



Budgeting: Planning for Success

Budgeting and Decision Making

Christopher J. Skousen; Larry M. Walther

Larry M. Walther

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Budgeting: Planning for Success – Budgeting and Decision Making

1st edition

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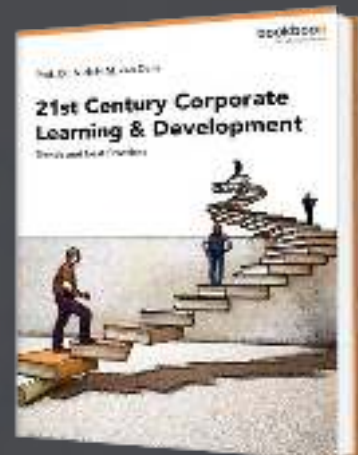
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Budgeting: Planning for Success

Your goals for this “budgeting” chapter are to learn about:

- The importance and use of budgets within an organization.
- The budget process and the impact of human behavior.
- The various components of a master budget.
- Budget periods and budget adjustments.



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1 Importance of Budgets

In beginning to write this chapter, I tried to find words to “sugar coat” the title. Perhaps the word “budget” could be avoided altogether. Words like “financial map” or “operational guide” might be suitable alternatives. After all, for those of you already in the workforce, you probably associate the word “budget” with “dread” or “drudgery” or some other less than flattering term. No doubt, some employees will question the need for a budget. The process of budget preparation is sometimes seen as painful, and it is not always clear how the effort that is required leads to any productive output. Furthermore, budgets can be seen as imposing constraints that are hard to live with, and establishing goals that are hard to meet!

Despite the rather dismal introductory remarks, it is imperative that organizations carefully plan their financial affairs to achieve financial success. These plans are generally expressed as “budgets.” A budget is a detailed financial plan that quantifies future expectations and actions relative to acquiring and using resources. Budgets don’t guarantee success, but they certainly help to avoid failure.

1.1 Forms and Functions

Budgets can take many forms and serve many functions. Budgets can provide the basis for detailed sales targets, staffing plans, inventory production, cash investment/borrowing, capital expenditures (for plant assets, etc.), and on and on. Budgets provide benchmarks against which to compare actual results and develop corrective measures. Budgets give managers “preapproval” for execution of spending plans. Budgets allow managers to provide forward looking guidance to investors and creditors. Budgets are necessary to convince banks and other lenders to extend credit.

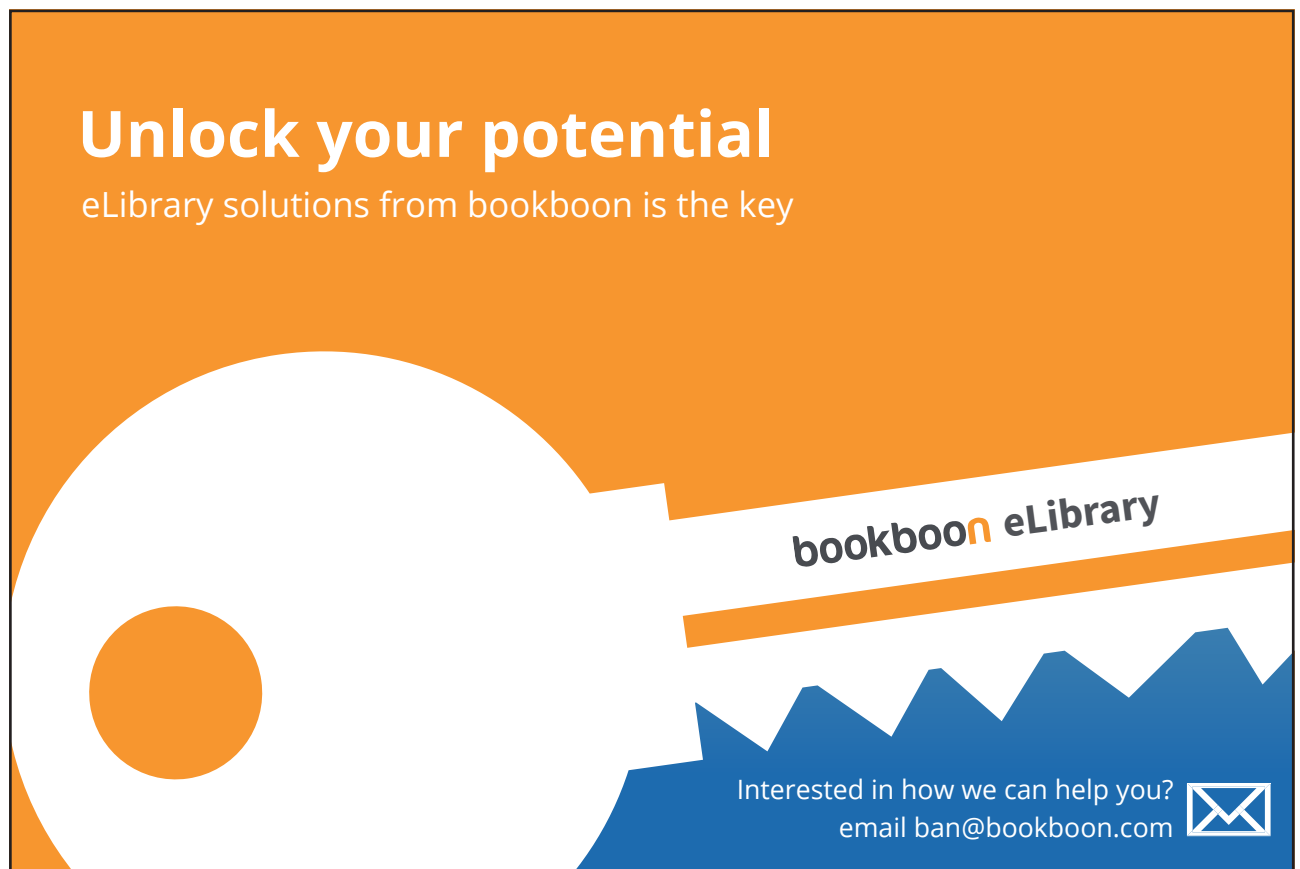
This chapter will illustrate the master budget which is a comprehensive set of documents specifying sales targets, production activities, and financing actions. These documents lead to forward looking financial statements (e.g., projected balance sheet, etc.). Other types of budgets (e.g., flexible budgets) are covered in subsequent chapters.

1.2 Avoiding Business Chaos

Perhaps the most compelling case for budgeting is to try to imagine an organization without a budget.

In small organizations, formal budgets are actually a rarity. The individual owner/manager likely manages only by reference to a general mental budget. The person has a good sense of expected sales, costs, financing, and asset needs. Each transaction is under direct oversight of this person and hopefully they have the mental horsepower to keep things on a logical course. When things don't go well, the owner/manager can usually take up the slack by not taking a paycheck or engaging in some other form of financial exigency. Of course, many small businesses ultimately fail anyway. Explanations for failure are many and varied, but are often pinned on "undercapitalization" or "insufficient resources to sustain operations." Many of these postmortem assessments reflect a failure to adequately plan! Even in a small business, an authentic business plan/budget can often result in anticipating and avoiding disastrous outcomes.

Medium and larger organizations invariably rely on budgets. This is equally true in businesses, government, and not-for-profit organizations. The budget provides a formal quantitative expression of expectations. It is an essential facet of the planning and control process. Without a budget, an organization will be highly inefficient and ineffective. Let's consider a "case study" into the importance of budgeting.

An advertisement for Bookboon eLibrary. The background is orange. On the left, there is a large white gear with an orange circle in the center. A white banner with an orange border curves across the middle, containing the text "bookboon eLibrary" in black. Below the banner is a blue jagged line representing a mountain range. In the bottom right corner of the ad, there is white text: "Interested in how we can help you? email ban@bookboon.com" followed by a white envelope icon.

Unlock your potential
eLibrary solutions from bookboon is the key

bookboon eLibrary

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1.3 An Electrifying Case in Budgeting

Imagine that you have just been appointed as general manager of a newly constructed power plant. Further imagine that you have considerable flexibility in running all facets of the plant. But, your compensation and ultimately your job will depend on the financial success of the venture. What is one of the first tasks you will undertake? Think about this question for a few minutes....

You have probably concluded that you need to quickly get a handle on the finances of the business. Your mind likely raced over a number of daunting challenges. How many customers will be served? What are the peak load electricity needs for these customers? What rate can be charged and will it be enough to cover expenses? How much fuel will be necessary to produce the electricity? How many employees must be available? Will the cash supply always be sufficient to meet cash outflow requirements? Furthermore, once the answers to these questions are in hand, how will actions be executed and controlled? In other words, once you decide how much fuel is needed, how will you make sure it is actually purchased (and no more!)? Once you conclude on the staffing plan, how do you put it in place? What will you do about expected periods of cash shortages?

Perhaps the above is simply too much to deal with. Let's assume you decide instead to spend all your time on marketing and personnel management. You join every possible community organization to get the word out about your company. You engage in countless publicity efforts. You attend every employee event, and you get to know most every employee on a personal level. In short, you do a marvelous job of selling electricity and motivating the employees to pull together as a cohesive caring team. Let's assume your efforts sold lots and lots of electricity! Unfortunately, the sales growth was such that the local natural gas pipeline could not deliver enough fuel to your plant to meet your demand. This caused you to truck in more expensive fuel oils to produce the electricity. In addition, the Transmission Department ordered a huge supply of replacement transformers just in case there was a bad electrical storm. Unfortunately, there was an ice storm and the Transmission Department did not have funds to acquire replacement wires that were destroyed. Your suppliers became concerned, as they sensed that your revenues might be inadequate to cover the added fuel cost and down-time due to the ice storm. As a result, vendors began to insist on shortened payment terms, thereby crunching the company's cash supply. To solve this problem, it was necessary to reduce the workforce, which generated ill will among all employees who now believe your caring attitude was anything but genuine. The disgruntled workforce became less responsive to the customers, and those customers began shifting to other electric providers.

Let's rewind this unfortunate scenario, this time utilizing a plan. Careful studies are performed to determine the most efficient levels of production for the plant, in conjunction with an assessment of customer demand. The expected sales are translated into a schedule of expected daily electricity production. Based on this information, long-term supply contracts are negotiated for natural gas supplies. Staffing plans are developed that optimize the number of employees and their work times. Contingency plans are developed for a variety of storm/catastrophe scenarios. Periods during which cash might be tight are noted and a line of credit is set up with a local bank to cover those periods. All of these activities lead to a projected outcome. Once the plan is in place, your managers will be authorized to act consistent with the plan, without having to clear every detail with you. It will be your job to monitor operations and take corrective actions when you observe deviations from the plan. The remainder of your time can be spent on public relations, employee interaction, and so forth. But, you are no longer flying blind; instead, your entire team is steering toward an expected outcome.

1.4 Recapping Benefits of Budgeting

As you can now see, the budget is an essential tool to translate abstract or general plans into specific action oriented goals and objectives. By adhering to the budgetary guidelines, the expectation is that the identified goals and objectives can be fulfilled.

It is crucial to remember that a large organization consists of many people and parts. These components need to be orchestrated to work together in a cohesive fashion. The budget is the tool that communicates the expected outcome, and provides a detailed script to coordinate all of the individual parts to work in concert.

When things don't go as planned, the budget is the tool that provides a mechanism for identifying and focusing on departures from the plan. The budget provides the benchmarks against which to judge success or failure in reaching goals and objectives and facilitates timely corrective measures.

Operations and responsibilities are normally divided among different segments and managers. This introduces the concept of "responsibility accounting." Under this concept, units and their managers are held accountable for transactions and events under their direct influence and control. Budgets should provide sufficient detail to reflect anticipated revenues and costs for each unit. This philosophy pushes the budget down to a personal level, and mitigates attempts to pass blame to others. Without the harsh reality of an enforced system of responsibility, an organization will quickly become less efficient. Now, deviations do not always suggest the need for imposition of penalties. Poor management and bad execution are not the only reasons things don't always go according to plan. But, deviations should be examined and unit managers need to explain/justify them.

Money is a scarce resource. Within most organizations it becomes very common for managers to argue and compete for allocations of limited resources. Each business unit likely has employees deserving of compensation adjustments, projects needing to be funded, equipment needing to be replaced, and so forth. This naturally creates strain within an organization, as the sum of the individual resource requests will usually be greater than the available pool of funds. Successful managers will learn to make a strong case for the resources needed by their unit. But, successful managers also understand that their individual needs are subservient to the larger organizational goals. Once the plan for resource allocation is determined, a good manager will close ranks behind the overall plan and move ahead to maximize results for the overall entity. Personal managerial ethics demands loyalty to an ethical organization, and success requires team work. Here, the budget process is the device by which the greater goals are mutually agreed upon, and the budget reflects the specific game plan that is to be followed in striving to reach those goals. Without a budget, an organization can be destroyed by constant bickering about case-by-case resource allocation decisions.

Another advantage of budgets is that they can be instrumental in identifying constraints and bottlenecks. The earlier example of the power plant well illustrated this point. Efficient operation of the power plant was limited by the supply of natural gas. A carefully developed budget will always consider capacity constraints. Managers can learn well in advance of looming production and distribution bottlenecks. Knowledge of these sorts of problems is the first step to resolving or avoiding them.

In summary, the budget is a necessary and defining instrument for successful operation of most organizations. This observation is equally true of business, governmental, and not-for-profit entities. As a result, the budget should be taken seriously and great care should be given to its construction. Let's next turn our attention to the processes used to prepare effective budgets

2 Budget Processes and Human Behavior

A comprehensive budget usually involves all segments of a business. As a result, representatives from each unit are typically included throughout the process. The process is likely to be spearheaded by a budget committee consisting of senior level personnel. Such individuals bring valuable insights about all aspects of sales, production, and other phases of operations. Not only are these individuals ideally positioned to provide the best possible information relative to their respective units, they also need to be present to effectively advocate for the opportunities and resource needs within their unit.

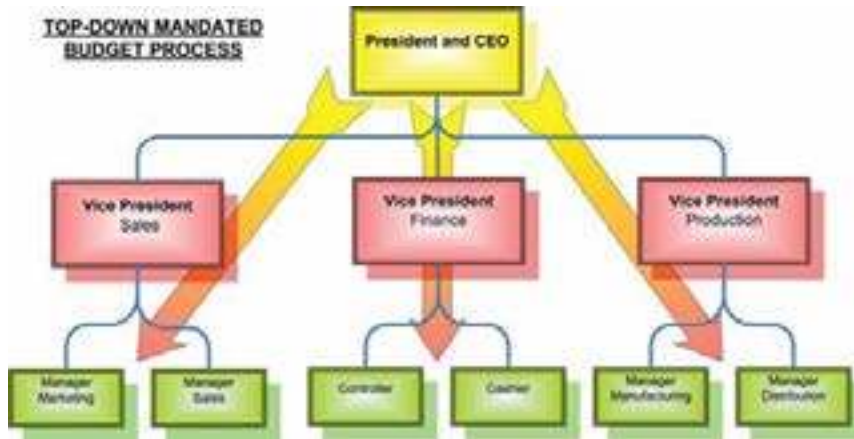
The budget committee's work is not necessarily complete once the budget document is prepared and approved. A remaining responsibility for many committees is to continually monitor progress against the budget, and potentially recommend mid-course corrections. The budget committee's decisions can greatly impact the fate of specific business units, in terms of resources made available as well as setting the benchmarks that will be used to assess performance. As a result, members of the budget committee will generally take their task very seriously.

2.1 Budget Construction

The budget construction process will normally follow the organizational chart. Each component of the entity will be involved in preparing budget information relative to its unit. This information is successively compiled together as it is passed up through the organization until an overall budget plan is achieved. But, beyond the data compilation, there is a critical difference in how budgets are actually developed among different organizations. Some entities follow a top-down, or mandated approach. Others utilize a bottom-up, or participative philosophy.

2.2 Mandated Budgets

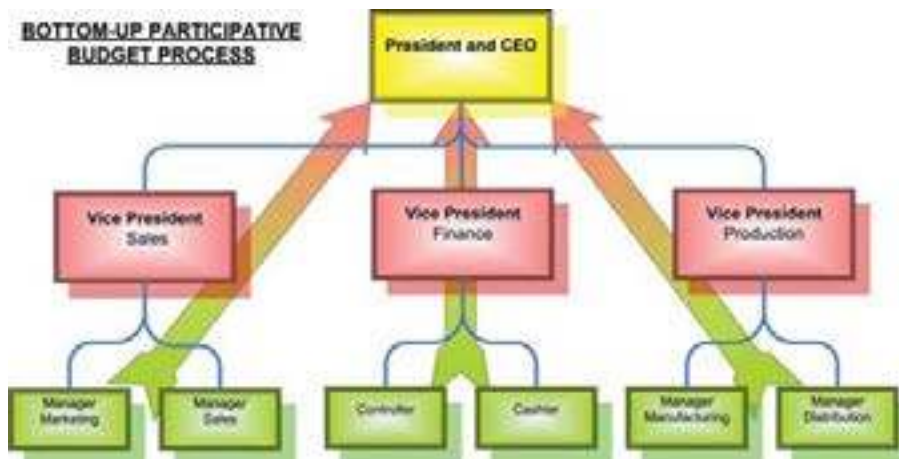
Some entities will follow a top-down mandated approach to budgeting. These budgets will begin with upper level management establishing parameters under which the budget is to be prepared. These parameters can be general or specific. They can cover sales goals, expenditure levels, guidelines for compensation, and more. Lower-level personnel have very little input in setting the overall goals of the organization. The upper-level executives call the shots, and lower-level units are essentially reduced to doing the basic budget calculations consistent with directives. Mid-level executives may color the budget process by refining the leadership directives as the budget information is passed down through the organization.



One disadvantage of the top-down approach is that lower-level managers may view the budget as a dictatorial standard. Resentment can be fostered in such an environment. Further, such budgets can sometimes provide ethical challenges, as lower-level managers may find themselves put in a position of ever-reaching to attain unrealistic targets for their units.

On the positive side, top-down budgets can set a tone for the organization. They signal expected sales and production activity that the organization is supposed to reach. Some of the most efficient and successful organizations have a hallmark strategy of being “lean and mean.” The budget is a most effective communication device in getting employees to hear the message and perform accordingly.

2.3 Participative Budgets



The bottom-up participative approach is driven by involving lower-level employees in the budget development process. Top management may initiate the budget process with general budget guidelines, but it is the lower-level units that drive the development of budgets for their units. These individual budgets are then grouped and regrouped to form a divisional budget with mid-level executives adding their input along the way. Eventually top management and the budget committee will receive the overall plan. As you might suspect, the budget committee must then review the budget components for consistency and coordination. This may require several iterations of passing the budget back down the ladder for revision by lower units. Ultimately, a final budget is reached.

The participative budget approach is viewed as self-imposed. As a result, it is argued that it improves employee morale and job satisfaction. It fosters the “team-based” management philosophy that has proven to be very effective for modern organizations. Furthermore, the budget is prepared by those who have the best knowledge of their own specific areas of operation. This should allow for a more accurate budget; in any event, it certainly removes one of the primary excuses that is used to explain why a particular budget was not met!



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On the negative side of the equation, a bottom-up approach is generally more time consuming and expensive to develop and administer. This occurs because of the iterative process needed for its development and coordination. Another potential shortcoming has to do with the fact that some managers may try to “pad” their budget, giving them more room for mistakes and inefficiency. More will be said about this problem shortly, but it is particularly problematic with a highly participative approach.

2.4 Blended Approach

Theoretically the budget process can be portrayed as top-down or bottom-up. But, the reality is that most budgets are prepared with a blended approach where information is passed both ways.

2.5 Organizational Structure Considerations

It is very important for managers at all levels to understand how information is transformed as it passes through an organization. Review the preceding graphics, this time noting how the top-down arrows change from yellow to pink as they pass through the middle-level leadership. Conversely, the arrows in the bottom-up approach morph from green to pink as they pass through the middle level managers. As budget information is transferred up and down an organization, the “message” will inevitably be influenced by the beliefs and preferences of the communicators. There is always a chance that information can be so transformed as to lose its original intent. Top management can lose touch with information originating on the front line, and front-line employees may not always get a clear picture of the goals and objectives originating with senior management.

2.6 Flattening the Organization Chart

There are staggering differences in the organization charts of different entities. Business growth is a natural incubator for expansion of the number of levels within an organization; as a result, great care must be taken to preserve the efficiency and effectiveness of growing entities. Sometimes the very attributes that contribute to growth can be undone by the growth itself. The charts of some entities consume many pages and involve potentially dozens of “levels.” Other companies may have worked to “flatten” their organizational chart to minimize the number of links in the chain of command. While these endeavors are often seen as attempts to reduce the cost of middle-level management, the overriding issue is to allow top management more clear and direct access to vital information originating with front-line employees (and vice versa). In addition to focusing on revenues and costs, the budget process should also be taken as an opportunity for continuous monitoring of the organizational structure of an entity.

2.7 Budget Estimation

One thing is sure, no one can see the future. And, budgets clearly involve a good deal of forward looking prognostication. As a result, a certain amount of error is inevitable. Accordingly, it is easy to slip into a trap of becoming cavalier about the estimates that form the basis for a budget. This should be avoided. Budget estimates should be given careful consideration. They should have a basis in reason and logically be expected to occur. Haphazardness should be replaced by study and statistical evaluation of historical information, as this provides a good starting point for predictions. Changing economic conditions and trends need to be carefully evaluated.

2.8 Slack and Padding

Because budgets frequently form an important part of performance evaluation, human behavior suggests that participants in the budget process are going to try to create “breathing room” for themselves by overestimating expenses and underestimating sales. This deliberate effort to affect the budget is known as creating “budget slack” or “padding the budget.” This is done in an attempt to create an environment where budgeted goals are met or exceeded. However, this does little to advance the goals of the organization.

When slack is introduced into a budget, employees may fail to maximize sales and minimize costs. For example, once it is clear that budgeted sales goals will be met, there may be a reduction in incentive to push ahead. In fact, there may be some concern about beating sales goals within a period for fear that a new higher benchmark will be established that must be exceeded in a subsequent period. This can result in a natural desire to push pending transactions to future periods. Likewise, padding the planned level of expenses can actually provide incentive to overspend, as managers fear losing money in subsequent budgets if they don't spend all of the currently budgeted funds. This has the undesirable consequence of encouraging waste.

2.9 Zero-Based Budgeting

The problem of budgetary slack is particularly acute when the prior year's budget is used as the starting point for preparing the current budget. This is called “incremental” budgeting. It is presumed that established levels from previous budgets are an acceptable baseline, and changes are made based on new information. This usually means that budgeted amounts are incrementally increased. The alternative to incremental budgeting is called “zero-based budgeting.”

With zero-based budgeting, each expenditure item must be justified for the new budget period. No expenditure is presumed to be acceptable simply because it is reflective of the status quo. This approach may have its genesis in governmental units that struggle to control costs. Governmental units usually do not face a market test; they rarely fail to exist if they do not perform with optimum efficiency. Instead, governmental entities tend to sustain their existence by passing along costs in the form of mandatory taxes and fees. This gives rise to considerable frustration in trying to control spending. Some governmental leaders push for zero-based budgeting concepts in an attempt to filter necessary services from those that simply evolve under the incremental budgeting process.

Business entities may also utilize zero-based budgeting concepts to reexamine each expenditure each budget cycle. While this is good in theory, zero-based budgeting can become very time consuming and expensive to implement. In business, the opportunity for gross inefficiency is kept in check by market forces, and there may not be sufficient savings to offset the cost of a serious zero-based budgeting exercise. Nevertheless, business managers should be familiar with zero-based budgeting concepts as one tool to identify and weed out budgetary slack. There is nothing to suggest that every unit must engage in zero-based budgeting every year. Instead, a rolling schedule that thoroughly reexamines each unit once every few years may provide a cost effective alternative.

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2.10 The Impossible Budget and Employee Capitulation

At the opposite end of budgetary slack is the phenomena of unattainable budget standards. If employees feel that budgets are not possibly achievable, they may become frustrated or disenchanted. Such a condition may actually reduce employee performance and morale. Good managers should be as alert to this problem as they are to budgetary slack. Suffice it to say that preparing a budget involves more than just number crunching; there is a fair amount of organizational psychology that a good manager must take into account in the process.

2.11 Ethical Challenges in Budgeting

You also need to know that many financial reporting frauds have their genesis in overly optimistic budgets that subsequently lead to an environment of “cooking the books” to reach unrealistic goals. These events usually start small, with the expectation that time will make up for a temporary problem. The initial seemingly harmless act is frequently followed by an ever escalating pattern of deception that ultimately leads to collapse.

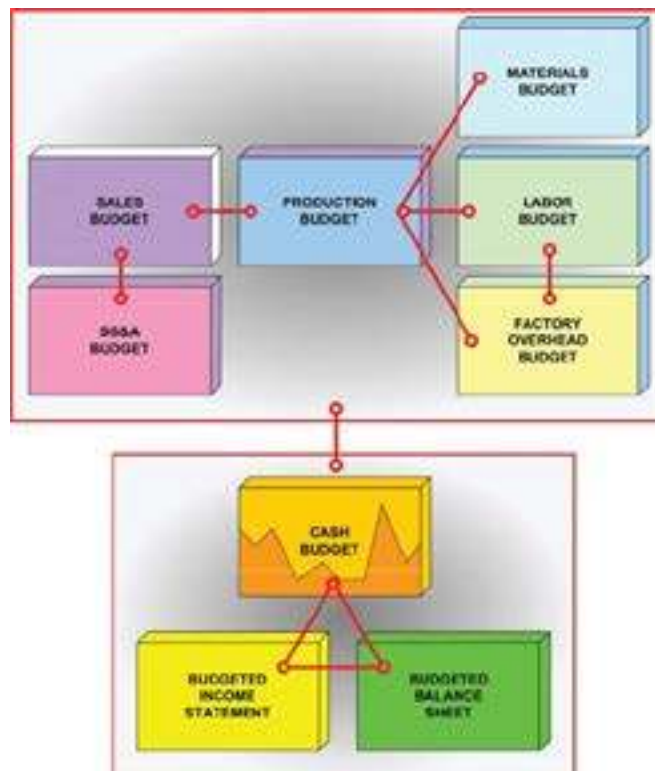
To maintain organizational integrity, senior-level managers need to be careful to provide realistic budget directives. Lower-level managers need to be truthful in reporting “bad news” relative to performance against a budget, even if they find fault with the budget guidelines. All too often, the carnage that follows a business collapse will be marked by management claims that they were misled by lower-level employees who hid the truth. And, lower-level employees will claim that they were pressured by management to hide the truth. Undoubtedly, someone reading these words today will find themselves facing this very challenge during their career. Be wise, and resolve that you will avoid the snare of this all too common destructive trap!

3 Components of the Budget

Business processes are highly complex and require considerable effort to coordinate. Managers frequently cite coordination as one of the greatest leadership challenges. The comprehensive or “master” budget is an essential part of the coordinating effort. Such budgets consist of many individual building blocks that are tied together in logical harmony, and reflect the financial plan for the entire organization. Careful articulation is essential.

The starting point for the master budget is an assessment of anticipated sales via the sales budget. The expected sales level drives both the production plans and the selling, general, and administrative budget. Production drives the need for materials and labor. Factory overhead may be applied based on labor, but it is ultimately driven by overall production. The upper portion of the following graphic is a simplified illustration of these budget building blocks. Notice that the background colors of each block reflect dependency on another budget (i.e., the production and SG&A budget blocks each have a purple background because they are derivatives of the purple sales budget).

The lower portion of the graphic illustrates that the planned business activities must be considered in terms of their cash flow and financial statement impacts. It is quite easy to plan production that can outstrip the resources of a company. In addition, a business should develop plans that have a successful outcome; the budgeted financial statements are key measures of that objective.



It would be very easy to expand the illustration to reflect additional interactions and budgets (e.g., the coordination of a long-term capital spending budget). However, the graphic would start to resemble the organization chart that was steam rolled earlier in this chapter. Little educational value would be derived by such a complex illustration. Instead, the point is to make it clear that comprehensive budgeting entails coordination and interconnection of various components. Next is a detailed illustration showing how these budget concepts are put into operation.

3.1 Sales Budget

The budgeting process usually begins with a sales budget. The sales budget reflects forecasted sales volume and is influenced by previous sales patterns, current and expected economic conditions, activities of competitors, and so forth. The sales budget is complimented by an analysis of the resulting expected cash collections. Sales often occur on account, so there can be a delay between the time of a sale and the actual conversion of the transaction to cash. For the budget to be useful, careful consideration must also be given to the timing and pattern of cash collections.



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Mezan Shehadeh recently perfected a low-cost vinyl product that was very durable and could be used outdoors in conjunction with rear screen projection equipment. This product enables movie theaters to replace the usual lettered signs with actual videos to promote the “now showing” movies. Mezan’s company, Shehadeh Movie Screens, is rapidly growing. The sales budget for 20×9 follows. Review the sales budget closely, noting the expected pattern of sales. The fall and winter seasons are typically the best for the release of new movies, and the anticipated pattern of screen sales aligns with this industry-wide business cycle. The screens are sold through a network of dealers/installers at a very low price point of \$175 per unit.

The lower portion of the sales budget converts the expected sales to expected collections. Dealers are normally given credit terms of 30 days, and the result is that roughly two-thirds of sales are collected in the same quarter as the sale itself. The other third is collected in the following quarter. Shehadeh started 20×9 with \$100,000 in receivables, and they are assumed to be collected in the first quarter of 20×9. Shehadeh’s dealer network has been carefully screened and the company has very few problems with uncollectible accounts. Shehadeh will end the year with \$140,000 in receivables, determined as one-third of the final quarter’s expected sales ($\$420,000 \times 1/3 = \$140,000$).

Mezan uses an electronic spreadsheet to compile the budget. This tool is extremely useful in budgeting applications. If care is used in constructing the embedded formulas, it becomes very easy to amend the budget to examine the impact of different assumptions about sales, sales price, etc. If you look closely at the very bottom of this illustration, you will note that a unique sheet is created for each budget building block; here, the Sales sheet is the active sheet:

SHEHADEH MOVIE SCREENS						
Sales Budget						
For the Year Ending December 31, 20X9						
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	
Estimated units	2,100	1,800	3,000	2,400	9,900	
X Per unit sales price	\$ 175	\$ 175	\$ 175	\$ 175	\$ 175	
Total estimated sales	\$ 367,500	\$ 315,000	\$ 525,000	\$ 420,000	\$ 1,627,500	
Expected Cash Collections From Sales						
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	
From current quarter sales	\$ 245,000	\$ 210,000	\$ 345,000	\$ 280,000	\$ 1,080,000	2/3 of current quarter sales (e.g., \$245,000 x 2/3 = \$163,333)
From prior quarter sales	\$ 180,000	\$ 172,500	\$ 137,500	\$ 175,000	\$ 665,000	1/3 of prior quarter sales (e.g., \$245,000 x 1/3 = \$81,667)
Cash collections from sales	\$ 425,000	\$ 382,500	\$ 482,500	\$ 455,000	\$ 1,745,000	

3.2 Production Budget

Sales drive the level of production. Production is also a function of the beginning finished goods inventory and the desired ending finished goods inventory. The budgeted units of production can be calculated as the number of units sold, plus the desired ending finished goods inventory, minus the beginning finished goods inventory. In planning production, one must give careful consideration to the productive capacity, availability of raw materials, and similar considerations.

Following is the production budget of Shehadeh Movie Screens. Shehadeh plans to end each quarter with sufficient inventory to cover 25% of the following quarter’s planned sales. Shehadeh started the New Year with 525 units in stock, and planned to end the year with 700 units in stock. Below is a quarter-by-quarter determination of the necessary production. Carefully examine this information, paying very close attention to how each quarter’s desired ending finished goods can be tied to the following quarter’s planned sales. In case it is not obvious, the estimated units sold information was taken from the sales budget; utilizing the power of the spreadsheet, the values in the cells on row 7 of this “production” sheet were simply taken from the corresponding values in row 7 of the “Sales” sheet (“=Sales!C7”, “=Sales!C8”, etc.).

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	Notes
Estimated units sold	2,100	1,800	3,200	2,400	8,000	from "sales" sheet
Desired ending finished goods	475	700	800	700	700	25% of following quarter's sales (e.g., 1,800 x 25% = 475)
Total units needed	2,475	2,298	3,800	3,100		
Less: Beginning finished goods	(525)	(275)	(750)	(800)	(525)	prior quarter ending amount
Scheduled production	1,950	1,875	2,850	2,300	8,125	

3.3 Direct Material Purchases Budget

Each movie screen requires 35 square feet of raw material. For example, the scheduled production of 1,875 units for the second quarter will require 65,625 square feet of raw material. Shehadeh maintains raw material inventory equal to 20% of the following quarter's production needs. Thus, Shehadeh plans to start the second quarter with 13,125 square feet ($65,625 \times 20\%$) and end the quarter with 19,950 square feet ($99,750 \times 20\%$). Budgeted purchases can be calculated as direct materials needed in planned production, plus the desired ending direct material inventory, minus the beginning direct materials inventory ($65,625 + 19,950 - 13,125 = 72,450$). This fundamental calculation is repeated for each quarter. The upper portion of the following "Materials" spreadsheet illustrates these calculations. Once again, the electronic spreadsheet draws data from preceding sheets via embedded links.



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	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	
Scheduled production	1,950	1,875	2,850	2,500	9,175	from "production" sheet
X Raw material per unit (sq. ft.)	38	38	38	38	38	38 square feet per screen
Total raw material needs (sq. ft.)	74,100	71,250	108,900	95,000	347,250	
Plus: Target ending raw material	19,600	19,600	19,600	19,600	76,800	20% of following quarter's needs e.g., 95,000 X 20% = 19,000
Total units needed (sq. ft.)	93,700	90,850	128,500	114,600	427,650	
Less: Target beg. raw material	(13,600)	(13,600)	(17,900)	(17,500)	(62,600)	
Raw material purchases (sq. ft.)	80,100	77,250	110,600	97,100	365,050	
X Estimated cost per square foot	\$ 1.40	\$ 1.40	\$ 1.40	\$ 1.40	\$ 1.40	
Cost of raw material purchases	\$ 112,140	\$ 108,150	\$ 154,840	\$ 135,940	\$ 511,070	
Expected Cash Payments For Materials Purchases						
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	
For current quarter purchases	\$ 56,070	\$ 53,175	\$ 77,420	\$ 69,070	\$ 255,735	80% of current quarter purchases e.g., 112,140 X 80% = 90,712
For prior quarter purchases	75,000	18,900	20,290	27,144	141,334	20% of prior quarter purchases e.g., 112,140 X 20% = 22,428
Cash payments for materials	\$ 131,070	\$ 72,075	\$ 97,710	\$ 96,214	\$ 497,069	

The direct material purchases budget provides the necessary framework to plan cash payments for materials. The lower portion of the above spreadsheet shows that the raw material is slated to cost \$1.40 per square foot. Shehadeh pays for 80% of each quarter’s purchases in the quarter of purchase. The remaining 20% is paid in the following period.

The direct materials budget also reveals a planned end of year inventory of 19,600 square feet, which has a cost of \$27,440 (19,600 × \$1.40). As you will later see, this value will be needed to prepare the budgeted ending balance sheet.

3.4 Direct Labor Budget

The direct labor budget provides the framework for planning staffing needs and costs. Each of Shehadeh’s screens requires three direct labor hours to produce. As revealed by the “labor” sheet, the scheduled production is multiplied by the number of hours necessary to produce each unit. The resulting total direct labor hours are multiplied by the expected hourly cost of labor to produce the total direct labor cost. As is usually the case, there is very little lag time between incurring and paying labor costs. Thus, Shehadeh assumes that the cost of direct labor will be funded in the quarter incurred.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Recap	Notes
Planned production	1,900	1,875	2,800	2,600	9,175	from 'production' sheet
Direct labor hours per unit	3	3	3	3	3	3 hours per screen
Total direct labor hours	5,700	5,625	8,400	7,800	27,525	
Cost per direct labor hour	\$ 14.00	\$ 14.00	\$ 14.00	\$ 14.00	\$ 14.00	
Cost of direct labor	\$ 81,800	\$ 78,750	\$ 117,600	\$ 109,200	\$ 387,350	

3.5 Factory Overhead Budget

Like many companies, Shehadeh applies overhead based on direct labor hours. Based on extensive analysis, the annual factory overhead is anticipated to include a fixed amount of \$220,200, plus \$5 per direct labor hour. The fixed portion includes depreciation of \$3,000 per quarter for the first half of the year and \$7,000 per quarter for the last half of the year (the increase is due to a planned purchase of factory equipment occurring at the end of the second quarter). Following is the factory overhead budget. Notice that the bottom portion of the budget reconciles the total factory overhead with the cash paid for overhead (depreciation is subtracted because it is a noncash expense). Both of these amounts will be needed to complete subsequent budget calculations.

Be mindful that the variable factory overhead rate shown in the spreadsheet is arrived at by very careful analysis. The budget process entails an assessment of variable overhead costs to determine this expected rate. As such, budgeting requires a great deal of study into the actual production process. There is much more to budgeting than just cranking numbers through a spreadsheet.

Microsoft Excel - Budget

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G7 - Labor109

SHEHADEH MOVIE SCREENS Factory Overhead Budget For the Year Ending December 31, 20X9							Notes
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Actual Budget		
Direct labor hours	8,000	5,425	8,500	7,000	27,925	Base "labor" overhead	
X Variable factory overhead rate	\$ 2.80	\$ 2.80	\$ 2.80	\$ 2.80	\$ 2.80		
Total variable factory overhead	\$ 22,400	\$ 15,190	\$ 23,800	\$ 19,600	\$ 81,090		
Fixed factory overhead	\$3,000	\$3,000	\$3,000	\$3,000	\$12,000		
Total factory overhead	\$ 25,400	\$ 18,190	\$ 26,800	\$ 22,600	\$ 93,090	applied factory overhead rate = \$10 per hour (\$107,025/27,925)	
Less: Depreciation	(2,000)	(2,000)	(2,000)	(2,000)	(8,000)		
Cash paid for factory overhead	\$ 23,400	\$ 16,190	\$ 24,800	\$ 20,600	\$ 85,090		

Sales / Production / Materials / Labor / Factory Overhead / Finished Goods / COGS / Cash / Income Tax / Balance Sheet

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The direct labor hours used in the Factory Overhead sheet are drawn from the Direct Labor budget. Further, the sidebar notes also indicate that the average overhead rate (fixed and variable together, applied to the total labor hours for the year) is \$13 per hour. This information is useful in assigning costs to ending inventory. Assuming an average-cost method, ending finished goods inventory can be valued as follows:

Cost Component	Units	Per Unit Cost	Per Unit Total
Direct material	30 sq ft	\$1.40	\$ 48
Direct labor	3 hour	\$14.00	42
Applied factory overhead	3 hour	\$13.00	39
			\$ 150
20 Units in ending finished goods inventory			20
Ending finished goods inventory			\$ 3,000

3.6 Selling and Administrative Expense Budget

Companies must also plan for selling, general, and administrative costs. These costs also consist of variable and fixed components. The expected quarterly sales are multiplied by the variable cost per unit. Total variable expenses are added to the fixed items. Some fixed items (e.g., rent) may be the same each quarter. Other fixed costs can change over time. Below, Shehadeh is assuming a small advertising campaign in the first quarter, to be followed by an advertising blitz in the second quarter, and then a return to a more normal level during the final two quarters. The bottom line of the SG&A budget is the planned level of expenditures. Most of these items are funded at about the same time as they are incurred. Therefore, one may assume that the expense amount is met with a similar amount of cash outflow.

SHEHADEH MOVIE SCREENS							
Selling, General, and Administrative Budget							
For the Year Ending December 31, 20X9							Total
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Budget		
Estimated units sold	2,000	1,000	3,000	2,000	8,000	From "Sales" sheet	
1 Percent variable SG&A	\$ 20,000	\$ 10,000	\$ 60,000	\$ 40,000	\$ 130,000		
Total variable SG&A	\$ 20,000	\$ 10,000	\$ 60,000	\$ 40,000	\$ 130,000		
Fixed SG&A							
Salaries	\$ 12,000	\$ 12,000	\$ 12,000	\$ 12,000	\$ 48,000		
Office	4,000	4,000	4,000	4,000	16,000		
Advertising	8,000	15,000	30,000	10,000	63,000		
Over	3,000	3,000	3,000	3,000	12,000		
Total fixed SG&A	\$ 27,000	\$ 34,000	\$ 49,000	\$ 29,000	\$ 139,000		
Total budgeted SG&A	\$ 47,000	\$ 44,000	\$ 109,000	\$ 69,000	\$ 269,000		

Each of the budgets/worksheets presented thus far are important in their own right. They will guide numerous operating decisions about raw materials acquisition, staffing, and so forth. But, at this point, it is very difficult to assess the success or failure of Shehadeh's plans! It is essential that all of these individual budgets be drawn together into a set of reports that provides for outcome assessments. This part of the budgeting process will result in the development of a cash budget and budgeted financial statements.

3.7 Cash Budget

Cash is an essential resource. Without an adequate supply of cash to meet obligations as they come due, a business will quickly crash. Even the most successful businesses can get caught by cash crunches attributable to delays in collecting receivables, capital expenditures, and so on. These types of cash crises can usually be avoided with a little planning. The cash budget provides the necessary tool to anticipate cash receipts and disbursements, along with planned borrowings and repayments.

Shehadeh's cash budget follows. In reviewing this document, you will begin to see that the data in most rows are drawn from earlier budget components (the beginning of year cash is assumed to be \$50,000). The cash received from customers is taken from the "Sales" sheet, the cash paid for materials is taken from the "Materials" sheet, and so on. The tax information is assumed; usually a tax accountant would perform some extensive analysis of the overall plan and provide this anticipated data. As mentioned earlier, it is also assumed that Shehadeh is planning to purchase new production equipment at the end of the second quarter, as shown on row 15 following.

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Sheet1

=\$Sales!F16

SHEHADEH MOVIE SCREENS						
Cash Budget						
For the Year Ending December 31, 20X9						Units
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Totals	
Beginning cash balance	\$ 10,000	\$ 97,540	\$ 64,416	\$ 4,654	\$ 176,610	
Plus: Customer receipts	180,000	287,500	437,000	405,000	1,309,500	from "sales" sheet
Available cash	\$ 190,000	\$ 385,040	\$ 501,416	\$ 410,654	\$ 1,485,910	
Less: Disbursements						
Direct materials	\$ 10,000	\$ 188,107	\$ 129,262	\$ 137,585	\$ 465,954	from "materials" sheet
Direct labor	81,900	78,750	110,700	105,000	376,350	from "labor" sheet
Factory overhead	75,300	76,175	92,000	87,640	331,115	from "factory overhead" sheet
SG&A	45,000	49,000	59,000	53,000	206,000	from "SG&A" sheet
Taxes	11,000	10,000	20,000	15,000	66,000	
Equipment purchase	-	100,000	-	-	100,000	
Total disbursements	\$ 172,000	\$ 402,032	\$ 351,262	\$ 385,625	\$ 1,311,919	
Cash surplus/deficit	\$ 18,000	\$ 183,008	\$ 150,154	\$ 25,029	\$ 376,201	
Financing						
Planned borrowing	-	100,000	-	-	100,000	
Planned repayment	-	-	(75,000)	(25,000)	(100,000)	
Interest on equipment	-	-	(1,000)	(2,000)	(3,000)	
Ending cash balance	\$ 18,000	\$ 183,008	\$ 75,154	\$ 23,029	\$ 399,211	

Sheet1 / Sales / Production / Materials / Labor / Factory Overhead / Finished Goods / SG&A / Cash / Income Statement / Balance Sheet

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Look carefully at the Cash budget, and you will notice that the company is on track to end the second quarter with a cash deficit of \$85,584 (before financing activities). To offset this problem, Shehadeh must plan to reduce expenditures or obtain added funding. The cash plan reveals a planned borrowing of \$150,000 during the second quarter.

Much of this borrowing will be repaid from the positive cash flow that is anticipated during the third and fourth quarters, but the company will still end the year with a \$25,000 debt ($\$150,000 - \$75,000 - \$50,000$). Interest on the borrowing is calculated at 8% per year, with the interest payment coinciding with the repayment of principal (i.e., $\$75,000 \times 8\% \times 3/12 = \$1,500$; $\$50,000 \times 8\% \times 6/12 = \$2,000$). Take note that accrued interest at the end of the year will relate to the unpaid debt of \$25,000 ($\$25,000 \times 8\% \times 9/12 = \$1,500$); this will be included in the subsequent income statement and balance sheet, but does not consume cash during 20X9.

3.8 Budgeted Income Statement and Balance Sheet

Shehadeh can also utilize the individual budget components to develop budgeted or “pro forma” financial statements. Almost every item in the budgeted income statement is drawn directly from another element of the master budget, as identified in the “notes” column.

The following budgeted balance sheet includes columns for 20×9 and 20×8. The 20×8 data are assumed. The 20×9 amounts are logically deduced by reference to the beginning balances and information found in the details of the master budget. The notes in column H are intended to help you trace the resulting 20×9 balance for each account. For example, ending accounts receivable of \$140,000 would relate to the uncollected sales during the fourth quarter ($\$420,000$ sales – $\$280,000$ collected = $\$140,000$), found on the “Sales” sheet.

3.9 External Use Documents

Caution – Caution – Caution! Projected financial statements are often requested by external financial statement users. Lenders, potential investors, and others have a keen interest in such information. While these documents are very common and heavily used for internal planning purposes, great care must be taken in allowing them to be viewed by persons outside of the entity.

Microsoft Excel - Budget

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EB - Production\Q11\Finished Goods\Q10

A	B	C	D	E	F	G	H	I
1	SHEHADEH MOVIE SCREENS							
2	Budgeted Income Statement							
3	For the Year Ending December 31, 20X9							
4	Items							
5	Sales			\$	1,875,000		from "sales" sheet	
6	Cost of goods sold							
7	Beginning finished goods	\$	65,250				from "balance sheet"	
8	Cost of goods manufactured		1,950,750				from "production" sheet (9,175 units) X from "finished goods" sheet (\$210 per unit)	
9	Goods available for sale	\$	1,261,000					
10	Less: Ending finished goods inventory	\$	91,000				from "finished goods" sheet	
11	Cost of goods sold				1,170,000			
12	Gross profit	\$			405,000			
13	SG&A				205,000		from "SG&A" sheet	
14	Income before interest and taxes	\$			199,000			
15	Interest				5,000		from "cash" sheet plus accrued interest on balance sheet	
16	Income before taxes	\$			194,000			
17	Income taxes				60,000		from "cash" sheet	
18	Net income	\$			134,000			
19								

Home Sales Production Materials Labor Factory Overhead Finished Goods SG&A Cash Income Stmt Balance Sheet

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	20X8	20X9	Notes
ASSETS			
Current Assets			
Cash	\$ 19,800	\$ 59,800	From "Cash" sheet
Accounts receivable	140,900	109,800	From "Sales" sheet (\$420,000 - \$280,000)
Raw materials inventory	27,440	19,190	From "Materials" sheet (C \$1.48 per sq. ft.)
Finished goods inventory	91,800	68,210	From "Income Statement" sheet
Property, Plant, & Equipment			
Plant and equipment	\$275,900	\$ 125,800	Increase from "Cash" sheet
Less: Accumulated depreciation	(80,900)	(83,800)	Increase from "Factory Overhead" sheet
Total Assets	\$ 472,940	\$ 302,200	
LIABILITIES			
Current liabilities			
Accounts payable	\$ 28,900	\$ 18,600	From "Materials" sheet (\$125,440 - \$100,312 = \$25,900) unpaid interest
Interest payable	1,900		
Notes payable	20,000	18,000	Increase from "Cash" sheet
Stockholders' equity			
Common stock	\$ 280,000	\$ 280,000	
Retained earnings	221,360	27,300	Beginning balance plus income from "Income Statement" sheet
Total liabilities and equity	\$ 472,940	\$ 302,200	

The accountant who is involved with external use reports has a duty to utilize appropriate care in preparing them; there must be a reasonable basis for the underlying assumptions. In addition, professional standards dictate the reporting that must accompany such reports if they are to be released for external use. Those reporting standards become fairly complex, and the specifics will depend on the nature of external use. But, those reports will necessarily include language that makes it very clear that the participating accountant is not vouching for their achievability.

Managers must also be careful in external communications of forward looking information. USA securities laws can hold managers accountable if they fail to include appropriate cautionary language to accompany forward looking comments, and the comments are later shown to be faulty. In addition, other regulations (Reg FD) may require “full disclosure” to everyone when such information is made available to anyone. As a result, many managers are reticent to make any forward looking statements. It is no wonder that many budgetary documents are emblazoned “internal use only.”

3.10 Performance Appraisal

This chapter has made several references to the fact that budgets will be used for performance evaluations. Actual results will be compared to budgeted results. These comparisons will help identify strengths and weaknesses, areas for improvements, and potential staffing changes. But, the process for performance appraisal is far more complex than simply comparing budget to actual results – so much so that the next chapter is devoted exclusively to this subject.

4 Budget Periods and Adjustments

Budgets usually relate to specific future periods of time, such as an annual reporting year or a natural business cycle. For example, a car producer may release the 20×8 models in the middle of 20×7. In such a case, the budget cycle may be more logically geared to match the model year of the cars rather than the actual calendar year.

There is nothing to suggest that budgets are only for one year intervals. For purposes of monitoring performance, annual budgets are frequently divided into monthly and quarterly components. This is helpful in monitoring performance on a timely basis. Sometimes, specific amounts within a monthly/quarterly budget are merely proportional amounts of the annual total. For instance, monthly rent might be 1/12 of annual rent. But, other costs do not behave as uniformly. For instance, utilities costs can vary considerably with changes in the weather, and businesses need sufficiently detailed budgets to plan accordingly. Major capital expenditure budgets may transcend many years. A manufacturer may have 10 facilities in need of major overhauls. It is unlikely they could all be upgraded in just one or two years; capital expenditure budgets may cover as much as a five to ten-year horizon.

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4.1 Continuous Budgets

Computer technology permits companies to employ continuous or perpetual budgets. These budgets may be constantly updated to relate to the next 12 months or next 4 quarters, etc. As one period is completed, another is added to the forward looking budgetary information. This approach provides for continuous monitoring and planning and allows managers more insight and reaction time to adapt to changing conditions. An analogy might be made to driving. A bad driver might focus only on getting from one intersection to the next. A good driver will constantly monitor conditions well beyond the upcoming intersection, anticipating the need to change lanes as soon as distant events first come into view.

4.2 Flexible Budgets

The discussion in this chapter has largely presumed a “static budget.” A static budget is not designed to change with changes in activity level. Once sales and expenses are estimated, they become the relevant benchmarks. An alternative that has some compelling advantages is the flexible budget. Flexible budgets relate anticipated expenses to observed revenue. To illustrate, if a business greatly exceeded the sales goal, it is reasonable to expect costs to also exceed planned levels. After all, some items like cost of sales, sales commissions, and shipping costs are directly related to volume. How ridiculous would it be to fault the manager of the business for having cost overruns? Conversely, failing to meet sales goals should be accompanied by a reduction in variable costs. Certainly it would make no sense to congratulate a manager for holding costs down in this case! A flexible budget is one that reflects expected costs as a function of business volume; when sales rise so do certain budgeted costs, and vice versa. The next chapter will illustrate flexible budgets in much detail.

4.3 Encumbrances

In working with budgets, especially budgets of governmental units, you may encounter an “encumbrance.” An encumbrance is a budgetary restriction occurring in advance of a related expenditure. The purpose of an encumbrance is to earmark funds for a designated future purpose. For instance, a department may have \$100,000 budgeted for office supplies for the upcoming year. However, the department may have already entered into a \$500 per month contract for copy machine repair services. Although \$100,000 is budgeted, the remaining free balance is only \$94,000 because \$6,000 has already been committed for the repair service. At any point in time, the total budget, minus actual expenditures, minus remaining encumbrances, would result in the residual free budget balance for the period.

Appendix

FUTURE VALUE OF \$1																
RATE PER PERIOD																
	0.25%	0.50%	0.75%	1.00%	1.50%	2.00%	2.50%	3.00%	4.00%	5.00%	6.00%	7.00%	8.00%	10.00%	11.00%	12.00%
1	1.00250	1.00500	1.00750	1.01000	1.01500	1.02000	1.02500	1.03000	1.04000	1.05000	1.06000	1.07000	1.08000	1.09000	1.10000	1.12000
2	1.00501	1.01003	1.01506	1.02010	1.03023	1.04040	1.05063	1.06090	1.08190	1.10290	1.12390	1.14490	1.16590	1.18690	1.20790	1.25440
3	1.00752	1.01505	1.02257	1.03010	1.04588	1.06171	1.07759	1.09352	1.12486	1.15620	1.18754	1.21888	1.25022	1.28156	1.31290	1.40490
4	1.01004	1.02015	1.03024	1.04030	1.06138	1.08243	1.10351	1.12459	1.16608	1.20757	1.24906	1.29055	1.33204	1.37353	1.41502	1.57552
5	1.01256	1.02520	1.03887	1.05251	1.07728	1.10208	1.12689	1.15170	1.21368	1.25517	1.29666	1.33815	1.37964	1.42113	1.46262	1.70262
6	1.01508	1.03038	1.04485	1.05932	1.09344	1.11819	1.14294	1.16769	1.25000	1.29149	1.33298	1.37447	1.41596	1.45745	1.49894	1.81262
7	1.01760	1.03553	1.05379	1.07214	1.10864	1.14608	1.18352	1.22097	1.31390	1.36539	1.41688	1.46837	1.51986	1.57135	1.62284	1.99062
8	1.02012	1.04071	1.06162	1.08284	1.12640	1.17108	1.21576	1.26044	1.37390	1.43539	1.49688	1.55837	1.61986	1.68135	1.74284	2.24662
9	1.02271	1.04591	1.06966	1.09398	1.14139	1.18989	1.23839	1.28689	1.42135	1.49284	1.56433	1.63582	1.70731	1.77880	1.85029	2.48662
10	1.02529	1.05114	1.07798	1.10483	1.16554	1.21869	1.27184	1.32500	1.48046	1.56195	1.64344	1.72493	1.80642	1.88791	1.96940	2.68662
11	1.02788	1.05640	1.08506	1.11387	1.17988	1.23599	1.29210	1.34821	1.52467	1.61616	1.70765	1.79914	1.89063	1.98212	2.07361	2.84662
12	1.03042	1.06188	1.09351	1.12633	1.19684	1.25735	1.31786	1.37837	1.57683	1.67832	1.77981	1.88130	1.98279	2.08428	2.18577	3.04662
13	1.03296	1.06699	1.10201	1.13809	1.21355	1.28361	1.35367	1.42373	1.64319	1.75468	1.86617	1.97766	2.08915	2.20064	2.31213	3.24662
14	1.03557	1.07232	1.11028	1.14847	1.22778	1.30184	1.37590	1.44997	1.70043	1.82192	1.94341	2.06490	2.18639	2.30788	2.42937	3.44662
15	1.03816	1.07765	1.11860	1.15887	1.24323	1.32139	1.40046	1.47953	1.75099	1.88248	2.01397	2.14546	2.27695	2.40844	2.53993	3.64662
16	1.04076	1.08307	1.12699	1.17258	1.26389	1.34799	1.43306	1.51813	1.80059	1.94208	2.08357	2.22506	2.36655	2.50804	2.64953	3.84662
17	1.04336	1.08849	1.13544	1.18430	1.28052	1.40024	1.52152	1.64280	1.94790	2.10939	2.27088	2.43237	2.59386	2.75535	2.91684	4.04662
18	1.04597	1.09393	1.14396	1.19615	1.30134	1.42625	1.55366	1.68243	2.00582	2.17731	2.34880	2.52029	2.69178	2.86327	3.03476	4.24662
19	1.04856	1.09940	1.15224	1.20611	1.32885	1.45861	1.59085	1.72501	2.10685	2.28834	2.46983	2.65132	2.83281	3.01430	3.19579	4.44662
20	1.05121	1.10490	1.16118	1.22019	1.34956	1.48395	1.62092	1.76011	2.19112	2.38261	2.57410	2.76559	2.95708	3.14857	3.34006	4.64662
21	1.05383	1.11042	1.16869	1.23039	1.36190	1.50107	1.64325	1.78843	2.27877	2.48026	2.68175	2.88324	3.08473	3.28622	3.48771	4.84662
22	1.05647	1.11597	1.17687	1.24472	1.38758	1.53098	1.67617	1.82435	2.36692	2.57841	2.78990	2.99139	3.19288	3.39437	3.59586	5.04662
23	1.05911	1.12156	1.18561	1.25716	1.40838	1.55760	1.70579	1.85697	2.45472	2.67621	2.88770	3.08919	3.29068	3.49217	3.69366	5.24662
24	1.06176	1.12716	1.19441	1.26973	1.42940	1.60044	1.75073	1.90391	2.54316	2.77465	2.98614	3.18763	3.38912	3.59061	3.79210	5.44662
25	1.06441	1.13280	1.20239	1.28243	1.45095	1.64401	1.79734	1.95252	2.63160	2.87309	3.08458	3.28607	3.48756	3.68905	3.89054	5.64662
30	1.07770	1.16140	1.25127	1.34785	1.56108	1.81195	2.09757	2.42738	3.24340	4.32194	5.74348	7.61220	10.00266	13.26768	17.44940	22.89230
35	1.09132	1.19073	1.29495	1.41665	1.68188	1.99989	2.37321	2.81380	3.94809	5.51692	7.68825	10.61858	14.71534	20.41397	28.19244	38.57485
40	1.10503	1.22079	1.34833	1.48888	1.81462	2.20804	2.68536	3.26264	4.80162	7.09999	10.29573	14.97448	21.72452	31.40942	45.25826	65.00087
50	1.13297	1.28223	1.45296	1.64483	2.10124	2.69159	3.43711	4.38291	7.10665	11.46740	18.42016	29.45782	46.96181	74.30752	117.3809	184.5648