Time to Bite the Hand that Feeds You?

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Abstract

The average life expectancy of a company is sadly only 40-50 years. You would think that a company lifetime could easily surpass our lifetimes because many generations can work at a company and pass down it's products, brands, know-how, competencies, customer base, etc. to successive generations. But ultimately companies die because they fail to adapt and change. One area of adaption that is the most difficult to navigate is when to start investing in new markets and de-investing in the traditional markets that initially built the company. Too many companies get themselves caught in a trap of continual investment in their 'core' markets, which are no longer growing and missing out on growth adjacencies that can fuel the company's next generation of growth. This paper will explore the reinforcing feedback loops and systemic delays that cause most companies to invest too much and too long in their traditional market and recommends a new R&D investment rule of thumb that breaks this cycle. A significant mindset change from looking at R&D allocation as a % of sales and instead adopting R&D as a % of future market size is proposed.

Introduction

One of the most vexing problems in business today is how to grow a company over the long run when markets change. Most successful companies are able to capitalize on a market segment that is appealing and is a good fit the company's offerings and strategies and this success may last 20 years. But many markets go through multiple waves of technology adoption and rarely are companies able to successfully ride more than their one wave. Why is that? Because there are powerful reinforcing feedback loops that encourage a company to sit in one segment for too long and cause their leadership teams to have difficulty seeing that their core business is running out of oxygen. This paper evaluates this reinforcing cycle and explores alternative policy choices to move from one wave in the market to the next with success.

There is a wealth of literature around the topic of business strategy and the challenges with corporate inertia. The reasons for corporate inertia have been articulated long ago (Hannan and Freeman, 1984) and because of this challenge, we generally see a Darwinian natural selection process across companies in an industry where the ones best suited to the current environment replace the ones that were best suited only to the past. One study (Noda and Bower, 1996) shows a good example where reinforcing feedback loops caused one company (BellSouth) to escalate commitment to a promising future business (wireless) while a peer company (US West)

faced some early disappointments and their reinforcing loop caused a de-escalation to their wireless business until it was too late to take advantages of this new growing market. But the best case for a company is an evolutionary *internal* selection process where resource allocation and reallocation shed old businesses and span new ones as Intel did by successfully moving from their DRAM core business to microprocessors (Burgelman, 1996). Though the strategy literature highlights that adaption is critical, there is little development of simple rules of thumb that top management can use to overcome the strong forces of inertia and ensure that their organizations are always adapting and investing in the new future. This paper proposes one.

This is an extremely simple model by any System Dynamics standards. However it is very powerful in a few respects. First the portfolio management of R&D dollars is an extremely important problem in the corporate world. The conceptual roadblocks that cause a company to invest too long in today's markets are worth illuminating as mistakes of this type are made in nearly every boardroom in the world. And secondly the System Dynamics model covered here, properly calibrated, can also provide a tool for organizations to use in their R&D allocation process.

The Business Scenario

My domain is Healthcare Information Technology like electronic medical records (EMRs), billing and scheduling systems for physicians and hospitals, etc. The adoption of IT technology in our industry always looks the same. In the beginning of the market, it is the largest and most sophisticated healthcare organizations that move from a paper-based process to an IT-based process first. For example, large hospital systems and academic medical centers adopted EMRs about 10 years ago at least in some form. The software vendors in this space built expensive, sophisticated IT systems to handle large complex organizations. The vendors built implementation and service approaches and teams that were comfortable taking 12 months to install an IT system and perform important but expensive workflow redesign services as part of the technology adoption. These initial sets of companies were successful, made money, and served the market well. We'll call this the L-Group Vendors. (L standing for Large Customers)

Then the next wave of customers adopt IT technology and they represent the midsize hospitals and midsize physician groups. This new wave is being serviced by a new set of companies since the original companies are unable to retool their products and process to fit this midsize market. In fact they don't even want to. For the most part, the L-Group Vendors pooh-pooh this market as small, unsophisticated, and 'beneath' them. So naturally since there is a market to be served, new vendors that don't have these biases crop up and serve the market well. We'll call this group the S-Group Vendors. (S standing for Small Customers)

Eventually the L-Group vendors run into a growth problem. The large hospitals have finished adopting the Health IT technology and move into maintenance mode and move their money elsewhere – building new hospitals, buying diagnostic imaging equipment, etc. So the L-Group Vendors find themselves serving a market that is not growing anymore. They see that the midsize customer market is big now, higher growth, and seems like an adjacency that they should be able to enter. They may have

this sinking feeling that they should have been investing in this midsize market years ago, or maybe not. But now they start investing in this new high growth market – most certainly too late as the S-Group Vendors are fully entrenched and serving the market well.

Why did this happen?

What can companies do to prevent getting caught in this trap?

Causal Loop Diagram

Lets start with why this happened. We are going to take the perspective of a successful L-Group company. The Causal Loop Diagram can be drawn like this as in Figure 1:

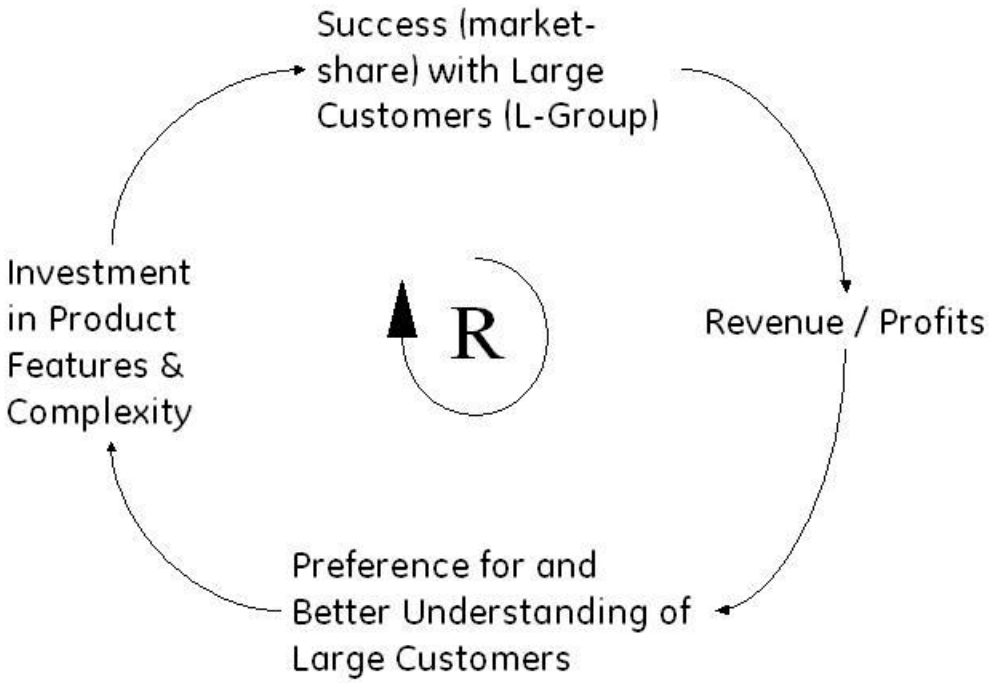


Figure 1. Causal Loop Diagram for L-Group Success

Success with this particular segment of customers brings you revenue and profits. Because these customers are your source of revenue and profits, you spend a lot of time with them, you understand their needs better, you have a natural desire to help them be more successful, and you have plenty of ideas on how you might continue to serve your sweet-spot customers. You receive frankly less to no feedback from customers from other markets. This increased customer understanding and motivation to serve and add value causes you to invest in features/complexity in your product to continue to serve these customers better. And naturally as you continue to improve your product for this segment, you will continue to gain market share in this segment. There

are other reasons that companies seem to have an up-market bias – bigger deals, more prestigious customer names, more noteworthy press releases, etc. which have been left out of this model but certainly compound this issue.

This story isn't necessarily bad. This cannot be characterized as a vicious cycle or a virtuous cycle just yet. Most successful businesses revolve around a core segment that they serve extremely well. But it can be bad if the segment no longer grows and you haven't built any adjacent markets to fuel your next wave of growth.

What gives in this model? Other segments. In Figure 2, the CLD is fleshed out a little more.

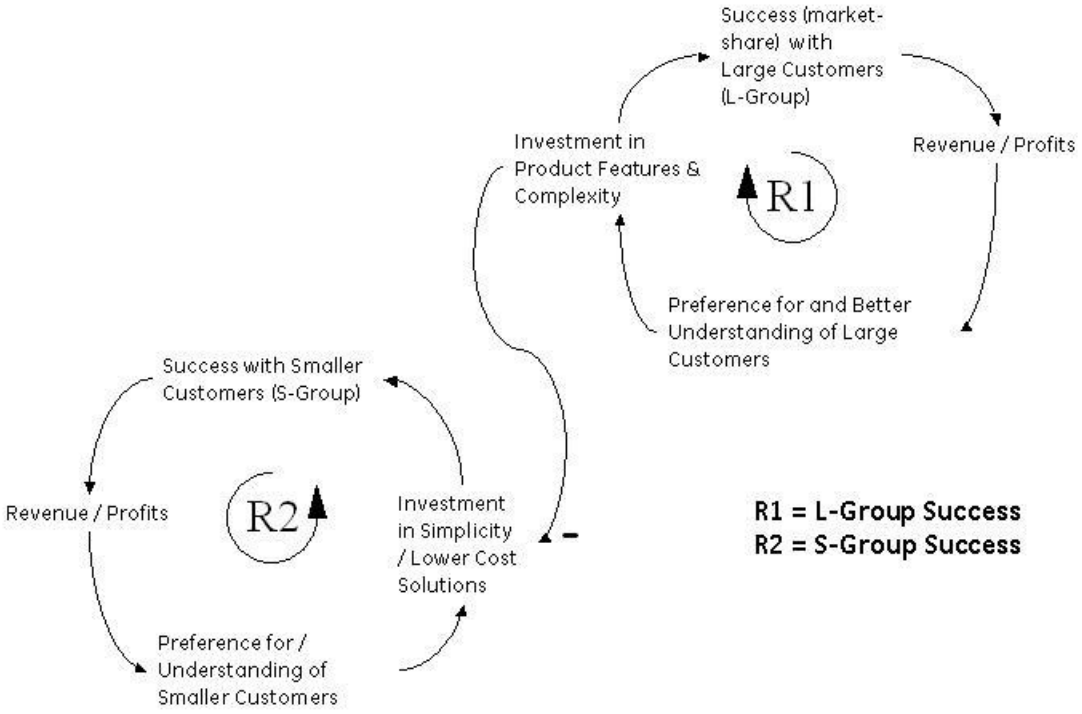


Figure 2. Causal Loop Diagram for Investment Choices in Two Markets

In this model, the smaller customer segment does not desire features and complexity. These customers desire simplicity and have a lower target cost. The S-Group vendors are sitting in the other reinforcing loop continuing to refine their product for this midsize market. All vendors face a limited R&D budget. The more they invest in features and complexity, the less they will invest in simplicity and lower cost. So if they are in the midsize market at all, they will loose market share overtime as they favor the large customer market over the mid-size customer market.

Again so far this isn't necessarily bad. The L-Group Vendors are digging into their market; the S-Group Vendors are digging into their market. And if you think this is a theoretical scenario, I can give you a dozen different Healthcare IT markets and can point out the L-Group and the S-Group vendors and I imagine this is replicated in many markets and many verticals around the globe.

OK. So now let us introduce the problem. The growth in the large market slows, the growth in the smaller market continues, and eventually the small customer market is larger than the L-Group market and the L-Group vendors stop growing and desire to move into the S-Group market. When and how should you make the move to invest in this new high growth market? What policies should you use to always be on your toes when your markets are changing?

System Dynamics Model Version 1

Here is a very basic model to test out some different policies on how a company should manage its R&D investment portfolio.

Here is the scenario that was modeled:

- The L-Group Market has an annual revenue size of $1B/year. Its growth rate (Average Annual Growth Rate, AAGR) is 0%, and the beginning market share of our company is 25%. Our company's beginning revenue from this market is 250M/year (25% * $1B).
- The S-Group Market has an annual revenue size of 250M/year – only ¼ the size of the L-Group market. But its growth rate is +20% and the beginning market share of our company is 25% as well. Our company's beginning revenue from this market is 62.5M/year.
- There is a concept of market affection, which is basically your degree of attractiveness to one or the other market on a scale from 0%-100%. If you prefer a market, you will invest more R&D as a % of sales into building products that that market prefers. And the more products you have for a particular market, the higher your market share in that market. And the converse is true – the fewer products, the less market share.
- In the beginning you have an equal preference for each market – your market affection is 50%/50%. As you become attracted to one market, your affection will only move at 5% per year. For example in year 1, if you prefer the L-Group market, the affect to move to 55%/45% L-Group vs. S-Group. The assumption here is that there is gradualness typical in companies when they are moving away from a market that has been important to them. These shifts take time because of legacy, customer base demands, unwinding verbal and contractual commitments, retooling employee skill sets and biases, etc.
- Lastly the cycle time to build new products and have them impact your market share is 3 years. Though software schedules can typically be a faster – 12 to 18 months lets say, it takes another 18-24 to have new products make a substantial contribution to a company's financials and market share.

In Figure 3 you can see a slightly simplified version of the model.

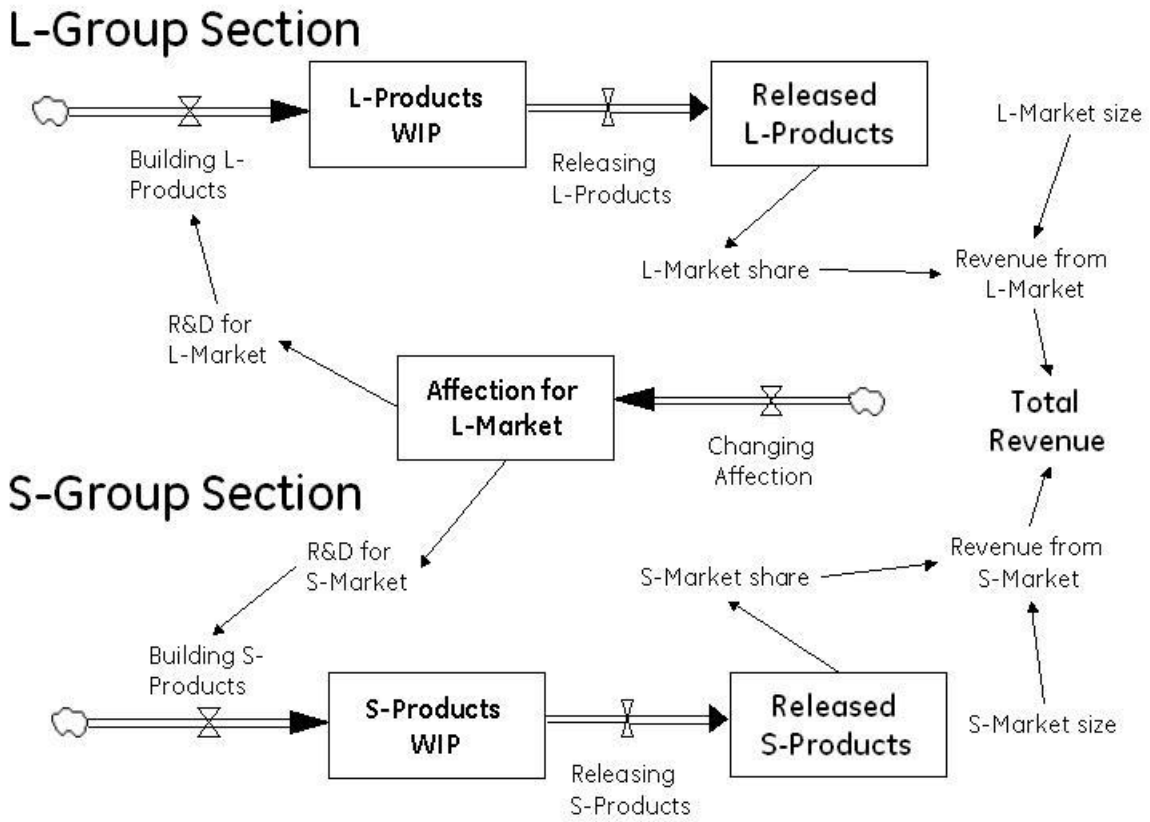


Figure 3. Stock and Flow Diagram for Investing in Two Markets

Starting in the center you can see the Affection for the L-Market stock. This will drive R&D for both the L-Market and the S-Market. Obviously more Affection for the L-Market will mean more R&D for the L-Market. R&D will drive product development, which as mentioned takes an average of 3 years to get to released products. The number of released products for the respective markets will drive the market share in those markets. This market share, combined with the size of the total market for that segment, will drive the revenue for that segment.

You can see that the part of the model that is not filled out is: what drives the Changing Affection? Here we will explore several different policy options.

The goals for the company are as follows:

- Maximize the total cumulative revenue over the time horizon. In particular the Accumulated Incremental Revenue over the company's starting revenue will be compared across the policy options.
- Grow faster than the overall market is growing.

The question is – how do you decide what market segment you should favor? Invest in your current revenue stream, invest in the highest growth market, the biggest market, something else?

I examined the following five policy options that I thought were typically chosen by companies, consciously or not. They are listed here along with the popular management expressions justifying each of them:

1. Favor the segment that gives you the most revenue. Invest in your 'core'.
2. Favor the segment that is the largest (market size). Fish in the biggest pond.
3. Favor the segment that is growing the most. Go for growth – even if it's small today.
4. Don't favor either segment – stick with 50/50 no matter what. A balanced portfolio across your core segments while investing in growth.
5. Favor the segment that will be the largest in 3 years. Go where the puck is going to be.

When I do this exercise with a management team, I ask which method is used most often. I always get the answer Policy 1 – Invest based on current revenue. Bigger businesses deserve bigger R&D budgets right? Fair is fair. In fact the most common metric around R&D investment is R&D as a % of sales, which basically encourages that behavior. More sales means more R&D. Smaller revenue means less R&D. Plus it's a common rule of thumb to not bite the hand that feeds you.

However I modeled these 5 policies under the scenario above to determine the best policy regardless of what was most common.

Policy 1: Favor the Segment that gives you the Most Revenue

If you go with Policy #1, favoring the segment with the most revenue, you get the following outcomes:

- 3.014B in Accumulated Incremental Revenue.
- Company grows more than the market 50% of the time.

Figure 4 shows the results of this policy.

Your revenue grows from both markets. In the L-Group market, you are growing because you are investing there and gaining market share. In the S-Group market, you are growing because the market is growing at 20%; You are loosing market share but the rising tide is helping you enough so there is some growth.

Because the L-Group market is giving you more revenue, you become more and more attracted to that market. You are investing there and become less and less attracted to the S-Group market. By year 10, you are all-in in the L-Group Market and no longer investing anything in the S-Group Market.

Your L-Group market share grows over time because you are investing there reaching over 50% by the end of the simulation. Conversely your S-Group market share ends at 13%.

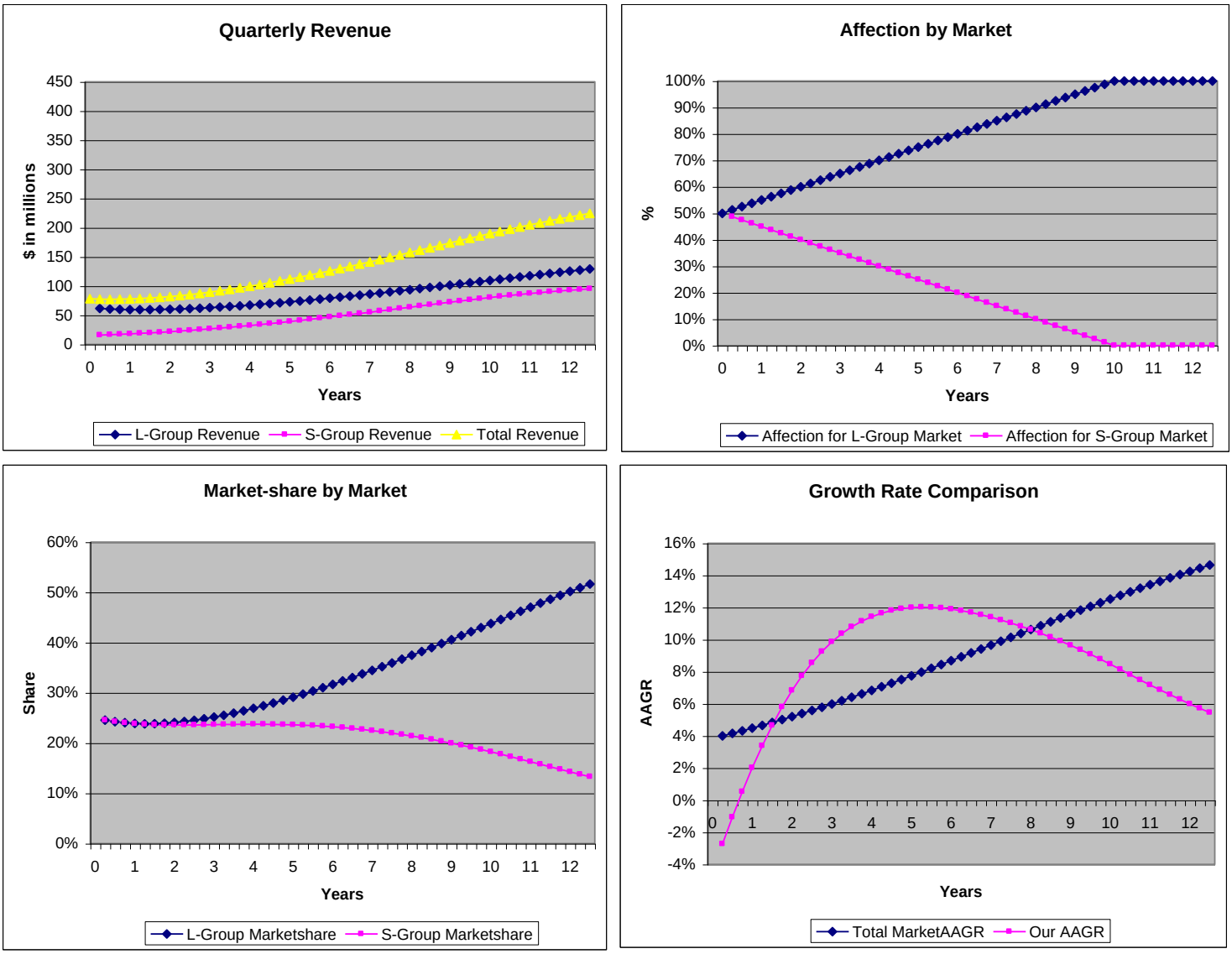


Figure 4. Results from Policy 1 - Prefer the segment that gives you the Most Revenue

Lastly you are able to beat the growth rate of the overall market about half the time. Your over-investment in the bigger L-Group market has paid off for the first several years of this simulation. However, sadly at the end of the simulation, you are growing way behind the market. The total market growth rate is now driven by the S-Group market which you are not much of a player in the out years and certain in the years following this simulation.

Policy 2: Favor the Segment that is the Largest.

You have the following outcomes by following this policy:

- 3.166B in accumulated incremental revenue. 5% better than policy #1.
- Company grows more than the market 52% of the time. 2 points better than policy #1.

Figure 5 shows the results of this policy.

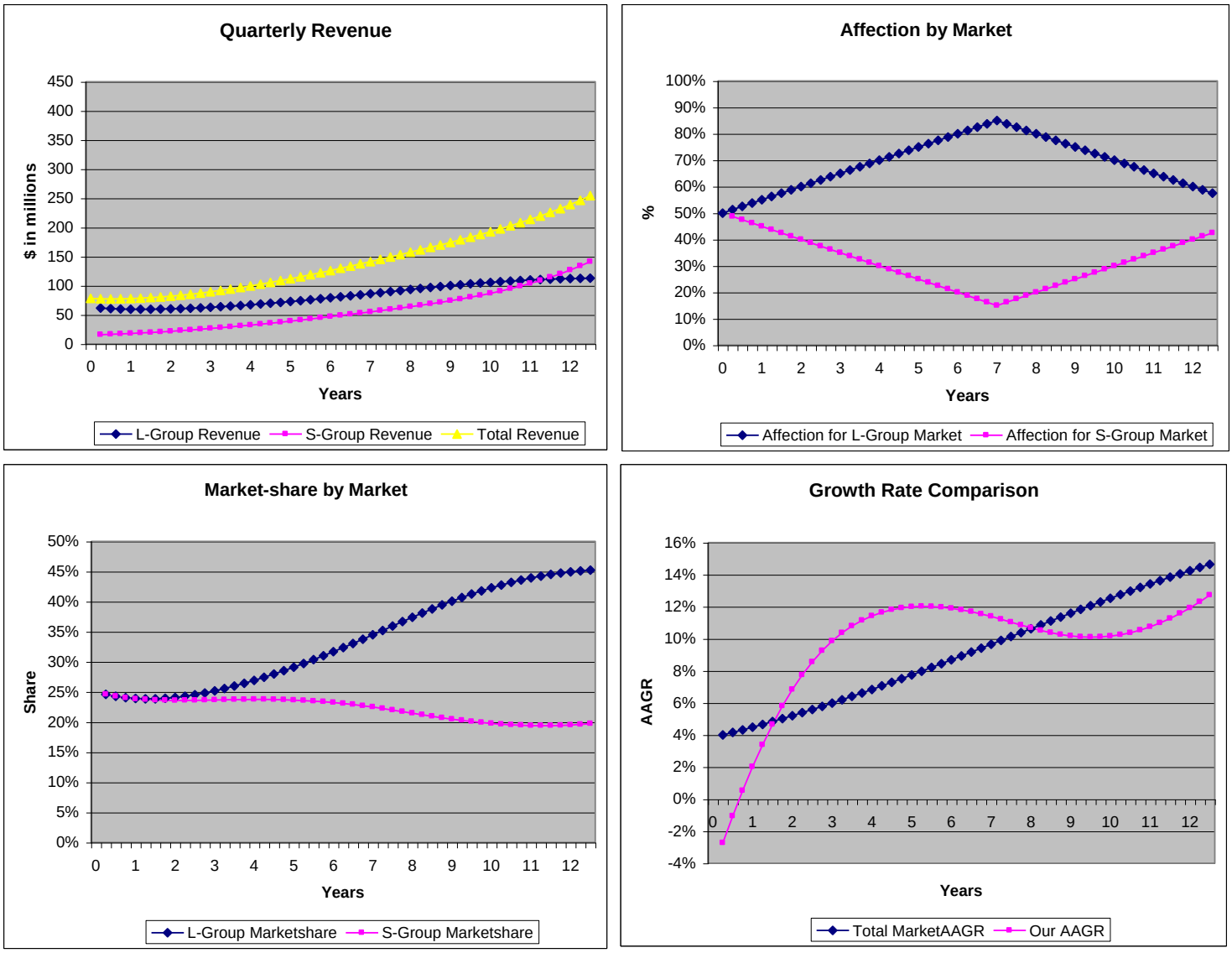
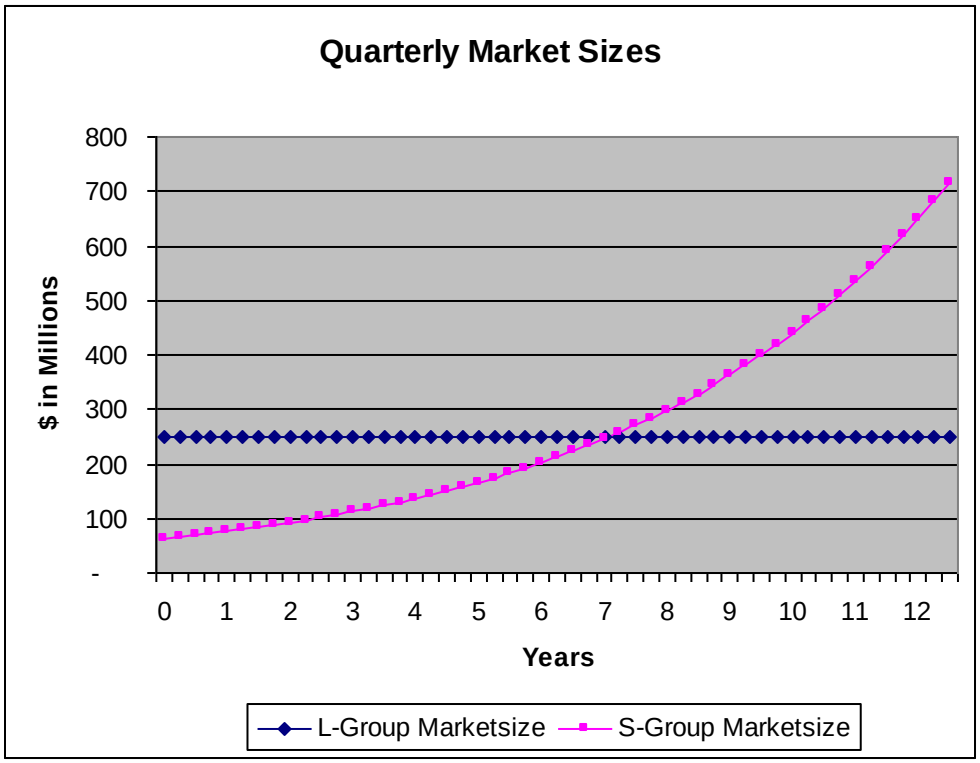


Figure 5. Results from Policy 2 - Favor the segment that is the largest market

This seems like a smart move. Invest in the L-Group segment for a while. Once the S-Group segment becomes big enough to matter, you start investing here.

This policy performs better than the first one. In year 7 (see below) the S-Group market becomes larger than the L-Group market. You begin to be attracted to the S-Group market when that happens and start to trend in that direction with your R&D spending.



You can see in the Affection graph, that you spend your first seven years investing in the L-Group market. Than at year seven, you gradually start to favor the S-Group market. Not a bad policy. You've lost market share in the S-Group market but start to regain it at the end of the cycle.

Though you have only beaten the growth rate of the market in 52% of the quarters, you are clearly headed in the right direction at the end of the simulation. If carried forward for 10 more years, this will probably make this policy look even better.

Policy 3: Favor the Segment that is Growing the Most – Go for Growth

You have the following outcomes by following this policy:

- 4.296B in accumulated incremental revenue. 43% better than policy #1.
- Your company grows more than the market 86% of the time. 36 points better than policy #1.

Figure 6 shows the results of this policy.

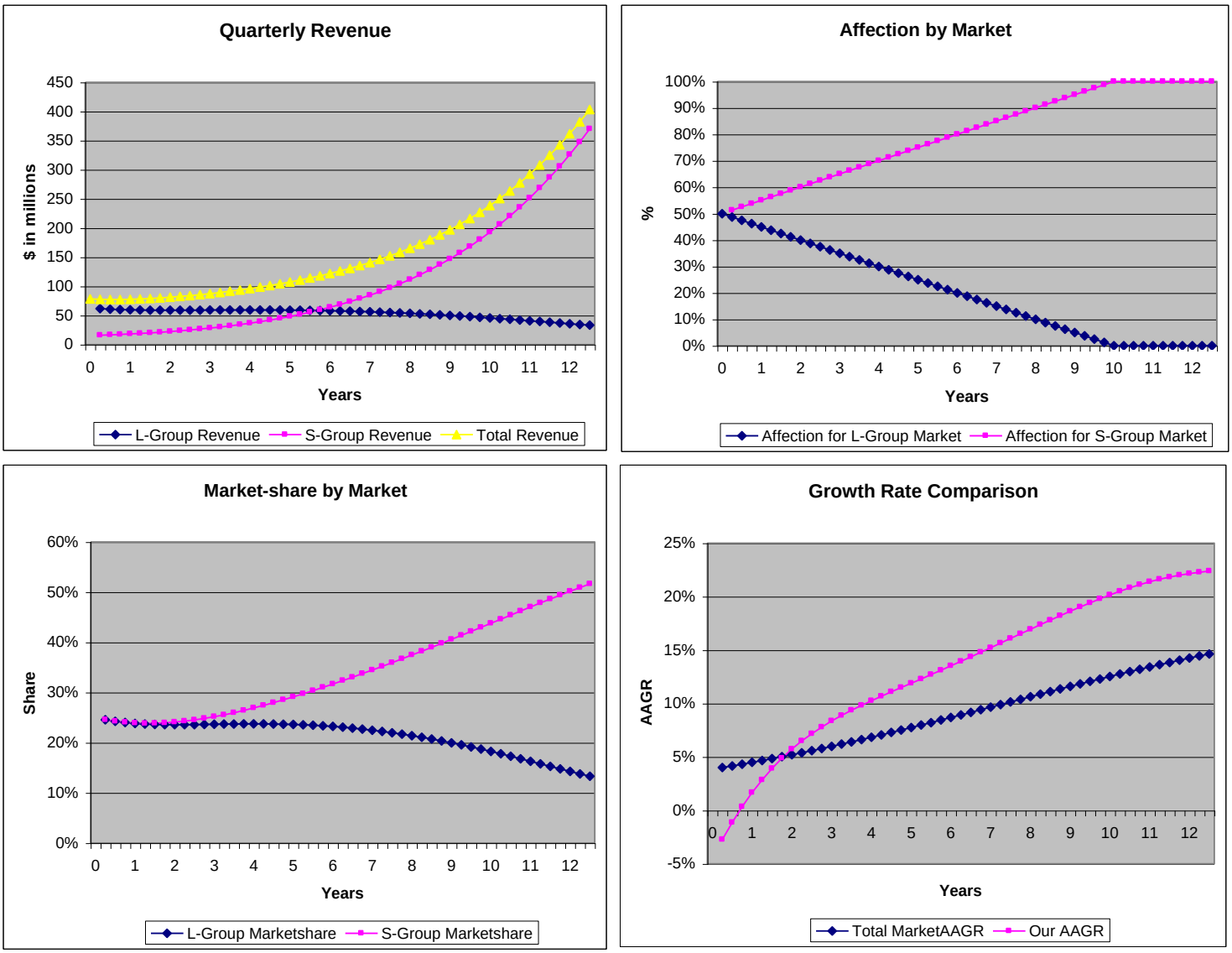


Figure 6. Results from Policy 3 - Favor the segment that is the highest growth.

Clearly this is a big improvement. You can see that the revenue growth is very strong driven by the rise in your S-Group Revenues.

By basing your decisions on growth rate alone, you end up playing the opposite of policy #1. All your affection from the beginning to the end is given to the S-Group Market. You are building products for the S-Group Market alone so your market share keeps rising in that market. So you have the high growth market + a rising market share.

Lastly you consistently outperform the market.

Policy 4: Don't favor either segment – stick with 50/50 no matter what. Hedge your bets.

This is the balanced policy. Partially feed your current markets while investing in your growth markets. This balanced perspective is also a very popular strategy that companies try to use.

You have the following outcomes by following this policy:

- 3.655B in accumulated incremental revenue. 21% better than policy #1.
- Your company grows more than the market 88% of the time. 38 points better than policy #1.

Figure 7 shows the results of this policy.

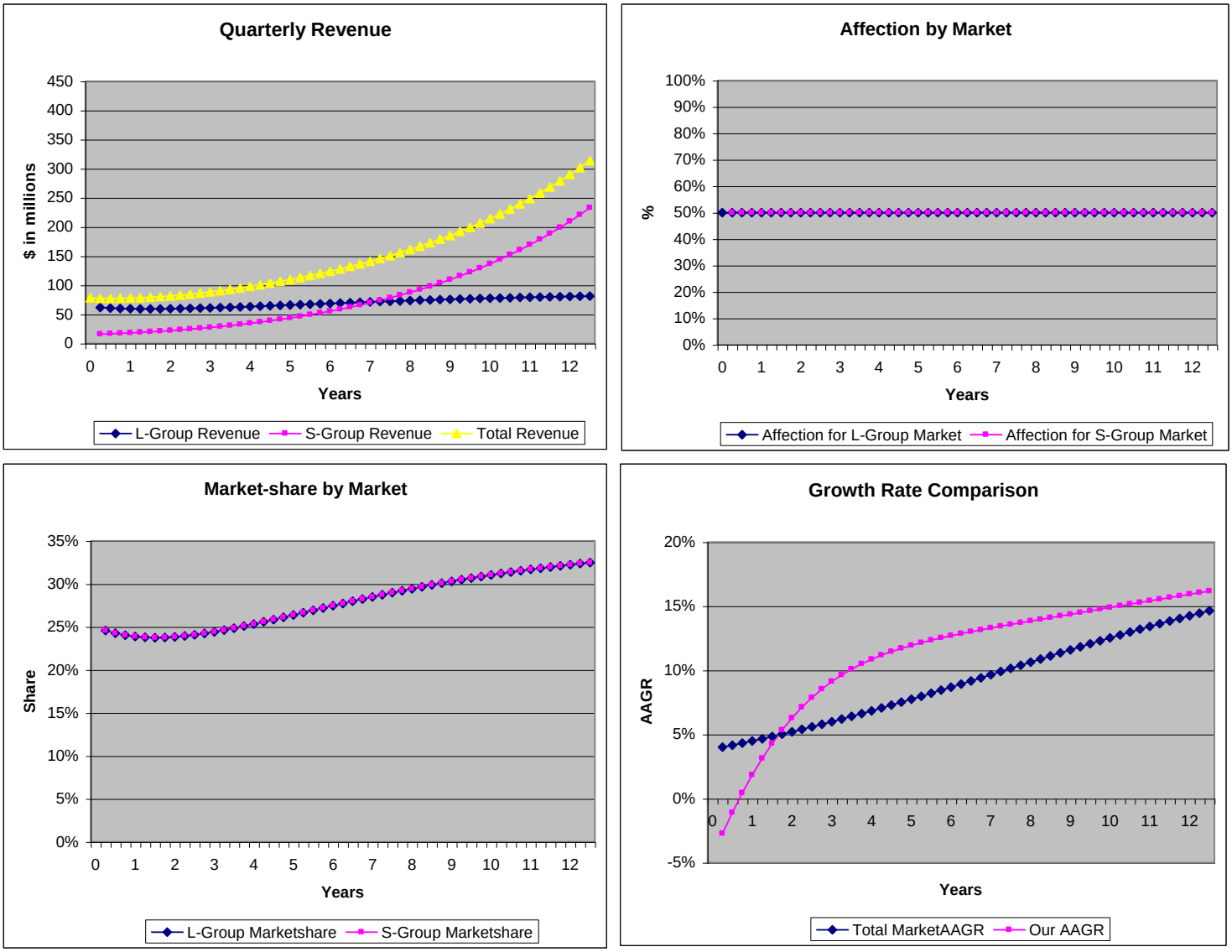


Figure 7. Results from Policy 4 - Don't favor either segment. Keep it 50/50.

This looks pretty good but not as good as policy 3. Your affection has stayed steady at 50/50. Your revenue has growth nicely with a balance from each market. Your market share is the same in both markets – the rise driving by new products. And lastly you typically outperform the market with this strategy

Your growth gap to the market is closing because you are an average player in both markets and will eventually grow at the average. Your inability to make tough choices have given you balance but if the simulation was carried out another 10 years, rather ordinary performance.

Policy 5: Favor the segment that will be the largest in 3 years. Go where the puck is going to be.

This was my guess as to the winner. You take 3 years to develop products, therefore point to the larger segment by the time the products are out.

You have the following outcomes by following this policy:

- 3.507B in accumulated incremental revenue. 16% better than policy #1.
- Your company grows more than the market 88% of the time. 38 points better than policy #1.

This was good performance but strangely not the best performance. Your market affection starts in the L-Group market but in year 4 switches to the S-Group market. As predicted, 3 years earlier than policy #2 which waits until year 7 when the S-Group market is actually bigger. But because you spent 3 years getting more and more attracted to the L-Group market (up to 71%) and the gradualness of your ability to move R&D dollars from once place to another (the 5% per year in the model), it actually takes until year 8 before you are truly spending more on the S-Group market. This, plus the 3-year delay in product development, adds up to a significant delay between recognizing the attractiveness of a segment, driving change in your organization, and truly making a difference in that new segment.

You can see that your market share in the S-Group doesn't increase much until the end of the simulation period. But your growth rate is strong throughout and will no doubt outperform in the next 10 years.

So what would sound like the best option was not, because of the severe time delays, much longer than the 3 years of product development.

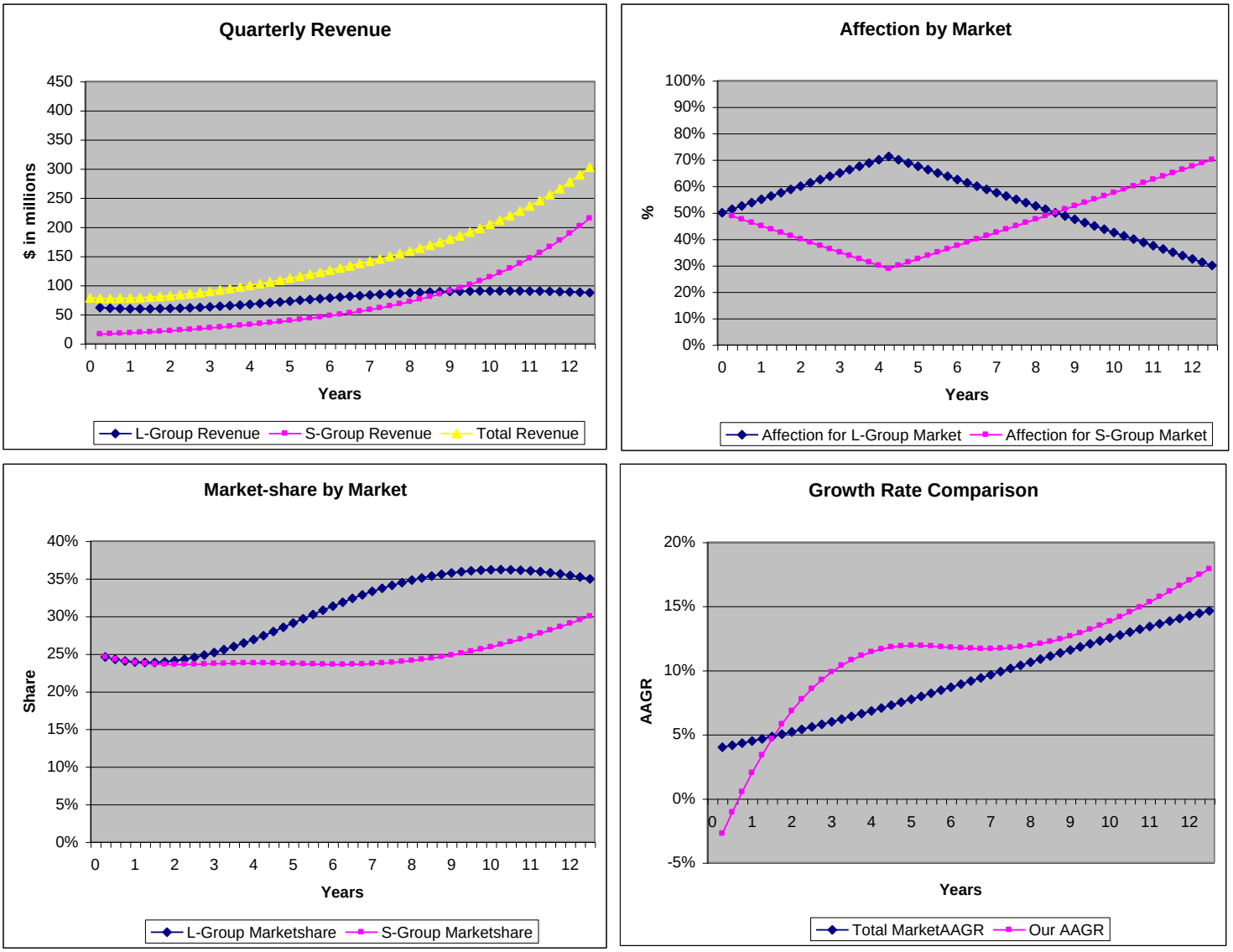
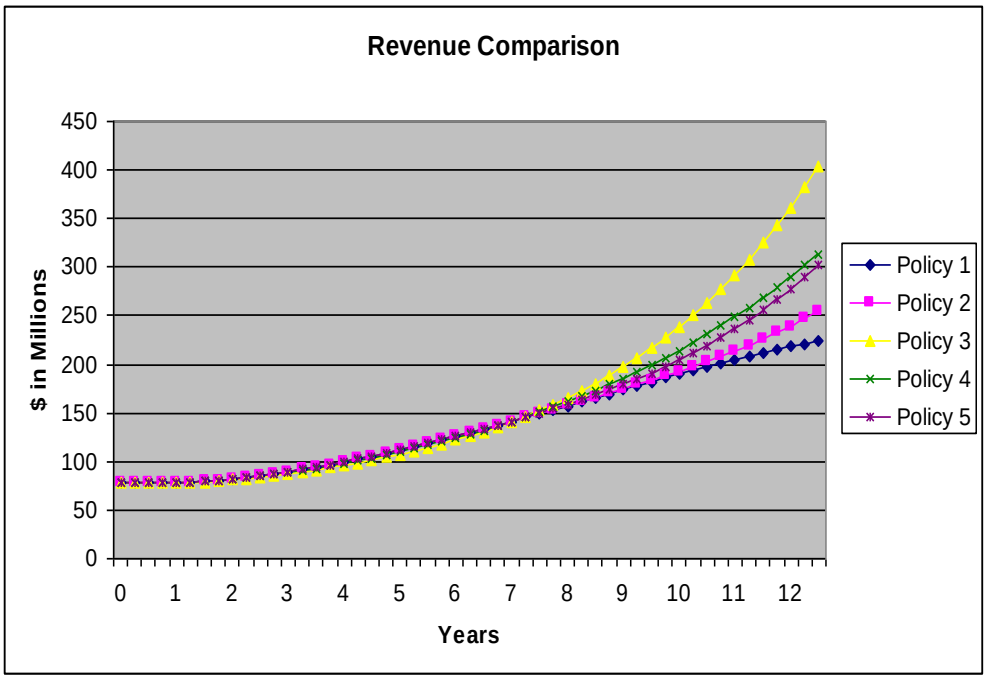


Figure 8. Results from Policy 5 - Favor the segment that will be the largest in 3 years.

The net of version 1.0 of this model was that Policy #3, going for the highest growth market from the beginning, was the winner. Here are the results:

Policy	Accumulated Incremental Revenue	Improvement % over Policy 1	Qtrs > Market AAGR
1-Most Revenue	3,014	0%	50%
2-Largest Market	3,166	5%	52%
3-Highest Growth	4,296	43%	86%
4-Invest in both	3,655	21%	88%
5-Largest in 3yrs	3,507	16%	88%



A few important notes on these results:

- What is most remarkable about these results is how they compare with reality. I mentioned that the most prevalent policy in business today is actually Policy #1. And this performed the worst by a large margin. How much more efficient could we make R&D investments if company's really understood this major disconnect?
- In this scenario it worked, but always favoring the Highest Growth segment is probably not always the best policy. In this case it was even though the highest growth was only ¼ the size of the large segment. For example if you make the highest growth segment tiny in size, than its high growth nature really doesn't matter. The next section will more robustly test the policy choices.

Monte Carlo Analysis

This research is using a generic model to apply to many company situations and I was concerned that the initial model parameters have significantly influenced the outcome of Policy 3 being the winner. So I ran a Monte Carlo analysis using 10,000 trials and a variety of market sizes and growth rates. Specifically:

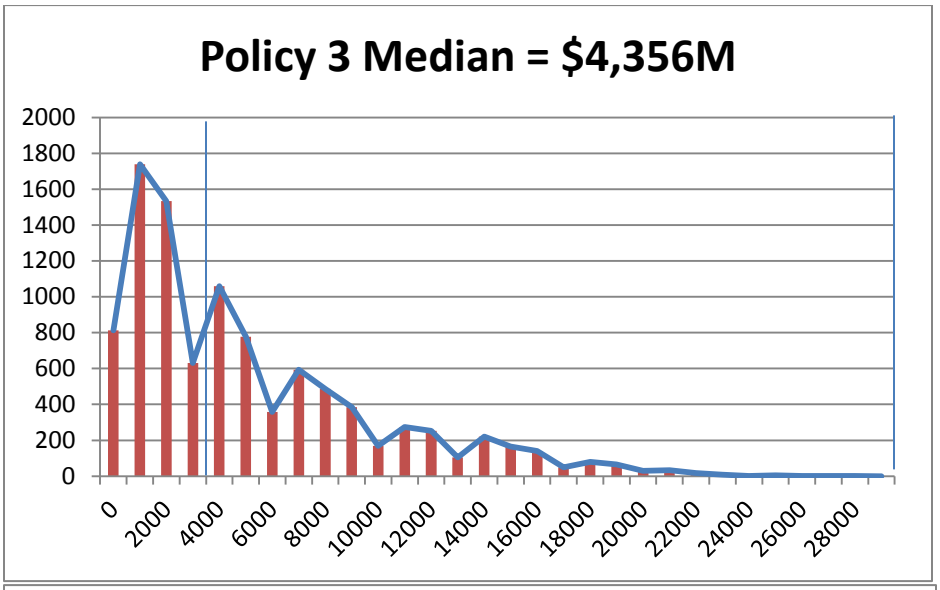
- Initial Market Sizes for both L-Group and S-Group markets were randomly selected from $0 – $1000M / year.
- Initial Growth Rates were randomly selected from -20% to 20% for both markets and then were held constant through the simulation timeframe.

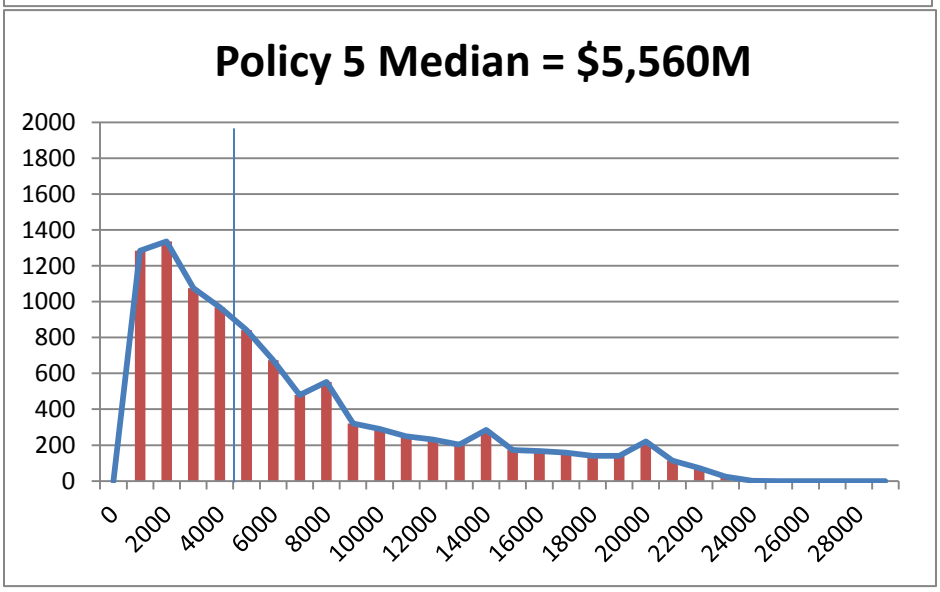
The results of this analysis were that Policy 5 was the winning policy across this broader arrange of company situations. Here were the results:

	Accumulated Revenue			
Policy	Mean	Median	Improvement %	% Time Best Policy*
Policy 1-Most Revenue	5,867	4,309	0%	22%
Policy 2-Largest Market	5,889	4,326	0%	23%
Policy 3-Highest Growth	5,886	4,356	1%	30%
Policy 4-Invest in Both	5,104	3,907	-9%	0%
Policy 5-Largest in 3yrs	7,501	5,560	29%	68%

*The reason these add to more than 100%, is that in the case of a tie for best policy, each of the winner policies is given credit.

This histograms that compare Policy 3 to Policy 5 are as follows:





Version 2.0 of the Model

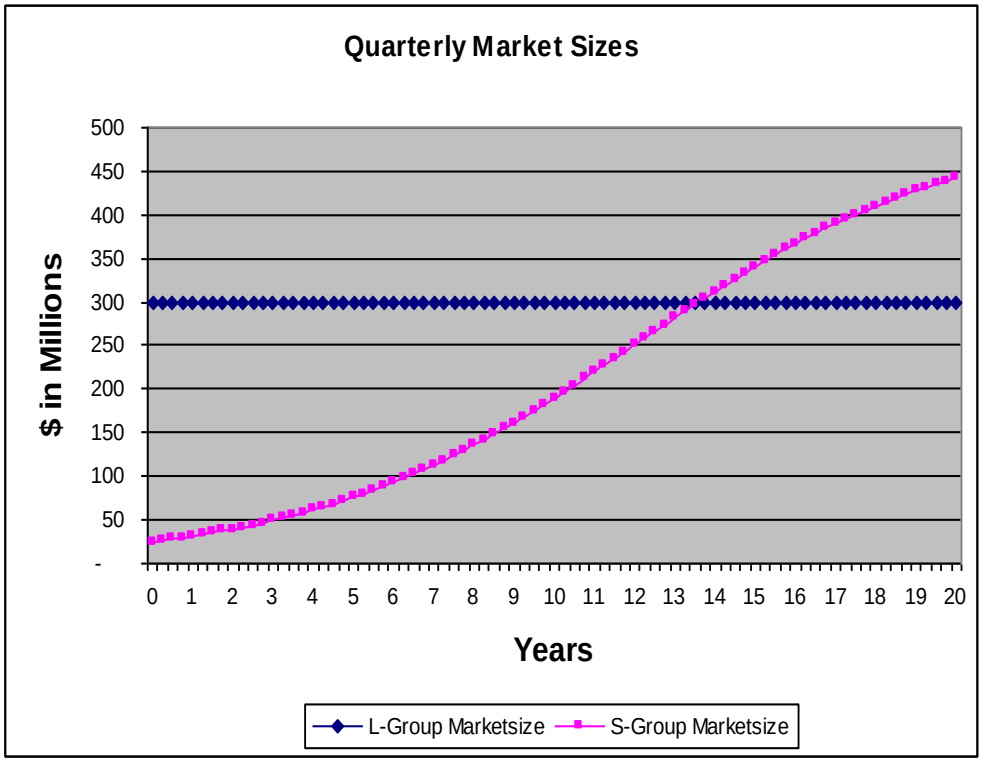
After presenting this model to leadership teams throughout my company, a few common questions came up:

1. Maybe the problem with Policy #5, with those initial parameters, was that the time horizon was not optimized. Given this scenario, would 5 years or 7 years perform better?
2. What would be the impact if we could change the organization faster? For example what if we could move our Affection by 10% per year instead of the 5% per year in the model.
3. Lastly what if we could develop products faster? For example what results could we obtain with a 2-year development timeframe instead of 3 years?

I modified the model in a few ways to try out some of these new hypotheses in the following ways:

- The simulation time of the model was expanded to 20 years instead of 12 to give more time for decisions to play out.
- The L-Group segment was modified to start at 1.2B/year and still be at 0% growth.
- To prevent the S-Group segment from become unrealistically big, I started it's size at 100M/year, it's initial growth rate at 24% and slowed its growth rate to eventually hit 3% in year 20.
- I hardwired the model to Policy #5 from version 1.0.

To illustrate this here are the respective market sizes for the simulation. You can see that the S-Group market becomes bigger in year 12.



Evaluating the Time Horizon

Here I evaluated different time horizons associated with the Policy 'Favor the market that is the largest in X years'. Here were the results of some selected time horizons:

Time Horizon	Accumulated Incremental Revenue	Improvement %
1	6,043	-2%
3	6,136	0%
5	6,362	4%
7	6,565	7%
9	6,641	8%
11	6,469	5%
13	6,387	4%

You can see that 9 years seems to be the best time horizon for these parameters and results in an 8% improvement over the original 3 years. This also matches the commentary from above. You have delays because of investing in the other market, delays changing an organization, and product development delays that roughly add up to this timeframe. To further illustrate the 9-year time horizon, you can see the results of this change in Figure 9.

This is a good example of navigating appropriately through both markets. In year 3 the switch is made to start to favor the S-Group market even though it won't be larger for another 9 years. That allows you to reap the rewards of the today's market (L-Group) while investing and eventually reaping the rewards of tomorrow's market (S-Group).

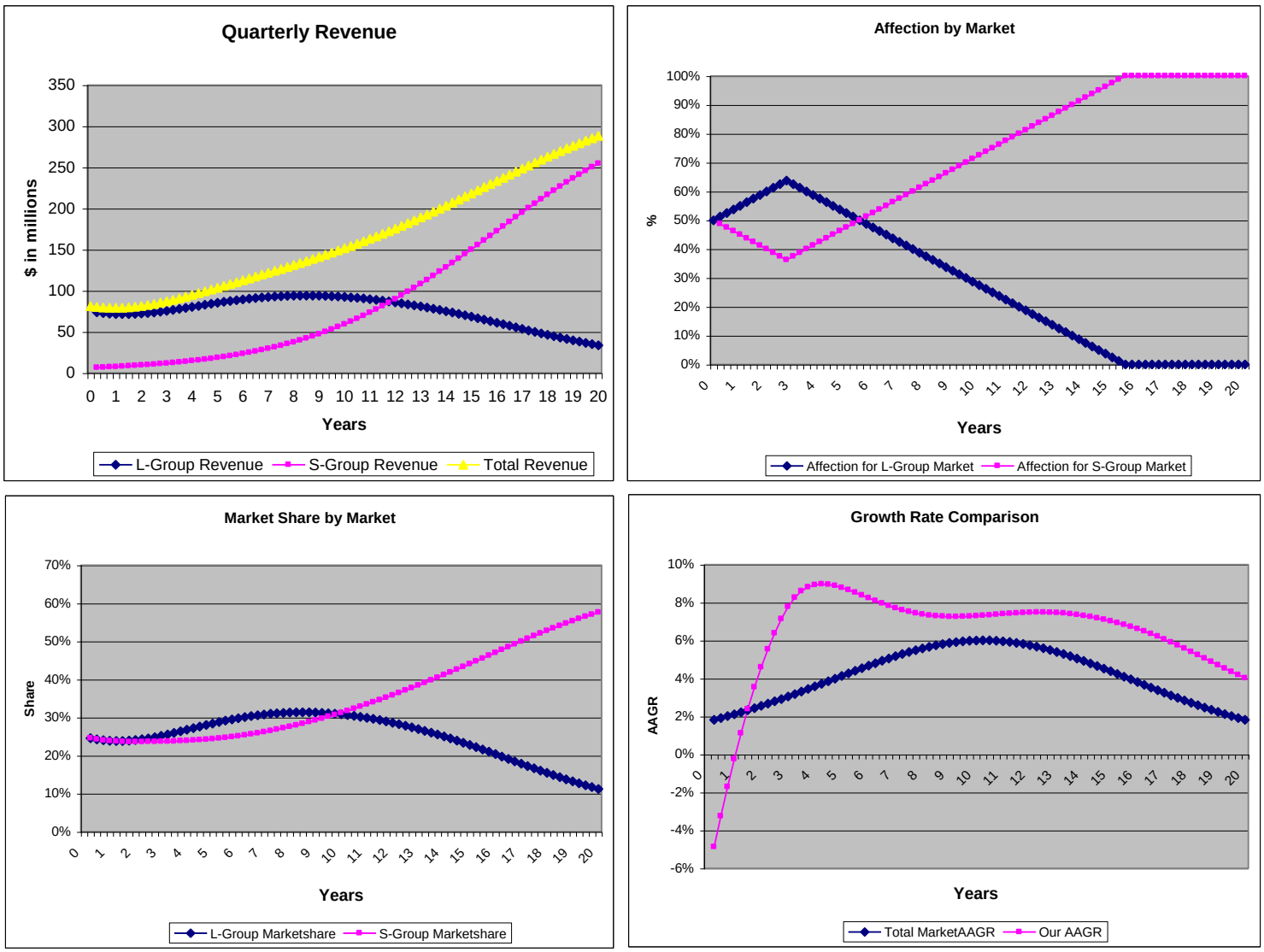


Figure 9. Results from investing using Future Market Size with a 9 year time horizon.

Evaluating the Timeframe required for Organization Change

Next we evaluate the benefits of moving the organization faster from one market to another. Specifically in the original model, the affection % could only move by 5% per year. This is because of the difficultly in moving away from a market as spending shifts take time because of legacy, customer base demands, unwinding existing commitments, etc. But what if you could figure out ways to do this faster?

The results are in the following table:

Affection Rate Speed	Accumulated Incremental Revenue	Improvement % over 5%/year Affection Rate Change
5.0%	6,136	0%
7.5%	6,340	3%
10.0%	6,523	6%
12.5%	6,677	9%
15.0%	6,799	11%

If you could move at 10% per year instead for example, that would be a 6% improvement over just the original pace of driving organizational change. In the model itself, the faster you can make this move, the better the improvement gets.

Evaluating the Timeframe required for Product Development

Lastly we take a look at the benefits of having a 2-year R&D timeframe instead of the model's original 3 years. Remember R&D does not just consist of building and releasing the products but also any time delays in making an impact in the market share. For some industries there maybe delays due to building market awareness, launch scheduling, market perception, building reference sites, etc. Here are the results:

R&D Timeframe	Accumulated Incremental Revenue	Improvement % over 3 year R&D Timeframe
5	4,861	-21%
4	5,482	-11%
3	6,136	0%
2	6,810	11%
1	7,503	22%

You can see that dropping down to a 2 year timeframe will yield an 11% improvement in accumulated incremental revenue relative to the 3 years. I've put in a few other data points to illustrate that basically the faster the better. It allows you to build up your market share in your chosen market faster.

Putting it all together

Lastly I looked at having a longer time horizon (7 years instead of 3 years) plus faster ability to change (i.e. 10% Affection Movement instead of 5%) plus faster R&D (2 years instead of 3 years) relative to the original parameters. Here are the results:

Improvements	Accumulated Incremental Revenue	Improvement % over Original Policy 5
Original Policy 5	6,136	0%
All Three Improvements	7,676	25%

Driving all three of these changes, gives you a staggering 25% increase from the original parameters of the model. (N.B. I changed the new time horizon from 9 years to 7 years because it turns out given the faster R&D timeframe and the faster ability to change, 7 years becomes the optimal time horizon – not 9 as with the original parameter values.)

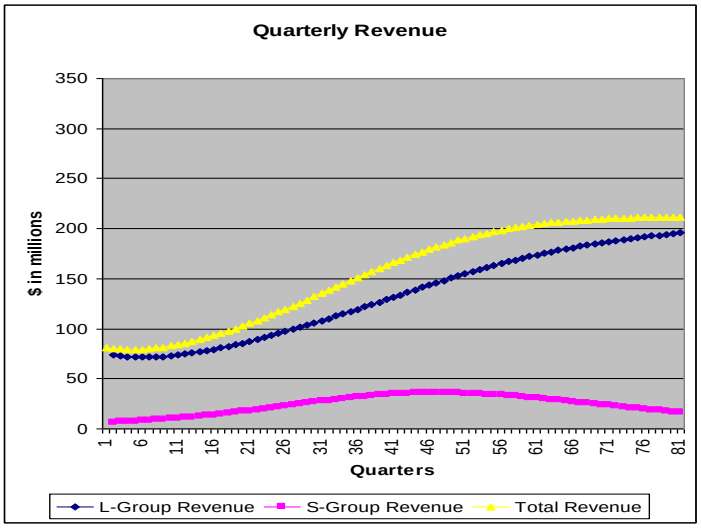
You can see that better policies plus increased knowledge of the dynamics of the situation driving other improvements yield a very different future for the company.

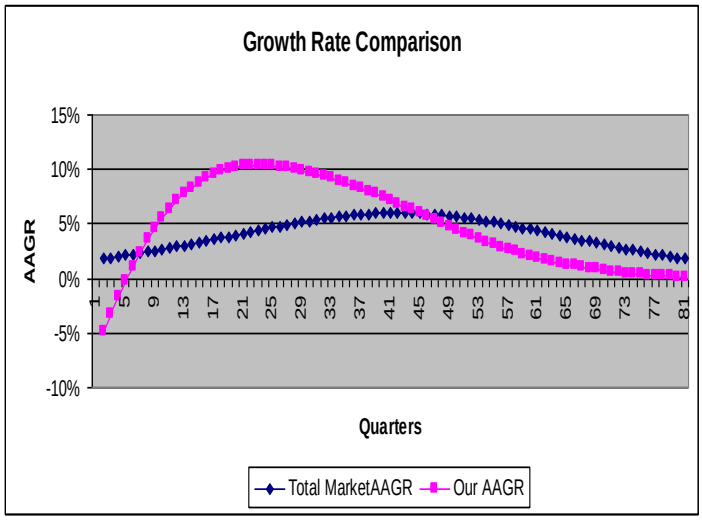
For the final points, I rebuilt version 2.0 of the model to run under the original Policy 1 which was the most popular way that companies allocate R&D dollars – by their current revenue streams and compared it with the new recommended way that companies make decisions based on this paper – Invest by Future Market Size (Policy 5), have a long-time horizon, change quickly when moving into new markets, and speed up your R&D cycle. To illustrate just how different these 2 companies are at the end, I offer the following comparison graphs in Figure 10.

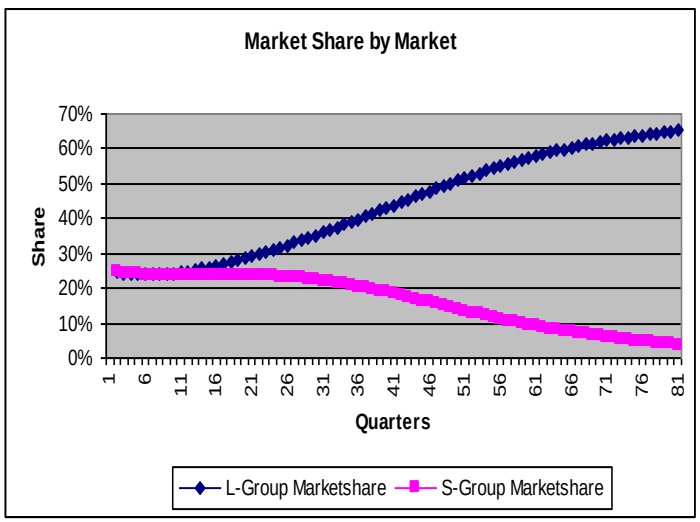
The company on the left is all about digging into the L-Group market. They've got a great share of the market, but they are no longer growing their revenues. They had a great run when they outperformed the market but those days are long gone. They continue to invest into their core and gradually ignore other markets. This makes things easy but it's a company without much of a future.

In contrast the company on the right has grown its revenues and they are still growing. Their growth rate did underperform the market somewhat while they retooled their product line for the growth markets. And it's paid off – they are now consistently growing faster than the market. Lastly they have invested in the L-Group while that market was hot, now they are investing in the S-Group and growing their market share nicely there. And with these policies they will be continually reinventing themselves when the next growth market comes along. The company on the right is all about smart change and moving quickly to the future.

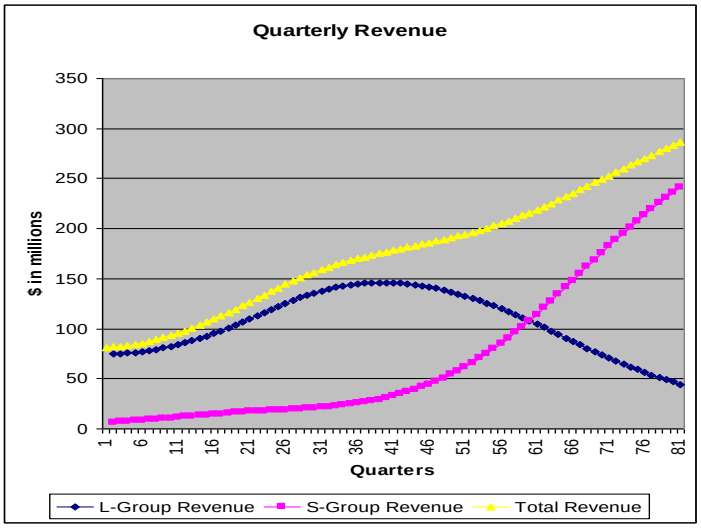
The Typical Company

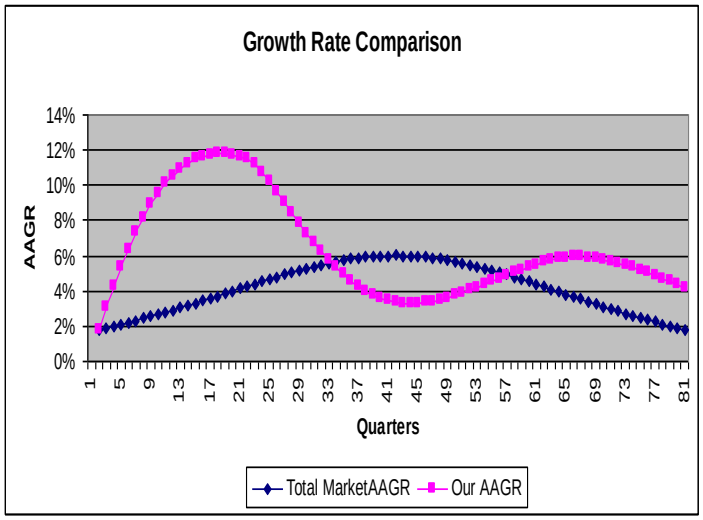






The New Company





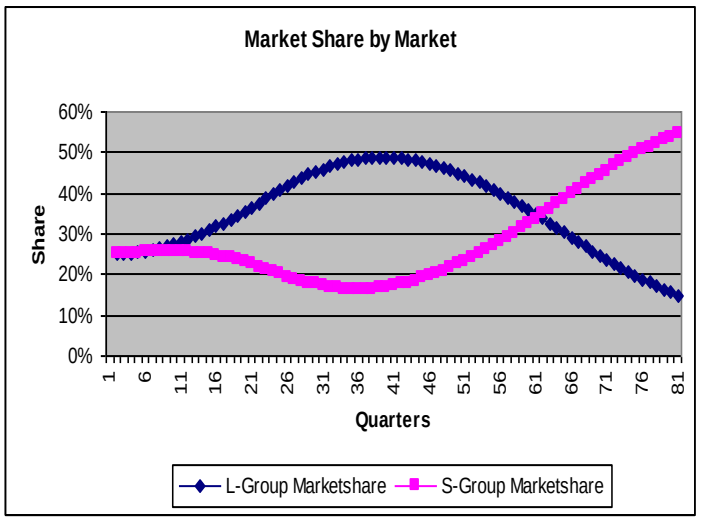


Figure 10. Comparison of a typical company using R&D as a % of Sales with a new company using R&D as a % of Future Market Size, a long planning horizon, faster organization change, and faster R&D.

Conclusion

The thinking and the tools that companies use today do not encourage them to change and adapt to the markets around them. There are strong biases that pull a company more and more toward its original market and inhibit its ability to invest in new upcoming growth markets. Today's leaders especially don't understand the large time delays that come with recognizing an interesting market, turning the ship around to invest in a new market, and then having the products out that truly impact market share and revenue. Today's methods of R&D investing are based on each business getting a % of its revenue that it can invest in R&D. This methodology, though fair and easy to understand and administer, is the epitome of this misunderstanding and it leads to significant underperformance, stagnation, and early unnecessary death of a company.

The System Dynamics model built to examine this situation clearly shows the trap that R&D as a flat % of sales can ensnare a company. Of all the logical choices of R&D portfolio management, this method often performs the worse despite being the most popular. Basing your R&D dollars on your current performance (e.g. revenue) can lead a company into a self-fulfilling prophecy. You are doing poorly in a market, so you invest less, which causes you to be even worse in that market. And this approach can lock a company into a market and a strategy that inhibits change. This paper concludes that basing your R&D investment on your Future Market Size is actually the wisest investment philosophy and allows your company to be continuously investing in where the future growth is. It also highlights the enormous benefits to decreasing the delays that are inherent in the system around organization change and product development timeframes. I hope with this work that R&D as a % of Future Market Size becomes the new standard in the industry.

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Biography

Don Woodlock is presently Senior Vice President and General Manager for GE Healthcare IT and is responsible for the business unit that builds IT systems for hospital departments. This $800 million business, headquartered outside of Chicago IL, is the market share leader and serves 3,000 customers in 50 countries with over 1,500 employees across the globe.

Don's work in System Dynamics consists of using SD tools to aid in decision making at GE Healthcare around R&D investment, headcount planning, balanced scorecards and performance, and leadership development. Don is also a leading video producer on System Dynamics with his video series Introduction to System Dynamics at www.systemdynamics101.com – with over 5,000 viewers. Lastly Don is pioneering the mainstream adoption of SD tools through the use of Excel as a modeling tool to facilitate broader use of the discipline.

Don holds a Bachelor of Science in Electrical Engineering from the Massachusetts Institute of Technology. He currently lives in the Chicago area with his wife and two children. His hobbies include running, playing guitar and spending time with his family.