THE ALIGNMENT PUZZLE WHITE PAPER

Deep dive:

Cashflow accounting

1. Introduction

Why is it necessary to delve into cashflow accounting when you want to improve alignment within organizations? For two reasons. First, because it should form the economic foundation for all decision-making and performance measurement within organizations. Second, because cashflow accounting should be the basis for a new kind of control system, as an alternative to the classic, cost-based systems.

By nature, people approach economic issues in terms of cashflows. However, in business schools and management programs they are taught to move away from that and instead think in terms of costs, revenues, value, and profit. These are highly complex, composite concepts are obligatory for external reporting, but can be misleading when used outside this context, e.g. for decision support and control of the primary process. When applied for control purposes, they frequently lead to local optimization and alignment problems.

Cashflow accounting takes us back to the essence of what it's all about: economic reality. That's why, in this deep dive, we describe the methods of cashflow accounting as we believe they should be applied.

1.1 Cashflow Optimization – From Whose Perspective?

It makes quite a difference whose perspective you adopt when considering economic optimization: that of the enterprise itself, or that of the external financier or bank. In both cases the objective is to maximize long-term net cashflow. But within the enterprise, there is a fundamental distinction between optimizing the company's cashflow versus optimizing the shareholder's cashflow.

In this paper, we focus on the company's perspective. Often this aligns with the interests of the shareholder—at least when the shareholder takes a long-term view. But it is far less aligned with the interests of shareholders seeking short-term profit.

1.2 Why Do Decision-Makers Look at Cashflow Instead of Value and Profit?

Actual cashflows and changes in the bank balance represent the real economy. That may sound self-evident, but confusion still arises because of the dominant role of financial statements, where value and profit are the central measures. This information is designed for external stakeholders.

Concepts such as value, profit, and costs are merely derivatives of cashflows, designed to give a snapshot of a company's financial health at the end of a reporting period.

But because methods of value and profit measurement have become so dominant, we often lose sight of what really matters: the cashflows.

There are two key reasons why one should focus on cashflows—and not on traditional concepts like value, profit, and cost—when justifying decisions economically:

Cash is real; profit and value are derivatives.
Cashflows are the true economy. Value, profit, and costs are artificially constructed concepts derived from them. They were invented as reporting tools for external parties, involving numerous rules, assumptions, and interpretations regarding the allocation of costs and revenues across reporting periods. This distorts the picture of a company's actual performance.

It's about influencing, not allocating.
When the allocation methods for primary and secondary costs were developed, the world looked very different. Today, change happens much faster, decision horizons are shorter, and the mix of direct and indirect costs has shifted. As a result, traditional management control systems no longer provide especially relevant information for many decisions. That's why it's important for decision makers to recognize that, when you're making a call, it's less about what gets 'allocated' and more about what you can actually 'influence.'

1.3 The Three Rules for Internal Decision Calculations

1. Forget sunk costs.
When a decision must be made—whether about an investment, a new product launch, or choosing the best strategy, you want to know the impact of the various alternatives on future cashflows. The first rule, found in any finance textbook, is simple: forget sunk costs. Sunk costs are expenses already incurred that cannot be affected by the decision at hand.

For example, a past investment to improve a machine should not influence whether to make a new investment in that same machine. Yet too often, such costs creep back into the analysis indirectly, for instance, through an overhead surcharge at an hourly rate.

Illustrative Story (The Lottery Example):
A man from Washington D.C. wins a $100 lottery prize. But there's a catch: he must collect it in New York City. He buys a bus ticket for $5 to get to the train station. Since $5 is less than the $100 prize, he goes ahead. At the station, he buys a train ticket to New York for $75. His total cost so far is $80—still less than $100—so he continues. In New York, he finds he must take a taxi for $25. That would bring his total cost to $105, more than the prize. At this point, he decides not to take the taxi and returns home empty-handed.

Everyone can see the absurdity of this decision. He should have ignored the bus and train costs (which were sunk and unrecoverable) and compared only the $25 taxi cost against the $100 prize. The correct choice at that decision point would have been to take the taxi. Better still, of course, would have been to realize beforehand that total travel costs would exceed the prize.

Another Variation (The Emotional Trap):
Another man also wins a prize to be collected in New York. Upon arrival, he discovers he misread the announcement: the prize is only $10, not $100. He reasons: "I've already spent so much, I might as well collect it." So he pays the extra $25 taxi fare to pick up the $10 prize.
In doing so, he spends $25 more on top of the $80 already spent, for a return of only $10—resulting in an additional net loss of $15.

Both are violating the rule: forget sunk costs!

2. Value is meaningless for internal decision-making.

The second rule is that "value" is useless for internal decision-making unless it is expressed as a cashflow. The "value" of assets at a given moment is usually a collection of historical costs allocated to inventories or production equipment. These valuations are relevant only for external stakeholders such as suppliers, customers, investors, and banks. Fortunately, banks and investors are now increasingly focusing on cashflows.

3. Allocating revenues and costs across reporting periods is irrelevant for internal decision-making.

The third rule is that allocating revenues and costs to specific accounting periods adds no value for decision support. What matters are the cashflows you can influence within the decision horizon. You need to evaluate only the net cashflow at the end of that horizon, not the intermediate accounting periods.

The impact on long-term net cashflow can differ greatly from the allocated costs and revenues within a single fiscal year. One perspective looks at "allocated costs and revenues," while the other looks at "cashflows influenced by the decision." The difference is profound.

1.4 What About Overhead Costs?

"But what about my overhead costs—don't I have to allocate those somewhere?" That's a typical question from the cost-allocation mindset. It is rooted in the assumption that products must always be priced at full cost plus a margin. Under that logic, full cost becomes the central piece of information for determining sales prices and, consequently, for many other decisions.

While that approach may have some strategic use in estimating a market price, it is rarely a sound basis for operational management.

The logical counter-question is: why should overhead costs be allocated at all? What specific decision are you trying to make where this allocation is necessary? Do you know for certain that those overhead costs will actually change with the decision? And if they do, wouldn't it be far better to look directly at the underlying cashflows related to overhead?

If you want to understand the contribution of a product or service to profit or operating cashflow, you should instead compare the net long-term cashflows of two alternatives:

- **ALT0**: Keep the product in the portfolio.
- **ALT1**: Remove the product from the portfolio.

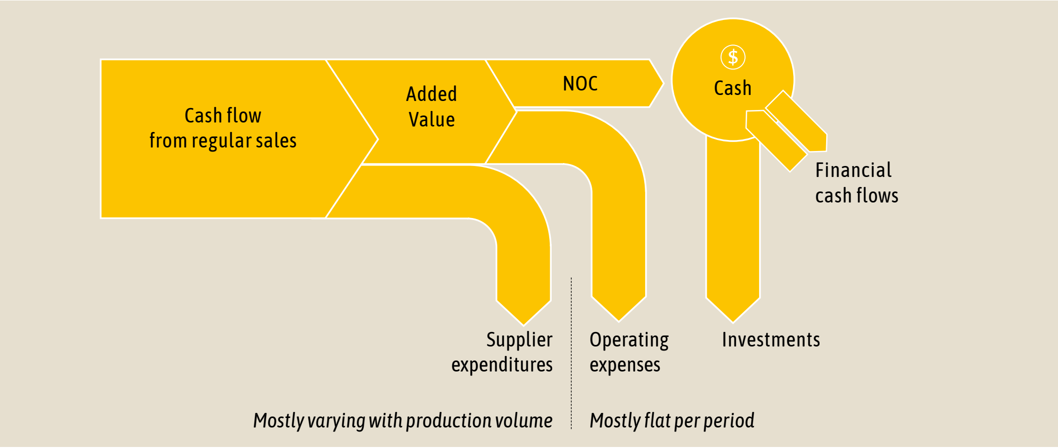
Then carefully analyze which inflows and outflows would differ between these two options across the entire decision horizon. This can be more time-consuming than applying a simple overhead markup—but it is the only correct way.

2. Classification of Cashflows

The number of transactions on a company's bank account can easily run into the thousands or even tens of thousands per day. To keep things manageable, it is helpful to categorize them. There are countless ways to do this, but in this book, we use the following five groups:

1. **Incoming cashflow from regular sales**: payments from customers for the company's core operations.
2. **Supplier expenditure**: expenses directly related to production and distribution volumes, such as raw materials and components. These are also called direct variable costs because they are linked to the product and vary with production volume.
3. **Operating expenses**: outlays not directly related to sales or production volume but still necessary to keep daily operations running. Examples include recurring fixed expenses like rent and salaries, as well as smaller short-term costs like a company outing.
4. **Investments**: expenditure on assets that will be used for more than a year, such as durable production equipment or an IT system.
5. **Financial cashflows**: money flowing to and from providers of equity and debt, including loans, interest, repayments, and dividends. These are also referred to as *financial cashflows*.

The difference between incoming cashflow from sales and supplier expenditure is called **Added Value** (also known as **throughput**). If we subtract operating expenses from that, we get the **Net Operating Cashflow (NOC)**.



NOC highlights the company's core cash-generating capacity without being clouded by less tangible accounting concepts such as depreciation, revaluations, financing activities, or book profits.

3. A Simple Example

To illustrate how cashflow-based decision-making works, let's start with a simple investment case. For simplicity, we will ignore payment terms, taxes, interest, and risk for now.

Suppose a company considers the following investment:

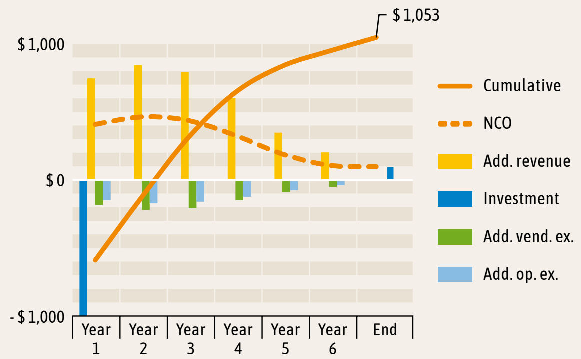
- An investment of $1,000 in a new machine, which will significantly increase revenues in the coming years.
- Supplier expenditure and sales-related cashflows will also rise.
- After 3 years, the revenue growth slows down, and after 6 years, the effect is gone.
- The machine can be sold at a residual value of $100.

The numbers are shown in the table.

If we add up the Net Operating Cashflows (NOC) over the years, we obtain the Cumulative NOC. This crosses the zero line in Year 2 (the payback period) and ends at a positive $1,053 after Year 6. The conclusion: economically, the investment is favorable.

The impact of the investment on the cash flows

	The impact of the investment				Totals	
Time	**Investment**	**Additional revenue**	**Additional vendor expenses**	**Additional operating expenses**	**Additional Net Cash from Operations (NCO)**	**Cumulative**
Start	-$ 1,000					-$ 1,000
Year 1		$ 750	-$ 188	-$ 150	$ 413	-$ 588
Year 2		$ 850	-$ 213	-$ 170	$ 468	-$ 120
Year 3		$ 800	-$ 200	-$ 160	$ 440	$ 320
Year 4		$ 600	-$ 150	-$ 120	$ 330	$ 650
Year 5		$ 350	-$ 88	-$ 70	$ 193	$ 843
Year 6		$ 200	-$ 50	-$ 40	$ 110	$ 953
End	$ 100	$ 0	$ 0	$ 0	$ 100	$ 1,053



4 Extending with Interest and Risk

4.1 Time and Uncertainty

In the previous example, we ignored two basic rules:

- A dollar today is worth more than a dollar tomorrow.
- A certain dollar is worth more than an uncertain dollar.

We did not yet account for interest and risk. There are several ways to do this. One is to assume the money for the investment must be borrowed from a bank and then calculate the repayments of interest and principal. Another is to assess the risk of each cashflow and apply a statistical correction. But both approaches create a lot of extra calculation work.

4.2 Discounted Cashflow (DCF) and Net Present Value (NPV)

A more practical method is to use the Discounted Cashflow (DCF). The DCF of a future cashflow is recalculated to its present value by adjusting for both interest and risk.

For example: an incoming cashflow of $100 in one year is worth $86.96 today if we assume 7% interest and 8% risk premium ($86.96 = $100 / (1 + 7% + 8%)).

The **Net Present Value (NPV)** is simply the sum of all discounted cashflows.

4.3 Always Compare Against Clear Alternatives

It is important to remember that no decision can be evaluated in a vacuum. Every decision must be judged relative to an alternative. In the earlier example, we implicitly assumed that the alternative to investing was simply "business as usual."

That is why the calculations focus only on the cashflows directly affected by the investment. In the tables, these were labeled as "additional."

When multiple options are on the table, it is helpful to define a baseline alternative (often called Alt0) against which all others can be compared. Most often, Alt0 is the simplest choice: "Do nothing, keep everything as it is."

4.4 The Example with Interest and Risk Using DCF

Now let's expand the earlier investment example with interest and risk. We will use a combined rate of 15%. The exact split between interest and risk (e.g., 10% + 5% or 7% + 8%) does not matter.

The discounted cash flow (DCF) is the present value of a future cash flow

$$DCF = \frac{CF_i}{(r+1)^n}$$

The Net Present Value (NPV) is the sum of all DCFs

$$NCW = \sum_{i=0}^{z} \frac{CF_i}{(r+1)^n}$$

Variables used:

DCF	$	The discounted cash flow
CF_i	$	The amount of cash flow *i* at the end of period *n*
n	-	Number of periods until cash flow CF_i occurs
r	%	Discount rate (interest + risk premium) per period
NCW	$	The Net Present Value of a set of *z* cash flows
z	-	Number of cash flows included
i	-	Summation index

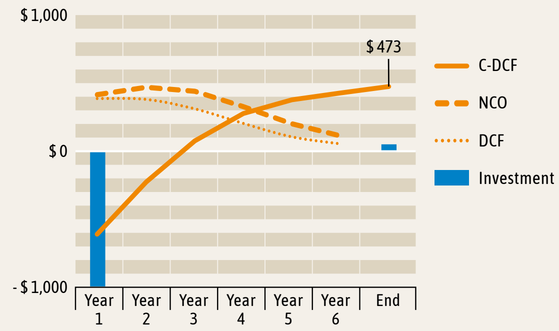
For simplicity, the three columns (revenues, supplier costs, and operating expenses) are combined into one column: NOC.

We also need to decide when the additional inflows and outflows occur: at the start, middle, or end of the year. Here, we assume they all occur halfway through the year. Thus, Year 1 uses half a period for discounting, Year 2 uses one and a half periods, Year 3 two and a half, and so on.

With a 15% discount rate, the $1,000 investment results in an NPV of $473 compared to the baseline (no investment). This is still positive and therefore attractive, but lower than the $1,053 total from the earlier calculation. If interest and risk premiums rise further, the NPV declines and eventually the investment may no longer be viable.

The impact of the investment on cash flows, including interest and risk

The impact of the investment				
Time	Investment	Additional Net Cash from Operations (NCO)	NCO discounted at 15% (DCF)	Cumulative additional DCF (C-DCF)
Start	-$ 1,000			-$ 1,000
Year 1		$ 413	$ 385	-$ 615
Year 2		$ 468	$ 379	-$ 236
Year 3		$ 440	$ 310	$ 74
Year 4		$ 330	$ 202	$ 276
Year 5		$ 193	$ 103	$ 379
Year 6		$ 110	$ 51	$ 430
End	$ 100		$ 43	$ 473



4.5 Notes on the Discount Rate

There has been much debate about which discount rate to use. Here, we use a simple single percentage that covers both interest and risk.

More advanced methods raise additional questions, such as whether to use the bank's lending rate or opportunity costs, or whether to calculate detailed probabilities for each cashflow instead of applying one risk premium across the board.

These refinements complicate the math. For the purposes of this book, we stick to one combined rate for all cashflows. The actual level depends on the situation and is ultimately a management decision.

5. The Seven-Step Method for Selecting the Best Alternative

When faced with multiple options, it's helpful to explicitly designate one option as the "zero alternative" and weigh all others against it. Often, it's easier to focus on the differences in cash flows rather than mapping out every possible flow in detail. You can approach this systematically by following these seven steps. The starting point is to treat every decision as if it were a project.

Step 1: Describe the decision that needs to be made.

Step 2: List the different decision alternatives and determine the time horizon for each one. If there are no alternatives, there is nothing to decide.

Step 3: Designate one of the options as the zero alternative (Alt0). Usually, the simplest option works best here.

Step 4: Identify the differences in cash inflows and outflows for each alternative compared to the zero alternative. You can use the same structure introduced at the beginning of this chapter. For operational decisions, the financial cash flows can generally be left out.

Step 5: Determine the discounted cash flows and the NPV of each alternative relative to the zero alternative over the full decision horizon.

Step 6: Assess the non-financial impact of each alternative. Before making a decision based solely on financial grounds, it's important to make sure there are no adverse non-financial effects—such as deteriorating working conditions, reduced customer satisfaction, or conflicts with corporate social responsibility commitments.

Step 7: Make the choice. Once all economic and non-financial consequences of the alternatives are clearly laid out, it's up to management to decide.

6. Expanded Example with Three Alternatives Compared to Alt0

Suppose a company can choose between three alternative investments, all of which increase production capacity and market demand.

- The first alternative is identical to the example from the previous section.
- The second alternative requires double the investment but also delivers a much higher NOC.
- The third alternative requires a much lower investment, generates a lower NOC, and in addition, the machine cannot be sold at the end of the decision horizon—in fact, disposal costs must be paid.

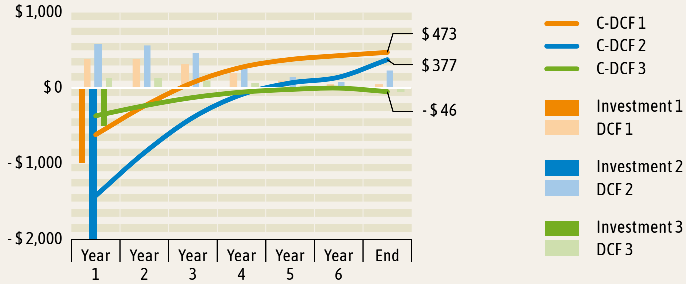
The numbers are shown in the table below, with three columns per alternative:

1. The (dis)investment.
2. The discounted Net Operating Cashflow (DCF).
3. The cumulative DCF (C-DCF).

At the bottom of the third column, the balance at the end of the decision horizon is displayed. This balance is the Net Present Value (NPV) of the alternative.

Compare three alternative investments compared to Alt0

	Alternative 1 vs. ALT0			Alternative 2 vs. ALT0			Alternative 3 vs. ALT0		
	Investment	15% discounted NCO (DCF)	Cumulative DCF (C-DCF)	Investment	15% discounted NCO (DCF)	Cumulative DCF (C-DCF)	Investment	15% discounted NCO (DCF)	Cumulative DCF (C-DCF)
Year 1	-$ 1,000	$ 385	-$ 615	-$ 2,000	$ 577	-$ 1.423	-$ 500	$ 135	-$ 365
Year 2		$ 379	-$ 236		$ 569	-$ 854		$ 133	-$ 233
Year 3		$ 310	$ 74		$ 465	-$ 389		$ 109	-$ 124
Year 4		$ 202	$ 276		$ 304	-$ 86		$ 71	-$ 53
Year 5		$ 103	$ 379		$ 154	$ 68		$ 36	-$ 17
Year 6		$ 51	$ 430		$ 76	$ 145		$ 18	$ 0
End	$ 100	$ 43	**$ 473**	$ 500	$ 232	**$ 377**	-$ 100	-$ 46	**-$ 46**



It is clear that the **first alternative** (shown in orange in the original table) is the most attractive, ending with a favorable balance of **$473** at the end of the decision horizon compared to Alt0.

The **second alternative** comes close, particularly because the investment has a relatively high residual value.

The **third alternative** ends with a negative NPV of -**$46**, making it the least attractive option. In fact, doing nothing (Alt0) is preferable to choosing this option.

When capital is scarce, the company must consider which combination of projects can still be financed and which mix yields the highest overall net cashflow.

In practice, some companies also apply a minimum return requirement for investments, known as the **Internal Rate of Return (IRR)**. This is often imposed by shareholders, who argue that if an investment cannot generate at least a certain return, it is better to distribute the money as dividends—allowing shareholders to seek higher returns elsewhere.

This is a classic example of a potential conflict between the interests of the company and those of the shareholders.

7. Cashflow Calculations in a Classic Production Bottleneck

A chain is only as strong as its weakest link, and that link is called the bottleneck. When you look for a bottleneck in a company, you often find that it differs over time intervals. In the long term, it is often market demand; on a specific day, it might be one production resource, and on another day, a different one. Only in rare cases is the bottleneck the same resource over a long period. This is what we call a classic or “true” bottleneck.

From an alignment perspective, these situations are especially interesting, because the entire company must orient itself around that single bottleneck.

7.1 A True Bottleneck Fully Determines Revenue Pace

In this subsection, we look at how cashflow calculations apply in a classic production bottleneck situation. Such a situation occurs when a particular machine is fully occupied and cannot easily be replaced. Demand for this capacity is extremely high, the machine is operating at full power, and it cannot produce more—imagine a machine running 24/7, 365 days per year.

There are no options to expand capacity.

Even so, decisions can still be based on the methods described in earlier sections: long-term cashflow optimization remains the goal. But with a bottleneck, one must carefully consider which alternatives are feasible, given the hard constraint of available production capacity.

The key parameter in a bottleneck situation is the **added value (throughput) per unit of scarce capacity**. After all, the bottleneck determines the company’s NOC. For example, if one hour of bottleneck capacity is lost due to a breakdown, the associated NOC is permanently lost.

7.2 Bottleneck Calculations in Historical Perspective

These types of problems were made famous by Eliyahu Goldratt (1947–2011) in the 1980s with his book The Goal (Goldratt & Cox, 1984). In unconventional presentations, he would light a large cigar and declare that *cost accounting is the number one enemy of productivity*.

During the 1980s and 1990s, Goldratt's ideas and his **Theory of Constraints (TOC)** sparked heated debate. They helped many companies streamline operations, if only by shaking up management teams and providing a shared framework for thinking.

However, true production bottlenecks are rare. Usually, bottlenecks are temporary—solved by investment in capacity, outsourcing, or price adjustments via the market.

Moreover, Goldratt's ideas about bottleneck accounting were not entirely new. Twenty years earlier, Van der Schroeff (1974, 8th edition, chapter 21) had already described similar situations, and in 1968 Klein Nagelvoort (1968, §8.3) did as well. They both highlighted **added value per unit of scarce bottleneck capacity** as the key to optimizing cashflows in bottleneck situations.

7.3 Setup of the Example: A Bridge to Classical Management Information

In the following example, we show how economic optimization should be performed in a bottleneck situation. We also use this opportunity to demonstrate the difference between decisions based on cashflow and those based on **classical management information**—specifically, cost allocation and absorption costing.

Absorption costing means that fixed costs are allocated to products using various allocation keys, including primary and secondary costs. This approach incorporates many non-controllable expenses and period costs. When such information is used superficially (which happens all too often), decision-makers can be misled.

We will show, however, that the classical approach can also lead to the correct conclusion—*but only if it is applied in a very elaborate way, with many corrections*.

A key difference from earlier examples is that this case does not have a clear start or endpoint. Therefore, the seven-step project method cannot be applied. Instead, we look at **cash generation per time unit**—in this case, per week. How many weeks are involved is irrelevant.

7.4 Example Calculation in a Bottleneck Situation: Scenario Description

For this example, let's imagine a very simple factory with just two machines (M1 and M2) and two products (P1 and P2). The point of the example is to clearly illustrate the bottleneck principle, so we keep it simple. But there must still be a decision to make—hence at least two machines and two products.

- **Machine M2** is fully occupied at 168 hours per week, with no options for overtime or expansion.
- Market demand exceeds production capacity. The question: which of the two products should be prioritized?
- Total weekly fixed expenses are **$10,000** (salaries, rent, insurance, etc.). These are allocated 60% to M1 and 40% to M2. The basis of this allocation (e.g., purchase value, age, floor space, or maintenance costs) is irrelevant here, as these expenses cannot be changed within the decision horizon.

7.5 Information from the Classical Management Accounting System

To link this to the traditional cost-based calculation, we also include depreciation. For both machines, this amounts to $1,000 per week. The following table presents the relevant data, the calculation of the machines' hourly rates, and the cost structure of the two products. The hourly machine rates are determined by dividing the weekly machine costs by the normal operating capacity. For bottleneck machine M2, this is at most 24 × 7 = 168 hours.

The two products have the same selling price and use the same amount of raw materials. However, they differ significantly in terms of the capacity required to produce them.

The calculation shows that the margin on product P1 is far less attractive than that of product P2 (4% versus 27%). Since the company cannot meet overall market demand, management would quickly be inclined—based on this data—to hold back demand for P1 and focus all efforts on the high-margin product.

We will show that this is exactly the wrong decision. Before getting into that, it's important to note that the table represents the kind of information generated by standard management accounting systems. Many companies are managed using cost and margin information from this system.

Bottleneck example base data

Machine hourly rate calculation	Machine M1	Machine M2
Depreciation per week	$ 1.000	$ 1.000
Allocated expenses per week	$ 6.000	$ 4.000
Allocated costs per week	$ 7.000	$ 5.000
Normal capacity per week [hours]	60	168
Machine hourly rate [$/hour]	$ 117	$ 30

Calculation of product cost and margin	Product P1				Product P2			
Raw material	1	pcs	$ 100		1	pcs	$ 100	
Machine M1 capacity usage	3	hours	$ 350		1	hours	$ 117	
Machine M2 capacity usage	1	hours	$ 30		5	hours	$ 149	
Product cost per unit			$ 480				$ 365	
Selling price per unit			$ 500				$ 500	
Margin per product, and as a % of the selling price			$ 20	= 4%			$ 135	= 27%

7.6 The Optimal Mix Based on Cashflow Information

Let's look more closely at the available and the required production capacity. Assume maximum market demand per week is **35 units of each product**. To meet that demand, we would need **140 hours on M1** and **210 hours on M2**. That's impossible, since only **168 hours on M2** are available.

If management simply accepts all incoming orders, lead times will grow because demand exceeds capacity. A choice has to be made: prioritize either P1 or P2.

- Alternative 1: Accept all demand for P1 and partially accept demand for P2.
- Alternative 2: Accept as much demand for P2 as possible and reject P1 entirely.

Both are feasible in terms of production capacity.

The profit calculation

Alternative product mixes and impact on required capacity

	Altx *	Alt1	Alt2
Units of P1 per week	35	35	0
Units of P2 per week	35	26,6	33,6
Required capacity in hours, M1	140	132	34
Required capacity in hours, M2	**210** *	168	168

* Alt x is full market demand; not feasible because max M2 capacity = 168.

Calculation of value added per bottleneck capacity

	Product P1	Product P2
Selling price per unit	$ 500	$ 500
Raw material price per unit	$ 100	$ 100
Value added per unit	$ 400	$ 400
Required M2 capacity per unit [hours]	1	5
Value added per M2-hour [$/hour]	$ 400	$ 80

Based on **classical margin information**, management would choose Alt2 (focus on P2).

But in a bottleneck situation, the key is **value added per hour of bottleneck capacity**. P1 yields $400 per M2 hour, while P2 yields only $80 per M2 hour.

Therefore, cashflow analysis points to the opposite conclusion: **Alt1 (prioritize P1)** is more profitable. P2 can still be produced with leftover capacity, but only after P1 demand is fully satisfied.

The NOC calculation also confirms this outcome.

Thus, cashflow-based decision-making leads to the opposite conclusion compared to margin-based accounting: **P1 is better than P2**.

Profit calculation based on cash flows

	Alt1 Mix: 35 P1 and 26.6 P2	Alt2 Mix: 0 P1 and 33.6 P2
Revenue per week, P1	$ 17,500	$ 0
Revenue per week, P2	$ 13,300	$ 16,800
Supplier expenditures per week, P1	-$ 3,500	$ 0
Supplier expenditures per week, P2	-$ 2,660	-$ 3,360
Fixed operating expenses	-$ 10,000	-$ 10,000
NCO, Net cash flow from operations	$ 14,640	$ 3,440
Depreciation	-$ 2,000	-$ 2,000
Profit per week	$ 12,640	$ 1,440

7.7 Further Analysis of Cost-Based Information: Capacity Utilization Results

This raises the question: is classical cost-based information simply wrong, or just misused? The answer: it is misused. Looking only at revenue and margin per product is not enough to justify a decision.

The missing element is the **capacity utilization result**. Cost-price and margin calculations are based on hourly rates, which in turn are based on assumptions about normal utilization. If actual utilization differs from that assumption, the results can diverge significantly, especially in bottleneck situations.

A correction must therefore be made by calculating the utilization result.

- For **Alt1**, M1 is used 132 hours instead of the assumed 60, so 72 "extra" hours are allocated.
- For **Alt2**, M1 is used only 34 hours, 26 fewer than the assumed 60.

This creates significant differences in utilization results.

Profit calculation

Classical, margin-based, adjusted for capacity variances

	Alt1 Mix: 35 P1 and 26.6 P2	Alt2 0 P1 and 33.6 P2
Revenue, P1	$ 17.500	$ 0
Revenue, P2	$ 13.300	$ 16.800
Cost of goods sold (COGS), P1	-$ 16.792	$ 0
Cost of goods sold (COGS), P2	-$ 9.722	-$ 12.280
Total margin per week	$ 4.287	$ 4.520
Capacity variance	$ 8.353	-$ 3.080
Profit per week	$ 12.640	$ 1.440

Calculation of capacity variances per week and per machine for both alternatives

	Alt1		Alt2	
	M1	M2	M1	M2
Normal capacity per week [hours]	60	168	60	168
Actual utilization per week [hours]	132	168	34	168
Capacity variance [hours]	72	0	-26	0
Hourly rate	$ 117	$ 30	$ 117	$ 30
Capacity variance	$ 8.353	$ 0	-$ 3.080	$ 0
Capacity variance per week	$ 8.353		-$ 3.080	

With this correction, we again arrive at the same profit figures as those from the cashflow-based approach. This confirms that **Alt1 (prioritize P1)** is indeed more profitable.

At first glance, this may look like a trick. But it isn't—this correction is logically necessary to adjust for artificially allocated costs.

The problem is that the method is cumbersome, time-consuming, and error-prone. And remember, this was only a simplified example. The principles themselves are not "wrong"—they are just often applied incorrectly.

It should be clear: it is much simpler and more reliable to **focus directly on cashflows**.

8. The NPV of a Cash-Generating Machine

8.1 The Investor's Perspective

As the final topic in this deep dive into cashflow calculations, let's step into the shoes of an external, long-term shareholder. We will provide a formula for calculating the Net Present Value (NPV) of a cash-generating machine. This is especially relevant when determining the fair price of company shares: how much would you be willing to pay, given a certain expected dividend?

This puts us in a different position than in previous sections. Before, we were focused on internal decision support; here, we are concerned with external valuation of the company. These two perspectives can sometimes conflict. Distributing dividends, for example, is not inherently in the company's best interest.

Valuation here is not based on historical costs (as in the balance sheet), but on expected future returns.

8.2 Formula: NPV with Regular, Perpetual, and Constant Returns

Suppose you could buy a machine that generates a fixed amount of cash at the end of every year, indefinitely. How much would you be willing to pay for it today?

For this, we use the formula for NPV in the form of an infinite series. With some basic math, we arrive at this surprisingly simple formula:

The Net Present Value of a cash-generating machine

The Net Present Value (NPV) equals
- the sum of all future cash flows CF,
- discounted at rate r.

If these are all equal, continue in perpetuity, and occur at the end of each period, NPV equals that cash flow CF divided by the discount rate r.

Variables used:

NPV	$	The Net Present Value
CF_i	$	CFi $ The amount of cash flow ***i*** at the end of period ***n***
n	-	Number of periods until cash flow CF_i occurs
r	%	Discount rate (interest + risk premium) per period
i	-	Summation index

$$NPV = \sum_{i=0}^{z} \frac{CF_i}{(r+1)^n}$$

IF $CF_1 = CF_2 = CF_3 = \ldots = CF_n$ **THEN**

$$NPV = \frac{CF}{r}$$

Imagine a company paying 1,000 in dividends every year on December 31, indefinitely.

- An investor applying a discount rate of 10% would be willing to pay $10,000.
- But an investor applying a 20% discount rate would be willing to pay only $5,000.

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