Capital expenditures:

The ultimate guide to managing capex in companies and organizations

ALMIRANTA

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Contents

This guide was created to help people in various positions within companies and organizations better understand how to manage capital expenditures. Although by nature, capital expenditures often represent the large items (in monetary terms) purchased by companies, the information readily available to managers on the subject is somewhat limited. Management of capex sometimes appears to be more of an art than a formal process. However, there are various tools and methods that managers can use in their everyday task of managing their capex process. Capital expenditures can take many forms, but at the end of the day, they share commonalities in all industries.

The following pages are intended to provide the reader with an overall view of capital expenditures, how one can use simple rules, tips, and reminders, to improve the management of the capex process in a company or organization.

We have divided this guide into three main parts.

The first part describes capital expenditures and how they differ from operational expenditures, often commonly referred to as **opex**. We look at different types of expenditures and how a user can improve the way they plan for medium and long term.

Part two gives a view into the process of creating capital expenditure requests. We include a substantial list of items not to forget when requesting funds for capital expenditures. Although not all items will apply to all expenditure, the list will prove practical for people just starting to create requests.

This second part of the guide will also attempt to provide examples of what makes a capex request sellable internally. The goal of creating a capex request is to get it approved.

However, we all know that in real life, many requests go unapproved, and not always for the right reason. On the surface, one might think that getting a capital expenditure request approved is a simple as assembling the information for the request, then putting everything together and waiting for the sign-off. That could have worked many years ago.

Unfortunately, in today's world, everything seems more complicated.

For starters, companies and organizations have become more complex. Many positions and departments that never existed before are now part of the capex approval process. Think about departments such as energy reduction or R&D credits. A few years ago, these departments might have been under other departments like production or real estate, or finance. Today they not only stand as separate departments but also gatekeepers of many capex approvers.

Then there is the fact that technology has evolved. For example, most production equipment operating 20 years ago in production plants were not even connected to the internet. Today so many production types of equipment have their IP address that companies need people dedicated to managing them. However, this also paved the way to have the IP people join the capex approval teams. Years ago, they became observers of the approval process. Then they evolved into gatekeepers. Today they are not only an intrinsic part of the approval process, but they are also often on the team that establishes the needs for the capex.

> Bottom line, to get a capex approved today, it takes more than merely assembling information on the corner of one's and sending it for approval.

Part three look at how companies can integrate other processes or programs into their capital expenditure process. An excellent example of this that we talk in the guide is energy saving. Too often, companies focus on acquiring new equipment, only to forget that they could optimize their expenditures by incorporating elements such as energy saving, grants, and incentives. These elements can provide numerous benefits which we explore in detail.

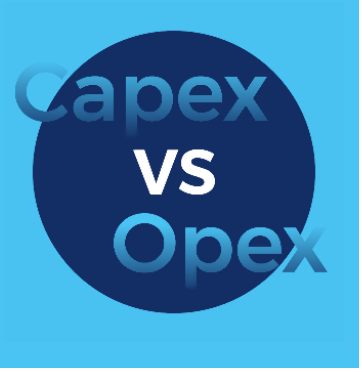
Disclosure: We are not accountants or taxation experts, nor are we lawyers. Local accounting and legal experts should carefully review all the information provided in this guide. Since this guide is meant for a broad reach of readership, it would have been impossible to adapt it to the laws of each province or state of each country. After managing billions of dollars in capital expenditures over the past 25 years across numerous industries (real estate, governmental, manufacturing, education, hospitality, we believe that we can provide our readers with valuable information on managing capital expenditures. We provide general rules for managing capital expenditures, tips, and ideas, but the final decision should be taken in concert with the experts that have a good understanding of the laws and accounting principle for your company or organization.

Part 1. Introduction to Capex

Section A – Capital vs Operational expenditure

Section A – Capital vs Operational expenditure

- **Understanding differences**



Capex vs. Opex.

The difference between capex versus opex has been described in great details many times already. Most literature will mention that capex relates to items that have a useful life beyond the current fiscal year. Alternatively, that capex increases the lifespan of its underlying asset — for example, a project of replacing a roof on a building. However, capex also include elements such as inventory and the purchase of property (buildings).

On the other hand, opex is usually described as all the maintenance and repairs of things. By nature, operational expenditures also includes many different elements, such as administrative expenses and utilities. Basically, the regular costs of running a business that is not capex, fall under the opex family.

In theory, the difference between the two worlds of capex and opex is clear. Moreover, for most of the purchases, it is. After all, if a company purchases a new production unit line, there is no debate, as it will fall under capex — same thing for buying new buildings.

However, the line does get blurred rapidly. For example, let's take a building. Let's consider a large shopping center of 1 million square feet. We know that shopping center roofs are built in many sections, and these sections do not always age the same way or at the same speed. Building managers often perform heat scans to see if there is moisture in the roof membrane and this enables them to determine which section of the roof needs to be replaced, and which sections can remain in place for a few additional years. The building managers will then plan which sections will be replaced each year. So, chances are, if the building managers have 10-year plans, they will try and replace roughly the same area of the roof each year. The logic behind this is that it enables them to even out the costs and avoid years with peaks (spiking costs) and valleys.

In the case of shopping centers, roofs are often large expenditures. That by itself would tend to put them in the capex group. In addition to this, they surely do extend the life of the building. After all, a building with no roof will deteriorate rapidly. Also, good luck finding any tenants for a shopping center with no roof, or a leaking one. So, the roof replacement has all the characteristics of a capex. It is a big expense item, and it adds years of lifespan to its underlying asset (the building beneath it). In this case, the building owners could pay for the roof replacement and amortize it over its useful life.

However, let’s consider an example here where the 1 million square foot building has five large roof section. In our case, let's assume that the building manager needs to replace 20 percent of the total roofing area each year for the next five years (each section of roofing is the same size). The annual amortization is the portion of the roof that the owner recharges to the tenants. The owner amortizes each section of roof on ten years, with the balance (non-amortized) carrying interest (at 10% per year) which is also charged back to the tenants (along with the annual amortization).

The chart below illustrates the area of roof replaced as well as the cost. For simplicity of this example, we do not show any inflation in the replacement cost, although we know that in real life, inflation needs to be considered. We also suppose that the roof replacement happens on Jan 1 of each year and the landlord invoices the tenants on Dec 31 for the full rechargeable amount (amortization and interest).

Year	1	2	3	4	5	6
Section	A	B	C	D	E	None
Cost	400,000	400,000	400,000	400,000	400,000	0
Total Cost	400,000	800,000	1,200,000	1,600,000	2,000,000	2,000,000
Amort	40,000	80,000	120,000	160,000	200,000	200,000
Unamortized	360,000	680,000	960,000	1,200,000	1,400,000	1,200,000
Interest	36,000	68,000	96,000	120,000	140,000	120,000
Annual Recharge	76,000	148,000	216,000	280,000	340,000	320,000

The first row of the chart indicates the annual cost of roof replacement.

The second row indicates the total cost to date for roof replacement

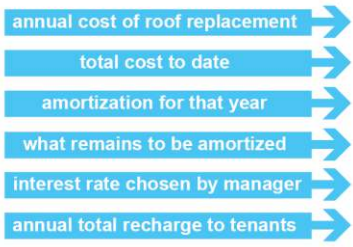
The third row indicates the amortization for that year

The fourth row shows the unamortized amount (what remains to be amortized)

The fifth row indicates the interest that the building manager applies to 'carry' the unamortized portion of the roof. We put an interest rate of 10% here for ease of calculation, and we suppose that the interest is calculated once at the end of the year instead of monthly as we would see in real life. This 10% is the interest rate that the building manager charges to the tenants in the shopping center for financing the roof replacement.

The last row indicates the total annual amount to be recharged to the tenants in the shopping mall.

We can show the table with the proper labels here:



Year	1	2	3	4	5	6
Section	A	B	C	D	E	None
Cost	400,000	400,000	400,000	400,000	400,000	0
Total Cost	400,000	800,000	1,200,000	1,600,000	2,000,000	2,000,000
Amort	40,000	80,000	120,000	160,000	200,000	200,000
Unamortized	360,000	680,000	960,000	1,200,000	1,400,000	1,200,000
Interest	36,000	68,000	96,000	120,000	140,000	120,000
Annual Recharge	76,000	148,000	216,000	280,000	340,000	320,000

As we can see in this example, the recharges to the tenants continue past the roof replacement period. We stop the chart at year six, but it will take until year 14 to amortize all the roof replacements simply because the last year of the roof replacement, year 5, needs to be amortized. If we calculate the total interest in this example, it comes to exactly $900,000. This extra cost is on a total roof replacement of $2,000,000. The interest alone adds a 45% cost to the tenants compared to a situation where the landlord would recharge the full roof replacement cost each year

Now, let's consider a second example where another building manager of a one million square foot shopping center has a 5-year roof replacement plan. In this second example, the manager plans to replace 20% of the roof each year, just like in our first example.

Only here, the manager argues that roof replacement is not capital in nature, but operational (an opex). The argument here is that although the roof does add life to the building, replacing the roofing membrane is merely a repair. Although the amount spent is large, the value of the roof compared to the cost of the building is relatively small. So, the managers decide that it is merely an extensive repair, but not a capital one. In this situation, the case for making the expense a capital one is a less clear cut.

The chart below shows what happens in this situation.

Year	**1**	**2**	**3**	**4**	**5**	**6**
Section	A	B	C	D	E	None
Cost	400,000	400,000	400,000	400,000	400,000	0
Total Cost	400,000	800,000	1,200,000	1,600,000	2,000,000	2,000,000
Amort	0	0	0	0	0	0
Unamortized	0	0	0	0	0	0
Interest	0	0	0	0	0	0
Annual Recharge	400,000	400,000	400,000	400,000	400,000	0

In this situation, the annual amount recharged to the tenants is the full roof repair cost. This case makes for a higher rechargeable number for years 1 to 5, but as we can see on the chart, year 5 is the last year where the tenant is charged. In this case, the total amount recharged over the five years is $2,000,000, with zero interest paid by the tenant.

As we can see, a simple decision to expense the repairs versus capitalize and amortize them can make a substantial difference in what is recharged to the tenants. Depending on the tenant, it can mean an added cost or saving. For example, if a tenant takes a 15-year lease starting on year one of the roof repairs, that tenant will end up paying 45% more if the landlord decides to make the expense a capital. That tenant might prefer that the landlord expense the roof repairs and recharges a higher amount for a few years instead of a lower amount for many more years.

> Note: in this example, we did not examine every possibility, such as the tenant preferring to have the landlord recharge the roof repairs with interest if the interest rate charged by the landlord is lower than the cost of capital for the tenant. The examples above are only meant to show the potential differences that can arise from deciding if an expense is a capital one or an operational one.

Capital expenditure is easy to identify until they are not. Since each company is different and will have a different type of costs, it is essential to determine from the start what will always constitute capex, what is clearly operational (opex), and how the ‘grey zone' will be defined. In all cases, have the consistency of action is always the best. So, if we catalog roofing repairs as capex, they should ever fall into that category and not change from year to year.

Capital expenditures are often, because of their nature, significant in cost. Because of this, the capex budget in companies can represent a sizeable amount. Hence the need to do proper management of it.

However, how do we define proper management of capital expenditure? After all, if a manufacturer needs a new production unit, then they need to purchase it (or lease it) — the same thing for a building that needs to be purchased. If the roof of a building is at the end of its life and is leaking, the debate as to replace it or not is usually a pretty short one. Some expenditures need to happen right away or at least at a predetermined time, and no amount of management will change that.

So, what capex should be managed, and how?

To answer this question, let’s look into part two of this guide.

Part 2. Creating requests

Section A – The planning stage of capital expenditures

Section B – Things not to forget when creating a capital expenditure request

Section C – Things not to forget when creating a capital expenditure request

As we indicated earlier, this section of the document will focus on the capital expenditure acquisition process.

This part is divided into three sections:

Section A	**planning stage of capital expenditures, the overall management of capex**
Section B	**describes what people can do to improve the odds of getting a capex request approved**
Section C	**lists all the points that should be considered when creating a request for expenditure**

Section A – The planning stage of capital expenditures

- **How to use long term planning to reduce costs**

Of all the steps that are involved in the entire process of managing capital expenditures, probably none are more important than planning. It is not only the first step of the process but also the one that will dictate everything that follows. This step is the key to managing capital expenditures. It is the strategic step where short-, medium-, and long-term decisions come to play (and sometimes fight each other).

Now, let's have a look at ways to reduce capital expenditure by improving the planning process.

The ultimate guide to managing capital expenditures in companies and organizations

Every company has a budget process. Without a formal budget process, things would quickly get out of hand. Companies would have no compass to be able to guide themselves. So having budgets is mandatory. In addition to this, most well-established companies have formal capital expenditures process in place. After all, capital expenditure often represents significant amounts of their budget. While most of them still rely on legacy spreadsheets for their capital expenditures management, they do have an approval process of some kind to be able to know who in the company has to approve what expenditure.

So far so good

> How is it then, that companies with the very structured budget process, and having a formal approval process for capital expenditures, are often at a loss when asked simple questions like, **"Where did their capital expenditures go over the past years?"** and, **"What was the return on their investments?"**

Unfortunately, few companies can produce the proper answers without extensive research. Year in year out, those same companies will spend millions and millions on various capex equipment or projects.

This process is not only inefficient from a strategic perspective; it is also less than optimal from a cost perspective.

Some companies allocate their capital expenditures on a first come, first served basis, where the primary business units put together an acceptable business case for a capex gets it approved. Others will seem to have a capex allocation process that works by decibel level, where the person or business unit that is the loudest to make their request seems to win. Finally, many companies will have the head office allocate a capex budget for the year and will then work somehow to spread out the amounts across the various business units of the company. In this situation, companies often go back to the first two models listed before (first come and who screams loudest). Many times, to appease the people (buy some peace), management will allocate approximately the same amounts each year to the groups, sectors, or business units. These amounts might be according to the size of the business units, or their level of sales, or based on another metric such as profitability. Sometimes it is merely because a business unit or group has not received sufficient funding in the past few years. The result is that this strategy gives way to a process of evening things out, where all business units are equally unhappy to see their requests or anticipated projects cut (often in half or more).

Each year, it is the same thing, the business units submit their requests, only to have management spread out the capex budgets and ask the business units to live with the allocated amount. The irony in this process (which is usually based on saving money) is that it costs the company more money to manage this way.

A complete set of keys

To reduce the overall cost of capital expenditure over time, companies must do better jobs in their capex management. Unfortunately, this cannot be done in one-step, and maybe because of this do we see so few companies that have mastered the capex management process.

For the manager to transform the way they manage capex, think about the process as like a path with a series of doors, with each door needing one special key to open. To complete the path, all doors need to open. However, if only one door remains closed, then it is not possible to complete the path. Before embarking on this path, the first step is making sure that one has all the keys in her/his pocket.

Key number 1: Plan to reduce – reduce your plan

To reduce capital expenditures, the first step is to a better plan. This sounds trivial, and most managers reading this will raise their hands and explain how well they plan their capex. However, most managers will only plan capex a few years ahead. Few put together long-term capex planning strategies. This is one of the keys that the manager needs.

Many companies only plan capex ahead one or two years. Very few companies will set out to make a 20- or 25-years year capex plan. In many cases, this is precisely what is needed. While this might raise eyebrows, we will go into detail as to why a company would need such an extended plan, especially when some companies do not know if they will even remain in business next year. We will list some arguments towards a 20 to 25-year capex plan here and finish with examples of companies and organizations which should benefit from long-term planning.

Argument number one.
Long term planning allows you to correct the trajectory.

The first thing people learn when they drive is to keep their eyes on the road and to investigate the distance. When you are driving on a highway, looking just ahead of your front bumper would be a recipe for disaster, as anyone who drives knows that if something happened, they would never have the time to stop. This is why people continuously look in the distance and occasionally look closer. Over time, we do this without even thinking anymore. In capital expenditure planning, we continually see companies who set up capex plans for one or two years and seem perfectly fine with this. The problem is that in today's world, business moves too fast and not planning sufficiently is asking for trouble eventually.

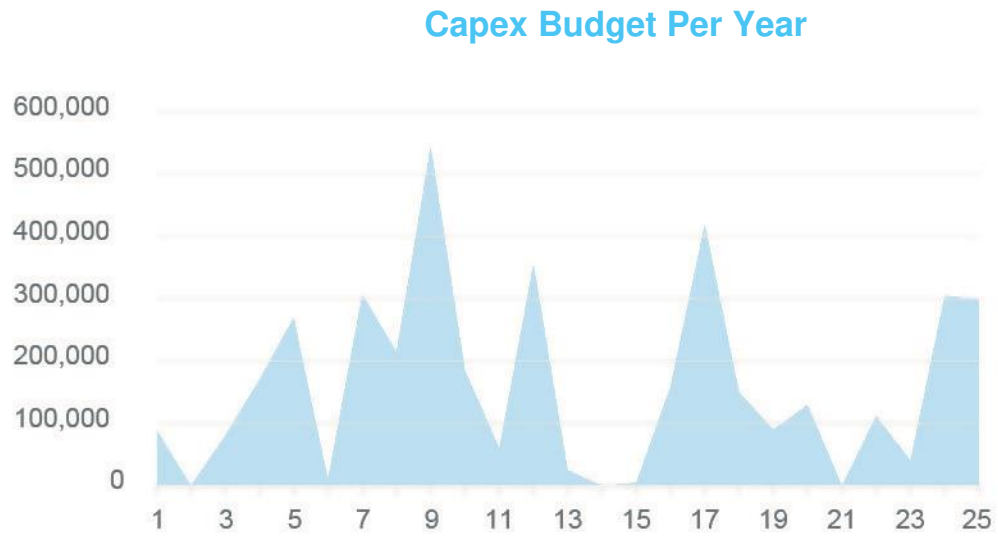
Let us suppose company X decides to create a 25-year capital expenditure budget. The first thing to look at is all the items that should go into that plan. At first, people might feel at a complete loss, not even knowing what to put in the budget. However, a quick look at the past reveals that the capex approved by the company was mostly for building and production. The company then decides to look at the condition of its buildings. It then creates a list of all the items that would need to be replaced in the next 25 years.

The company then looks at when these expenditures could potentially happen. For example, if for one building there are five sections of roof that all have different ages, the company might decide that roofing is suitable for 20 years and from their estimate when each part of the roof will need to be replaced. After the roofs, the company looks at all the other building items from structure to parking to elevators, windows, HVAC systems, and others. For each item, the company evaluates in what condition the item (or equipment) is and when it could be replaced. For each item, the company will also write down a guesstimate, give it the best shot at estimating how much the item would cost to be replaced. Inflation is also added to the cost. At this point, there are still many uncertainties, namely of timing and cost.

Once all the building components have been entered in the 25 years capex template, the company will add up all the costs for each year to see what it looks like.

Description	Year 1	Year 2	Year 3	Year 4	Year 5…	… Year 24	Year 25
Structure	50,000		125,000	80,000		30,000	160,000
HVAC	20,000	60,000		100,000			30,000
Parking		30,000	30,000			70,000	
Roofing	170,000			120,000		80,000	
Equipment X		90,000	95,000				110,000
Equipment Z		27,000		135,000		125,000	
Total	**240,000**	**207,000**	**250,000**	**435,000**	**0**	**305,000**	**300,000**

The results at first will probably not be beautiful. Some years might see huge expenses while another year might see a small amount or nothing at all. This is normal.



As previously mentioned, at this point, the company has created the template with many uncertainties.

1. It does not know if the items will need to be replaced in the year that it put the item. How can anybody know ten years from now if a section of the roof will need to be replaced or if it could still be suitable for a few years? Even worse, if the company is a manufacturer, how they can know in advance which

production equipment will be needed? Especially if they do not know when new sales will happen.

2. It only estimated the costs for each item, so they all have errors and the items the most in the future probably carry the most significant errors.

However, it is a start. The next step the company takes is to look at what is planned for the short term, for the next 2 or 3 years and see if everything makes sense. Do the items really need replacement? Are they well estimated in terms of price?

Then, the company has a look at operations. Each year it spends on operations equipment. At this stage, the company does the same process for production equipment as it did for building items. It adds up all the costs for each year and then refines the production equipment and cost estimates for the first 2–3 years and finally, it adds that to the building items.

The company now has a 25-year capex plan, although it might be more precise (and better) for the first 2–3 years than the other 22–23 years. During the year, the company decides to collect more information, on an ongoing basis, about all the items that it listed in the years from say, year four to year 25.

> “The goal is to go back and see if it made sense to put some equipment in specific years.”

If the equipment or building repair can be moved by a few years (advanced or delayed), the company makes a note of this. The idea is to refine the capex plan as much as possible, with the information available. Seeing a plan of 25 years will start to allow the company to smoothen total capex costs over the years.

For example, if in year nine the total capex was much higher than in years 8 and 10, perhaps it would be possible to accelerate or delay some items that were budgeted for year number 9.

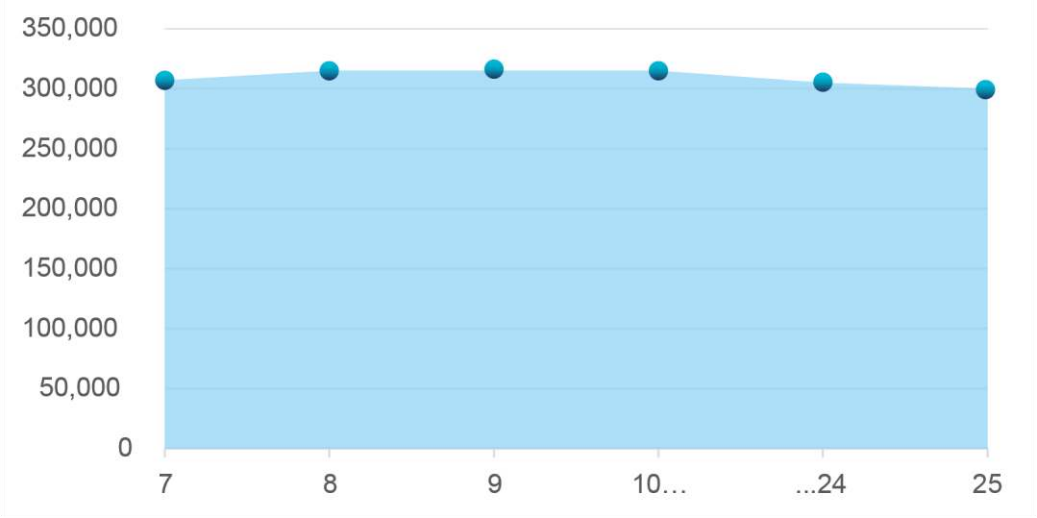
For example, the company could delay some structure work from year 9 to year 10 and accelerate the planned equipment X purchase to year 8.

Description	...Year 7	Year 8	Year 9	Year 10...	...Year 24	Year 25
Structure	110,000		130,000 →		30,000	160,000
HVAC	92,000		105,000	40,000		30,000
Parking		70,000	35,000		70,000	
Roofing		80,000	105,000	55,000	80,000	
Equipment X	105,000	←	100,000			110,000
Equipment Z		65,000	70,000	90,000	125,000	
Total	**307,000**	**215,000**	**545,000**	**185,000**	**305,000**	**300,000**

Doing so will reduce the total capex budget for year nine while increasing it for years 8 and 10.

Description	...Year 7	Year 8	Year 9	Year 10...	...Year 24	Year 25
Structure	110,000			130,000	30,000	160,000
HVAC	92,000		105,000	40,000		30,000
Parking		70,000	35,000		70,000	
Roofing		80,000	105,000	55,000	80,000	
Equipment X	105,000	100,000				110,000
Equipment Z		65,000	70,000	90,000	125,000	
Total	**307,000**	**315,000**	**315,000**	**315,000**	**305,000**	**300,000**

The result shows that the totals now vary less from year to year.



What the company wants to achieve is to remove peaks or valleys and end up with total capex budgets that are relatively equal year to year. It may tweak the template to allow the total capex budget to slightly increase each year (say to take into consideration inflation), to remain flat or to decrease it a little each year.

Each time the company purchases a piece of new equipment or item, it then proceeds to put it back in the 25 years capex budget. For example, if it buys a rooftop unit that serves to cool a building, it might find out that the unit usually is suitable for 15 years so that it will add the cost (plus some inflation) of a new rooftop in 15 years from now — installing a new roof? It might plan for its replacement in 20 years (depending on the type & quality of the roof installed).

Description	Year 3	Year 4	Year 5…	…Year 18…	…Year 23	Year 24
…						
Rooftop	120,000			190,000		
Roofing	210,000				395,000	
…						

In the two examples above, we can see that the rooftop initially purchased for $120,000 is added to the budget in year 18, which is 15 years in the future. The amount is estimated at $190,000 to take into consideration some inflation. The roofing, which was purchased in year 3, has been scheduled for replacement in year 23, which is 20 years in the future. The amount in year 23 is the estimated amount the user estimates it will cost to replace the roof in that year.

The idea here is not to have a perfect plan for 25 years; this is merely impossible. As noted before, nobody knows if a roof section will need to be replaced in exactly 20 years or if a rooftop unit will be at the end of its life after 15 years. That rooftop unit might last 20 or 22 years with proper maintenance, maybe more However, what the company can do is refine the first years of the budget (2-3 years) so that it knows precisely how much it needs to spend on capex and for all the other years, adjust every few years by going back and evaluating the conditions of the building items or equipment. For example, the company might do an infrared scan on the roofs every two or three years to determine which will be the next sections of the roof to be replaced. Each time it has new data, the company might decide to accelerate or delay an expense. A production unit that was scheduled for replacement is now found to be in better shape than people thought. Its replacement might be delayed a few years. A structure has just been found in worse condition than expected. The company might advance the repair, as needed. Each year the company goes back and looks in detail at what is planned for the next two or three years, but it also takes a hard look at everything that is intended for the other 22 or 23 years in the 25-year budget.

Over time, the company will get better at estimating capital expenditures, and this exercise will become second nature, just like driving.

> Note: we talked here about smoothing the budget charts to remove peaks and valleys. However, since every company is different, the goal of the capex planner is to align the budgets with the company. If a company is mature and sales are stable year after year, the capex planner might try and have cape budgets that are even year after year. However, another company that is growing fast might be ok with increasing capex budgets. Inversely, a company in a consolidation stage might prefer decreasing budgets. A long-term plan will help the capex planner adapt the capex budgets to any company situation.

Argument number two.

Long term planning allows you to see the light at the end of the tunnel.

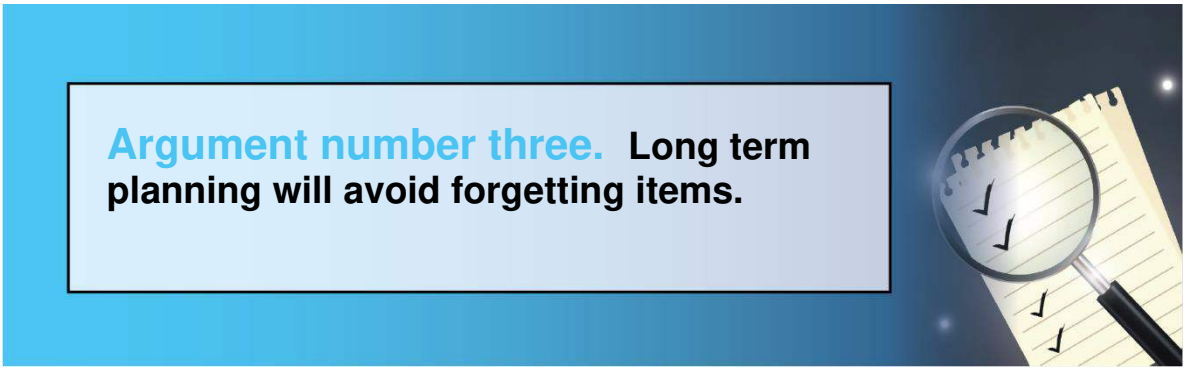
If a company is seeing its capital expenditures rising each year, it might well feel that there is no end in sight. Over time, buildings and equipment get older and require more upkeep. New production equipment becomes more expensive each year, and companies are struggling to keep up with their competition. Because of this, capital expenditure is an essential part of the company's budgets. Having long term plans can help see the bigger picture. While we would provide numerous examples here, we can list a few. The goal of these examples is to highlight the benefits of long-term planning.

For example, a company has a building where each year it is spending significant amounts in capital expenditures for a particular business unit. Year after year, it gets many requests for different building renovations and equipment. However, one year, the company decides to create a long-term plan for capital expenditure. After a 25-year plan is made, it is found that over the next ten years alone, everything (or almost) in the building will need to be repaired or replaced. Because the company was only doing capex budgets one or two years at a time, it never realized the condition of the building. Now that it has the information, the company can make some decisions. They could sell the building and either buy or lease a new building, preferably one in perfect condition. They could keep the building but see what they can spread out so that instead of having to renovate everything in the next ten years, they can do it over 20 years. For this they might repair some components instead of replacing them (e.g., parking, roof) and for other component or equipment, they might bite the bullet and decide to combine all the work that was planned over a period of a few years and do it right away in order to get a better pricing on the repairs.

Another example is if the company was spending capital expenditure on building systems year after year (heating, cooling, ventilation), instead of continually repairing some components or equipment, they might decide to create an energy saving project where they would replace various equipment and package it in a project that has a reasonable payback. The project might allow them to throw even in some components

that carry no payback at all, but once blended in a project with excellent energy saving measures equates to an acceptable payback.

There are numerous other examples that could be described here, the idea to keep in mind is that by having more extended capital expenditure plans, it can allow people in a management position to have better information and from there, allow them to brainstorm on what could and should be done.



Planning is creating checklists of what to do. Also, long term planning is creating long-term checklists. Just as one prepares for a long journey (or holidays) by making a checklist of what to bring, what to do, long term planning for capital expenditures will help the user avoid forgetting things. For some components, it is easy not to ignore them, especially if they need to be replaced often. However, some others (think elevators or large transformers, for example) we buy and do not often think about replacing them until they break down. Then it is too late.

Planning a long time ahead will avoid forgetting things, and it helps avoid leaving precious money on the table.

Argument number four.
Long term planning can get you better pricing (procurement, consultants)

Now, let us see what type of companies would benefit from this: virtually any company which spends significant amounts on capex each year.

While this might sound like about every large company or organization, it is precisely that. Too often, companies do not do an excellent job of combining their capex needs to get better pricing. For example, if a company has fifty business units spread out over the country, does it systematically align its capital expenditures so that each time there is a type of component, project, or equipment that is purchased, all business units get together to get a group price? Chances are, few do it unless the business units are centralized. However, there are many ways that procurement can help remove some of the money left on the table.
Let us look at an example here.

> **Company X** has fifty business units, of which twenty have plans to purchase new production equipment next year. The business units did not talk to each other, but it seems that there are three leading vendors (which manufacture this type of production equipment) that will supply most of the equipment to the business units, with three other less popular vendors looking to sell to a few business units only. If nothing is done, the company will end up, during a 12-month cycle, buying twenty new pieces of equipment from six (6) different vendors.
>
> **Company Y** also has fifty business units, of which twenty have plans to purchase new production equipment next year. However, Company Y has a capital expenditure plan that calls for analyzing all the proposed expenses, and it has a long-term capital plan. It finds that each year the company purchases about twenty new pieces of equipment of that type. It has been doing this for many years now and will need to do this for many years to come. Company Y also has cross-functional teams that debate which supplier to use, and they have selected two vendors to be their preferred vendors for that equipment, with one vendor being the first choice and a second vendor being seen as an acceptable second choice. Looking at their long-term plan, they find that they will need to purchase one hundred pieces of equipment over the next

> five years. The company then asks procurement to go to both selected vendors and ask pricing for twenty equipment and with discount clauses (tier discounts) for additional purchases right up to one hundred equipment, with delivery clauses (including price escalation) over the next five years. The company wants to select both providers to avoid being locked in with a single one, but the actual percentage of split (how much equipment are purchased) between the two vendors can vary.

Both vendors come back with pricing and procurement finds that the best mix of price and vendor is to purchase eighty equipment from the first vendor and twenty from the second vendor. The company locks in great pricing today and gets to have the equipment delivered over the next five years. With the savings that the company achieves, it can even purchase more equipment (or buy it sooner). The vendors are happy because they managed to lock in a large order, and they can also better plan their production, knowing how much equipment they need to manufacture in the coming years.

This is only one example of what is possible to do with long-term planning combined with proper procurement processes. Companies can apply similar strategies with many other capex items.

Key number 2: Allocate on merit, not because

As we previously mentioned, many companies will allocate capex budgets to various groups or sectors of companies, simply because they did this the previous years. The result is that each year the same groups receive roughly the same amount of capex budget simply because that is how they did it before.

The second key to the path of capex reduction is to allocate capex to individual merit. This means that capital expenditures are only awarded if specific performance criteria are met. These criteria should typically be financial. They can be a return on investment (for example a minimum Internal Rate of Return, a maximum payback period) or other criteria. However, each project should come with this.

> “Combined with key number one (long term planning), a company could see all the capex projects that are proposed for the coming years and start by allocating funds to the best projects (for example, those with the best return on investment) and stop when the annual funds are exhausted.”

While this might seem unfair because some business units might produce the best capex requests, eclipsing other business units, allocating capital on merit has many advantages. First, it forces the people in the company to produce promising ideas. Instead of having an annual amount for capex automatically carved out for them, each business unit will now fight for its food. Second, it allows the company’s management to sort all capex requests from best to worse and establish a cut-off at a specific point. Very soon, word will spread in the company of that cut-off point, and business units will be looking for ways to improve their capex request to meet the threshold. Some business units which like to control their ship might become more open to head office suggestions about cost reduction ideas such as group purchase, finding grants and others.

Key number 3: Consider the lifecycle cost whenever possible, because cheap is too expensive

Too often, companies seeking to purchase a piece of equipment or do a project put together a request for proposal and then select the lowest price when all specs are considered equal. The problem with this is that specs are rarely equal, and not considering everything might end up a costly decision. Including lifecycle cost analysis is an essential part of the capex process, and we think it deserves its chapter. Chapter below focuses on lifecycle cost.

Key number four: Proper tools

Tools have been around for almost as long as humans have been. To say that they have tremendously evolved over the centuries is an understatement. However, they have always had the same purpose: to help the user do better, do more, do faster, do stronger.

In management, companies have tools to help them do better, do more, do faster, and do at less cost. Having the proper tools can help create and manage a cost-effective capital expenditure process. While many companies still rely on homemade spreadsheets for this, having more specialized software can make a significant difference in reducing the cost of capital expenditures overall. Chapter xxx touches on this subject.

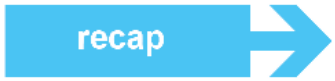
Other items to consider

We have covered the capital expenditure planning and detailed ways that companies and organizations can implement management methods to reduce their cost of capital. In every situation, we have considered capital expenditures. However, there are other ways that companies can reduce their capex costs, at times, by avoiding them. While not always possible, it is still good to have a look at alternatives to straight capital expenditures, and we will list some of the other options here.

Purchase vs. lease.

The notion of capital expenditure involves the purchase of an equipment, component, repair, or project. However, in some cases, the company might be better off to lease than to purchase. Although not always applicable, it is something to be considered, depending on the nature of the capex and the intended usage by the company. For example, if a company needs a forklift for its operations, it could go ahead and purchase it like regular capital expenditure. It would pay for it outright (or have it financed) and then amortize it over several years. However, since this equipment is a forklift, and several suppliers lease these types of equipment, the company could decide to lease the forklift. It could also include the maintenance and repairs in the leasing agreement, to have a better knowledge of the costs right from the onset, instead of having to budget for unexpected repairs in the coming

years. In addition, leasing the equipment would remove the uncertainty of the residual value (or having to find a buyer for the old forklift in a few years).
By performing a detailed cost analysis of lease vs. purchase, the company can find out what would be the best decision for this type of equipment. The same can be done for several other equipment or components.
One point, in this text, we do not discuss capital lease vs. operational lease, the point here above is only to outline potential alternative to standard capex purchase.



As we saw up in this section, companies could benefit from improving the planning and management of their capital expenditures. By doing so, they can ultimately reduce their overall capex costs in a few ways.

Now we will take a look at the process of getting a request for capital expenditure approved in a company or organization. This process is a crucial one. After all, one might have the best idea for a project, but if the project is not approved, if the project is not funded, it will remain at the idea stage. Getting the capex approved means that a request was created and assembled in a way that it is sellable. That is, sellable to the people with authority to approve the request.

The following section of the guide will look at how to assemble the information to get your capital request approved.

Section B – Improving the odds of getting your capex request approved

- **How to assemble a request**
- **Anticipate questions from approvers**

The ultimate guide to managing capital expenditures in companies and organizations

People that oversee and approve capital expenditures in companies usually get to review the business cases that come with the capital expenditure request. Most companies and organizations do request some kind of business case to be created before giving the green light for any project or capital expenditure that is not pre-approved. Moreover, even when it is pre-approved, most people still need to re-justify the capex before they initiate the expense.

If you are part of the approval process of capital expenditures in your company or organization, you know that all these requests come with a reason. People that seek approval of capital expenses use several reasons for their justification, and this in itself is probably one of the most critical elements of the business case. However, over time, the process of capital expenditure approval has seen an increase in the number of reasons used for justifying them and its adding complexity for everyone involved.

Let us explain

Over the past years, companies have typically spent money for capital expenditures for several reasons, such as the need to replace older existing equipment or acquire new equipment to grow their business or complete some significant repairs to a building. Later, when efficiency improvement became more popular (and such equipment became available), companies started to replace current equipment with more efficient ones, to gain efficiency by reducing workforce (by automating processes), waste, and energy.

These are only a few reasons for spending on capital expenditures, but they illustrate that reasons have evolved over the past decades to include new ones. Over many years, companies evolved their justification criteria for spending on capital expenditures. If one hundred years ago, most capital expenditure was justified by replacing old equipment or doing major repairs, new justifications for capital expenses would be much more complex and varied today.

Reasons today, in addition to the previous ones used in the past, now include legislation, insurance, disuse, energy-saving, health and safety, and environment to name only a few. Of course, traditional reasons such as replacing equipment which has reached the end of their life, are still popular. Nevertheless, we are seeing new reasons relating to fields such as the environment becoming more popular these days.

The problem for people in a capital expenditure approval position is that getting to understand the reasons for the capital expenditure demand is also getting more difficult because of the evolving reasons for the request. Also, without a good understanding of the reason for the capex request, many people can take a fallback position (that may seem risk-free) of denying the capex request. After all, if we reject the approval, do we eliminate the possibility that the project or the capital expenditure would have been a wrong decision? Moreover, what about the good projects that are being denied simply because the approvers do not fully understand the reason behind the capital expenditure request? Unfortunately, numerous companies and organizations are missing opportunities because of this.

If replacing an equipment, because it is too old to function correctly, is a concept that everyone can understand and are approved without too much pain, getting to replace a perfectly good equipment for another one, which will improve quality, reduce staff and the company's carbon footprint at the same time is another story.

The same thing applies for retrofit projects whose primary purpose is to save energy. Instead of having to simply compare between keeping old equipment running and purchasing a new one, the capital expenditure approver now has to understand new concepts and see the cumulative effect of a combination of factors. In addition, often, the first thing that the approvers will normally do is seek more information before making their decision.

For the person seeking to get a projector purchase approved, it also means that he or she will need not only to answer these questions but to explain in a language that the approver will understand and in the same process, do it convincingly.

Questions from the approvers can be very varied, depending on the nature of the capex request:

- Can you explain how this retrofit project will help us save energy and reduce our carbon footprint at the same time?
- How much of this project is for saving energy, and how much is simply to make us look greener?
- I do not understand this project. How do we measure the immediate benefits for the company?
- Do we do use standard methods such as Payback, Net Present Value (NPV), or Internal Rate of Return (IRR)?
- Can we get grants for the project?
- How many grants are we estimated to receive, and how much is based on internal guesstimates?
- Is this for safety reasons? Why was it safe last year and suddenly, it is now not safe? What has changed?
- Are we replacing it because of legislation? We just changed the equipment last year; can we continue as we are doing now?
- Insurance wants us to spend for what? Is this an absolute requirement (if we do not do this, do we lose our insurance protection) or another one of their nice-to-have proposals?
- Is this capex for a production unit for a new client? Do we know for how long we will keep the new client? What happens if we lose the client before the new equipment has been fully paid for?
- What is the lifecycle cost for this equipment, and did we do a lifecycle cost analysis for any other alternatives?
- What is the urgency suddenly? Things were working well until today.
- The savings related to this equipment purchase are based on a reduction of headcounts. Have we clearly identified whom we will let go and all the costs associated with this?
- These are only a few examples of questions that come up all the time. These days there are many, many more questions and rightfully so. However, how often are capital requests denied because the approvers did not fully understand the

benefits behind the request, or because of a perceived risk attached to these requests?

Because of the explosion of reasons, getting projects approved requires that the initiator of the request do more homework than before. No one really expects the capital expenditure approvers to be experts in all fields such as legislation, health, and safety, energy-saving, insurance, and others, but the approvers need to be able to analyses the capital expenditure requests that are initiated for very several reasons.

How can the initiator of the capital request and the approver get to be on the same level, so that the good capital expenditure requests are approved and those that provide less value to the company are rejected?
First things first. It is up to the initiator of the capital request to provide enough information for the approver to understand fully what he or she is approving. In the capital expenditure request, the initiator must clearly state at a minimum:

1. **What the expenditure request is about,** providing as many details as possible on the project, the purchased equipment, the cost, timeline, and other elements that are associated with the capex request such as warrantee, performance guarantee.

2. **The reason or reasons behind the expenditure.** This is providing information on the benefits that the expenditure will bring (help to increase production, reduce costs, comply with legislation, save energy, add security to workers…etc.).

3. **Any explanation on why the capex needs to be approved** now can be useful. A request for capital either triggers an event (the company wants to invest in a project or machinery), or it is triggered by an event regardless of if the event happened suddenly (the equipment broke down) or over time (the entire roof needs to be changed). In any event, the capex seeker will need to explain why now.

4. **The total cost,** meaning the cost and all potential additional costs that may arise. This is usually an excellent time to include an element of risk in terms of possible cost overruns. If the capex request is a simple equipment purchase, this can be simple to isolate, but if the capex is for the expansion of a manufacturing plant and includes process equipment as well as the building, there might be multiple

sources of a potential cost increase.

5. **The other risks (all of them).** Capital request that is for more complex equipment or projects should include information on the potential risks; this shows the approver that homework has been done. For example, if there is a risk that the new equipment the capex request is seeking may take more time to install and get running up to the desired production speed, there might be production downtime because of this, and it should be considered in the analysis. Risks can be apparent (ex: delay in equipment installation can cause delays to production, which in turn can cost the company money), but they can also be less noticeable. For example, if the purchase of new equipment is meant to replace employees, have the costs of terminating the employees and the risks associated (being sued by the employees or problems with unions) been adequately evaluated?

6. **The benefits to the company/organization.** These include the standard financial benefits (payback, NPV, IRR), quality (improvement of production quality), and health, safety, cost reduction, marketing/sales/image benefits (if the project helps the environment for example). The benefits and the reason usually go together; although, some capital expenditure might not have many benefits. For example, if a new municipal law requires a company to install something new, say a fence, while this new law will be the reason for the capex request, but it might not bring any benefit for the company (apart from getting the city off the company's back).

7. **The downside of not doing the project.** If there are benefits to the capital expenditure that is requested, there is probably a downside to not doing it. It is important to outline the downside or potential consequence or loss of opportunity that would result from not getting the capex approved. This can range from government penalty (suppose the company does not authorize a capex request that was for something related to legislation) to loss of insurance coverage (supposing the request is from the insurance company as is mandated to keep the coverage).

   Finally, it can also lead to negative public news (suppose the capex request was for replacing a chimney that emitted pollution next to a residential area). These are simply examples, and there are many other potential downsides. The important part is to provide the information on the capital expenditure request for the

approvers to understand fully the consequences of not approving the capex. However, it is up to the people seeking to get the capex approved to highlight the consequences (if any) of not pursuing a capital expenditure.

8. Depending on the nature of the capex request, **a description of how, who will implement the project,** component, or work, and when. While this might be straightforward if the capital expenditure is for the acquisition of a forklift, if the capex request is for a building expansion or a new production unit, there might be many elements to consider here.

9. **Information on alternatives.** Since the vast majority of capital expenditures have alternative solutions, it is best to be well prepared and have several alternatives in terms of what to do, what other vendors to consider or other potential equipment to purchase. Showing to the approvers that some alternatives were considered shows that homework was done and will help avoid some of the questions such as, "What are the alternatives?"
   Alternatives can be other types of equipment, other vendors, but they can also be other forms of getting equipment. For example, an alternative to purchasing equipment might be to lease it. Instead of replacing equipment, we can look at an overhaul. An alternative to buying new might be to buy second-hand. Whatever the nature of the capital expenditure, there are often alternatives that can be found.

10. **Any technical information that the approver needs** to understand should be presented in a straightforward way so that the person (or persons) in the position of approving the capital expenditure can take a sound decision. The more information and explanation that is provided, the more the approvers will understand what the request is about and in many cases, the more they can tend to be favorable to the request (if the request already meets the company's criteria of course).

The process of capital expenditure has evolved, significantly, over the years. Today, there are more reasons to initiate a request for capital than there used to only a few years ago, and this tendency is probably going to continue in the future.

People seeking to get their capital expenditure approved should consider that the multiple reasons available for their capital expenditure justification only makes the work of the approvers more complex and therefore, they should provide them with as much information as possible in order for the approvers to take decisions that make great business sense for their companies or organizations.

Section C – Things not to forget when creating a capital expenditure request

- **All the important elements to consider when assembling your request**

We have looked at the planning of capital expenditures as well as how to justify a request. For the next chapter of this guide, we will provide you with a list of items that should be kept in mind when creating a capex request. We have assembled a list of the most essential elements to consider for a capex request. Because each request is different and each company has different needs, it is possible that not all items on the list apply to all capital expenditures request. Therefore, this list should be used more as a 'do-not-forget-to-think-about' list than a finite list of items to be included in every capex request. A final note, the list does not sort the items by level of importance. Here again, because each company is different, some items on the list might be very important for a company and of less significance to another.

Most complex tasks these days require some kind of defined checklist before people can start. Take an airplane, for example. One would probably not want to fly on a plane where the captain and co-pilot have not gone over their checklist to review essential elements like fuel, doors, and many other items on their list. Going to be pure memory is not in the best interest of anyone in this case.

Therefore, why when people in companies put together a capital expenditure (capex) request, they often fail to go over a checklist? One explanation could be the rush to get the capex approved.

Although this argument would not explain everything; for many companies, by the time that the people put together a business case for a capex, they are already running behind their schedule. If the capex concerns the replacement of production equipment, every hour lost can represent lost production. However, this would not explain all situations. There are many cases where people have sufficient time to plan for the capex, and they still fail to go over detailed checklists.

Instead of trying to find out the "why" companies do not have a checklist, we will focus here on the checklist itself, so highlight the items that should be addressed, regardless of how fast the capex needs to be approved. After all, most of the elements contained in the list can be addressed at the very time that people are putting the capex request together. Also, even at times where it is simply not possible to put together a formal capex request, people in companies can still use the list to integrate the elements in their purchase.

Regardless of the complexity of the purchase, having a good checklist handy can prove useful, even when the purchase seems like a repeat of something the company already previously purchased. Also, if this idea applies to seemingly standard equipment, it indeed does apply if the equipment is something brand new and coming from a foreign country.

So, what should be a capex checklist? Although the reader will probably find other items that can be added to the checklist below, the items listed here should constitute the minimum to keep in mind when purchasing a new piece of equipment.

1. What is the real price?

That is the total price with everything included

This first item on the list might seem trivial. After all, price is a central piece of any capex. However, the price can take many forms. For example, if the capex is for a piece of equipment, does the price include only the equipment or does it also include installation? Does the price include the start-up of the equipment? Does the price include tax and other fees or duties? Does it include shipping cost, insurance, etc.?

2. When will it be delivered?

The exact day it will arrive at your site

The second most crucial element is the delivery date. This again seems obvious, but depending on what the people want to purchase, they will need to validate if the agreement is talking about when the equipment is going to be delivered or ready to operate.

For example, if the contract states a turnkey installation, is the delivery date the date that the equipment arrives at the customer's site or the date the equipment is ready to operate? If the equipment is set to be delivered at a port, is the delivery date the day that it enters the port, or the day that it has cleared customs and is ready to be taken. The date is simple to understand, but knowing exactly what the date is referring to is not always so simple.

3. Where is the delivery point?

Learn the incoterms if possible, do not get surprised if the delivery is at the manufacturer's place if it is written, "Ex works" in your contract

Incoterms are great because they enable people to speak the same language. That is, for people who already speak the incoterm language. For others, it may be a little tricky. Terms such as "free on board" and "ex works" mean quite different things. It is important to understand what the meaning of the terms, and if in doubt, to seek help from people that speaks incoterm language. Remember that incoterms cover a wide range of elements, such as delivery points and costs such as insurance and transport (to name a few).

4. When do you take ownership?

When is ownership transferred to you?

While this item is usually covered in the Incoterms, when there are Incoterms, in the case where the agreement or contract is in another format (plain text for example), it might be a little more challenging to understand when the company takes ownership of the purchase. If the purchase is equipment, the information should be clearly spelled out in the agreement or contract. If the purchase is a project or group of equipment, then depending on the situation, there might be multiple dates for transferring ownership from vendor to buyer. Having a complete understanding of when the ownership is transferred is important to know.

5. When do you take responsibility?

If something breaks, when is it under your insurance?

In most cases, the responsibility is transferred when the company (client/buyer) takes ownership from the vendor.

This, however, is not always the case. In some cases, there might be a third party involved (a contractor, an installer, or other) and the dates at which the ownership is transferred are different from the date at which the buyer becomes responsible for breaks or additional costs.

6. Who provides insurance, and for what amount?

Unsurprisingly, insurance is never a popular topic. Most of the time it is a necessity which people hope they will never need, while most always regretting having to pay for this when nothing happens. It is a tricky situation; however, it is also necessary in most cases. Having the proper amount of insurance will provide some peace of mind, but companies need to remember that they also need to look at what they need to have covered by insurance.

In the case of simple equipment, is insurance needed for replacement of the part only? Does the insurance cover all the costs such as transport and other duties? What if the component takes 30 weeks to manufacture and gets lost along the way,

will equipment replacement insurance be enough? Will, there are other forms of insurance (loss of production) available, the goal of this item here is simply to make the reader reflect on the insurance that he or she has on the capex, and who pays for it (vendor, buyer, or other).

7. What happens if there is a problem?

Can I return it? What if the equipment is received partially broken?

Most buyers normally assume that if the equipment is broken, the vendor will supply a new one. However, depending on the nature of the capex, this item can rapidly become a complicated one.

For example, what if the equipment breaks once it is installed and cannot be removed? Will the vendor repair the equipment locally? What if the capex is a project? Who pays for what in the event that it needs repairs? In the case where the equipment can be returned, who pays for the transport, duties fees, insurance, and other costs?

8. How do we pay?

Check, transfer, letter of credit, or other methods

Depending on the capex, payments might be small and be paid with a simple check or wire transfer. However, in other cases, if there are other means of payment like letters of credit, it is important to know the details involved.

9. When do we pay what?

Timeline for actual payments

The timeline of payments may be a small element if the capex is a small one. However, if the capex is for a piece of equipment, which costs millions of dollars, the payment terms take on a vastly different magnitude. In these cases, it might be important to talk with the treasury department of the company (or whoever oversees handling the money in the company) to secure the funds when they are needed. It is also good to know if there are penalties for past due payments, in the purchase agreement.

10. Are there taxes to be paid, how much, and to who?

Taxes are so much an intrinsic part of the business that we do not often forget. However, it is important to know all the taxes that need to be paid, both local and foreign.

For example, if the equipment is coming from a foreign country, and they impose an exit tax (most often called some kind of duty name), it is important to know who needs to pay for it, when, and how much it represents.

11. Performance clauses

Quality, speed, number of items, efficiency, and durability

This is the most complex of all items on the checklist. When a capex represents something like complex assemblies, production equipment, or projects, the notion of performance often surfaces. Performance can take many forms such as speed, quality, and the number of items produced, efficiency or durability, as well as a combination of all these forms. Having a proper performance clause will protect the buyer, to various levels, from surprises. The goal is to keep in mind what is important.

For example, if the equipment is purchased for production, some of the characteristics might be more important than others. The important thing to know is what will happen is one of the characteristics that do not materialize. For example, **if the equipment needs to operate to a certain speed, but only achieves 80 percent of that speed, does the purchase agreement have a mechanism for compensation to the buyer?**

What if the production equipment is simply of no use to the buyer if it achieved this speed level (supposing it is attached to other production equipment, and it absolutely needs to run at a higher speed)? Can the buyer send back the equipment and be compensated for it? Are there any penalties for the vendor that applies in such a case? Covering all the bases here is mandatory to avoid costly surprises, especially for production equipment. However, even in the case of other types of equipment, it is important.

For example, if the capex is for a rooftop unit, which serves for cooling a building, what if the unit does not deliver the cooling capacity that it is expected to? Does the agreement say that the vendor can supply a second unit to increase the cooling

supply? What if there is not enough place to install a second unit? Can the buyer force the vendor to replace the unit with a larger one? **Again, having a strategic reflection of what is expected from the equipment, component, or project outlined in the capex is important.**

12. Installation requirements

Electricity needed, mechanical, plumbing to plan for, settings required, access in building to bring the equipment inside, permits, or any other installation requirement

This item is often a source of budget overruns when it should not be. Regardless of the complexity of the capex, if there is a component of the installation, the capex seeker should outline the additional costs that will be related to the installation. Nobody wants to present an entire capex business case, for a project, only to have to come back to management later to explain that installation costs were forgotten in the process.

13. What are the dimensions of the package or the equipment, and what is the weight?

For most purchased equipment, the size and weight are already known. However, if the equipment is part of a new project, it might be important to know in advance the dimensions of the equipment. Nobody wants to end up having to order a crane at the last minute for something that was supposed to go into a freight elevator.

Weight can also be a factor. For example, if a component or equipment needs to go on the roof of a building as part of a project, knowing the weight in advance might help plan for roof reinforcement (if required). Even when the equipment represents a replacement for an existing one, knowing in advance the dimensions and weight of the new equipment might avoid some unwanted surprises.

14. What is the packaging, labeling, and in what language do instructions come in?

This item is often forgotten. However, unless the purchased product is made locally, it is important not to take for granted that all information will be provided in English, or any other language that is needed. The capex seeker simply needs to validate with the

vendor, what will be the language or work, and documentation. It is better to be safe than sorry.

15. Security concerns (are guards required, extras, etc.)

This item relates more often to projects than to simple equipment purchases. For example, if the capex is for the construction of a new building, who will be responsible for ensuring the security of the site during construction time? While this is usually a subject between the contractor and the client, it can still be an element to consider in the total cost of the capex request.

16. Patents, potential lawsuits if we are buying something new

Does the seller have the patents?

This is an element that few companies think about, but that has the potential to cause headaches.

Suppose a company purchases a piece of new production equipment, and after visiting the manufacturer's facilities and seeing the equipment operate, the company makes the decision to buy a piece of equipment. However, two months after the equipment is installed and running, the manufacturer is hit with legal action because someone claims that the manufacturer stole the patent to the equipment.

Worse, the legal action is seeking to have all equipment removed from all sites or demand that the end user pays a hefty fee. What happens, in this case, and who will compensate (and protect) the buyer in this case? New equipment and modern technologies are great; however, making sure that the seller/manufacturer is habilitated in delivering what is in the purchase agreement is important. At a minimum, the seller should be able to guarantee, in writing, to protect and compensate the buyer in any event that the manufacturer gets sued and that someone comes to claim something from the buyer. However, even if the legal case does not directly affect the buyer, what if it is sufficient to bankrupt the manufacturer? Where will the buyer get support, training, parts, and service?

17. The solidity of the company

(Two guys in their basement versus an international company)

This one is trivial and does not always allow the buyer to make many changes to the agreement, but sometimes the buyer can introduce some clauses to help protect him/herself. For example, if the supplier is providing specialized equipment, the buyer might want to add terms to offer extra training (in case the manufacturer goes belly-up). The buyer might even ask for some information to be placed in an escrow, to be used in the situation where the manufacturer goes out of business.

While this is more common for software purchases, where the software company can place the source code in escrow to allow the purchaser some usage in the case where the software companies goes bankrupt or ceases operations, this kind of protection for the buyer can sometimes be applied for other purchases, such as capex (although not always).

The key item to remember here is that if the company has concerns about the solidity of a company, doing credit reports will not do much to help. Today even large companies with thousands of employees can go bankrupt overnight, and credit checks will not prevent this. The best for the buyer is to protect itself by analyzing where the risks lie and mitigating them as best possible. Sometimes the mitigation can be as simple as finding a second supplier that can take over in case the first one goes out of business.

18. Support

Cost, hours, extras, what is included and what is not

Depending on the nature of the capital expenditure, these items might represent substantial cost. Anything dealing with support to the equipment, component, or project should be addressed at the same time as when the main item is negotiated. Knowing what is included, and what comes at extra cost is always good to know.

19. Training

Where it is given, at what cost, when is it given, how long does it last, what is the cost of extra training if needed

Like the item above, anything related to training and the cost associated with it should be made part of the agreement.

If training involves bringing in people from outside the city (or even the country), it is essential to determine who will pay for what (travel, room, and board).

20. Spare parts kits

What is recommended, frequency of anticipated repairs, the budget required

Spare parts are not often forgotten when it comes to production equipment, as most people involved in the capital expenditure process will naturally have this element in mind when negotiating new equipment or a project. However, for other equipment or components, it might not always be automatic to include them in the capex request. Depending upon the situation, the cost of the spare parts and the cost of maintenance could be included in the cost analysis of the capital expenditure request. In some cases, these costs can tip the scale towards one supplier versus another.

21. Is this a new technology

If that is the case, has it been thoroughly tested elsewhere before?

Item 16 above cautions the capex seeker about potential litigation problems if a manufacturer does not have all the required intellectual property. However, even in the case where the manufacturer does have everything, if the equipment or technology purchased is new, does the buyer know what he or she is getting into? Has the equipment been tested with success elsewhere? It is one thing to purchase simple software and must report a bug, which can be easily fixed in a brief period. It is an entirely different story to buy a new million-dollar production unit that does not work.

22. Are you helping to develop the equipment?

If so can you get a non-compete or protection clause for a while?

This item is one of the rarest, but something to consider depending on what is at stake. For example, a company decides to purchase new production equipment and have it modified for the company's needs. The modifications will stand to make the equipment much better/faster/efficient/reliable than before. However, to complete the changes, the manufacturer asks the company to help. The agreement between the

company and the manufacturer states that the manufacturer and the company will work together to improve the equipment. The company will allow the manufacturer to conduct tests on the company's production line until the modifications are complete.

> This is a win-win situation. The company gets different equipment, giving it a competitive advantage over its competition (and it even gets a rebate from the manufacturing company for being so helpful). The manufacturer gets to test and improve its product on live production, something difficult to replicate on a manufacturer's site.
>
> The manufacturer is happy to have created improved equipment, and the company is pleased to have such great equipment for its production. However, six months later, the company learns that the manufacturer just sold six improved pieces of equipment to its biggest competitor.
>
> This is not a situation that any company wants to find itself: Developing something to be used by others. At least not for a while.

It is not always possible to prevent this from happening, but it can sometimes be possible to insert wording into the purchase agreement to delay the time to market for the manufacturer. This can sometimes give the purchasing company a head starts over its competition.

23. When does the warranty start to kick in and when does it end?

For simple equipment purchases, the warranty clause might be simple. However, if the capex involves a group of equipment or a project, there might be several different warranty clauses, each with their own set of terms and conditions. Going over these terms with a fine-tooth comb can be helpful to avoid future unnecessary costs. Items to look for are what are included in the warranty when it starts, and when it stops, under what conditions it can be used, and what can void it.

24. How many items are we really buying?

A single unit, a group of units?

This one is probably one of the most obvious items of all but can be a source of costly errors. Knowing how many items/equipment/components the agreement includes is obviously important. However, going over the contract while keeping in mind how many items the parties are negotiating is always good. Nobody wants to

sign an agreement that calls for the purchase of a dozen items when only one is needed.

25. Is the city ok with the installation of the equipment?

Especially if this is installed outside

If the capex is for the replacement of existing equipment, this item is generally not a source of concern.

However, for new installations, it is sometimes important to make sure that the city will approve the installation. For example, if the capex is for new production equipment and requires some of the components to be installed on the roof, does the city need to approve of what is installed on the roof for noise, pollution, visual or other? Having the proper permits and authorization from authority entities is, without saying, necessary.

26. Is the landlord ok with what will be installed in or on the building?

If you are a tenant

This item is like the previous one. If the company planning the capex purchase needs to install equipment in a building, if this building happens to be leased, the company should make sure that it has the green light from the landlord (in writing) before engaging any costs. This is another ‘better safe than sorry' item.

27. Is your insurance company aware of what you are buying and installing, are you still covered?

As previously indicated, insurance will never win a popularity contest. Because of this, it is normal to forget to inform the insurance company upon installing new equipment or components. Usually this is done when the capex relates to a larger project. However, depending on the nature of the equipment, not only will the insurance company be notified, but the new equipment might also modify the overall risk (and premium cost) of the company or the building which hosts the equipment. Also, the insurance company might require additional measures to be added to the equipment (like special sprinklers, for example) before approving the installation.

These items can increase the cost of the capex and should be considered when putting together a capex request business case.

28. For how long is the quoted price good for and is it for everything in the quote?

Quotes are typically valid for a defined period, and one should not assume that the price would remain the same after that period. When getting quotes, it is important to make sure that the supplier's quote remains valid long enough to be able to get the capex request approved. In addition, one should ensure that everything in the quote is valid for the same period. Sometimes suppliers will provide a validity period different for labor than for equipment, so it is always good to carefully read the terms and conditions of the quotes and when in doubt, have the terms confirmed in writing by the supplier.

29. Is everything in the quote of the same currency?

Also, although it might sound trivial, understanding correctly which currency is used is essential. Equipment made in Asia, for example, might be quoted in local currency but the vendor might ask to be paid in equivalent USD at the time of the sale.

30. Has someone from a legal department/firm reviewed the agreement?

In some companies, sending the purchase agreement to the internal/external legal department is standard procedure. For others, it is on a case-by-case basis, depending on the number of dollars involved, or the complexity of the capex, or a combination of both. While many view the role of the legal as a watchdog (that often seems to slow down the process), when done correctly legal can be a powerful ally to have on one's side.

For starters, they usually speak the language of the agreements and can help spot clauses that other people might not naturally catch (obligations, automatic renewals,

others). Bottom line: The more significant and more complex a capital expenditure is, the more legal should probably get involved in helping.

31. Are there any grants or research and development credits or incentives that you can get when buying the equipment?

This item can potentially be a source of cost reduction for capital expenditure. Taking into consideration grants and incentives can improve the return on investment of capex.

32. Is energy saving been considered?

When done right, energy saving can be integrated into the capital expenditure process and help improve the financials of the capex request. We provide a section on this specific topic later in the guide.

Part 3. How it all comes together.

Section A – Incorporating additional benefits to the capex process

Section B – Reducing the cost of capex

The first two parts of this guide covered the basis of capital expenditures. We looked at what were capital expenditures, how they were treated. We covered the planning process of capex management, as well as how to get the requests approved. Finally, we listed items not to forget when creating the actual capex request.

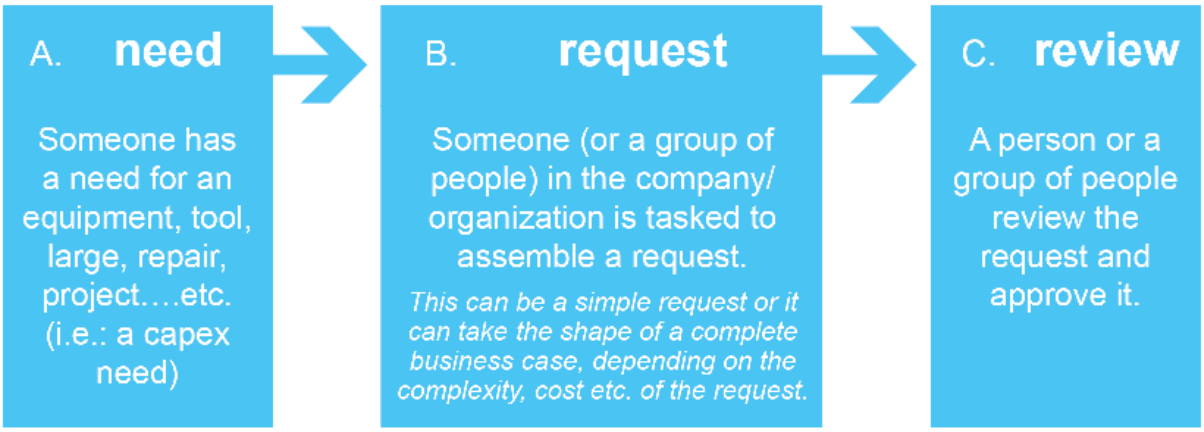
In this last part of this guide, we will take a deeper dive into how we can extract the maximum benefits from a capital expenditure request and how we can improve the overall process in a company or organization. We will take a look at how capital expenditures can integrate with other elements of your business for additional benefits.

Finally, we will discuss about the players and the policies in which they navigate, and how they can positively influence the process.

Section A – Incorporating additional benefits to the capex process

- How to improve the capex process
- Integrate other elements
- Players and policies

In many companies and organizations, the capex process works basically like this:



The role for the people involved in step **b** of the process is to assemble sufficient information for the people in step **c** to be able to approve the request. In some companies, some people might be involved in more than one step. For example, the person with the need might also be the person creating the request. A person assembling the business case for the request might be involved in the approval process also.

Unfortunately, this process tends to create silos within companies and organizations, and the result can leave behind some benefits that could have been obtained if the process was opened up a little.

For example, let's consider Company A. This company manufactures widgets for numerous markets. Their widgets are sold all over the world.

The director or production of Company A is getting a request to increase capacity within a six-month timeframe. Sales & Marketing have secured long term orders for additional widgets. While this is excellent news for the teams in sales and marketing, for production, this creates a problem if their current production equipment cannot produce more widgets. Worse, they need to have the extra capacity within six months, so that leaves them very little time to purchase additional production equipment, receive it, install it, and to get it in operation.

A production team is quickly tasked with finding which equipment to purchase. Among a selected group of vendors, one vendor is chosen for its price and manufacturing capacity. The controller of the production group is tasked with rapidly creating a business case for the acquisition of a new widget production line. The controller then creates the request, using a mix of spreadsheets and attached documents to complete a business case ready for approval.

As soon as the request is finished, it is sent off for approval. The approval team at the plant level consists of the controller (who also created the request), the director of operations, and the plant manager. In addition to this, because of the amount of the request, the request must also be approved by the division VP Operations, the VP Finance of the division, and the Sector President.

A few weeks pass, and the request is finally approved, after being sent in internal mail from department to department. There were some delays because approvers had questions, and some details of the request were missing, so some email exchange occurred.

At this stage, the production group has a green light to purchase the new production line. They then create a project task which will be responsible for the purchase and installation of the new line.

We can fairly say that company describes what happens in many companies. The process and players might vary a little, but overall logic is the same.

Now, let's consider Company B, which has developed a program of maximizing benefits into their capital expenditures.

Company B also manufactures widgets, and their Sales and Marketing departments just signed a new contract which will start in 6 months. Upon being informed of this, the production department quickly gathers its key team for a meeting. Current production is not sufficient, and they only have six months to increase production. A new production line will be required.

The team brings in various people to assist in creating the specifications for the request. People from the supply chain, R&D, IT, and energy saving are invited to a meeting. Upper finance is also invited since the cost of the new equipment will need their approval. At the meeting, the director of productions outlines what is the need of the plant and what they are looking for. Each member of the team adds some comments. For example:

1. The supply chain will want to know where the equipment will come from because it can help to reduce transport costs. They also want to know if the vendor selected might be one with which they already have agreements in place, with rebates in escalation tiers, so that could have an impact on the closing price of some vendors. There is also all the notion of warranties and services that they need to be involved.
2. R&D (research and development) are on standby to help discuss any potential grants that the company could get in the event that some modern technologies are being used, merely a new way to work.
3. The energy department is offering its guidance to help select the vendor. They point out that some vendors sell production lines that are more energy efficient than others. This needs to be considered since the production line will be using energy for at least the next ten years. They also need to understand how this new production line will influence the total energy consumption in the building. Finally, they point out that there could be grants and incentives from both the local utility provider as well as the State, depending on what equipment is ultimately selected. The grants and

incentives could be substantial and should be integrated into the total cost when selecting a vendor.

4. IT and finance list their requirements and indicate their full support to expediting the request once they receive it.

The production team works with the other departments throughout the equipment and vendor selection process, and the information they provide is included in the capital expenditure request. They have selected a different vendor than Company A because of numerous reasons:

1. Supply chain already had an agreement with a supplier, resulting in volume rebates.
2. The new vendor happens to sell equipment which is more energy efficient
3. R&D and energy secured grants and incentives for the new equipment from numerous sources (new job creation, new technology installed, utility grants for energy saving)

The bottom line is that the elements provided by the various departments improve the financials of the business case. Company B presented a much better product than Company A. Since Company B already had a team in place comprising of members of different departments, no time was wasted, quite the opposite. Since all departments were involved from the start, few questions were raised during the approval process and upper management, knowing that finance was involved, gave a quick signoff.

> Side note: if a company is planning to create a team that comprises of various departments in order to approve future capex request (i.e., IT, Procurement, operations, energy, R&D, legal, finance, and others such as consultants), it is better to assemble the team and get them to know each other in terms of what they will each bring to the table BEFORE there is an actual capex request on the table. Going over potential cases of what the team could be called to approved and having the team players share with the group how they would provide guidance to the process (and not slow it down) will prove beneficial later. Knowing in advance how the process will work will help mitigate some premeditated feelings that people (or groups) might have. For example, if the operations department know that the people on the approval team will be there to help them potentially optimize the capex request (getting grants, reduce energy and costs), they will be much more open to sharing their ideas before they put their capex request on paper. However, if they feel that the team will slow down the process, there is a good chance that the team will receive the capex request only once production has completed it, with the pressure now being put on the team members to approve it right away. After all, as production could point out, production is the department that creates finished products, so without production, we lose money. This is not a situation where the company wants to be in.

Let's now look at the elements that the departments can bring to improve the capex process:

Section B – Reducing the cost of capex

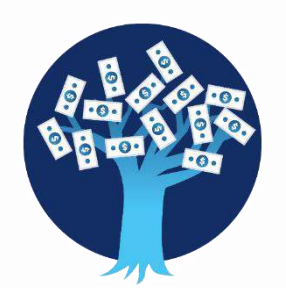
- What can we add to reduce the costs
- Grants and incentives
- Energy Saving
- Lifecycle Cost
- Money left on the table (MLT)
- Policies
- Tools for the trade

One of the most significant challenges in companies and organizations is reducing costs. So much that many managers now have their performance bonus tied to this single item. Today managers try to cut costs everywhere they can, and capital expenditures are not sparred.

We have looked at the planning process and the items to include in a capex request. For the next section of this guide, we will look at what else can be done to reduce the cost of capital acquisition requests and how they can be made part of the capex process.

Grants and incentives.

Welcome free money.



Grants and incentives are, in many cases, free money. They might come with some strings attached, but those usually are parameters to standardize the process. For example, for energy incentives, the utility provider might promise an incentive amount but hold off a portion of the guaranteed amount for up to one year, solely to validate what the incentive receiver (the company applying for the grant) promised it would do. If a company is getting an incentive because it is implementing an energy reduction project which will lead to a saving of $500,000 per year, it would be reasonable for the provider of the incentive to wait a few months (or even a full year) to validate that the energy savings are indeed happening. However, if the company delivers on its promise, then the money will be there. The same thing can be said about grants related to innovation (research and development).

Grants and incentives are great ways to improve a capital expenditure's return on investment. They do so by reducing the total cost of the capex.

For example, if a capex costs 1 million dollars and generates an annual saving of $100,000, we can say that the payback is ten years (1,000,000 divided by 100,000).

Year	0	1	2	3	4	5	6	7	8	9	10
cost	-1,000,000										
saving		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

$$\text{Payback} = \frac{\$1{,}000{,}000 \text{ (cost)}}{\$100{,}000 \text{ (annual savings)}} = 10 \text{ Years}$$

Take the same capex and apply a grant of $300,000, the capex now has a total cost of $700,000 (1,000,000 – 300,000) and the payback falls to 7 years.

Year	0	1	2	3	4	5	6	7	8	9	10
grant	300,000										
cost	-1,000,000										
saving		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000

$$\text{Payback} = \frac{\$1{,}000{,}000 \text{ (cost)} - \$300{,}000 \text{ (grants)}}{\$100{,}000 \text{ (annual savings)}} = 7 \text{ Years}$$

Grants and incentives are, most of the time, very interesting. Enough so that many large companies have departments whose objective is solely to apply for them whenever possible. While smaller companies might not be able to have full-time people for this task, sometimes it can be done part-time and in concert with local consultants which can be brought in for a specific capex. Many of these consultants work on a percentage basis, so they only get paid a portion (between 10 and 30% on average) of what they can get in terms of grants and incentives.

Energy savings

The second element that we look at that now is energy saving. We briefly touched base earlier on the fact that if the company has a dedicated energy reduction expert, he or she can help the capex process by researching what grants and incentives could be applied to the expenditure. Regardless of if the expert is in house or an external consultant that the company works with on a regular basis, the logic is the same: that person should be able to provide insight as to what grants or incentives can be obtained by various sources (government, utility providers, others) and bring this information to the table when the company is assembling a capex request. Any dollar obtained via a grant or an incentive will help the capex's financials.

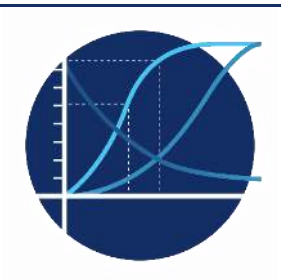
However, beyond the free money that grants can provide because of an energy saving element within the capex, the concept of energy saving can be a valuable one. If we take a simple example where a company needs to replace a cooling system, say a chiller, in a building. The new chiller will be a capital expenditure, and surely, the company's approvers will want to see a request or even a business case to justify the replacement. The company could decide to replace the equipment by a similar equipment, or they could look at it from an energy point of view and do a lifecycle cost analysis and determine that a more energy efficient chiller is the best solution, even if the initial capex cost is higher.

This example is pretty clear cut since it is dealing with cooling units and thus, is directly related to energy consumption. Most people that would be responsible for the chiller would be thinking about energy reduction and consider the energy usage of the chiller in the vendor selection.

However, let's look at something less obvious. Let's consider a production plant that needs to replace a large production unit. The proposed production unit consists of numerous sub components, such as AC and DC motors, heaters, and coolers. The unit is custom made by the vendor. The vendor purchases the steel for the structure of the production unit, then all the programmable controls, the motors, and the other subcomponents are purchased from different sub-vendors and assembled in the vendor's manufacturing plant.

In such a situation, many companies negotiate with the vendor for pricing, delivery, installation, the capacity of production, as well as items such as maintenance, spare parts, commissioning, support, and training. They often leave out the energy efficiency of the sub-components simply because they are focused on the common elements, we list listed. However, when negotiating with the vendors, some companies do insert their energy saving personnel or consultants in the team. These people can question the vendor on what type of motors or sub-components will be installed, and how could they benefit from improving these components. For example, if the vendor was planning of have all AC and DC motor as standard efficiency, an excellent question to ask the vendor would be ‘what would be the additional cost for replacing the standard motors with high-efficiency motors?' After all, if the production unit is going to work on a 24 hours-7-day cycle, the extra cost for the high-efficiency motors might come with a great (short) payback. It might influence the return on investment of the entire production unit itself nicely.

Lifecycle Cost



We briefly touched base on the notion earlier when we talked about conducting a lifecycle analysis for a chiller replacement. While most people agree with the definition of a lifecycle cost analysis and what elements they must include, these analyses are not, unfortunately, done in conjunction with a capex request as they probably should.

In the following pages of this guide, we will discuss the place of lifecycle costing in the capital expenditures process. We will also show when, and how, a lifecycle cost analysis can be used in the decision process. Finally, we will also touch on non-capital expenses and see how lifecycle can be a beneficial element of a supply chain and procurement process.

The ultimate guide to managing capital expenditures in companies and organizations

Capital expenditures are nothing new. They are an essential component of many companies since most of the new production equipment, building construction, renovation, or expansion projects (to name only a few here) involve capital expenditure. In many companies, the capex budget represents a sizable portion of the total budget.

Despite this, many companies have had problems in calculating the benefits of capital expenditure over the years. Most companies set policies and procedures for how capex should be approved, what information is needed for the approval process, and what elements should be included in a business case. However, these policies often lack a strategic analysis component. This is where tools like lifecycle analysis can help provide companies with guidance that can lead to better capex investment decisions.

Lifecycle Cost and its Popularity

Although the term remains popular, it is surprising that few companies use lifecycle cost analysis (LCCA) regularly. Some of the recurring arguments are that completing a detailed LCCA takes time, and it is not always easy to do. Others will argue that complexity can be a challenge and will defer to using a simple business case with standard financials such as payback, internal rate of return, or net present value. While there is some data collection required, doing a detailed LCCA requires using a standard method and sticking with it.

First, let us define what lifecycle cost is. The term lifecycle cost describes the total cost of a purchased item over the period of its useful life. To calculate this, we usually use the term Lifecycle Cost Analysis (LCCA).

The Lifecycle cost analysis is basically a detailed breakdown of the elements that make up the lifecycle cost.

Put simply; lifecycle cost analysis is the concept of identifying and quantifying, both in terms of cost and time frame, what is related to the element. Adding at time zero (today) all the positives and negatives (costs and benefits) of the item targeted by the analysis over the determined period will give us the total cost of the element. In addition to this, we can also chart the curve cost over time. This shows how much money the element is costing each year, and it can be useful for budget planning purposes.

Before we show how this is done, let us look at why and when a lifecycle cost analysis should be performed.

Why do a Lifecycle Cost Analysis

The first question that comes to mind, before doing an LCCA, is if there is going to be a benefit. If there is no benefit associated, why spend the time collecting the information and assembling the analysis?

Lifecycle cost analysis can be a great tool to help a user decide on a course of action, for example deciding on which product or equipment to purchase, or if it is better to replace or repair the equipment. **The strength of the analysis is to be able to establish a baseline on which the user can compare items, whether these items are capital in nature (for example production equipment) or non-capital (e.g., equipment repair).** The LCCA is a great tool because of the multiple elements that it includes, namely costs, and benefits, and when each of them occurs.

When to do a Lifecycle Cost Analysis

The second question that might come to mind is when does it make sense to do a lifecycle cost analysis? Let us look at a few scenarios where the analysis could be useful.

For this guide, and to simplify things, we will define a product as any physical element that a user might need to purchase for a company. This can include any equipment, component, or repair items, regardless of if they are capital expenditures or simply ordinary expenses. Also, because of the time and effort involved in doing an LCCA, they should be associated with products that cost a significant amount of money. For example, one would probably not do a lifecycle cost analysis for the purchase of a small equipment or equipment part, which costs a few dollars only. However, if the user needs to purchase many equipment or parts, and if the aggregated cost is significant, the lifecycle cost analysis might come in handy to help the decision process. Finally, it is worth pointing out that there is no cost threshold for doing an analysis. One company might not care about the difference in lifecycle cost for a piece of equipment that costs $1,000 while another company might set the minimum bar at $50,000. This is very subjective.

A piece of advice here would be to run LCCA and decide where the minimum threshold should be. Over time, if a user notices that there are differences deemed valuable enough with products that cost, say, $20,000, then that might become the threshold. However, keep in mind that in comparing products, the difference between lower cost products might be wider than between higher cost products. For example, there might be a greater difference in the LCCA (in percentage) between a particular type of motor that sells for $10,000 than another one that sells for $50,000. Each product is different, so each company will need to decide where to set the threshold depending on its needs.

Let us look at the situations where an LCCA could be helpful:

- Comparing multiple vendors when selecting a product
- Selecting a type of product
- Deciding if a purchase or replacement should be done
- Correcting for the future

Let us look at each of the situations above.

Consider a company which needs to replace a piece of equipment. The standard process is to define the specifications of the equipment that the company needs to purchase (for example, type, capacity, size, speed…etc.) and put these specifications in an official request for proposal or request for quotation (RFP or RFQ). It either sends it out to suppliers on invitation or makes it public, depending on the situation and/or the company's policies.

The company then receives several proposals, with each vendor providing its own set of specifications and terms and conditions (price, delivery date, what is included, warranty, other). These can be short or lengthy depending on the nature of the purchase, but the logic is always the same.

The company then proceeds to analyses the proposals it received. Unless the purchase is for a pure commodity (e.g., sugar), then there is a remarkably high probability that the proposals will differ from one another. In addition, even in a pure commodity purchase, they differ. As companies are always trying to take the best decision and comply with budget requirements, many of them will go and select the lowest price if the proposals offer equipment with similar specifications. **However, unless the company integrates all the elements of the purchase, it does not know if it is selecting the lowest priced equipment.** It only knows that it will choose

the lowest priced equipment **at the acquisition time**. When all costs are considered, the company might actually be purchasing the most expensive equipment out of the proposed ones. The only way to know is to do a detailed lifecycle cost analysis. Unfortunately, many companies either do not take the time to do it or do not know how.

If the vendors want to differentiate themselves, proposing distinct types or models of equivalent equipment (by equivalent we mean that they would render the same service as what the purchasing company is requiring) makes sense. Each vendor can highlight one or several unique features of the equipment they offer. This makes it more difficult for the purchasing company to compare vendors but gives the vendors the ability to stand out from the crowd.

In this situation, doing an LCCA makes sense. If the purchasing company asks each of the vendors to provide detailed specs of the proposed equipment, it is possible to create a detailed lifecycle cost analysis and select the best equipment and vendor from the group.

Let us list the items that we could include in a typical lifecycle cost analysis, keeping in mind that not all items will be required for each LCCA.

What could be considered in an LCCA

1. Cost of purchase (the product itself)
2. Cost of delivery
3. Installation cost
4. Annual maintenance cost (including preventive and corrective as well as tools required)
5. Commissioning costs and ramp up costs
6. The yearly cost of energy
7. Hours of operation
8. The life expectancy of the product
9. Net resells (residual value) at the end of the life expectancy. The value is the price the product can be sold at the end of its life, minus the cost to remove it. We need to consider any cost that might result from the removal of the product, such as demolition/construction as well as restoration obligations. In many cases, the removal cost is equal to or higher than the reselling price.

Other items to potentially include in the analysis are:

10. On-going labor cost (to operate the equipment)
11. Learning and training as well as manuals and documentation
12. Any other expenses such as an annual fee for usage (e.g., franchise or licensing)
13. Warranty Costs
14. Benefits such as revenue or savings
15. Grants & incentives
16. Additional costs such as insurance, permits, storage costs for parts…etc.
17. Reliability and loss of operation
18. Restoration, remediation costs, and recycling
19. Taxes and interest

Let us look at a few of these items in detail.

Cost of purchase, delivery, and installation

This is the easiest one to get to conduct the analysis since the vendor will typically include it with the proposal. The cost of purchase of the equipment (or any type of product) is the total cost to have the product readily available for delivery.
Delivery cost includes all the costs associated with having the equipment or product delivered to your site.
Installation cost relates to the price paid for installing the product, so for example, it might include charges like bringing electricity and water to the unit. It might also include alterations that need to be done to the building to install the equipment properly.

Maintenance

This one should always be included in the analysis. However, estimating it over time is not a straightforward process. For some equipment, maintenance is linear over the lifespan of the equipment, but for others it is now. In most cases, the maintenance cost increases over a period. For some equipment, the maintenance almost seems like an exponentially growing cost, especially towards the end of the normal life of the equipment. While there are some ways to estimate the maintenance cost over time,

none are perfect because it is impossible to forecast what will break and when correctly. Predictive maintenance and other tools are there to give general guidelines. However, using past field experience, manufacturer's expertise, and other sources of information, it is possible to sketch out an idea of what the maintenance cost could look like from the time the equipment is purchased to the time it is disposed of. Keep in mind that since this is not an exact science, some errors will necessarily be introduced here in the lifecycle cost analysis.

Commissioning and ramp up

Often referred to as commissioning or ramp up costs, this item can be integrated with the product costs of purchase, delivery, and installations. However, we elected to describe it separately here. Commissioning costs are those associated with starting up the product. This applies mostly to equipment such as production (manufacturing) equipment or base building (HVAC) equipment. In both cases, the idea behind commissioning is to get the equipment up and running at optimal (manufacturer designed) performance. For example, if a piece of production equipment was manufactured to create 1,000 widgets per hour, then this should be the goal to reach during the commissioning process. In buildings, we commission the HVAC systems for them to perform their duties or provide heating and cooling to occupants and minimize energy consumption. These costs can be substantial and will need to be included in the lifecycle cost analysis.

Energy

The cost of energy often includes the popular electricity and natural gas, but it can also include water (supply and discharge costs), as well as any other source of energy (fuel, propane, coal…etc.).

When using the cost of energy in the analysis, keep in mind that it will introduce several errors in the analysis since the prices of utilities fluctuate over time. What companies know is the cost of energy at present and if lucky, the cost of utilities soon (next few months or next year). Rarely (if ever) have companies been able to estimate without error the cost of energy over a prolonged period. Some companies introduce hedging in their energy purchase, but this method of protection also has its limits in time. When a company purchases a piece of equipment with an expected lifespan of 20 or 25 years, no

one will be able to predict precisely what will be the cost of energy over these years. What they can do is estimate the energy consumption as best possible and then estimate how much energy will change (i.e., usually rise) over time.

Hours of operation

The hours of operation for a piece of equipment can dramatically vary the lifecycle analysis since they represent a huge factor in the cost of service. Hours of operation influence the energy consumption as well as the wear and tear costs (maintenance). However, because they are not always easy to know with precision, they often (but not always) introduce a source of error in the lifecycle cost analysis. For example, if the equipment is known to work specific hours, then the amount of error can be minimal. However, most equipment related to building or operations have fluctuated hours each year, so they are not always easy to estimate. In addition to this, since the lifecycle cost needs to consider the costs over the lifespan of the equipment, determining the hours of operation of equipment over many years can be nearly impossible for many types of equipment.

Life expectancy

The life expectancy of the product is simply the number of years that the product is expected to be able to operate at the proper output. For example, if a sizeable cooling unit such a centrifugal chiller has a life expectancy of 25 years this would mean that the buyer of the equipment can expect the chiller to provide cooling for that period until the equipment needs to be replaced. Obviously, during such an extended period, there will be costs related to maintenance and normal wear and tear. However, the equipment itself should last 25 years before it is deemed to require too much investment to continue operating it and thus would need to be replaced by a piece of newer equipment.

Each product has a unique life expectancy, and people conducting lifecycle cost analysis should make a best effort to determine what will be the life expectancy of the purchased product at their site. To do this, one must consider the environment in which the product will operate as well as the amount of maintenance and repair that the company is willing to provide to the product. It is logical to think that if a company purchases a new cooling unit and does little or no preventive maintenance on it, the equipment will last a smaller number of years than if the manufacturer's recommended maintenance is done religiously. The same logic can apply to the

environment. If the equipment operates in harsh conditions where corrosive chemicals are in the open, it is reasonable to think that the equipment will not last that long. Same if the equipment is in tropical areas exposed to salt air. Cooling units located in hotel resorts next to oceans typically last many years less than units located much further inland, dryer (and non-salty) environments. It is merely a matter of common sense. This common sense should be used in the LCCA when estimating the life expectancy of the product.

Residual value

Most of the time, when lifecycle cost analysis is performed; companies assume no value to the equipment. The main reason for this is that a small residual value many years in the future does not represent much in terms of present value. Also, since the driving reason for conducting a lifecycle cost is to evaluate all costs during the lifespan of the equipment, it is naturally assumed that at the end of the period used in the analysis, the equipment will have reached the end of its life, and therefore be almost worthless.

However, depending on the type, composition, and location of the equipment, a residual value of zero might not be appropriate. For example, depending on the type of equipment or project, it might still have an attractive residual value. Some equipment might no longer serve the purpose of the company, but it can be resold to other companies, which could use it. Also, depending on the composition of the equipment, it might have materials that have value. This can be the case with equipment with recyclable materials (metals like copper, steel, or silver, for example). In such a case, the equipment might have no production value whatsoever but value simple based on its material content.

As we can see, the residual value is not always zero. However, what happens when it is less than zero? In a rush to calculate a lifecycle cost, many companies fail to consider the cost of removal of the equipment. In some cases, depending on the nature and location of the equipment, the cost of removal can be substantial. For example, if a large piece of equipment was installed on the ground level, the cost for removal is probably lower than if it was installed on the roof of the building, especially if cranes need to be brought in to remove it. While some companies manage to make deals with recyclers to remove the equipment for free (in exchange for letting the recycler take the equipment), is many cases the money generated by the recycling of the equipment is not sufficient to cover

the cost of removal. While it might be challenging to estimate the exact cost of removing equipment 20 years down the road, an estimate can still be made and included in the lifecycle analysis.

On-going labor costs

This cost is related to the hours of operation of the product. Moreover, because the hours of operation tend to fluctuate, calculating the cost of labor associated with operating the product can be a challenge. However, this cost can be significant and over time can represent many times the actual purchase price of the product itself.

Learning and training

The increasing complexity of equipment being purchased today, the costs associated with learning and training are on the rise. To the actual price of the training courses or sessions, we need to include side costs like documentation and other materials required, conference rooms with food and beverages (to host training sessions), as well as short term loss of productivity (people in training are not always doing their regular work during that time).

Annual fees for usage

Some capital expenditures require yearly fees for using the product. Some software, equipment, buildings, and others might have an annual cost solely for the annual usage. If so, it is essential to include them in the LCCA.

Warranty Costs

Some manufacturers will include a certain level of warranty with their products. However, in some cases, the manufacturer will offer an extended warranty, either to prolong the initial coverage period or to extend the range of what is covered by the original warranty. Before purchasing extended warranties, the capex initiator should understand what type of warranty is already included with the product and question if the proposed additional warranties are worth the cost. Many manufacturers or resellers (especially those in the office supply world) are notorious for selling extra coverage on coverage such as computers and printers, sometimes offering coverage for a more extended period than the company uses the equipment.

In any case, costs associated with warranties should be included in the LCCA.

Benefits

So far, we have described in fair detail all the costs associated with a lifecycle cost analysis. After all, it is called a lifecycle COST analysis. However, there are more than costs that need to be considered. Benefits represent a significant part of the equation. While not all capex can show the benefit that is easy to estimate, for those benefits that can be calculated in monetary value, they should be included in the analysis. If the capex helps the company generate revenue (increases sales) or reduce costs like production, energy, time or if it helps improve efficiency, that benefit should be included in the LCCA. When possible, break down the benefit to show the number of dollars, hours, percentage, an element that the benefit touches.

For example, if a lifecycle cost analysis is being done on a project of a robot that can replace three employees, the benefits of saving manpower should be detailed with number of hours (per week, month or year) saved, costs saved per hour (including salary, fringes, overtime, and other) should go against the costs in the analysis.

Grants and incentives

Grants and incentives have a positive effect on LCCA. Often referred to as ‘free money,' they usually serve the purpose of helping companies and organizations go ahead with a purchase or project for which the company or organization would not usually conduct without the funds. That is in theory. In reality, many companies and organizations manage to get grants and incentives, even for projects that they would go ahead without receiving them. In those cases, the grants and incentives simply improve the numbers. Any grant and/or incentive that can be applied to a project or product purchase will help by reducing the cost of the product or project. So, for example, if a company decides to purchase new production equipment, if a government department provides a grant for the purchase of the equipment (say for job creation), the grant can go against the purchase cost of the equipment, to reduce its cost. This, in turn, improves the lifecycle cost analysis because it reduces the total life-cycle cost of the equipment.

Other costs such as insurance, permits, storage for parts…etc.

This is where we can add any other expenses that are not part of the group above. Charges related to insurance, licenses (to receive or operate), storage costs related to spare parts, these

costs are often forgotten simply because they either do not represent a significant amount or they get bent. For example, the company might have an insurance policy which covers all equipment, so adding a piece of new equipment might not add to the insurance premium. This is true but depending on the nature of the equipment to be purchased, it might increase the insurance premium.
Keep in mind some of these costs (like permits, especially if building a new site) can represent a significant amount of money, and their cost should be included in the cape request.

Reliability and loss of operation

This cost is related to the reliability of the equipment or project. Although it is not extremely popular in lifecycle cost calculations, depending on the nature of the equipment or project, it might be interesting to introduce the notion of loss of operation, even if only after the lifecycle analysis has been performed. For example, a company receives several proposals for the purchase of equipment and conducts lifecycle analysis on the proposed equipment to determine which would be the best one to select. After the analysis, it is determined that two pieces of equipment have almost the same results. Looking into the potential costs derived from the loss of operations could help sort out a winner. Loss of operation can occur when a piece of equipment breaks down or requires maintenance, which takes time away from operations. If a piece of equipment is known to require more hours of interrupted operations to conduct maintenance, this can be included in the analysis.

Restoration, remediation costs, and recycling

This item is an evolving one, and it is growing each year. Many actions involving the environment that companies did decades ago are no longer permitted, or at least they are not free anymore. Today most countries have laws in place to protect the environment and to force companies to remedy their actions if they have adverse effects on the environment. For example, manufacturing companies that used to contaminate the soil with chemicals must now restore the ground when disposing of a site.

Recycling costs include all costs associated with returning the product to a recycler and having the product recycled. Governments sometimes impose a recycling cost to be paid at the time of the

purchase of the product (ex: tires, batteries) and sometimes the cost is born when the company disposes of the product.

Regardless of the type of cost, whether it is for restoration, remediation or recycling, the company will need to reflect on the possibility that they will exist for their purchase and if they do, consider them when doing a proper lifecycle cost analysis.

Taxes and interest

We included this item last in the list, but it does not mean that this should be the least considered item on the list. Quite the opposite. Taxes and interest paid to acquire the product can represent two substantial elements in an LCCA. However, since each company is different, since each country has its own set of laws on taxes, providing examples that would suit all readers is difficult. What is important to remember is that tax can have positive and negative effects on a lifecycle cost analysis. For example, if the purchase of new equipment is tax deductible as it often is, the real after cost amount can be reduced. This can help the purchase of the equipment. On the opposite side, the interest paid for acquiring a piece of equipment only adds to the costs, even if they are deductible. However, here again, the tax (or tax deduction) on interest should also be considered.

For companies comparing vendors together, the effect of taxes and interest might not change much. After all, a vendor that is more expensive than another for a product with the same specification will be more costly with or without the effect of taxes and interest. However, to calculate a true lifecycle cost, the company will need to account for taxes and interest, if applicable to the company. We highly suggest talking with local accountants to determine how to treat taxes and interests in your analysis.

Conducting the Analysis

In theory, a lifecycle cost analysis is simple: Add up all the costs related to a piece of equipment (or project depending on the case) over the useful life of the equipment, then subtract the residual value and you have a lifecycle cost. One can also improve the calculation by adding a discount factor in order to improve the decision process, but this is simple mathematics.
In real life, we are often confronted with more complex situations. For example, different pieces of equipment rarely have the same life expectancy. How do we compare one piece of

equipment with a life expectancy of 10 years with one that has a life expectancy of 15 years? Do we run an LCCA for ten years and consider the residual value of the most extended lifespan equipment or do we make the analysis on 15 years and consider the need to purchase a piece of new equipment for the one that only has a 10-year life span? In that case, at the end of the 15th year, that equipment will have only run half its life (five years out of a potential 10).

One thing we must keep in mind when equipment repurchase is the inflation cost. A piece of new equipment purchased ten years from now will most likely be more expensive than one purchased today.

As we can see, in both cases, we need to include the value of one of the pieces of equipment that still has value, regardless of the selected time frame.
Here, as in most situations where we compare multiple products with different lifespans, there is no perfect answer. A company could try doing a ten-year analysis and then do a 15-year analysis to see if the analysis produces different conclusions on which equipment and vendor to select. Finally, depending on how the equipment is amortized may have an impact on the number of years to use. For example, if all equipment in this category is amortized over ten years, it might make sense to use a 10-year analysis for the LCCA.

> Note: For companies that lease space, it might make good sense to conduct the analysis on a time frame that is the shorter of two possibilities: The product lifespan or the remaining term on the lease (some companies use the remaining term of the lease plus the duration of the first option, but each company can set their policies).

This scenario is somewhat like the situation above. In this scenario here, we are looking to select a type of product even before we invite the vendors to submit their proposals. For example, a company might be looking at replacing the floor covering and is looking to decide if it should replace the current covering with carpet or tile. While it may be possible to simply issue a request for proposal to various vendors and see what different solutions they might propose, the company might want to decide on carpet versus tiles before inviting the vendors.

They might ask local users (employees on the building floor) what they prefer or speak with an interior designer to align the color and texture of the carpet or tiles with the walls and furniture. Regardless of the reason, the company might need to compare the types of products. Information needed. Much like the first scenario, in this case, an LCCA could be done to help guide the company in its decision. The results might go in opposite directions from what they want (of what the designer proposes in this situation), but at least the LCCA provides another argument for decision purposes. Information required is the same as when comparing vendors.

The only problem here is that exact costs are often not known, and people tend to work with price estimates (guesstimates).

The LCCA can also be used to differentiate or optimize between multiple products proposed by the same vendor. If the company has already selected the vendor, but the vendor offers two distinct types or models of equipment, the lifecycle cost analysis can prove to be a useful tool to help decide which brand or model to select. For example, a company might want to determine if it wants to install double glass windows on a new building or triple glass windows. Using the cost of the different windows and the R factor (insulation factor) to calculate the difference in energy costs with both types of windows, a company could run an LCCA and decide which type of windows to purchase.

We often speak of the lifecycle cost analysis as a tool to help compare things. However, what about using it to initiate projects, or reject them?

If we take a scenario where a heating or cooling equipment is at the end of its normal life, and it must be replaced, then an LCCA to select the best replacement makes sense. In this case, nobody is really questioning the need for the equipment, only which one to purchase.

However, what if a vendor comes and proposes to replace the cooling or heating system one year after the company has installed it? The vendor is offering to replace any equipment that is still practically new (especially if the unit has a 15, 20, or even 25-year lifespan).

Why would a company even consider replacing a piece of almost new equipment? Well, it depends. It could be that the vendor proposes to replace the equipment with a newer one that requires less maintenance, costs less energy to operate, comes with an incredibly attractive

grant or a mix of all these. In this case, it could be worthwhile to conduct an LCCA to see if the replacement makes any sense. In this situation, if the new equipment needed less energy to operate, the company could elect to do a simple payback analysis which would be done by dividing the cost of the equipment by the annual (energy) savings generated by the new equipment. However, paybacks often fall short because they do not consider a number of items. For example, what happens with the non-amortized portion of the existing equipment?

Depending on the nature of the product, it might be amortized over its lifespan, and so the cost attributed to a business unit might be spread out over time.

If the existing equipment can be sold for the same amount as the non-amortized cost, then that is one thing. In real life, the chances of that happening are probably slim so the user will need to consider the difference between the non-amortized amount and the residual value as a cost that needs to be added to the LCCA.

Another possibility is if the equipment was financed. If the company is still paying for the equipment, the total cost to dispose of the equipment and cancel payments (if lucky) or most likely, finish paying for it will need to be considered.

In this situation, doing only a payback calculation on the new proposed equipment would be a mistake. Here, a detailed lifecycle cost analysis would prove valuable.

This scenario occurs too rarely, unfortunately. Correcting for the future involves doing an LCCA analysis upon equipment replacement, so when a piece of equipment has reached the end of its life. The idea here is to be able to see if the initial LCCA was good and if some assumptions need to be modified. The reasons, so few companies do this are numerous. First, few companies remain in business or keep their installations long enough to do this analysis. Second, for those that do keep their buildings almost forever (government, education institutions, some real estate managers, and manufacturers) going back in files 10 or 15 years is not always evident.

However, for some equipment, there is sometimes no need to wait for the full lifespan of the equipment to start correcting for the future. For example, if a large shopping center has many rooftop units on its roof, the operators might have a good idea of how long a unit is good for at the current location. In some cases, the lifespan of the roof time units in that shopping center might be shorter than the manufacturer's recommended lifespan. Alternatively, (as it happens often), the shopping center employees became great at fixing the units and using parts from older units and they can extend the life of the rooftop's way beyond any of the manufacturer's recommended lifespan. In both cases, when purchasing a new rooftop, the company might want to take its own reality about rooftops into consideration when doing an LCCA.

The Limitations of LCCA

Although a great tool for selection and decision purpose, the LCCA does have its limitations and should not be taken as a unique tool for all decisions. For example, the LCCA will not factor in elements like criticalness (meaning how critical the equipment is to the operations). For example, when selecting between two equipment, a lifecycle cost analysis might recommend one particular equipment over another, but that equipment might break more often, and it

might be part of operations that cannot afford to stop. In this case here, the level of the criticalness of the equipment might take priority over the results of the life cycle. Other factors that are hard if not impossible to integrate into an LCCA are quality (what is the quality of the output of the equipment, in the case of production equipment), delivery time, and customer service. If a company need to purchase a piece of equipment and the LCCA indicates that equipment A is preferred, but it also happens to be back-order for 12 months, the LCCA might prove to be of little usage, apart from pointing out (and justifying internally) the additional cost of having to select another equipment.

In a comparable situation, the equipment might be in an area were stopping the operating to service it could be cost prohibitive. While the maintenance cost itself might be low and impact the equipment positively in a lifecycle cost analysis (making it the preferred equipment), the production department might have a different opinion if the equipment maintenance forces operations shut down each time it needs a servicing. Here again, the lifecycle cost analysis results might take a back seat to other criteria.

Cumulative Costs

We saw in this text that the LCCA can be an excellent tool for comparing products when a purchase needs to be done. However, while the LCCA does an excellent job showing what the total cost over the entire lifespan of a product is, it falls short when the user needs to know what happens during that life span. For example, a building owner might need to replace an air conditioning system and wants to decide which equipment to purchase. Having four choices from four different vendors, the user goes and calculates the lifecycle cost of each of the equipment and finds the equipment with the lowest life-cycle cost. By default, this would be the equipment to purchase. However, this analysis only shows the total cost for the equipment, not what happens each year during the equipment's lifespan.

One interesting way to look at the LCCA when comparing vendors is to look at the Cumulative Costs over a determined period. **This can be done the same way as a normal LCCA, only instead of adding up all the costs and benefits over the entire product's lifetime, we calculate a cumulative cost of the product for each year and then plot it on a chart.** If the equipment has a lifespan of 10 years, we will calculate ten annual cumulative costs and add them to a ten-year chart.

Cumulative Cost

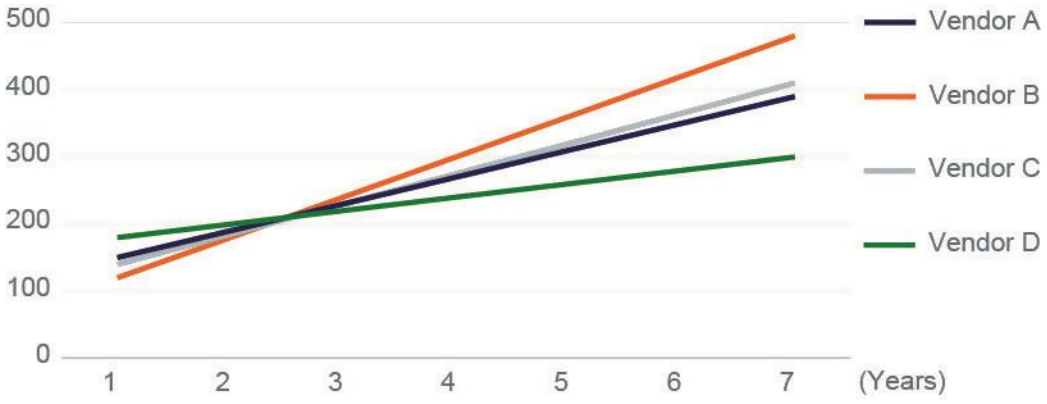
Another tool that companies can use to help them in the decision-making process is the Cumulative Cost. The cumulative cost is like the Lifecycle cost. **The only difference in both analysis tools is that the cumulative cost does not always include a discount factor, to sum up, all costs in Net Present Value.** However, it is possible to introduce a discount factor which would put it in line with the standard lifecycle cost analysis.

The Mechanics

To conduct a cumulative cost analysis, the user needs to calculate the total annual cost of the product or equipment for each of the years during the lifespan of the product or equipment. For example, if a company is looking to purchase a piece of new equipment which has a lifespan of Seven (7) years when comparing different equipment to purchase, the company could look at the annual cost for each year, for each of the equipment it is looking to compare.

Plotting the Results

In the case above, the results could look something like the chart below. The chart shows a Cumulative Cost from year one to seven for each of the potential equipment (represented by Vendors A to D).

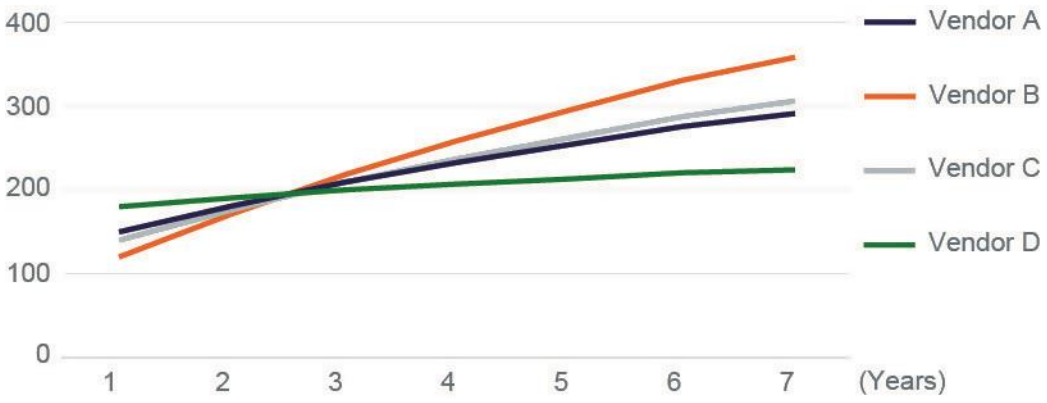


We can see that on the chart above, the equipment of Vendor B starts out to be less expensive (has lower cost) during the first year. The price for that year includes the purchase cost, the installation cost as well as all other costs of operation (including energy, maintenance, & labor).

At the other end of the spectrum, the equipment of Vendor D has the highest cost in year one. This could be that the price of acquisition and installation is higher than all other equipment. However, we can notice in the chart that around the third year, the equipment of Vendor D intersects the cumulative cost of the other equipment. Then in year number four, the equipment from Vendor D shows a total cumulative cost lower than all other equipment. By year seven it is clearly the least expensive equipment of the proposed group. The reason that the equipment from Vendor D has a lower slope than the others is because the annual cost is lower. This can be because the maintenance cost is lower, or the equipment is more energy efficient and thus requires less energy than the others to operate. It can also be another reason or a combination of reasons. The bottom line is that the equipment that costs the most in year 1 has a cumulative cost that is the lowest of the group in year seven.

Using the chart above, companies can make strategic decisions. For example, if the equipment in the example above is a part of a building and if the company is going to sell the building next year, it probably does not make sense to purchase anything other than the equipment from Vendor B (the less expensive on year one). However, if the company knows that it will keep its building for more than three years, then the equipment from Vendor D makes more sense. **Adding a discount factor to the chart on the previous example could be required if the company wants to include the cost of money or financing in the analysis.**

If we add a five percent (5%) discount rate, we can see that the chart curves a little during the last years, but at that rate, it does not change the decision process. Depending on the discount rate used, the chart could look quite different, however.



Mechanics of the Life Cycle Cost Analysis

The calculation of the LCCA is simply the addition at time zero (present time) to all the elements that influence the analysis. The mechanics are mostly the same as when doing a Net Present Value (NPV) calculation.

From the main section of the guide, we identified sixteen of the most common items to include. While not necessarily a complete list. Some specific industries in research, health, manufacturing, utilities, and government, to name a few might want to add other items. For example, a utility producer might want to add the environmental cost of building a new power plant or adding a piece of specific equipment to an existing one.

If we take the nineteen items listed previously:

1. Cost of purchasing the product
2. Cost of delivery
3. Installation cost
4. Annual maintenance cost
5. Commissioning costs and ramp up costs
6. The annual cost of energy (including water costs, intake, and discharge)
7. Hours of operation
8. The life expectancy of the product
9. Net resell value at the end of the life expectancy

10. On-going labor cost
11. Learning and training as well as manuals and documentation
12. Any other costs such as an annual fee for usage
13. Warrantees
14. Benefits such as revenue or savings
15. Grants & incentives
16. Other costs such as insurance, permits, part storage…
17. Reliability and loss of operation
18. Restoration and environmental remediation costs
19. Taxes and interest

The lifecycle cost analysis is simply the exercise of quantifying each of these elements above, positioning them in time (do they happen once and if so, when or are they recurring and if so, at which frequency). Once we have identified and quantified all the items, we simply sum them up at time zero, so we can add them in today's currency (money).
Bringing back to time zero is done to consider all costs and benefits in today's currency.

> For example, if a product is purchased today for $10,000, this is the cost in today's currency. If the product provides a saving of $5,000 twelve months from now, that $5,000 is worth less than $5,000 today because of the value of money in time. What we need to do is to actualize that $5,000 to bring it in today's currency. Basically, calculate what is the equivalent today of $5,000 in one year from now. We do with by using a Discount Factor (DC). The discount factor is usually determined by the company. Without going into details in this guide, we can say that the discount factor can be influenced by many items such as inflation, cost of financing (WACC), desired return on investment or other. While the determination of the discount factor can be subject to a future guide, let us assume here that the company has decided to use a ten percent (10%) discount factor.

To bring to "today's money" the $5,000, we need to actualize it by one year. The calculation is

> Present Value
> = $5,000 × 1 ÷ (1+DC)
> = $5,000 × (1 ÷ (1 + 0.1))
> = $5,000 × (1 ÷ 1.1)
> = $5,000 × (0.9090)
> Present Value = $4,545.45

This means that using a 10% discount factor, an amount of $4,545.45 today is worth the same as an amount of $5,000 one year from now.

If in the example above, we only had these two elements, a cost, and a benefit (savings) after one year, we could say that the LCCA is equivalent to:

Cost of product + Benefit (where the cost of the product would be a negative number since there is an outflow of money required to purchase the product.

LCCA= −$10,000 + $4,545.45 = −5,454.54

This means that the equipment has a total lifecycle cost of $5,454.45 over the course of the year.

Suppose now that we decide to include the residual value of the equipment, and it is $2,000 at the end of the third year (we suppose that the equipment only produced a one-time $5,000 savings one year after its purchase). In this case, we need to actualize that $2,000 residual value amount by three years, using the same discount factor
as previously used.
The LCCA would then be calculated as (using a discount factor DC of 0.1)

LCCA

= −$10,000 + $5,000 × (1 ÷ (1+DC^1)) + $2,000 × (1 ÷ (1+DC^3))

−$10,000 + $5,000 × (1 ÷ 1.1) + $2,000 × (1 ÷ 1.1^3)
= −$10,000 + $5,000 × (0.9090) + $2,000 × (1 ÷ 1.331)
= −$10,000 + $4,545.45 + $2,000 × 0.7513
= −$10,000 + $4,545.45 + $1,502.63
LCCA = −$3,951.92

We can see that LCCA is negative. This is the total cost of the equipment over the three years when we consider its acquisition cost, the generated savings, and the residual cost.

In real life, our new equipment would generate savings each year. To calculate this, we simply add the savings for years 2 and 3. Supposing all savings arrived at the end of the year, we would have:

LCCA

$= -\$10{,}000 + \$5{,}000 \times (1 \div 1.1) + \$5{,}000 \times 1 \div 1.1^2) + \$5{,}000 \times (1 \div 1.1^3) + \$2{,}000 \times (1 \div 1.1^3)$

$= -\$10{,}000 + 4{,}545.45 + \$4{,}132.23 + \$3{,}756.57 + \$1{,}502.63$

$= \$\ 3{,}936.88$

We now have a positive LCCA, so the equipment actually generates more savings than its cost.

recap

As we have seen here, the lifecycle cost analysis is a great and underused capital expenditures management tool. However, it should be used only as a tool to help the decision process, not as an absolute decision maker. When done correctly, it can help highlight many elements that are not generally considered in other analysis. The role of the LCCA is first to serve as an adviser, pointing out all the positives and negatives of a product or project purchase in terms of cost and benefits to allow the manager to make a final decision.

Now, we would like to look at another tool that can be used for capital expenditures management. This one is more of a management concept or way of thinking. It is the concept of the money left on the table.

Money left on the table (MLT). How much is your company leaving out?

The concept of money left on the table is nothing new. Most people will define it as a lack of doing something, which results in not obtaining the maximum financial benefit. It can mean any money or funds that a person or company did not get for whatever reason. We could list hundreds of examples that would apply to both individuals as well as companies, but for the sake of this guide, we will limit ourselves to the world of companies and organizations as well as to the field of capital expenditures.

So how does MLT apply to capex? Think of all the ways a capital expenditure might not have to be maximized in terms of benefits. Few examples here could be:

a. The company paid too much for the expenditure, did not negotiate enough or selected a more expensive vendor
b. The company did not get all the grants or incentives that it could have received for the capex
c. The company did not conduct a complete lifecycle cost analysis, and even though they did purchase from the lowest priced vendor when we include the cost of maintenance, support, training, and energy efficiency of the purchased item, the company is actually paying more than if sourced from another vendor.
d. The company did not involve the procurement department and therefore did not negotiate tier rebates that came with purchase volume negotiated with preferred suppliers
e. The company did not include energy savings or available grants into their purchase decision.

These examples above are just a few of the many money left on the table situations that can occur. This is why it is always a good idea to keep an MLT list on the corner of the desk during the capital expenditure process.

We have talked so far about the capex acquisition process itself. However, behind the process is the underlying set of rules that the company must establish (and follow) to make things work properly.

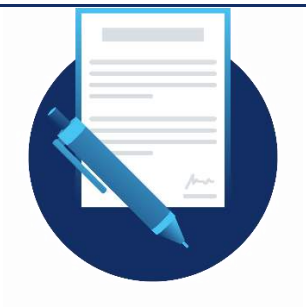
The next chapter goes into the world of policies and procedures and seeks to reflect on them. For some, the policies in place at companies and organizations are meant to be set in stone. How often do we hear someone say something along the lines of: ‘we’ve always done it this way.' For them, the rules are the rules, and people must comply.

For others, the mindset is more towards the ‘rules are meant to be broken’ ideology.

Between these two groups, there is a wide valley. This is where company policies operate. Sometimes they are followed, and some other times they are not. Moreover, when they are not, the offenders are fast to point out the flaws in the system.

The next chapter attempts to highlight ways that companies can evolve their policies to improve the capex process.

Policies
– policies and more policies



Policies and procedures serve as the guideline for how things operate. Also, the world of capital expenditure management is filled with them. Without policies in place, it would be impossible to manage capex. Everyone would do what they want, and that's often a recipe for financial disaster.

The policies of the company or organization do not serve the purpose of slowing things down and making life more complicated, even if they actually do feel like that sometimes. The goal of the policies in place in the world of capital expenditure management is to ensure that the proper people are tasked with planning, requesting, approving, and spending capital.

Enforcing policies

One of the main challenges of enforcing policies comes from the fact that many companies and organizations are still using a mix of spreadsheets and paper for the creation and approval of their expenditures. While worksheets are great tools, they were not meant to manage capital expenditures of multi-business unit companies. If all your operations are under one single roof, using paper requests is probably a good way to go. However, if your activities are spread out across various business units, at one in times, this might cause problems. We have identified here the most common issues that arise:

1. Projects going ahead without having all the proper approvers review the request
2. Spending over budget, often without any red flag raised in time
3. Delays in getting the expenditures approved by all
4. Lack of tracking and lack of insight

Without spending too much time on each of these sources of problems, let's provide more detail and look at why they happen in the first place.

The first source of problems, having projects going ahead without prior approval of all players is popular in companies. It is not because people fail to see an approval on purpose. However, policies change, people are added to the approval group. People migrate from one sector/group/business unit/department to another. Keeping track of who must approve what is a task in itself.

Also, depending on the situation, people might see urgencies differently. If the production department needs new equipment for increasing output, they might need the equipment today, or at least, as soon as possible. Another department in the approval process might not see this request as urgency and simply add the new request to their work pipeline. At one point, it will be easy for production to go ahead with the purchase and deal with the consequences of their action later.

The second source of problem, spending over budget, happens when there is no alarm raised during the tracking process. People receive approval to proceed with a capital expenditure and start engaging funds against the approved capex. However, then something happens, and they

go over budget. Some companies allow people to complete the expenditure and then report on what happened. Many will allow for some kind of ‘float' of over budget amount, in dollars or percentage of the approved amount, before they seek re-approval. Other companies will force the people to stop and get re-approval the moment there is an overspending situation. Regardless of the case, tracking this comes with challenges.

Policies in place should be flexible enough to allow some ‘float' on some projects while preventing other projects from becoming an over-budget disaster. This is a good example of where evolving policies can take place.

For example, let's look at a large company with over 1 Billion dollars in sales and many business units. If a capex is for the purchase of a new forklift for a business unit of the company, does it matter if the final purchase price comes in at a few percentage points higher than planned? Not that it is a good thing, over budgets are almost always bad. However, what is the net impact on the business unit if forklift ends up costing 10% more than expected? At the company level, the net effect is close to nil.

However, what if the same company is building a new 400 million dollars manufacturing site. What if the cost goes over budget by 10%? That would probably cause a few ripples in the company, right up to upper management.

So having a flexible approval policy can be very beneficial. Many examples can include allowing for floats on smaller projects, raising alarms when a capex goes over budget by X number of dollars (instead of a percentage of the approved capex), allowing for urgent (with that definition to be clearly defined) expenses to be approved by a smaller group of people, or having them pre-approve the request in order to initiate the purchase, but still have the regular approvers review what was purchased, in order to make recommendations for future other urgencies of the same type.

The third source of problems, delays in approval, is probably the one most people working in companies feel the most. It also goes hand in hand with the first problem (going ahead without all approvers). Also, companies using spreadsheets instead of specialized software for managing their capital expenditure process feel it more than others. If the request for expenditure was created on paper, chances are it will spend more time in internal mail than on the desks of the approvers. If the capex requires the signature of many people spread out across different cities (or worse, countries), by the time it gets the approval of all of the approvers the delays caused might represent money. For example, the purchase of equipment which is tied to a currency exchange rate, or the price of a commodity. Take a company based in the US that negotiates with a vendor based in Europe for the purchase of production equipment. The equipment includes lots of steel and happens to be sold in Euros. The vendor includes a clause that the price of the equipment will be partially tied to the price of steel, so if steel fluctuates, so will the price of the equipment (although in smaller proportion).

To make things more complicated, the vendor requires 30 weeks for manufacturing the equipment. Depending on how long it takes for the company to get the approval to purchase

the equipment from the vendor, the company making the purchase might end up having to pay extra because of the currency fluctuation (or pay to have some method of hedging in place but that also comes with a cost). It might have to pay more because of the change in the price of steel. Finally, the company might not receive their production equipment on time, which could cause lots of problems on the production floor.

Companies should have their approval policies flexible enough to recognize which capex request has the potential for such price swings. While most companies do prioritize their capex, this is too often accomplished by simply adding a field (priority 1,2, 3…) in the request. So, when that request ends up under a pile of other requests, the priority levels serves no purpose. Bottom line, delays introduced in the approval process, whether coming from spreadsheets or other sources, can end up costing the company lots of money.

The 4th source of problems derives from lack of tracking and lack of insight. This is problems from not having a clear picture of what was spent, why, and on what.

While many will say that this is the role of accounting and finance, unfortunately, many companies and organizations do not always correctly track where their capex money went. They can run reports on how much they spent per vendor and provide information on where it was coded (ex: building equipment), but that does not tell the whole story.

Was the cost of the building equipment initiated because of legislation or normal wear and tear? If it was legislation, was it the city requiring something? (Ex: a wall to reduce the sound to nearby residents) Alternatively, was it initiated by insurance (fire hazard) or a new regulation? Unless the company keeps track of the reasons, it becomes difficult to run reports and see how much was spent per reason for a business unit. Moreover, it becomes almost impossible for the head office to see the bigger picture of where the money went. So, in that case, overall capital expenditure planning becomes more difficult.

An evolving working process

In this guide, we have looked at the capital expenditure process, from the planning stage to the creation of capex requests. We have discussed how to improve the justification of an expenditure and what not to forget when submitting a request. We talked about some of the elements that can be added into the capex process to improve it. The capital expenditure management process is complex, and managing it daily traditionally involved the usage of numerous printed spreadsheets and text documents. People needing to create capital expenditures requests typically start by assembling the information needed, then they create spreadsheets to calculate the request's cost and benefits. They then supplement the request with text documents to provide written justification for the request. Once assembled, they need to figure out who must review and approve the expenditure. Finally, they send the request either via email or more often, in the internal mail and then wait days (or weeks) for a response.

While a majority of companies continue to operate this way, many companies and organizations now realize that the increasing complexity of the capex process, combined with the growing and continually changing the list of reviewers and approvers within the company, can create substantial difficulties for managing capex the traditional way. This increased complexity also tends to add delays to the approval process, making it harder (and too often more frustrating) than before to continue to operate the traditional way.

Tools for the trade

This guide would not be complete without pointing out that the authors of this guide offer a capital expenditure management software. Sold as a SaaS on a per-user basis, Capexplan stands for Capital Expert Planning. Capexplan is a complete online software that enables companies and organizations to plan and manage their entire capex process across all their business units. It enables users to create complete capex requests and, using the company's policies, reach out to the proper approvers. This results in substantial time and money saving.

The software also comes with the tools and reports to track where your money went and why. Capexplan is offered by Almiranta Corporation at www.almiranta.com or visit our product page for a free trial directly at www.almiranta.com/capexplan.

In summary

The world of capital expenditures is vast. Not only in terms of the amount of money it often involves, but also in terms of what it includes at companies and organizations. If the company replaces a large piece of equipment, chances are it will be categorized as a capex. Every project will probably fall under that category as well. New buildings, building expansions, they are all capex.

It is also an increasingly complex world, where new players, both internal to the companies as well as external, are continually coming to the table and get involved earlier and earlier in the process. No longer, advisors or simple gatekeepers, many have become part of the core capex review and approval teams.

Many companies and organizations would benefit in better planning their capital expenditure. The benefits are primarily monetary, but they are also about the efficiency of work. Better planning the capex process often means planning with a longer-term perspective in mind, gaining better insight as to why the company is spending for expenditures, and where. It also means establishing policies and procedures to optimize the purchasing process and taking concrete action to adhere to them to reduce the capex costs. And finally, it means involving as many stakeholders from within the company, as possible, and getting them to understand their respective roles before there is an actual urgent capex request that arrives. That way, people will have the time to know each other, work together, and appreciate the input that each can offer.

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