SKILL DEPLETION OVER TIME

An analysis of STRATCOM employee attrition and resulting skill gaps.

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Motivation

The J1 department of United States Strategic Command ("STRATCOM") develops and administers command manpower and personnel policies, human resources, and personnel assignment programs. As employees retire or otherwise end their employment, skills that the employees possess deplete. The goal of this project is to use current and historical employment trends to forecast future skill gaps as attrition occurs.

Materials

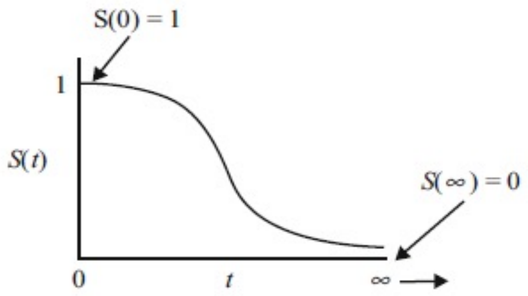
Analysis was completed using two sets of data: Civilian retirement dates by MPCN and FMTS data from 2018 to 2021. Retirement dates by MPCN contained an individual's employment start date and retirement eligibility categories based on an employee's age and/or time in service. The largest number of civilians retire using the 62/5 category (the year the individual reaches age 62 with at least 5 years of eligible service) followed by the 60/20 category (age 60 with at least 20 years of service). The FMTS data contained gender information and open and occupied positions by skillset. The FMTS files listed positions whether they were vacant or not, while the Civilian Retirement info was only reported for filled positions.

A few skills were specifically called out for further research, in priority order:
- All GS grade levels for:
  - 2210s (Information Technology)
  - 08XX (Engineering)
  - 15XX (Operations Research)
- GS-12 and below for:
  - 0301 (Administrative General)
  - 0343 (Program Analyst)

Finally, divisions/branches filled with only GS-13s and above were of particular interest because the replacements STRATCOM would ideally promote and/or develop are not readily available. Subsequently, the labor gap would have to be filled by an external and expensive hiring pool of individuals. These are highly specialized areas.

Methodology and Models

Survival Model
A survival function S(t), is the probability that a subject survives longer than time t.

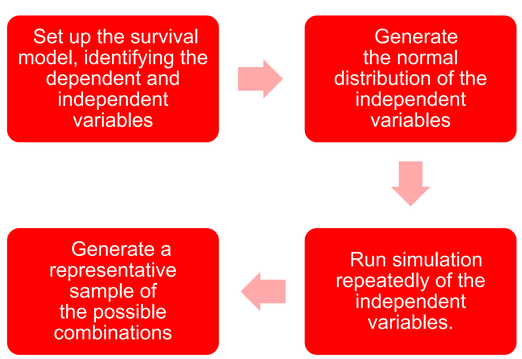


The x axis is time, from zero (when the observation began) to the last observed time point. The y axis is the proportion of subjects surviving.

A survival model was used in the analysis to predict how the likelihood of employees continuing service in STRATCOM had changed over the next two years.

Monte Carlo Simulation
The Monte Carlo simulation is a technique used to create forecasts by randomly adjusting the variables in the prediction model. By creating these random variations, we can identify the range and likelihood of possible predictions.

In our analysis we conducted our forecast over 10,000 iterations of the Monte Carlo simulation of our survival model to provide a distribution of probable outcomes.



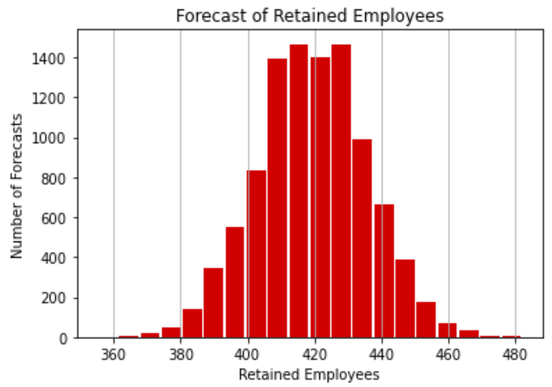
Model Interpretation and Data Analysis

The survival function identified nine variables from the dataset that had significant importance to an employee's decision to continue service in STRATCOM. These variables were significant at the 10% level. A positive coefficient indicates that the variable increases the amount of time an employee is likely to stay. The list of significant variables and their effect are listed below:

Variable	Coefficient	Standard Deviation	P-Value
60/20Y	0.017287	0.314817	5.18E-02
MRA/30Y	0.106168	0.301058	8.68E-36
50/20Y	0.12828	0.353143	7.23E-38
AnyAge/25Y	0.248803	0.329438	1.44E-157
*Skill_1550	-0.568397	6.628611	2.39E-03
*GRD_DR01	0.572865	9.415697	3.12E-02
Gender_M	0.179599	2.896034	2.81E-02
*Office_J57	-0.595902	11.4571	6.55E-02
*AnnInd_9	-0.203815	3.407277	3.42E-02

Note: *Skill_1550: Computer Science Series

Results and Conclusion



One Year Forecast

Skillset	Current Number of Employees	Median Retained Employees	25% (Lower Quartile)	75% (Upper Quartile)
All Skillsets	1254	419	208	430
08XX	138	41	37	44
2210	245	81	76	86
15XX	143	44	40	47
0301 (GS12 and Below)	41	15	13	17
0343 (GS12 and Below)	27	10	8	11

Two Year Forecast

Skillset	Current Number of Employees	Median Retained Employees	25% (Lower Quartile)	75% (Upper Quartile)
All Skillsets	1254	308	208	430
08XX	138	29	26	32
2210	245	60	55	64
15XX	143	32	28	35
0301 (GS12 and Below)	41	12	10	14
0343 (GS12 and Below)	27	8	6	9

The results of our forecast yield a notable career event for most STRATCOM employees, regardless of Age, Gender, Skill, or Grade.
- Skill 905-General Attorney is at 100% risk (only one employee)
- Skills 08XX, 2210 and 15XX are at constant risk due to other market opportunities. It is important to look at these positions and have succession planning in place.
- There are 18 offices that are solely comprise of employees with Grade 13 or higher.

Offices with only GS-13 or Higher (18)		
CAG	J6	J73
IM5	J51	JFE
IM8	J54	JWEWR
J33	J55	NED
J3G	J57	NES
J4I	J58	SAG

Restrictions/Limitations

- The cross-sectional data did not allow for the analysis of economic conditions on the effect of employee retention. Future improvements to the forecasting would be to include multiple years of the MPCN data to tie in labor market data.
- The dataset only identified individuals currently employed and their years of employment. The lack of identified retirement dates causes the model to be based entirely on right censored data which increases uncertainty in the results

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