Quantifying the Future-Proof Network

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In the world of telecommunications, there are few concepts that elicit both universal agreement and disdainful eye-rolling as readily as the phrase "future-proof." Nobody wants to make a major capital investment in a network asset that will be rendered technologically obsolete before the money spent can be recovered. On the other hand, nobody wants to overspend on the basis of unquantifiable suppositions about the long-term viability of a given technology. In other words, everybody knows what "future-proof" means, but nobody knows what it is worth.

While the notion of a future-proof investment has been around for awhile, it really became a part of the common vernacular as fiber-to-the-home went mainstream. When early adopters first rolled out FTTH in 2001 or 2002, they were investing heavily in the future-proof proposition as they paid a significant premium for FTTH over more traditional architectures. By 2008, we are seeing circumstances where FTTH is being selected as a technology on the simple basis of being less expensive to both build and operate. Nevertheless, there are still those applications where FTTH carries a first-cost premium over other wireline alternatives, and there is still a lot of metallic media being deployed to homes across the country.

So, in those circumstances where FTTH still competes against metallic media products, some means of quantifying the future-proof value proposition would be helpful. Admittedly, any such means would have to be filled with assumptions about technologies, bandwidth trends, market performance and myriad other factors which could be easily challenged. However, no perfect investment analysis tool has ever been developed, and the impossibility of perfection does not excuse us from an honest effort to quantify a key value proposition. Therefore, we are going to compare a generic metallic media last-mile solution to FTTH, and try to see if a basic depreciation method can be used to quantify the future-proof value of one versus the other.

The Tool

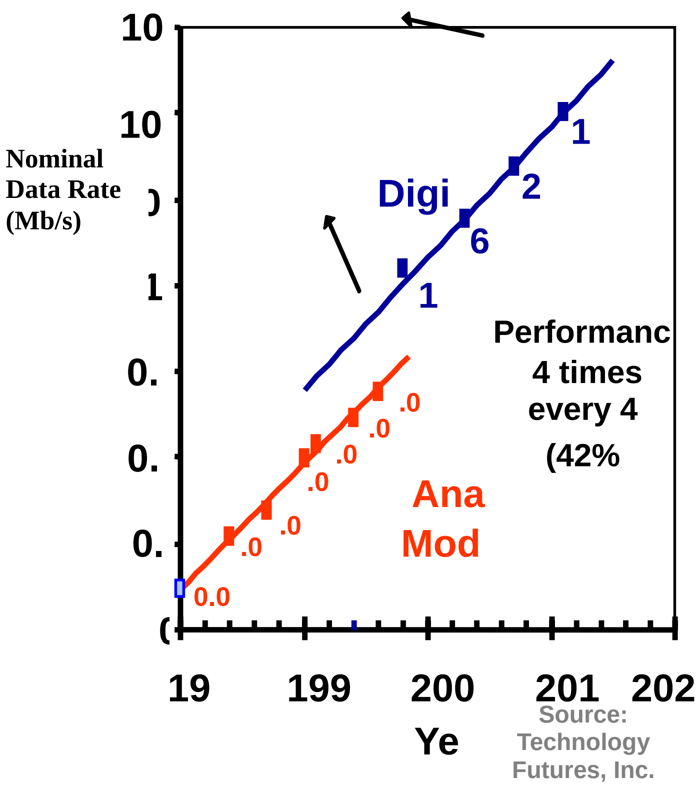
A network is a fixed asset and, like any fixed asset, its ability to provide services declines over time. This decline is reflected on a corporate balance sheet as depreciation. Such a depreciation figure on a balance sheet is distinct from the market value of an asset. The discipline of accounting assumes that the company invests in fixed assets for the purpose of using those assets as opposed to selling them. Also, in the reality of the telecommunications industry, there are defined depreciation standards for federal income tax and there are depreciation periods for specific assets which are established by public utility commissions. However, our intent is to use depreciation as a tool to quantify the future-proof value of a given technology. Therefore, we will go back to the original intent of depreciation in accounting and we will determine depreciation expense based on the original three factors: (1) The assets initial cost, (2) its expected useful life, and (3) its estimated value at the end of its useful life (or "salvage value").

The initial cost of a last-mile network can be fairly easily calculated. However, the expected useful life and salvage value are quite a bit more subjective. Obviously, part of the useful life and salvage value calculations must be based on simple mechanical reliability – i.e., how long can we expect the asset to last before we see widespread mechanical failure due to the effects of aging? In telecommunications, however, it is even more obvious that technological obsolescence will play a major role in determining the useful life of an asset.

Technological Obsolescence

In days gone by, a telephone line was installed with the intent of providing telephone service and nothing more. Nowadays, a connection in the last-mile exists to support broadband services, and nobody can state precisely how much bandwidth will be required to remain competitive. Some estimates foresee super high-definition and ultra high-definition televisions streaming three-dimensional content over an IP pipe. Those estimates yield forecasts for multiple gigabits to the home within the next 20 years. More conservative forecasts predict that providers in competitive markets will need to support 100 megabit connections to residential subscribers at some point between 2015 and 2020 in order to remain competitive. Those estimates are based on historic trends as charted in Figure #1:

Figure 1



For the purposes of establishing a depreciation expense rate which we can use to quantify a future-proof proposition, we will assume that a network asset will be technologically obsolete if it cannot deliver 100 megabits by 2018. Obviously, there will likely be some non-competitive markets where subscribers will have to live with far less than 100 megabits in 2018. However, it is not far-fetched to assume that there will be several markets where a gigabit is available to the residential subscriber. Thus, 100 megabits by 2018 seems like a reasonable metric.

The Benchmark

By any standard, FTTH is the benchmark for a future-proof last-mile network.

When viewed from a mechanical reliability perspective, most FTTH network designs limit the electronics to the gear in the central office and the equipment at the customer premise. Therefore, we have primarily passive devices constructed of glass and plastic in the outside plant. Those devices can be remarkably robust. If the optical fiber itself employs synthetic silica materials to mitigate aging effects, the cable lifespan should be determined by the propensity of its plastic components to change dimensionally with age. Assuming those plastic components are the limiting factor, most fiber optic cables should perform reliably in excess of 40 years. Other outside plant components used in FTTH perform at the same level or better.

From a technology standpoint, optical fiber is frequently described as having unlimited bandwidth potential. This is a basically true statement if we assume that most of the PON-based networks being used to support FTTH are constructed with full-optical spectrum fiber and splitters plus bend-insensitive fiber where needed in order to accommodate a transition to dedicated-bandwidth solutions (i.e. WDM PON technology). Still, the distances between the central office and subscriber in many FTTH applications would likely require some level of dispersion compensation as data rates approached levels between 10 gigabits and 40 gigabits per-subscriber. However, those numbers are still well within the functional range of even the most aggressive bandwidth predictions for the next few decades.

So, from a purely technical and mechanical standpoint, an FTTH network can reasonably be expected to remain viable in excess of 40 years. However, accidents and competition happen, and must be accommodated. Therefore, it is a common industry assumption that the passive infrastructure in a FTTH build can reasonably be expected to last at least 20 years to 25 years. So, for the purposes of this exercise, we will use 25 years as our estimated life for the outside plant components in a FTTH network.

Any last-mile network consists of both the outside-plant infrastructure and the electronics which drive content across the last-mile. Today's electronics used to support FTTH are not usually driving bandwidths in excess of 100 megabits. Furthermore, electronic devices have more moving parts than passive infrastructure and are prone to break-down more often. So, we will assume a functional life for FTTH electronics of 10 years. Some pundits might point out that 10 gigabit GPON and EPON are on the visible horizon, and WDM PON is already being deployed in trials. Thus, 10 years might seem far too generous. The pundits are right, but if we accept the argument that today's GPON should be depreciated in five years due to technological obsolescence, then we might as well write-off a metallic media network on the day it is deployed.

For the purposes of our future-proof value calculation, we are going to assume that an FTTH network costs $2,000 per subscriber to deploy. We will also assume that $500 of that cost is the last-mile electronics which will be depreciated over the course of 10 years, and the remaining $1,500 is the cost of the installed infrastructure which will be depreciated over the course of 25 years. Furthermore, we will assume that the network fully depreciates and has no salvage value. These are all big assumptions, but they are reasonably realistic and conservative.

The Competition

As mentioned earlier, FTTH is being deployed in some applications because it is simply cheaper than options using traditional metallic media. In those circumstances, we could hope that the future-proof argument no longer carries any weight as the reasonable choice would be to select the better network that costs the same or less money. However, there is still a great deal of copper being deployed, and the argument in favor of the traditional approach is usually first-cost. So, we will give our FTTH alternative the generic title of “metallic media” and we will assume that the installed cost in the last-mile is $1,800 per subscriber for the particular application under consideration.

Most metallic media products in competitive markets are going to be some type of deep-fiber HFC (hybrid fiber coax) or DSL solution. The best VDSL solutions might push 100 megabits, but only for short distances. Thus, we can assume that VDSL would require a cost-prohibitive level of re-engineering and installation of active field components in order to remain viable in a 100 megabit market. HFC might conceivably support speeds in excess of 100 megabits using emerging technologies. However, there are so many variations on HFC and the distances supported over coax, that assuming the average HFC plant will ever operate over 100 megabits seems far fetched. More likely, we will see some incumbent operators leveraging their existing fiber assets to migrate to FTTH, and others leveraging non-competitive markets to milk their infrastructure investment for as long as possible.

So, based on historic growth rates for nominal bandwidth consumption and the known limitations of twisted pair and coax, we are going to argue that a metallic media last-mile network will be technologically obsolete by 2018. Therefore, we will fully depreciate the metallic media product over the course of 10 years. A good argument could be made that the metallic media networks being deployed today should have some residual value after 10 years due to the amount of fiber deployed in their designs. While this is true, it is difficult to quantify on a global level due to the diversity among metallic media designs. Furthermore, we have already conceded a major advantage to the metallic media products in our first-cost by excluding the net present value of well-documented operating expense savings in FTTH products. So, depreciating these networks over the course of 10 years with no residual value seems fair and reasonable in comparison.

The Math

Based on our simple analysis thus far, we are left with three assets which need to be depreciated: an FTTH outside plant infrastructure, the FTTH electronics, and the metallic media product. The unit of measure will be “per-subscriber” and the depreciation method applied will be straight-line. The straight-line method assumes the same amount of depreciation expense for each year of the asset’s useful life – which seems most appropriate in this application. The formula is:

(Initial cost – salvage value)/years of estimated life = annual depreciation expense

By plugging in our previous assumptions about the cost and life expectancy of our network options, we arrive at annual depreciation expense rates of $60 for FTTH outside plant infrastructure, $50 for our FTTH last-mile electronics, and $180 for our metallic media product. If we limit our view of those numbers to the first ten years after construction, we can use a total annual depreciation rate of $110 for the FTTH network ($60 + $50). When plotted over the span of those same ten years, these values give us Figure 2.

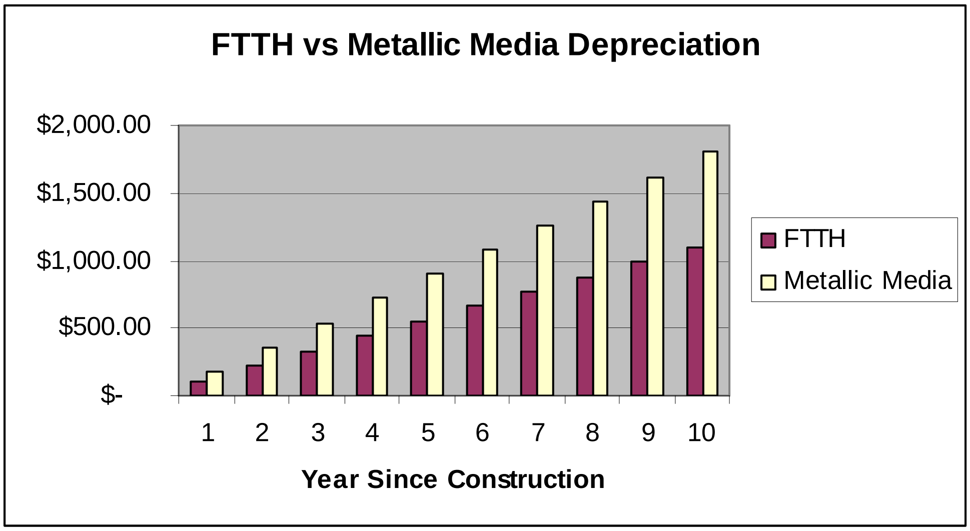


Figure 2

We now have a graph that shows the difference in the accumulated depreciation expense of a metallic media last-mile network versus an FTTH network based upon historical bandwidth trends and assumptions about technological obsolescence. However, our goal is to put some quantification around the value of a "future-proof" network. Based upon an initial cost of $2,000 per subscriber for a FTTH network and $1,800 per subscriber for the alternative, we can see that our difference in depreciation expense exceeds the $200 first-cost differential by the end of year three. However, this does not give us a workable answer. A difference of $200 in first-cost is $200 in our pocket today while a loss of value through depreciation reflects future dollars.

One of the problems with quantifying a future-proof proposition is that the value is realized many years from now. Thus, we must attempt to account for the time value of money. Every company has their own assumptions about the rate of return which can be realized from a dollar. If that rate of return is high, then the time value of money has a huge impact on capital investment decisions. If the rate is lower, the impact of the time value of money is lessened. For the purposes of this exercise, we will assume a 10% required rate of return on our investment just because it is a reasonable, middle-of-the-road number. Adding that assumption to our calculation changes the depreciation graph over the first 10 years to the numbers seen in Figure 3.

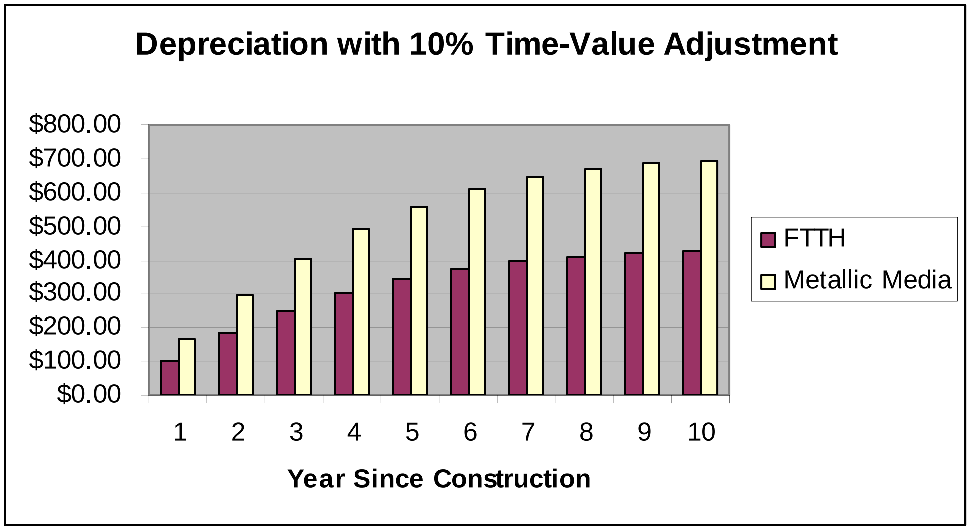


Figure 3

Where does this information fit when quantifying the future-proof value proposition? We can look at the difference (or "delta") in accumulated depreciation between the two networks over the span of 10 years. We can also look at that same depreciation delta as a dollar figure which has been corrected for a 10 percent required rate of return. And, finally, we can compare both of those values to the difference in the original installed cost. When graphed, those numbers give us Figure 4.

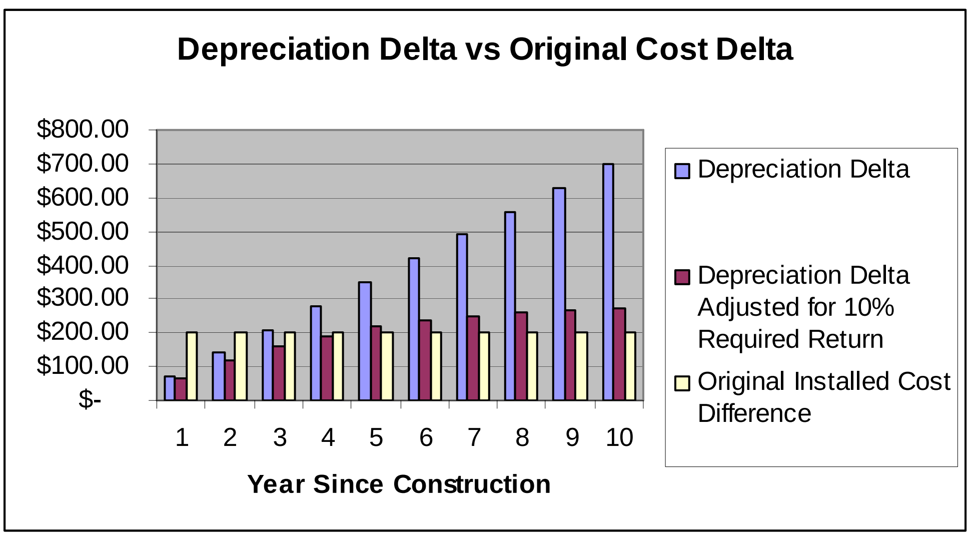


Figure 4

Based on the assumptions we made in this exercise, we see that even the time-value corrected depreciation delta exceeds the original installed cost differential by year five. Interestingly, almost any last-mile carrier would look for a payback period on their investment that falls within five years. Thus, the point where our depreciation delta passes the first-cost metric is also about the same point where we would expect to own a paid-for asset. So, we might argue that the present value of the future-proof proposition exceeds the cost differential between our two network options within the required payback period for the asset.

While the purpose of this exercise has been to put some dollar figures around the notion of future-proofing, some related points warrant clarification. It should not be assumed, for example, that an FTTH network would see the same rate of payback as a metallic media network. There is ample documentation available to suggest that the capabilities of FTTH can enable greater revenue and, therefore, a more rapid recovery of capital. Additionally, FTTH deployments can frequently be designed to have a very positive cost-per-subscriber versus cost-per-home-passed ratio. This advantage facilitates a good alignment between capital investment and revenue generation. Finally, as mentioned earlier, FTTH has considerable operating expense advantages over traditional wireline solutions. So, the future-proofing proposition needs to be analyzed and understood, but FTTH can stand on the merits of a more rapid payback than metallic media with or without the future-proof argument.

Final Points

Of course, there are a lot of assumptions at play in our future-proof calculation and no investor in their right mind would spend capital solely on the basis of a supposed future-proof value. However, the assumptions in our example are less significant than the veracity of the method. If large sums of money are to be spent and technologies are to be evaluated for their long-term viability, something beyond a gut-feel and vendor propaganda should be used when assigning a dollar value to that viability. The depreciation approach represents one possible method, but better methods might be considered. What is needed, however, is a disciplined process to make our best estimate of the present value of a future capability. Adhering to a process gives us the best possibility of finding the right variables and making the right decision.