date Changes $	Cost To Date Total $ (AC)	Unit Cost To Date (AUC) AC/AQ	Quan. To Complete (CQ) BQ-AQ	Cost To Complete $ (CC) CQ*AUC	AC+CC			FC-BC	FC/BC
202	Footings			91 m	0												
		03310	Concrete	18 m3	0	18 m3	2680	0	2680	148.89	0	0	2680	100%	111%	270	1.11
203	Found. Walls			66 m	10 m												
		03110	Form	157 m2	21 m2	178 m2	1486	199	1685	9.47	286 m2	2708	4393	38%	47%	834	1.22
		03210	Reinforce	0.721 ton	0.120 ton	0.841	513	85	598	711.06	1.363 ton	969	1567	38%	33%	-239	0.86
													Total Contract to Date ($)				4871
													Total Change Orders to Date ($)				1012
													Total Costs to Date ($)				5883

Figure 9—Weekly Cost Summary Showing Changes

Act. Code	Activity Description	Cost Code	Cost Code Description	Quantity			Labor Cost ($)			Cost Per Unit			Variance ($)		Forecast	% Complete		Includes Changes
				Week	Cum	Budg	Week	Cum	Budg	Week	Cum	Budg	Week	Cum	Cost ($)	Quan.	Cost	
202	Footings																	
		03110	Concrete	18 m3	18 m3	18 m3	200	200	160	11.11	11.11	8.89	40	40	200	100%	125%	No
203	Found. Walls																	
		03110	Form	86 m2	178 m2	464 m2	609	861	2003	7.08	4.84	4.32	237	93	2246	38%	43%	Yes
		03210	Reinforce	0.406	0.841	2.204	100	210	622	246.31	249.70	282.21	-15	-27	550	38%	34%	Yes

Figure 10—Labor Performance Report

Week = [(Week cost per unit - Budget cost per unit) * Week quantity] (<= 0 is good)
Cum = [(Cum cost per unit - Budget cost per unit) * Cum quantity] (<= 0 is good)
Forecast cost = Cum cost per unit * budget quantity (assuming actual unit cost to date will prevail for the remainder of the project)
Percent Complete:
Quantity = Cum quantity/budg quantity
Cost = (Cum cost per unit * Cum quantity)/(Budget cost per unit * budget quantity)

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Act. Code	Activity Description	Cost Code	Cost Code Description	Budgeted Quantity	Actual Quantity to Date	Budgeted Cost $ (BC)	Actual Cost to Date $ (AC)	Percent Complete to Date % (QUAN.)	Percent Complete to Date % (COST)	Forecast Cost at Completion $(FC=AC/%)	Variance (<0 is good) (FC-BC)	Index (<1 is good) (FC/BC)	Includes Changes (Y or N)
202	Footings			91 m	91 m	3346							
		03310	Concrete	18 m3	18 m3	2410	2680	100%	111%	2680	270	1.11	No
203	Found. Walls			76 m	29 m	15177							
		03110	Form	464 m2	178 m2	3600	1685	38%	47%	4393	793	1.22	Yes
		03210	Reinforce	2.204 ton	0.841 ton	1813	598	38%	33%	1567	-246	0.86	Yes
										Total Contract to Date ($)			4871
										Total Change Orders to Date ($)			1012
										Total Costs to Date ($)			5883

Figure 7. Weekly Performance Report