The Impact of Sales-practice Startup Dynamics on Sales-force Productivity

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Abstract:

The problem of sales force turnover has been extensively studied; its causes amongst psychological, managerial, and workplace conditions have been examined. In this paper, we explore a structural cause of turnover related to the startup dynamics of a sales agent's practice and propose structural interventions for turnover's amelioration.

Our interrogatory technique utilizes a formal simulation model of the sales agent's startup dynamics. With the help of this model, we study how variances in the agent's resource base (skill, natural market, and lifestyle buffer) influence their three-year survival rates and overall career productivity. We show that a pure commission-based compensation policy selects a sales force optimized for surviving startup dynamics, not for long-term profitability. We examine a mix of policy interventions designed to align the sales force with a company's long-term interest.

Introduction

The problem of sales force turnover has been extensively studied; and its causes amongst psychological, managerial, and workplace conditions have been examined. In this paper, we describe a possible structural cause of turnover related to the startup dynamics of a sales agent's practice, investigate the implications of our hypothesis, and propose structural interventions for turnover's amelioration.

Because of the magnitude of costs turnover imposes, a wealth of studies have investigated the proximal causes of this turnover with an eye to policy intervention. These studies take two general perspectives: elements that vary with the workplace, and elements that vary with the individual sales agent. We can get a sense for the diversity of this literature with a brief survey of the causal mechanisms considered.

Focusing on the workplace, Lucas et al. cite the impact of supervisory consideration, intrinsic and extrinsic job satisfaction, and task-specific self-esteem (Lucas, Parasuraman, Davis, & Enis, 1987). Seligman and Schulman discuss how learned

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helplessness encourages quitting (Seligman & Schulman, 1986). Schwepker describes the impact of the sales organization's ethical climate (Schwepker, 2001). Sager considers the impact of job stress and satisfaction, perception of fairness, and comparison with other jobs (Sager, 1991). Jaramillo explores the impact of wasted time on individual attitudes (Jaramillo, 2006), Babakus and Cravens investigate the role of emotional exhaustion (Babakus & Cravens, 1999), while Roberts and Chonko continue the exploration by looking at pay satisfaction (Roberts & Chonko, 1996). Morgan and Inks describe the impacts on turnover of sales force automation (Morgan & Inks, 2001).

Concerned with the individual, Russ and McNeilly study characteristics of experience, gender, and performance (Russ & McNeilly, 1995), while Ingram and Lee consider individual commitment (Ingram & Lee, 1990). Parasuraman and Futrell investigate demographic impacts (Parasuraman & Futrell, 1983). Tyagi and Wotruba investigated the impact of individual dispositions on the workplace conditions associated with turnover (Tyagi & Wotruba, 1993).

Despite such exhaustive characterization, missing from this literature is a discussion of how the structure of a commission-based sales practice itself creates dynamics that favor high rates of turnover.

Case Study

To make our investigation concrete, we focus our attention on life insurance sales agents who are paid on commission. The life insurance industry has notoriously high rates of sales force turnover, with estimates from the Life Insurance Research and Marketing Association placing four-year retention rates for new agents at 16% in 1992(Weeks, 1995), and 13% in 2014(Leary, 2014), giving our case study both relevance and power.

Data Collection

To understand the startup dynamics of a new agent, we conducted a series of semi-structured interviews with representatives from our case study's home office. During 6 one to two-hour in-person interviews conducted over the course of several months, we met with 8 different executives responsible for Information Technology, Marketing and Promotion, Digital and Customer Service, Insights and Analytics, and Operations. We began with open-ended questions designed to elicit an understanding of the sales agents' behavior, drawing on each organization's unique perspective. We then engaged the interviewees in collaborative model-building exercise designed to elicit their understanding of the structure of interactions and feedbacks that drove the agent's startup dynamics. Finally, we asked specific, quantitative questions about various components of our model.

We additionally conducted approximately 10 one-hour interviews with these executives by teleconference as we refined our models, seeking input into various structural components of our simulation and eliciting values for rough parameterization.

Lastly, we conducted a set of one-hour in-person interviews with each of four sales agents at various stages in their careers, and with a general manager of their sales practice. In these interviews we asked a series of open-ended questions designed to assess the congruence between our understanding of the sales agent startup dynamics and that experienced by the agents themselves. We then asked specific, quantitative questions designed to elicit parameter values and uncertainties for our simulation model.

Questions and Hypotheses Arising from Interviews

Interviews with sales agents revealed that voluntary departure could occur for individuals who were not dissatisfied with the work itself but were unable to get their practices successfully established. Each new sales agent entered the practice with a social or financial 'buffer' that allowed them to meet expenses until they could count on commission for their income. If an agent could no longer make this work, they might be forced to give up the potentially high rewards of future commissions for immediate income. Agents who remained termed this the "fail-out" dynamic; we will consider its existence as our first hypothesis in this paper.

> **Hypothesis 1:** Startup dynamics for a new sales agent constitute a race to earn sufficient income before running out of startup buffer.

Given this hypothesis, managers were concerned with three questions: 1) how can we understand the dynamics of starting up a sales practice? 2) what policies could be implemented to reduce 'fail-out'? and 3) what implications do the startup dynamics have on the quality of the sales force? Responding to this need, we chose not attempt to determine the magnitude of the fail-out effect either absolutely or in comparison to other causes of turnover, but merely to determine the internal consistency of the hypothesis and its correspondence to the observed effect.

To understand this dynamic, we chose to simulate the agent's startup process with a dynamic model and tested various policies against a population of simulated agents.

Startup Dynamics

In this paper we consider sales agents who are paid commission based upon the number and value of the sales they make in categories of insurance products. When agents with no prior sales experience enter the firm, they are given training in the company's offerings, and basic sales strategies. They are then sent forth to recruit customers.

Agents begin their sales efforts by reaching out to their 'natural market' – the network of friends, family, and colleagues with whom they have existing relationships. Members of an agent's network who may have interest and means to purchase the product are considered 'qualified leads', to whom the agent devotes their sales effort to convert them into 'clients'. Agents meet with their clients on an approximately annual basis following the initial sale to help reassess the clients appropriate product mix. During these meetings, agents solicit 'referrals' to friends and colleagues of their clients, in an attempt to generate new qualified leads for future sales.

The makeup of this natural market varies, but by and large, sales to these "Tier 1" individuals are small, and their primary benefit to the agent is their potential contacts with individuals of a more lucrative market. By chance, a small fraction of referrals will be to a tier of individuals with more resources at their disposal, and greater inclination to buy insurance products, as diagrammed in Figure 1. Sales to leads in this second tier can provide a comfortable source of income to the agent.

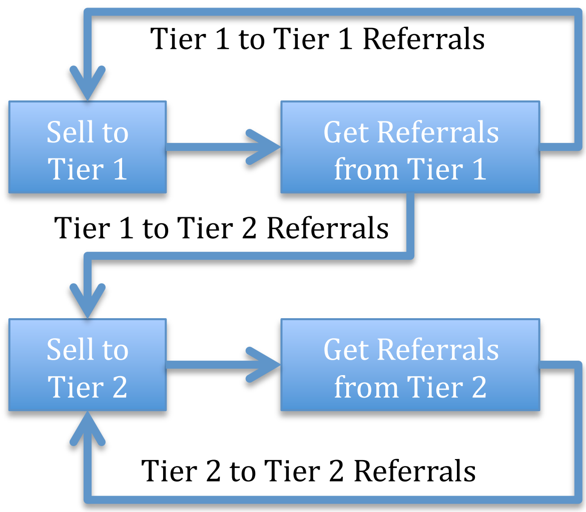

Figure 1: Startup Dynamics - An agent must use sales to their tier 1 'natural' market to gain access to and jumpstart sales and referrals amongst tier 2 clients.

Given this structure, the survival of an agent in the sales force depends upon their ability to leverage their Tier 1 'natural market' to gain access to a second tier of potential customer, at which point they are able to meet their expenses. Our second hypothesis follows from this:

> **Hypothesis 2:** To earn a livable income and avoid fail-out, an agent must leverage their 'natural market' for access to a more lucrative tier of leads.

In our interviews with agents and managers, it became apparent that this process of 'natural selection' was perceived as a selection mechanism that ensured that only productive, highly motivated individuals would remain in the sales force. In the words of our interviewees, to be a sales agent is to "eat what you kill". A new agent must 'refuse to fail', and be persistent 'when your back is against a wall and you're scraping to get a lead'. If an agent 'might not make a dollar for a year' they 'have to be all-in'.

While emphasizing the characteristics of personal determination that were necessary for success as a sales agent, our interviewees described their own process for surviving the startup dynamic. Some described the ability to rely on a personal financial buffer to cover their expenses. Others described an ability and willingness to live with extreme frugality or depend upon family or friends. It became apparent that these buffers could vary in both type and extent from agent to agent. Our discussions with the agents suggested the second hypothesis of our paper:

Hypothesis 3: The startup dynamic selects partly for agents with skill and determination, and partly for individuals with a large startup buffer or above-average natural market.

Finally, in our meetings with sales agents and home office management, we were exposed to the reality that even for agents who successfully navigated the startup dynamic, there could be a large difference between top performing agents and those who earned a more modest living. Our fourth and final hypothesis concerns this disparity:

Hypothesis 4: The 'natural selection' mechanism is an inferior method for optimizing a sales force for performance.

Simulation Model

Through our interviews we identified the feedback structures responsible for creating the startup dynamic briefly sketched in Figure 1. For each agent, we constructed a system of differential equations to track the state of an agent's stocks of leads and clients in their natural market, a second tier market, and a third tier market tier superior to both[3]. We constructed a model that conformed to the agent's own understanding and language for the startup process. In some places fidelity to the agents' mental model adds mathematical complexity to the equations to gain explanatory effect.

Based upon feedback from our interviews, we conceptualized the allocation of an agent's time as being distributed first to servicing existing clients, followed by sales to leads in descending order of value. We consider an agent's buffer at any point to be drawn by ongoing expenditures and built up through commissions from sales to each tier of leads.

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[3] While figures are approximate, one could think of Tier 1 leads as those making ~$50k/yr, Tier 2 as those making ~$500k/yr, and Tier 3 as those making 5$MM/yr. clearly the groupings are arbitrary to some degree but are representative enough for this model.

The system of differential equations making up the heart of the model appears in the equations below. The first equation tracks the rate of sales as dependent upon the likelihood of a successful sale and the amount of effort devoted to sales in a particular tier along with the loss rate of clients. The second equation tracks how leads are acquired from each tier. The third tracks the impact of commission and expenses on the agent's buffer.

$$\frac{dC_i}{dt} = s \cdot \frac{e_i}{e_R} - \frac{C_i}{l}$$

$$\frac{dL_i}{dt} = \sum_{j=i-1}^{i+1} C_j \cdot r \cdot u_{ij} \cdot q - s \cdot \frac{e_i}{e_R} - \frac{L_i}{f}$$

$$\frac{dB}{dt} = \sum_{i} s \cdot \frac{e_i}{e_R} \cdot n_i - x$$

The parameters in these equations are as follows:

C_i	Clients in Tier i
L_i	Leads in Tier i
s	Sale success rate
e_i	Effort devoted to selling to leads in Tier i
e_R	Effort required to make a sale
l	The average lifetime of a client
q	The qualification rate of new leads
r	The referral rate
u_{ij}	The chance that a referral from Tier j will be for a client in Tier i
f	The shelf life of a lead
B	The sales agent's buffer
n_i	Income per sale to a lead in Tier i
x	Monthly expenses

We allocate the time the agent spends first to existing clients, and then to Tier 3, 2, and 1 leads in decreasing order of priority, each up to the point where sales are limited by the number of leads available. For a more complete description of the time allocation, see Figure 13.

For simplicity in modeling, we chose to omit feedbacks that encourage a successful agent to balance their workload and income expectations or to increase their monthly expenses. Agents continue to work at the pace they set while struggling to make it through the startup dynamic and they continue to spend as frugally as they did initially. Clearly this assumption is unrealistic, but it does not impact our discussion of agent fail-out rate and is useful for assessing the *potential* for long-term agent performance, without introducing complexity to the system. We also simplify by modeling the size of the buffer as a multiple of an agent's constant monthly expense, in order avoid needing to provide absolute figures for compensation.

Diagrams of the full model of startup dynamics are found in Appendix B: Model Structure. The full set of equations formalizing the system dynamics model is found in Appendix C: Model Equations.

In our interviews with sales agents and sales managers, we asked our interviewees to estimate a ranges of values for each of the free parameters in the model as they perceived them in the overall beginning sales force (not only their unique experiences). In the absence of measurements of the system in operation, these subject matter experts give us a sense of the likely variance in behavior of the system. Estimates of model parameter baselines and uncertainty estimates obtained through our interviews are found in Appendix D: Estimates of Model Parameters.

Avoiding Fail-out

Individuals with a significant buffer to begin with are at an advantage, and some will succeed even if their skill, effort, and network resources are low. Overall, there are multiple ways in which a sales agent can avoid failing out before their buffer runs dry: For example, individuals who have built up savings in prior occupations, who are able to live with family, or who are willing to live extremely frugally for the time it takes to build up a client base.

We can simulate these hypothetical individuals in our model by adjusting the parameters for the effort required to make a sale (inversely related to skill), time spent with clients (determination), the initial mix of leads (network) and startup buffer. For example, Figure 2 presents the results of a simulation in which the individual's buffer is steadily eroded until month 20, when their income begins to exceed their expenses.

Figure 2 displays complete state information for the system, over the course of the first 36 months of the agent's career. The topmost plot shows the number of clients that the simulated agent has acquired in each of the three tiers. As referrals are modeled as coming from existing clients, this figure essentially reveals the agent's instantaneous capacity to generate new leads from his existing network. We see that over the course of the simulation, the agent develops this capacity first amongst Tier 1 clients, then amongst Tier 2 clients, and finally by the end of the simulation is beginning to build a base of Tier 3 clients. The second plot shows the number of leads that an agent has at any given time. The last plot shows the instantaneous buffer that the agent has available in units of months of expenses. If this line drops at any point below zero, the agent will have 'failed out'.

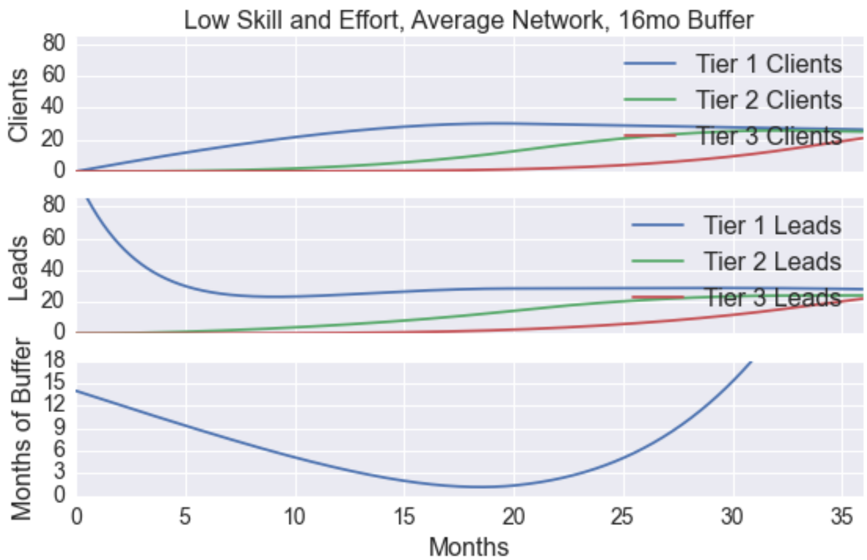

Figure 2: A low-skill, low-effort, low-network value sales agent can avoid failure by having a substantial buffer.[4][5]

A sales agent may also avoid fail-out if he or she comes into the position with access to a more lucrative set of leads. Figure 3 shows the results of a simulation in which a low skill/effort individual with an average buffer can avoid fail-out on the strength of some preexisting Tier 2 leads that allow them to work through the startup dynamic with a small number of Tier 2 clients instead of having to begin with a larger number of Tier 1 clients.

[4] For parameter values used in these exploratory model runs, see: Appendix 1: Parameter values for exploration and policy runs:

[5] Plots and analysis in this paper were generated using PySD, a tool for conducting analysis of system dynamics models using python.(Houghton & Siegel, 2015)

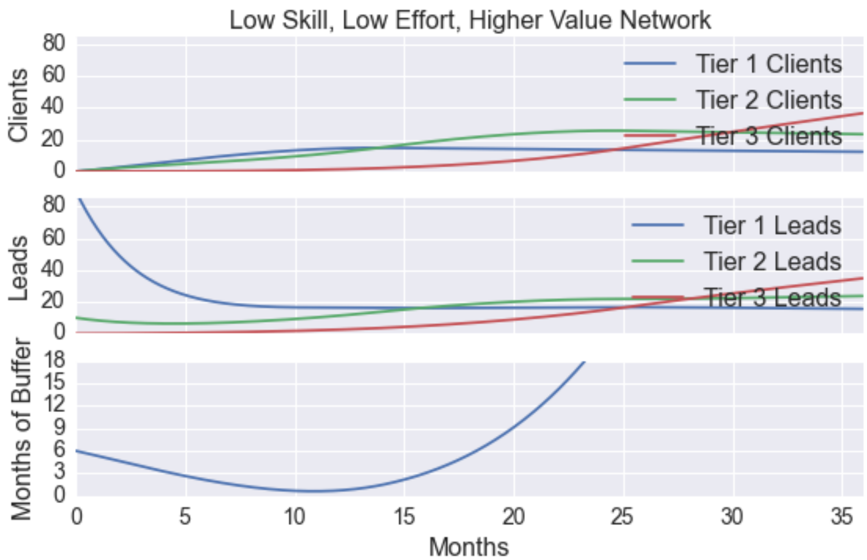

Figure 3: A low-skill, higher network value sales agent can avoid failure with an average buffer. In this case the initial client base is made up of Tier 2 individuals.

Finding Success

In the cases above, the sales agent was able to avoid fail-out, but their overall success is limited in comparison to simulations we will see next. True success is not merely avoiding fail-out, but developing a base of high tier clients. The path to this success requires a combination of effort and skill. Figure 4 shows the startup dynamic of a skilled individual with an average (6 month) buffer. We see that after avoiding fail-out, the sales agent goes on to establish a strong base of clients within all tiers; by the end of the simulation the agent has developed a robust number of Tier 3 clients and a strong growth trajectory.

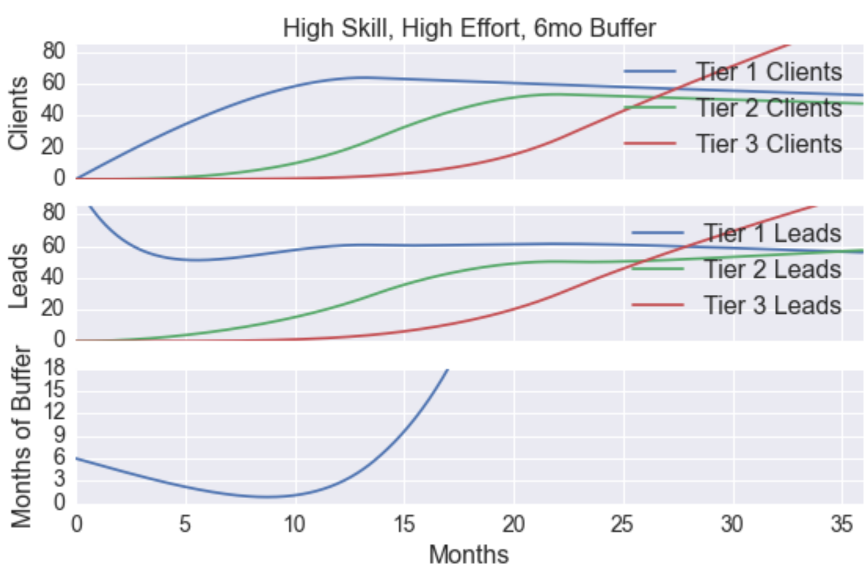

Figure 4: A high skill, high determination individual can succeed with an average buffer.

Despite both skill and effort, in the case of the agent profiled in Figure 4 we see that the simulated sales agent comes perilously close to fail-out at around 9 months, due entirely to the startup dynamic involved in creating a client base. Indeed, if we reduce the buffer of this individual from 6 to 5 months as seen in Figure 5, they do indeed fail out of the sales force, as their buffer drops below zero around month 7.

Figure 5: Even high skill individuals may be vulnerable to small changes in their startup buffer.

This scenario is detrimental to all parties involved: the agent's existing clients are now 'orphaned' and are statistically likely to abandon the firm's services. The firm incurs the cost of hiring, training, and maintaining a new sales agent and loses the revenue that would have been brought in had the agent remained. The agent has to enter a new line of work with their safety buffer depleted.

Policy Options for Sales Managers

Faced with the realization that an agent's natural startup dynamics may eliminate high achievers while lower performing agents survive on other merits, what are the options available to the manager of such a sales force?

One policy would be to put in place work aids designed to improve the ability of an agent to complete sales. These may be policies that locate a sales agent in the heart of a major metropolitan area to decrease travel time or provide customer relationship management systems that reduce overhead of data management. For example, if by some combination of means, the sales manager cuts overhead to give the agent 25% more time with leads and clients, the agent will not fail out and in addition will see gains to their long-term performance, as seen in Figure 6.

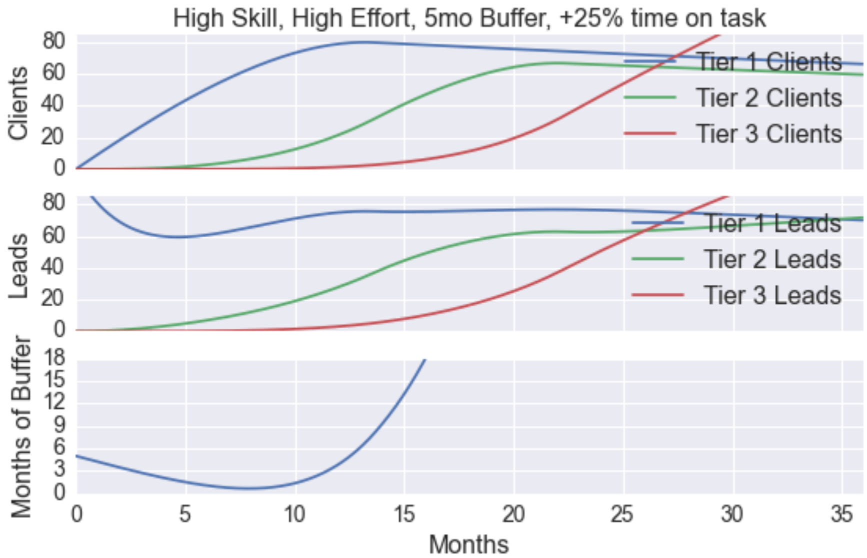

Figure 6: Policies that give the agent a higher fractional time-on-task mitigate fail-out risk and improve long term performance.

Another policy option is for the sales manager to subsidize the income of the agent for some number of months. In Figure 7, we show that if a sales manager chooses to subsidize 25% of the agent's expenses (instead of reducing overhead), the agent can make it through the startup dynamic and contribute to the firm.

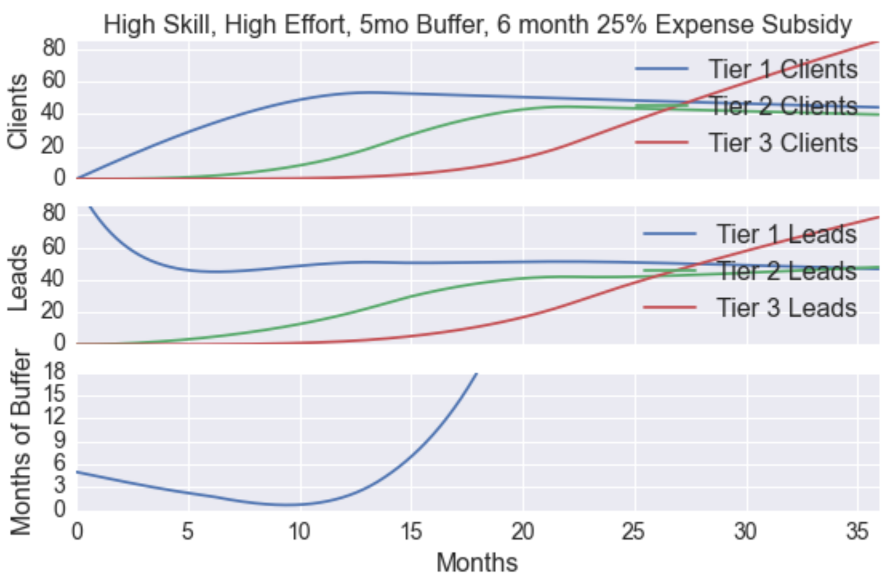

Figure 7: A small startup subsidy can carry an agent through the startup dynamics.

Sales Force Population Analysis

Having answered questions about the nature of the startup dynamic, and the general policies available to sales managers, we now turn to the question of what these dynamics and policies do to the sales force as a whole. To explore this question we'll construct a hypothetical population of 1000 individuals identical in all but two respects. The first difference will be to vary among the population the size of their startup buffer according to a uniform distribution from 0-14 months. The second difference between members of the simulated sales force will be to vary the amount of time that an agent must spend with a particular lead (on average) before that lead will commit to a purchase. We will vary the effort required for them to make a sale according to a uniform distribution from 0-16 hours.

Each individual could thus be considered to occupy a point in a two-dimensional parameter space, with their individual initial buffer defining their location along a horizontal axis, and their skill (as represented by how long it takes them to make each sale) on the vertical axis. Using our three-tier model, we simulate the behavior of an each agent for 36 months. If the agent fails out of the sales force before the end of the 36 months, we color a marker at their location in the two-dimensional parameter space **red**. If they avoid failure for 36 months, we color them **green**.

The general pattern shown in our analysis is that individuals with either a high initial buffer or a low amount of effort required to make a sale (therefore high skill) are able to avoid failing out of the sales force. We see that a whole group of high skilled individuals (low required effort) fail out because they do not have a sufficient buffer to survive the startup dynamic. Separating the agents who fail out from those who do not is a line we might call the 'failure front'. The goal of a sales manager should be to shift or reshape this failure front to include a larger proportion of high skilled agents.

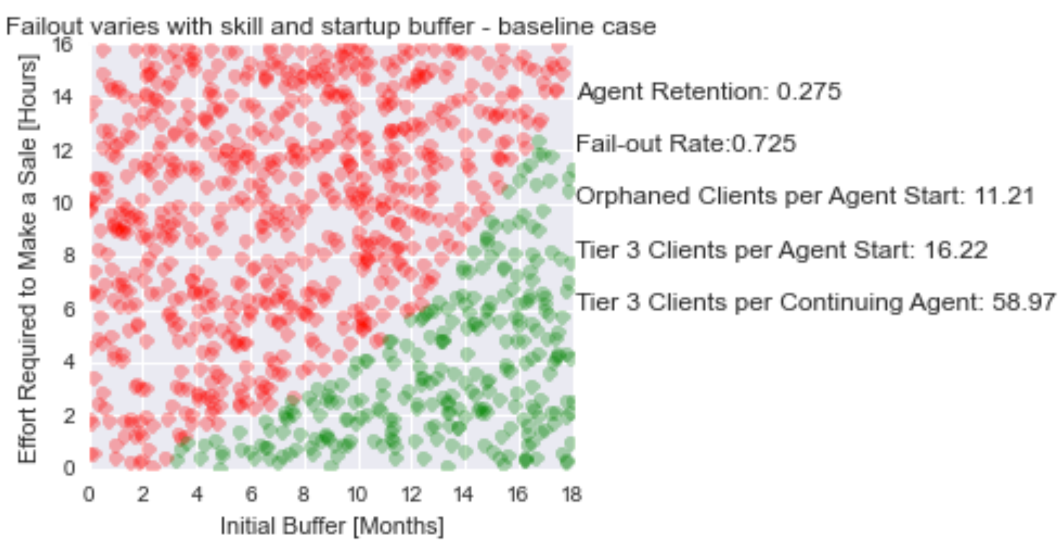

Figure 8: A population of 1000 agents with default values for all parameters excepting the initial buffer and time to make a sale.

In the baseline case seen in Figure 8, we simulate the population without any added management policy. For our toy population, we see a fail-out rate of 73%, meaning that 73% of individuals who start work will need to start over with an empty buffer.

On average, just over 11 clients are orphaned for every agent who begins the process. From a customer satisfaction perspective, this is a number to minimize. Lastly, we see an average of 16.2 non-orphaned Tier 3 clients for each agent who begins the process. This specific metric gives us the best estimate of the financial performance of our sales force.

Implementing policies designed to reduce overhead and thus increasing time available to spend with leads or clients by 25% scales the failure front vertically, as seen in Figure 9. In this case we see an equal percentage increase in the population of low-buffer individuals as of high-buffer individuals. We see a slight improvement in retention and productivity, but counter-intuitively, a slight worsening in the average rate that clients are orphaned. This worsening is due to the fact that agents who fail out acquire slightly more clients before they do so.

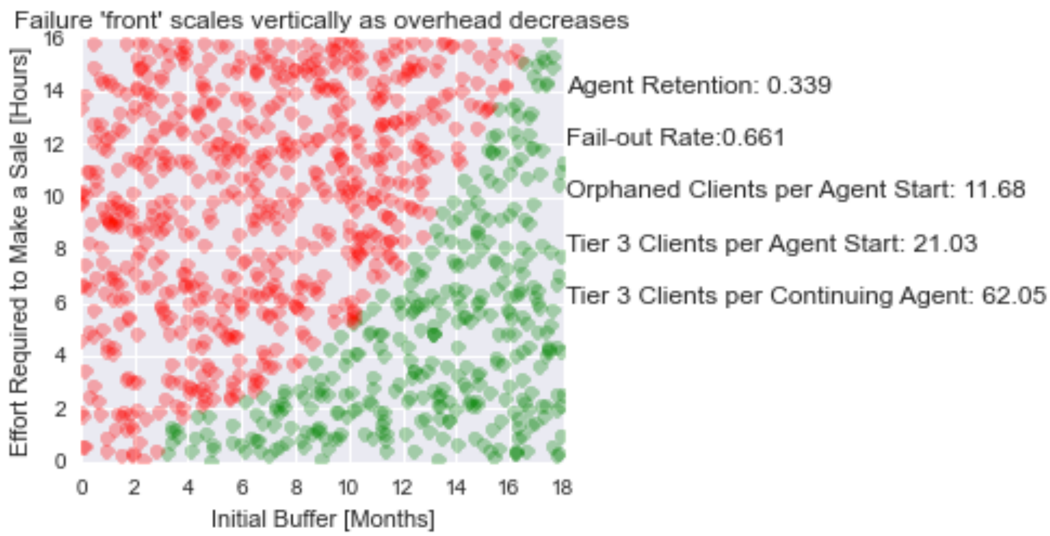

Figure 9: Improving the agent's time-on-task scales the failure front vertically

If instead of reducing overhead, the sales manager chooses to provide a subsidy to new agents at 30% of their monthly expenses for 6 months as in Figure 10, we see the failure front shift to the left (essentially by 6 months * 25%). Because the failure front is concave-up, this leftward shift of the failure front implies a larger fractional increase in high-buffer individuals than low-buffer individuals. While we see larger improvement in agent retention (and correspondingly in the number of orphaned clients), smaller gains occur in productivity as indicated by Tier 3 clients.

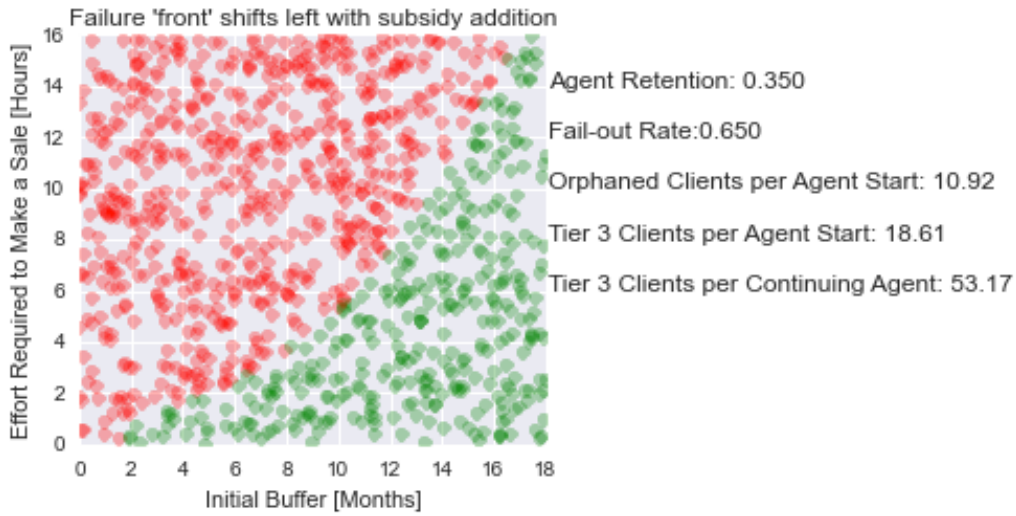

Figure 10: Providing a startup subsidy to new agents shifts the failure front to the left.

This toy population has been helpful for demonstrating the qualitative impact of various policies on the performance metrics we have identified. It is not, however, representative of the actual population of new agents. When we simulate over a population with parameters drawn independently from the distributions for population parameters estimated from our interview responses, we see similar patterns of results, albeit with different magnitudes, as seen in Table 1.

Table 1: Simulated results on a population more representative of the observed sales force.

Policy	Baseline	Overhead Reduction	Startup Subsidy
Agent Retention	0.1 (100%)	0.13 (128%)	.21 (206%)
Fail-out Rate	0.9 (100%)	.87 (97%)	.79 (88%)
Orphaned Clients per Agent Start	0.8 (100%)	1.0 (123%)	1.17 (148%)
Tier 3 Clients per Agent Start	3.5 (100%)	5.2 (150%)	7.6 (218%)
Tier 3 Clients per Continuing Agent	33.8 (100%)	39.8 (118%)	35.8 (106%)

The general similarity in results here gives confidence that the lessons regarding dynamics and policy interventions that we drew from our toy population may be valid for populations with distributions of attributes closer (although by no means identical) to the true population of agents.

Discussion

The hypothesis that startup dynamics contribute significantly to new sales agent fail-out is consistent with the mental models of sales agents and sales. Simulating the behavior of a single sales agent reveals that the race of the agent to generate Tier 2 and Tier 3 leads before fully exhausting their buffer is a reasonable explanation for the observed fail-out behavior. Increased efficiency is shown to ameliorate fail-out and improve long-term performance by increasing the rate at which the agent can generate new leads. Startup subsidies are shown to ameliorate fail-out by extending the time available for the agent to make the transition to a Tier 2 market.

In simulated agent pools, the fail-out process selects for a combination of skill and start-up buffer in ways that exclude a number of high-skilled individuals and include a number of individuals who succeed by having a large startup buffer or a high-value starting network. While commission-based compensation for sales agents may have a motivating effect for established agents, the startup dynamics associated with building a network and client base apply selection pressures on the sales force that are only weakly aligned with selecting for productivity. Policies that support individual agents through the startup dynamic can improve retention rate, average skill, and total productivity.

Conclusion

This paper constructs a plausible causal model for the sales agent's startup dynamic and its impact on sales-agent fail out. Through simulation, we show that the structural understanding of the startup dynamic revealed by our interview subjects leads to an outcome that is consistent with observed fail-out behavior. We have demonstrated the impact of two possible correction strategies at the individual level, and on the productivity of the sales-force as a whole.

Further research is needed to build additional confidence in these hypotheses. Of particular help would be a longitudinal study of a number of sales agents from day one through either fail-out or a fixed future time, tracking their leads and clients in a number of different tiers. While it would be difficult to assess an agent's startup buffer, if conducted carefully, an experiement could be conducted to test the impact of subsidization or efficiency improving tools on improving the fail-out rate.

Works Cited

Babakus, E., & Cravens, D. (1999). The role of emotional exhaustion in sales force attitude and behavior relationships. *Journal of the Academy of Marketing Science*. Retrieved from http://link.springer.com/article/10.1177/0092070399271005

Houghton, J., & Siegel, M. (2015). Advanced data analytics for system dynamics models using PySD. In *Proceedings of the 33rd International Conference of the*

System Dynamics Society. Retrieved from http://www.systemdynamics.org/conferences/2015/proceed/papers/P1172.pdf

Ingram, T. N., & Lee, K. S. (1990). Sales force commitment and turnover. *Industrial Marketing Management*, *19*(2), 149–154. doi:10.1016/0019-8501(90)90039-X

Jaramillo, F. (2006). The role of time wasted in sales force attitudes and intention to quit. *International Journal of Bank Marketing*. Retrieved from http://www.emeraldinsight.com/doi/abs/10.1108/02652320610642326

Leary, P. (2014). Distribution Expansion NOW IS THE TIME. *LIMRA MarketFacts Quarterly*, (4), 18.

Lucas, G., Parasuraman, A., Davis, R., & Enis, B. (1987). An empirical study of salesforce turnover. *The Journal of Marketing*. Retrieved from http://www.jstor.org/stable/1251646

Morgan, A., & Inks, S. (2001). Technology and the sales force: Increasing acceptance of sales force automation. *Industrial Marketing Management*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0019850199001157

Parasuraman, A., & Futrell, C. (1983). Demographics, job satisfaction, and propensity to leave of industrial salesmen. *Journal of Business Research*. Retrieved from http://www.sciencedirect.com/science/article/pii/0148296383900371

Roberts, J., & Chonko, L. (1996). Pay satisfaction and sales force turnover: The impact of different facets of pay on pay satisfaction and its implications for sales force management. *Journal of Managerial Issues*. Retrieved from http://www.jstor.org/stable/40604098

Russ, F. A., & McNeilly, K. M. (1995). Links among satisfaction, commitment, and turnover intentions: The moderating effect of experience, gender, and performance. *Journal of Business Research*, *34*(1), 57–65. doi:10.1016/0148-2963(94)00042-D

Sager, J. (1991). A longitudinal assessment of change in sales force turnover. *Journal of the Academy of Marketing Science*. Retrieved from http://link.springer.com/article/10.1007/BF02723421

Schwepker, C. H. (2001). Ethical climate's relationship to job satisfaction, organizational commitment, and turnover intention in the salesforce. *Journal of Business Research*, *54*(1), 39–52. doi:10.1016/S0148-2963(00)00125-9

Seligman, M., & Schulman, P. (1986). Explanatory style as a predictor of productivity and quitting among life insurance sales agents. *Journal of Personality and Social Psychology*. Retrieved from http://psycnet.apa.org/journals/psp/50/4/832/

Sterman, J. (2000). Business dynamics. Retrieved from http://www.citeulike.org/group/1702/article/986718

Tyagi, P. K., & Wotruba, T. R. (1993). An exploratory study of reverse causality relationships among sales force turnover variables. *Journal of the Academy of Marketing Science*, *21*(2), 143–153. doi:10.1007/BF02894425

Weeks, B. (1995). Unit supervisor position: The real reason behind the life insurance industry's crisis. *LIMRA MarketFacts Quarterly*, *14*(4), 41.

Appendices

The models, data, and analysis scripts used in this paper are available at https://github.com/JamesPHoughton/sales_agent_startup_dynamics. These models are based upon the 'system dynamics' paradigm, which formalizes differential equations and feedback structures in a format accessible and appropriate for use in sociological and strategic analysis. For further discussion of the paradigm, see (Sterman, 2000).

Appendix 1: Parameter values for exploration and policy runs:

The following table lists the parameter values that were used to generate simulation runs that were described above in the sections Avoiding , Finding Success, and Policy Options for Sales Managers. Parameters not listed are baseline values as described in Appendix D: Estimates of Model Parameters.

Parameter	Figure 2	Figure 3	Figure 4	Figure 5	Figure 6	Figure 7
Startup Subsidy	0.0	0.0	0.0	0.0	0.0	0.25
Length of Startup Subsidy	0.0	0.0	0.0	0.0	0.0	6.0
Fraction of Effort for Sales	0.2	0.2	0.3	0.3	0.375	0.3
Effort Required to Make a Sale	4.0	4.0	2.0	2.0	2.0	2.0
Total Effort Available	200	200	250	250	250	250
Initial Buffer	14	6	6	5	5	5
Initial Tier 1 Leads	100	90	100	100	100	100
Initial Tier 2 Leads	0	10	0	0	0	0

Appendix B: Model Structure

To understand the startup dynamics of a new agent, we conducted a series of interviews with representatives from our case study's home office. Over the course of several months, we realized a structure that included the dynamics of an agent's client base as disaggregated into a number of 'tiers' of clients that each represents different income levels, sale size, and payoff for the agent, as seen in Figure 11. We then modeled the agent's 'startup buffer', simply as an account that is drawn down continually by monthly expenses, and is rebuilt through various amounts of commission as seen in Figure 12. Lastly, we model the allocation of time that an agent gives to various tasks, prioritizing service of existing customers over new sales, and sales to high value leads over low-value leads, as seen in Figure 13.

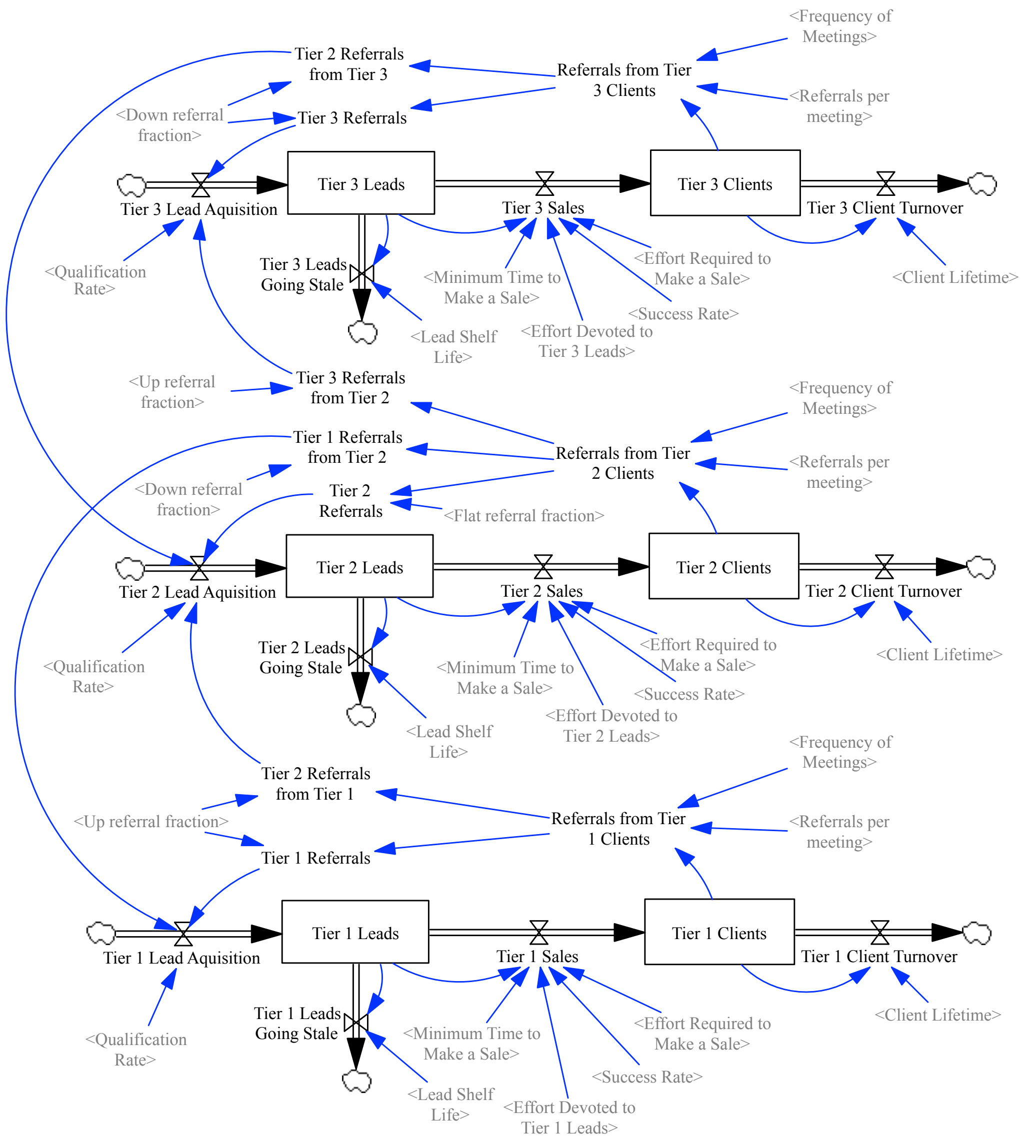

Figure 11: The sales dynamic portion of the model formalizes the agents' understanding of how one tier of leads and clients can help develop another tier.

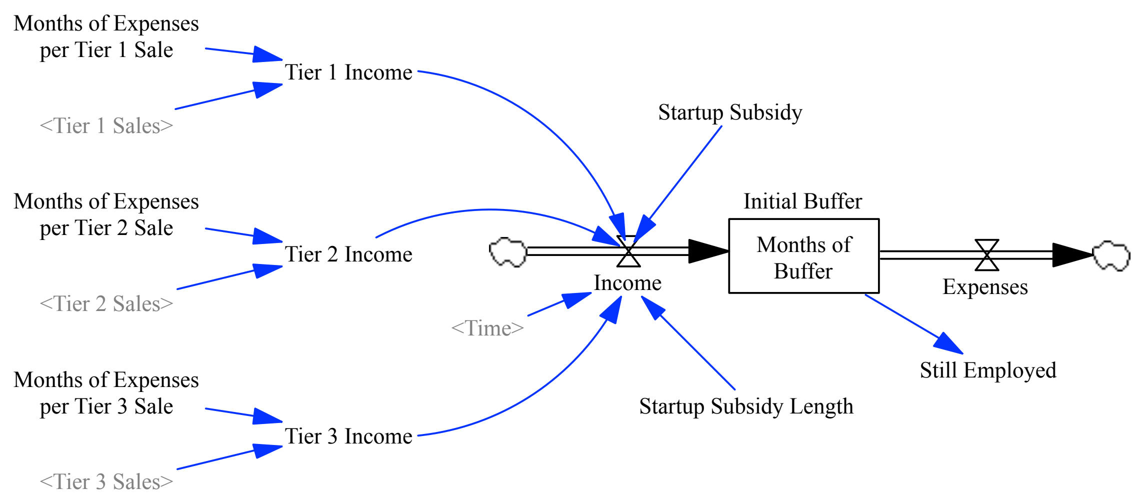

Figure 12: The financial buffer portion of the model formalizes an abstract representation of the agents income and expenses.

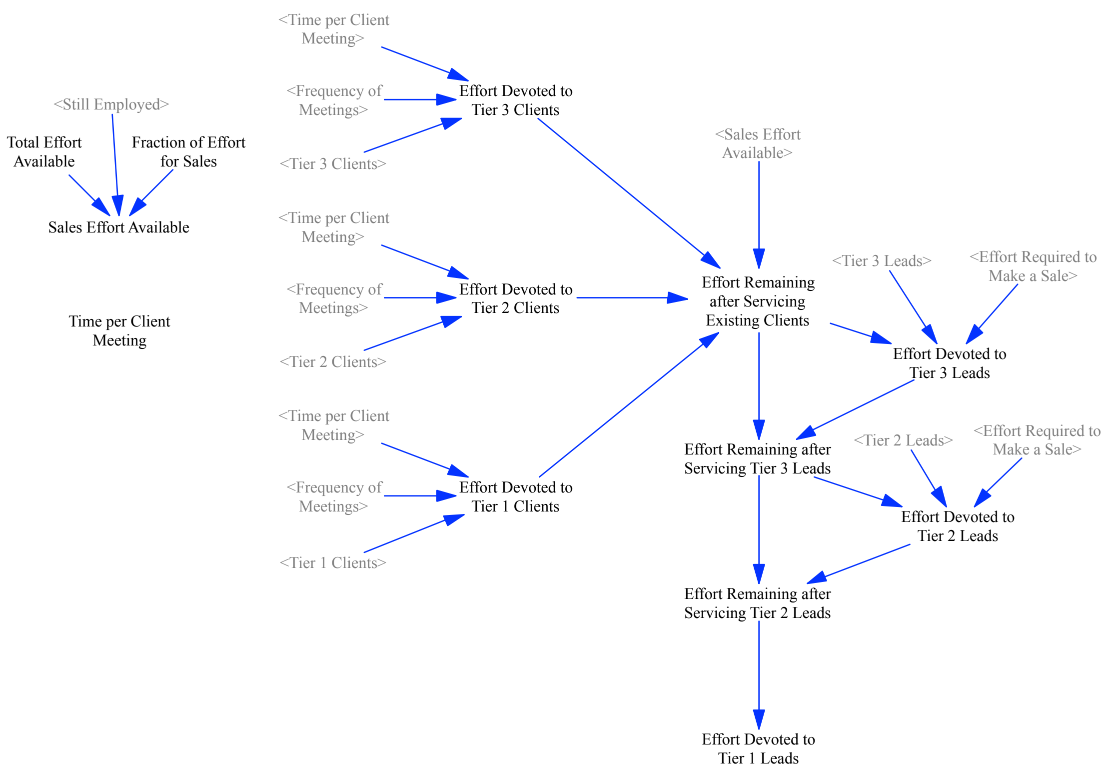

Figure 13: The priority allocation section of the model formalizes the way agents distribute their time amongst servicing existing clients and making new sales. Effort is first dedicated to existing clients, and then apportioned in order of priority.

Appendix C: Model Equations

Effort Devoted to Tier 2 Leads=
MIN(Effort Remaining after Servicing Tier 3 Leads, Effort Required to Make a Sale * \
Tier 2 Leads / Minimum Time to Make a Sale)
~ Hours/Month
~ This is the amount of time the agent spends with a tier 2 lead in a given \
year, working to make a sale.
|

Effort Devoted to Tier 3 Leads=
MIN(Effort Remaining after Servicing Existing Clients, Effort Required to Make a Sale\
* Tier 3 Leads / Minimum Time to Make a Sale)
~ Hours/Month
~ This is the amount of time the agent spends with a tier 1 lead in a given \
year, working to make a sale.
|

Qualification Rate=
1
~ Persons/Referral
~ What is the likelihood that a lead will be worth pursuing? Some leads \
might not be worth your effort. According to interviewees, leads that are \
properly solicited and introduced are almost always worth following up \
with.
|

Tier 1 Lead Aquisition=
Qualification Rate * (Tier 1 Referrals + Tier 1 Referrals from Tier 2)
~ Persons/Month
~ How many new tier 1 leads does an agent net?
|

Tier 2 Lead Aquisition=
Qualification Rate * (Tier 2 Referrals + Tier 2 Referrals from Tier 1 + Tier 2 Referrals from Tier 3\
)
~ Persons/Month
~ How many new tier 2 leads does an agent net?
|

Tier 3 Lead Aquisition=
Qualification Rate * (Tier 3 Referrals + Tier 3 Referrals from Tier 2)
~ Persons/Month
~ How many new tier 3 leads does an agent net?
|

Success Rate=
0.2
~ Dmnl
~ What is the likelihood that a given lead will become a client, if the \
agent devotes the appropriate amount of attention to them?
|

Tier 1 Sales=
Success Rate*MIN(Effort Devoted to Tier 1 Leads / Effort Required to Make a Sale, Tier 1 Leads\
/Minimum Time to Make a Sale)
~ Persons/Month
~ The rate at which Tier 1 leads become clients. This is limited either by \
the effort of the agent, or the natural calendar time required to make a \
sale.
|

```
Tier 3 Sales=
	Success Rate * MIN(Effort Devoted to Tier 3 Leads / Effort Required to Make a Sale, \
		Tier 3 Leads/Minimum Time to Make a Sale)
	~	Persons/Month
	~	The rate at which Tier 3 leads become clients. This is limited either by \
		the effort of the agent, or the natural calendar time required to make a \
		sale.
	|

Tier 2 Sales=
	Success Rate*MIN(Effort Devoted to Tier 2 Leads / Effort Required to Make a Sale, Tier 2 Leads\
		/Minimum Time to Make a Sale)
	~	Persons/Month
	~	The rate at which Tier 2 leads become clients. This is limited either by \
		the effort of the agent, or the natural calendar time required to make a \
		sale.
	|

Still Employed=
	IF THEN ELSE(Months of Buffer < 0 , 0 , 1 )
	~	Dmnl
	~	Flag for whether the agent is still with the firm. Goes to zero when the \
		buffer becomes negative.
	|

Income=
	Tier 1 Income + Tier 2 Income + Tier 3 Income + IF THEN ELSE(Time < Startup Subsidy Length\
		, Startup Subsidy , 0 )
	~	Months/Month
	~	The total income from commissions on sales to all tiers.
	|

Effort Devoted to Tier 1 Clients=
	Tier 1 Clients * Time per Client Meeting * Frequency of Meetings
	~	Hours/Month
	~	How much time does the agent devote to meetings for maintenance and \
		soliciting referrals from Tier 1 Clients.
	|

Tier 1 Income=
	Tier 1 Sales * Months of Expenses per Tier 1 Sale
	~	Months/Month
	~	This is the amount of money an agent makes from all commissions on Tier 1 \
		Sales
	|

Effort Devoted to Tier 2 Clients=
	Tier 2 Clients * Time per Client Meeting * Frequency of Meetings
	~	Hours/Month
	~	How much time does the agent devote to meetings for maintenance and \
		soliciting referrals from Tier 2 Clients.
	|

Effort Devoted to Tier 3 Clients=
	Tier 3 Clients * Frequency of Meetings * Time per Client Meeting
	~	Hours/Month
	~	How much time does the agent devote to meetings for maintenance and \
		soliciting referrals from Tier 3 Clients.
	|
```

Effort Remaining after Servicing Existing Clients=
MAX(Sales Effort Available - (Effort Devoted to Tier 1 Clients + Effort Devoted to Tier 2 Clients\
+ Effort Devoted to Tier 3 Clients), 0)
~ Hours/Month
~ How much effort remains after higher priority sales and maintenance \
activities are complete?
|

Effort Remaining after Servicing Tier 2 Leads=
MAX(Effort Remaining after Servicing Tier 3 Leads - Effort Devoted to Tier 2 Leads, \
0)
~ Hours/Month
~ How much effort remains after higher priority sales and maintenance \
activities are complete?
|

Effort Remaining after Servicing Tier 3 Leads=
MAX(Effort Remaining after Servicing Existing Clients - Effort Devoted to Tier 3 Leads\
, 0)
~ Hours/Month
~ How much effort remains after higher priority sales and maintenance \
activities are complete?
|

Fraction of Effort for Sales=
0.25
~ Dmnl
~ Of all the effort devoted to work, what fraction is actually spent doing \
sales and maintenance activities? This includes time spent with existing \
clients soliciting referrals.
|

Expenses=
1
~ Months/Month
~ How many months of expenses are expended per month. This is a bit of a \
tautology, but its the right way to account for the agents income and \
spending while preserving their privacy.
|

Sales Effort Available=
Fraction of Effort for Sales * Total Effort Available * Still Employed
~ Hours/Month
~ How much total time per month can an agent actually spend in sales or \
maintenance meetings?
|

Initial Buffer=
6
~ Months
~ How long can the agent afford to go with zero income? This could be months \
of expenses in the bank, or months of 'rent equivalent' they are able to \
borrow from family, etc.
|

Startup Subsidy Length=
3
~ Months
~ How long does a sales agent recieve a subsidy for, before it is cut off?
|

Total Effort Available=
200
~ Hours/Month
~ This is the total number of hours the agent is willing to work in a month.
|

Months of Buffer= INTEG (
Income-Expenses,
Initial Buffer)
~ Months
~ This is the stock at any given time of the money in the bank, or remaining \
familial goodwill, etc.
|

Months of Expenses per Tier 1 Sale=
12/500
~ Months/Person
~ Income from commission for a sale to a tier 1 lead. Measured in units of \
months of expenses, to preserve agents privacy.
|

Months of Expenses per Tier 2 Sale=
12/50
~ Months/Person
~ Income from commission for a sale to a tier 2 lead. Measured in units of \
months of expenses, to preserve agents privacy.
|

Months of Expenses per Tier 3 Sale=
12/5
~ Months/Person
~ Income from commission for a sale to a tier 3 lead. Measured in units of \
months of expenses, to preserve agents privacy.
|

Tier 3 Income=
Months of Expenses per Tier 3 Sale * Tier 3 Sales
~ Months/Month
~ This is the amount of money an agent makes from all commissions on Tier 3 \
Sales
|

Tier 2 Income=
Months of Expenses per Tier 2 Sale * Tier 2 Sales
~ Months/Month
~ This is the amount of money an agent makes from all commissions on Tier 2 \
Sales
|

Startup Subsidy=
0.75
~ Months/Month [0,1,0.1]
~ How much does an agent recieve each month from his sales manager to help \
defer his expenses, in units of months of expenses?
|

Time per Client Meeting=
1
~ Hours/Meeting
~ This is the number of hours an agent spends with a client, maintaining the \
relationship/accounts, and soliciting referrals, in one sitting.

|

Client Lifetime=
120
~ Months
~ How long, on average, does a client remain with an agent?
|

Down referral fraction=
0.2
~ Dmnl
~ What is the likelihood that a referral from a second or third tier client \
will be to the tier below them?
|

Effort Devoted to Tier 1 Leads=
Effort Remaining after Servicing Tier 2 Leads
~ Hours/Month
~ This is the amount of time the agent spends with a tier 1 lead in a given \
year, working to make a sale.
|

Tier 2 Referrals from Tier 3=
Referrals from Tier 3 Clients * Down referral fraction
~ Referrals/Month
~ This is the number of Tier 2 leads that are aquired through referrals from \
tier 3.
|

Flat referral fraction=
1 - Down referral fraction - Up referral fraction
~ Dmnl
~ What is the likelihood that a referral from a client will be to a lead in \
their same tier?
|

Frequency of Meetings=
1/12
~ Meetings/Month/Person
~ How many maintenance meetings does the agent have with each client in a \
month?
|

Lead Shelf Life=
3
~ Months
~ After a certain amount of time, leads go stale. It gets awkward to keep \
interacting with them, and you're better off moving on. How long is that?
|

Referrals from Tier 1 Clients=
Tier 1 Clients * Frequency of Meetings * Referrals per meeting
~ Referrals/Month
~ The number of referrals coming in from maintenance meetings with tier 1 \
clients.
|

Referrals from Tier 2 Clients=
Tier 2 Clients * Referrals per meeting * Frequency of Meetings
~ Referrals/Month
~ The number of referrals coming in from maintenance meetings with tier 2 \

clients.
|

Referrals from Tier 3 Clients=
Tier 3 Clients * Frequency of Meetings * Referrals per meeting
~ Referrals/Month
~ The number of referrals coming in from maintenance meetings with tier 3 \
clients.
|

Referrals per meeting=
2
~ Referrals/Meeting
~ How many referrals can an agent comfortably gather from his clients in a \
given maintenance meeting?
|

Tier 1 Client Turnover=
Tier 1 Clients/Client Lifetime
~ Persons/Month
~ This is the flow of tier 1 clients leaving the practice.
|

Up referral fraction=
0.15
~ Dmnl
~ The likelihood that a referral from a tier 1 or tier 2 client will be to a \
lead of the tier above them.
|

Tier 1 Leads Going Stale=
Tier 1 Leads/Lead Shelf Life
~ Persons/Month
~ These are tier 1 leads that grow old before they are sold, and are unable \
to be followed up on.
|

Tier 1 Referrals=
Referrals from Tier 1 Clients * (1-Up referral fraction)
~ Referrals/Month
~ This is the number of Tier 1 leads that are aquired through referrals from \
any tier client.
|

Tier 1 Referrals from Tier 2=
Referrals from Tier 2 Clients * Down referral fraction
~ Referrals/Month
~ This is the number of Tier 1 leads that are aquired through referrals from \
tier 2.
|

Tier 2 Client Turnover=
Tier 2 Clients/Client Lifetime
~ Persons/Month
~ This is the flow of Tier 2 clients leaving the practice.
|

Tier 2 Clients= INTEG (
Tier 2 Sales-Tier 2 Client Turnover,
0)
~ Persons

~ These are active clients who provide a regular level of return to the \
company.
|

Tier 2 Leads= INTEG (
Tier 2 Lead Aquisition+Tier 2 Sales-Tier 2 Leads Going Stale,
0)
~ Persons
~ These are individuals who have been identified as targets and are somewhere in the \
sales process, before a sale has been made.
They may or may not have been contacted by the agent yet. If they can be \
converted to clients, they will have a regular level of return for the \
company.
|

Tier 2 Leads Going Stale=
Tier 2 Leads/Lead Shelf Life
~ Persons/Month
~ These are tier 2 leads that grow old before they are sold, and are unable \
to be followed up on.
|

Tier 2 Referrals=
Referrals from Tier 2 Clients * Flat referral fraction
~ Referrals/Month
~ This is the number of Tier 2 leads that are aquired through referrals from \
any tier client.
|

Tier 2 Referrals from Tier 1=
Referrals from Tier 1 Clients * Up referral fraction
~ Referrals/Month
~ This is the number of Tier 2 leads that are aquired through referrals from \
tier 1.
|

Tier 3 Leads Going Stale=
Tier 3 Leads/Lead Shelf Life
~ Persons/Month
~ These are tier 3 leads that grow old before they are sold, and are unable \
to be followed up on.
|

Tier 3 Client Turnover=
Tier 3 Clients/Client Lifetime
~ Persons/Month
~ This is the flow of regular clients leaving the practice.
|

Tier 3 Clients= INTEG (
Tier 3 Sales-Tier 3 Client Turnover,
0)
~ Persons
~ These are active clients who provide a regular level of return to the \
company.
|

Tier 3 Referrals=
Referrals from Tier 3 Clients * (1- Down referral fraction)
~ Referrals/Month
~ This is the number of Tier 3 leads that are aquired through referrals from \

any tier client.
|

Tier 3 Leads= INTEG (
Tier 3 Lead Aquisition+Tier 3 Sales-Tier 3 Leads Going Stale,
0)
~ Persons
~ These are individuals who have been identified as targets and are somewhere in the \
sales process, before a sale has been made.
They may or may not have been contacted by the agent yet. If they can be \
converted to clients, they will have a regular level of return for the \
company.
|

Tier 3 Referrals from Tier 2=
Referrals from Tier 2 Clients * Up referral fraction
~ Referrals/Month
~ This is the number of Tier 3 leads that are aquired through referrals from \
tier 2.
|

Effort Required to Make a Sale=
4
~ Hours/Person [0,50]
~ This is the amount of time the agent must spend (on average) with a lead \
(high or low value, for now) to make a sale.
|

Minimum Time to Make a Sale=
1
~ Months
~ What is the absolute minimum calendar time it would take to make a sale to \
a person, even if you had all the hours in the day to devote to them?
|

Tier 1 Leads= INTEG (
Tier 1 Lead Aquisition+Tier 1 Sales-Tier 1 Leads Going Stale,
100)
~ Persons
~ These are individuals who have been identified as targets and are somewhere in the \
sales process, before a sale has been made.
They may or may not have been contacted by the agent yet. If they can be converted \
to clients, they will have a regular level of return for the company.

We initialize to 100 because agents begin their sales careers with a list \
of 200 friends and family, about 50% of whom they might contact.
|

Tier 1 Clients= INTEG (
Tier 1 Sales-Tier 1 Client Turnover,
0)
~ Persons
~ These are active clients who provide a regular level of return to the \
company.
|

****
.Control
**~
Simulation Control Parameters
|

FINAL TIME = 120
~ Month
~ The final time for the simulation.
|

INITIAL TIME = 0
~ Month
~ The initial time for the simulation.
|

SAVEPER =
TIME STEP
~ Month [0,?]
~ The frequency with which output is stored.
|

TIME STEP = 0.0625
~ Month [0,?]
~ The time step for the simulation.
|

Appendix D: Estimates of Model Parameters

To identify parameters of our model, we conducted semi-structured interviews with a variety of individuals throughout the sales organization, asking them to estimate a likely range of values for individuals who were just entering the sales force. We also asked open ended questions designed to elicit these individuals' understanding of the startup process, in order to build confidence that the model structure we had constructed represented the world as it was known to these individuals.

Our interviews surveyed the following individuals:

- A young sales agent near the end of the startup process
- An established sales agent responsible for training new young professional agents
- A very high performing sales agent
- General Manager of the Sales Agency
- A sales agent in the middle of their career

The raw responses of our interviews are listed in below in the order in which they are listed above. Not all individuals were able to estimate values for all questions, and in these cases we have left the entry blank. To simulate the overall population, we hand-fit distributions representative of the responses to our interview questions. As our object is not to make quantitative predictions about outcomes, merely to show that the lessons drawn from our toy population hold for a population more representative of that observed,this simplification is appropriate.

Parameter	**Units**	**Raw Responses**	**Baseline Value**	**Estimating Distribution**
Referrals per meeting	Referrals	Min:[1,0,-,-,1] Mean:[2,2.5,-,-,2] Max:[10,30,-,-,-]	2	lognormal(mean=log(2), sigma=.75)

Minimum time to make a sale	Months	Min:[0.3,0.5,-,-,0.25] Mean:[1.5,1,-,-,1] Max:[2,1,-,-,3]	1	lognormal(mean=log(1), sigma=.3
Frequency of Meetings*	Meetings /Month	Min:[1,-,-,1,1] Mean:[1,-,-,1,1] Max:[2,-,-,1,1]	1/12	lognormal(mean=log(1.0/12), sigma=.25)
Success Rate	-	Min:[0.1,-,-,-,-] Mean:[0.3,0.1,-,-,-]	.2	beta(a=12, b=50)
Effort Required to Make a Sale	Hours	Min:[3,2,-,3,3] Mean:[-,3,-,-,-] Max:[5,5,-,5,6]	4	lognormal(mean=log(4), sigma=.15)
Up-Referral Fraction	-	Mean:[0.1,0.2,0.1]	.15	beta(a=8, b=40)
Down-Referral Fraction	-	Min:[-,0.1,0.1,-,-] Mean:[-,0.2,0.3,-,-]	0.2	beta(a=10, b=40)
Lead Shelf Life	Months	Min:[2,-,-,-,-] Mean:[3,-,-,-,3]	3	lognormal(mean=log(3), sigma=.1)
Client Lifetime	Months	Min:[-,-,-,-,36] Mean:[-,120,-,-,120]	120	lognormal(mean=log(10), sigma=.25)
Total Effort Available**	Hours/ Month	Min:[-,-,-,-,160] Mean:[-,-,-,-,200] Max:[-,-,-,-,250]	200	lognormal(mean=log(200), sigma=.2)
Fraction of Effort Spent with client/ lead	-	Mean:[0.2,0.25,-,-,0.1]	0.2	beta(a=8, b=20)
Time per Client Meeting	Hours	Min:[0.75,-,-,-,1] Mean:[1,-,-,-,1.25] Max:[-,-,-,-,1.5]	1	lognormal(mean=log(1), sigma=.25)
Months of Expenses per Tier 1 Client***	Months/ Person	Assume same ratio holds with Tier 2/Tier 3 for estimate	12/500	.1 * Months of Expenses per Tier 2 Client
Months of Expenses per Tier 2 Client	Months/ Person	Mean[0.24,-,-,-,-]	12/50	lognormal(mean=log(.24), sigma=.25)
Months of Expenses per Tier 3 Client	Months/ Person	Min[-,-,1.2,-,-] Mean[-,-,2.4,-,-]	12/5	10 * Months of Expenses per Tier 2 Client
Initial Months of Buffer	Months	Min[-,3,-,-,-] Mean[-,-,-,6,-] Max[-,-,-,-,12]	6	lognormal(mean=log(6), sigma=.25)
Qualification Rate	-	Mean[0.9,1,-,-,-]	1	beta(a=95, b=5)

* Policy set by Sales Manager

** Inferred/Computed from other responses (e.g. residency = 1/turnover rate)
*** Respondents unable to estimate, too small. Our model is insensitive to this value, as the primary value of Tier 1 clients (according to our interviews) is to provide referrals to Tier 2 leads, not as a source of direct income. In this case, a simple estimate taken from the relative magnitude of Tier 2 and Tier 3 leads is appropriate.