Changing Careers to Become a SAS Programmer in the Biotech / Pharmaceutical Industry

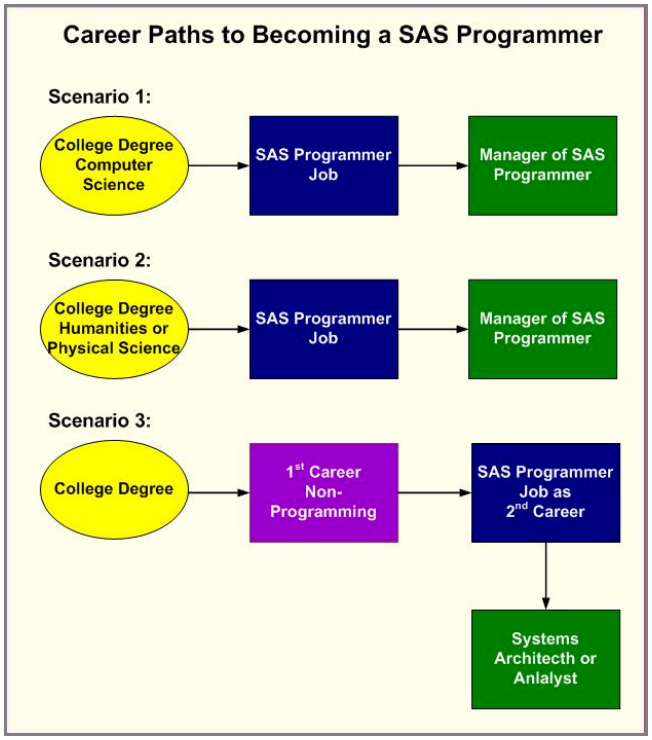
Sy Truong, Meta-Xceed, Inc, Milpitas, CA

ABSTRACT

The ebb and flow within the technology sector, ranging from the dot com bubble to outsourcing, has programmers searching for job security. Many individuals have considered becoming a SAS programmer within the Biotech and Pharmaceutical industry due to the longer project life cycle of years rather than months. The best path to enter this field can be elusive. There are challenges especially for those starting out since it requires three years of experience to obtain that first job. This paper distills real life stories from SAS programmers within the Biotech and Pharmaceutical industry. It describes many different paths and suggests recommendations based upon these experiences. When starting out on a new career path, sage advice from seasoned professionals in the field can save a lot of time and energy. Armed with the knowledge and shared experiences from the stories told in this paper, you will propel yourself into a more challenging and successful career.

INTRODUCTION

There are many paths that individuals take to arrive at a career as a SAS Programmer. SAS is a programming language which requires the rigors of a computer scientist. However, to become a clinical trials analyst also requires a thorough understanding and knowledge of the clinical data to be analyzed. The combination of these distinct skills attracts people from diverse backgrounds. It is surprising to find so many different backgrounds of individuals with differing talents and interests who gravitate towards this career path. Like many other career paths dealing with technology, things change. The dynamic aspects of the job require programmers to become resourceful and to survive. They therefore must re-invent themselves continually. The core understanding of the analytics behind clinical trials evolves but remains comparatively stable. Once you master this and the accompanying programming techniques, you have a good foundation for becoming a successful Clinical Trials Programmer. There are many scenarios which you can take. The following diagram depicts three. There are many more and the combinations of steps can lead to a myriad of good paths.



This paper evaluates various different paths that individuals took on their road through clinical SAS programming. There is no one correct path but rather a diverse set. This demonstrates the unique combination of skill sets needed to thrive in this environment. This position has only recently been established so many of the individuals who entered this field did not set out to become a clinical SAS programmer. For many, the journey was unplanned and there were no road maps. They were pioneers and navigated their career path following their intuition and relied on luck. There are many lessons that can be gained from these pioneers. The paths which these pioneers paved will provide a clearer vision and set of directions for future aspiring SAS programmers who plan to venture on the same roads.

ASSOCIATE DIRECTOR OF BIOANALYSIS - DAVID TAPPE

It is not about how good a SAS programmer you are. It is about being focused on the data and your representation of the data that leads to success.

Starting Out

When David started out on his first SAS programming position at Syntex in Palo Alto, California in the 80s, this type of work was not well understood nor well known on the west coast. The term "Bioanalyst" used at Syntex for statistical programmers was foreign and he did not know what to expect.

David went to UCLA to obtain his bachelors degree in Mathematics. He then continued his studies at Fresno State in Biology and did his thesis work in Lymnology, or the study of fresh water ecosystems. His academic experience did not include formal computer science nor teach him how to program in SAS, but it did include exposure to research methods and statistics that he used in his thesis. In fact, David had little formal programming training. He was introduced to programming when he took a FORTRAN course at UCLA. Back in the days of punch cards, he used FORTRAN for an ecosystem modeling class in graduate school. Out of personal interest, he learned BASIC programming on his own while working as a Lab Technician at U.C. Berkeley. As he developed his career, the technical aspects of programming were merely a means to an end. That end was the data itself and how the data demonstrated meaning when analyzed. The meaning of the data was therefore pivotal and overrode the mechanics of getting there. David gained enough proficiency in programming on the job to perform well in his job without much formal training.

In 1979, David moved to Walnut Creek in the east bay after he had completed his course work in Fresno. He explored jobs in the bay area and first worked in the department of Materials Science at U.C. Berkeley helping on research projects aimed at finding ways to utilize coal dust. As that job was ending, he found a job announcement at the U.C. Berkeley placement center for a Bioanlyst at Syntex. Syntex was an established pharmaceutical company, but due to the lack of experienced statistical programmers in the bay area at the time, they hired people at entry level. Although he lacked the job specific experience, he applied for the job at Syntex because he was intrigued by the blend of statistics, health research and programming mentioned in the job announcement. At the time, however, he did not know what a Bioanalyst did or what the job entailed. The commute from Walnut Creek to Palo Alto required him to go over the east bay hills, across one of the bay bridges. This added to his commute totaling about 60 miles. The job had to prove to be a good fit for him to keep up with this grueling commute, even with the help of a carpool. In the end, it was the research aspect and ability to understand the meaning behind that data that cemented his decision to stay in this field as a career.

He began to appreciate the goal of producing study reports summarizing the safety and efficacy results of clinical trials. While he enjoyed programming and developing good SAS programming skills, the output produced by his programs were more important than the SAS programs. He began to realize that this was the pivotal aspect of the Bionalyst's job. The Biostatistician, who was the Bioanalyst's client, wanted to receive quality output tables representing the study data and its analyses results. They were not interested in the quality of the SAS program used to create the tables, so long as they produced accurate results.

The understanding of the disease that he was working on was another fascinating aspect of the job. He is not clinically trained as a MD or a RN, but his interest in research and learning about the disease related to a given drug allowed him a unique view of the data. This was a window through the data which provided meaning that became essential in his work. The interactions with other team members mostly involved communicating with the Biostatistician. However, it also included interacting with the other clinical team members, such as the MD in charge of the project. The Biostatistician and Bioanalyst worked together closely in analyzing and producing report tables and graphs. Even though the meaning of the statistics is in the domain of the statistician, it often ended up with the Bioanalyst needing to interpret their instructions to fill in the gaps. This multi-faceted aspect of the job kept David interested in the work which sustained and rationalized his long commute for 12 years.

Growing within the Job

Although the data kept David interested, he did explore technical aspects of the job as well. He continued to develop his SAS programming skills by taking some database design courses at U.C. Berkeley Extension. This gave him the opportunity to work on several Oracle database projects. He also was part of the initial Rx/Clinical development team, a joint venture between Oracle and Syntex that led to Oracle Clinical, the leading clinical trial database management system used in the pharmaceutical industry.

He began to take on management responsibilities, managing both people and projects at Syntex. This continued on in his career at Chiron in Emeryville. He modestly attributed the management of people as being an easy job because the people he worked with were capable and good to work with. Since he had a good understanding of what it took to perform as a Bioanalyst, he was able to identify people who had the right balance of research and interest in the data, along with the technical programming skills. It was a combination of having the tenacity to understanding the clinical aspects of the data while having the technical skills to deliver analysis. This was what David had strived for himself and was what he looked for in forming the teams which he managed.

David is now the Associate Director of Bioanalysis at Novartis (formerly Chiron). He is very proud of the team that he put together since he started at Chiron. David's first goal at Chiron was to establish a standard set of reporting macros which would handle the standard CRF (Case Report Forms). He decided to have his Bioanalysts balance their workload of producing the day-to-day analysis and reporting work with developing and maintaining a standard library of macro software. The standard software mostly focused on generating safety summaries since the efficacy data usually varied too much between projects. The difference among studies didn't lend itself to standardization. He proceeded to assign Phil to work on Lab data, Frances to develop macros for Adverse Events, Rob to work on Demographics and Conmed while David himself worked on the Dosing information. It was a management style that allowed him to participate in the work firsthand, while motivating the team to develop software. This was all implemented on top of the normal study analysis work that they had to do. He enjoyed working on his macro component which organized dosing information into a dosing analysis file and then joined this file with time-dependent events in a study. This allowed integrating a subject's dosing experience with other study data such as adverse event and efficacy data. For example, an adverse event can occur at any specific time during the study. His macro would then merge this data with the dosing information and added variables such as the exact dose, the cumulative dose, time since last dose, etc... This was derived in association with the adverse event of this event.

David's approach to developing the macro system was to standardize any area where the potential use outweighed the development and validation costs. Having a standard macro system available provided for consistent analyses across studies, projects and output. It also prevented the programmer from having to do repetitive tasks. This allowed them to focus on the unique efficacy aspects of each study. It made the job easier and more efficient for the Bioanalyst. His team was also more engaged and interested since the work was more dynamic and became more like a unique puzzle that needs to be solved for every study.

It took a year to develop the 1st version of the software with much of the team's efforts focused on the macro system without a lot of competing study analysis work. Later on, it took more time to implement subsequent version releases since the programmers usually had project work that took precedence over the standard macro development. David thinks however that this was a more cost effective approach. By giving the development efforts to the senior programmers who work with the analyses themselves, the development of software was implemented by the same individuals who understand it the most.

David has a low key approach to managing his people. He sets out goals and expects his people to work conscientiously and autonomously. He does not see himself as having a draconian style but rather a gentle coach approach. David performs peer reviews and makes suggestions but in general, leaves his people alone. He sees that it is this freedom that allows the talents of each individual to thrive and discover the unique balance of various skills to be a successful Bioanalyst.

CONSULTING SAS PROGRAMMER – GENE

Being resourceful and learning new things will keep you from becoming stagnant and become successful as a SAS programmer.

Back in the Day

Gene's introduction to computers and technology started back in high school in the 70's when he used the Texas Instrument calculators that allowed him to program equations. He then learned assembly language and machine code on DEC PDP-11 and Zilog Z-80 microprocessors. Gene enjoyed working at the machine level of these 16 and 8-bit machines because it taught

him the fundamentals and rigorous approach towards programming, including debugging programs. He then progressed into learning the BASIC language. In addition to Gene's disposition towards problem solving which attracted Gene towards computers, he also had interest in becoming a "doctor" so he started his undergraduate work at Johns Hopkins in 1980 on a degree in Biomedical Engineering. This combined his clinical aspirations with his analytical, research-oriented, engineering ambitions.

The university setting, including summer jobs, gave Gene experience working on research projects. Even though he spent a lot of time in the lab working on animals, technology was ever present. For example, the research labs had a Radio Shack TRS-80 computer controlling a dog's heart rate. The combination of technology as applied to medical research was fascinating because it was very "Frankenstein". Similar to how tinkering with early 8-bit computers gave Gene the fundamentals of software development, the laboratory he worked in gave him a foundation for medical research which later aided him in his work on clinical trials.

Although he did not use SAS yet, Johns Hopkins and his graduate work at Case Western Reserve University did allow Gene to work with BMPD. This was another statistical software package at the time which allowed him to run statistical models such as on ANOVA, T-TEST which were in routines similar to SAS PROCs.

The First Job

One of the first jobs that Gene started to work on after his Masters degree in Biomedical Engineering was working as a Data Manager in Los Angeles for a non-profit organization named Los Angeles Regional Family Planning Council. He worked on projects dealing with clinical trials on contraceptives such as the IUD and non-latex condoms. Gene worked closely with the data in a role as a DBA/Data Manager using dBase III with tasks such as defining the database structure and setting up data entry screens. He was also introduced to SAS but had limited resources since there were no other SAS programmers in the entire organization. He therefore referred to his manager who had a statistical background, but was limited in SAS knowledge and he also used SAS reference manuals. Gene enjoyed learning programming on his own and purchased additional SAS manuals directly from SAS Institute to teach the SAS language to himself. .

As a Database Manager, Gene worked closely on data discrepancies such as programming edit checks and the process of transferring data from dBase to SAS via flat ASCII files. Once he had the data in SAS, he was able to generate descriptive statistics using PROC MEANS, FREQ and UNIVARIATE. The programming practices being conducted were not as formally structured as in a typical clinical trial. As a policy, permanent analysis files were never saved, but instead the same SAS program would import the source data, create temporary analysis files, and directly generate statistical reports . At this point, Gene only dabbled in SAS and it had not yet become his main job.

After leaving LA, he moved to the San Francisco Bay Area to work for a medical device company dealing with laser eye surgery named VISX. He sought out this new position as a biomedical engineer, since it matched his college education. Although he did initially accomplish some engineering improvements on their product, his background in working with clinical data ultimately dictated his role at VISX. Since Gene had been working as a data manager, they had placed him in a position working closely with their DOS-based Paradox database with analysis in SAS. He continued working on the data discrepancy management which was then exported to SAS for analysis. Since this medical device was VISX's major product and its major competitor, Summit Technologies, was developing a similar product, there were tremendous timeline pressures to get the data submitted to the FDA for approval and beat their competitor to the open market. So VISX decided to hire SAS consultants to assist in achieving this goal. Although marketing approval for VISX's product was virtually completed in Canada and Europe, they were still in the process of getting approval in the USA and therefore were submitting the clinical trial reports to the FDA. Part of Gene's responsibilities was to guide the SAS consultants in their job. He was not their formal manager but he worked closely with them since he understood the meaning of the data and had some experience with SAS programming. He could bridge the gap between what topics the statisticians wanted to report on and how SAS programming could accomplish these tasks. This was an eye opening experience in that for the first time, he discovered that there existed such a job where you can program in SAS 100% of the time as a job! This intrigued him since he did not care for the administrative aspect of the jobs he had seen. These SAS consultants would just come in, focus on their work and were not involved in as much meetings or office politics. These guys were "do-ers" not "talkers". They did not have administrative tasks such as dealing with yearly performance reviews and were just there to do a specific job. Gene saw this as a refreshing alternative way of working. He also liked how these consultants had opportunities to experience how different companies operated since they did not stay at one company as long as permanent employees. This variety of work kept these consultants on their toes and prevented them from falling into a rut, with boredom and stagnation.

This insight encouraged Gene to continue to learn more about SAS through the use of the few SAS manuals he had access to. He also learned by seeing sample code that these consultants would share with him. Gene was now spending 50% of his time working on SAS which was more than he had ever done before.

Transition to Consulting

There were corporate challenges at VISX which lead to layoffs. This and other management turmoil lead Gene to try out the consulting world starting with work at Roche Biosciences. It started out as a 3 month contract which is typical for an initial contract. This introductory period allowed the company to evaluate the consultant to see if it worked out without making a big commitment. If things went smoothly and there was work to be done, it was normally extended. Gene worked on the precursor to Oracle Clinical known as Rx/Clinical which is the clinical trials relational database jointly developed by Oracle and Syntex, which later became Roche Biosciences. Even though he started out working in the role as a data management, Gene grew into the position of a SAS programmer and continued to work as a consultant at Roche for three and a half years. This was where he learned the majority of his SAS programming skills. During these same years, Gene noticed that there were some individuals in this large organization who began to have a "DMV" mentality. After years of working in a bureaucratic organization, they lacked the desire to learn new things and became less motivated. Some of his colleagues were in the same company for tens of years. He began to see how this stagnation crept into his work routine as well, even though he was a consultant. This realization woke Gene up to the reality that perhaps he was also falling into this stagnation, and keeping true to his original reasons for becoming a consultant, he decided to make a change.

Gene ventured into a short contract with Quintiles Pacific down the Peninsula in Mountain View. This was the first time he worked in a Clinical Research Organization (CRO) which was different from his experience with a pharmaceutical company. His initial thoughts were that since it was a service organization, the work would be varied since they were servicing many different clients at the same time. It turned out however that many clients rely on the CRO to dictate the standards and the way the work was done. It therefore turned out that the work was still done mostly in the same way across different clients and projects.

The desire to learn new things and work in different environments drove Gene to continue into other projects. He had heard from other SAS consultants that finding jobs on your own was the way to earn the biggest salary. Despite this fact, Gene relied on job placement firms such as Trilogy and ASG to land him new opportunities. Gene preferred working in this manner because he relied on the marketing resources of these firms to find him the projects so he could just focus on 'doing the work and not trying to find the work'. If one is lucky, there is always something new and interesting to learn within each work environment. At Pharmacyclics, he worked with the Trialex System which was a browser based thin client software to manage reports and analysis files he created using SAS. Now living in North Carolina, his current project is for Schwarz Bioscience, which is actually based in Germany. He however works at home most of the time connecting to servers in Germany. When Gene started, they did not have cube space in their North Carolina office, so the arrangement was for him to connect via his cable modem from home and work through a remote desktop within a Citrix environment. Most of the time, it worked well but once in a while, his keyboard would spontaneously switch to a German style keyboard and his Ultraedit editor would create unexpected characters so he would have to log out and back in to use an English keyboard again.

Different organizations have different approaches towards validation of SAS programs. This is partly due to varying interpretations of the regulations and also due to how different managers and organizations function. At this current project, Schwarz Biosciences has an approach of validating all the output 100%. This means that there is an independent programmer who would produce the same numbers in a separate SAS program stored in a separate SAS dataset which is distinct from those that are meant to be submitted to the FDA. This means that there is a separate program that performs a PROC COMPARE to ensure that the two sets of numbers are identical before it is deemed "validated". When Gene first started, he primarily did the duplicate validation type programming. Now that he has been on the project longer, he is doing more of the original programming that will be part of the submission.

Since he works remotely, Gene's main method of communicating with his coworkers is through email. Ninety percent of the time, his email and communications are dealing with detailed information such as data, file, and variable names. He does recognize that at times, it does take a little longer to describe or show someone something in email whereas if he were to be physically in front of them, it would be faster.

Resourceful Reinvention

Gene has found many creative and resourceful ways to learn and reinvent himself as a SAS consultant. Even before he started working professionally, his interest in 8-bit microprocessors and working at the electronic circuitry level coincided with his tinkering tendencies and attention to detail personality. This inclination to focus on the details grew as he worked with data discrepancies. If Gene were to find one data issue, it would bother him to just leave the rest alone. He has to then investigate

the rest to ensure that there are no such problems occurring elsewhere. There is a certain satisfaction and comfort knowing that he can ferret out all the discrepancies that exist in a database. An inclination to focus on details also helps in debugging SAS programs created by others.

He did not attend SAS training courses. Instead, Gene gravitated towards getting his consultant firm to pay for the SAS reference manuals he requested. He actually appreciated the cost effectiveness of user manuals since it is a continuous source of knowledge that can be referenced over and over. Good reference manuals had sample code that could be used as templates to algorithms in real world applications. Gene started his own personal electronic library of sample code that he refers to on occasions. This process started in his early days when he first started working with SAS consultants prior to him becoming a full time SAS programmer. Since then, he continued adding to it from other programmers, including original algorithms he came up with and code that he acquired at SAS conferences. Regarding SAS conferences, he sees SUGI being the biggest and the most expensive. There seems to be a larger representation of more seasoned SAS programmers and managers that attend SUGI as compared to other SAS conferences. He sees it as not necessarily focused on the Pharmaceutical industry so it is only by chance to find a paper with substance and relevance. Gene prefers the smaller regional conferences or PharmaSUG where there is more diversity of attendees and the focus of the talks seems to be more relevant for him. Recently, he had shared his original SAS applications as a speaker at these conferences. Gene is constantly sharpening his skills and looking for insight by these many resourceful approaches. It is a Darwinian world where if he sharpens his tools and constantly reinvents himself by learning new things, he would survive and thrive as a SAS programmer.

STATISTICAL PROGRAMMER - SUZY Q

There are many career paths. Sometimes, it is the unexpected and unplanned ones that turn out to be the path that best fits your personality and talents.

In the early 1960's when Suzy went to college, they did not have computer science as a major. Suzy majored in mathematics for her first two years at UC Berkeley. She found upper division math classes rather difficult and decided to switch to psychology, keeping math as a minor. Psychology was a very different discipline compared to mathematics but it was very inline with her interest in teaching. Throughout her academic experience, there were no computer classes offered for liberal arts majors. The only technology used at the time for psych statistics classes was a giant calculator that looked like a typewriter with a crank handle for the "enter" key.

Suzy graduated in June 1966 and planned to get a teaching credential starting the following fall. During that summer, she had plans to work as a cocktail waitress in Tahoe. Her father did not think that this was a fitting job after all her education. He therefore contacted a friend to arrange for an interview which resulted in an internship job at IBM. Suzy was overwhelmed at first during training since there was a group of 41 summer interns and she was the only female. This was her first introduction to computer programming which included languages such as COBOL and FORTRAN. The programs were executed on an IBM 360 computer. She used a terminal which ran IBM's early version of DOS that pre-dated any PCs or Microsoft operating systems. This job was an eye opener for Suzy since she was fascinated with technology and programming.

After that summer she continued on her career path to become an elementary school teacher. She discovered that the student teaching program at Berkeley was not fully challenging her so she quit. The internship position that she held in the past lead Suzy to apply for a full time position with IBM as a Systems Engineer. The job entailed doing both programming and operating system upgrades along with enhancements for clients such as Kaiser Aluminum and the SF Chronicle. Suzy taught programming classes for IBM to clients in COBOL, RPG, and Assembler Language. Suzy's husband served in the military during that time so she traveled with him while juggling programming jobs and substitute teaching. Once they arrived to the San Francisco Bay Area, Suzy started to work for Bechtel in their corporate IT department as an operating system programmer.

Suzy took some time off to raise a family before she re-entered the work force on a part-time basis. She taught Assembler Language programming at Laney College for a couple of years. This was rewarding but it was also frustrating since her students struggled to get computer jobs after completing their programming classes. They had to have 2 years of computer experience before they could get a job in the field, so it was very difficult getting that initial foot in the door. After her

teaching position, Suzy worked for a freight company where she started out doing data entry. She then obtained a promotion to a programming position shortly after. In this job, she was responsible for producing listings and summary tables. The work kept her challenged but the data was very dry. She had an interest in science and medicine and wanted to work in the new biotech industry where the data dealt with human clinical trials.

Suzy then enrolled in a masters program at Hayward State University to study statistics. This enabled her to gain the credentials she needed to work in the biotech industry. This was her first introduction to SAS. The University also taught SPSS and BMDP software for statistical modeling. She enjoyed the fact that the classed were small with only between 20 to 30 students per class. This increased the interaction between students and professors. She was originally planning to become a statistician but realized that most companies require a PhD in statistics to function in that role. Her degree was more suitable for a job as a bioanalyst or SAS programmer.

Her first position after graduation was working for XOMA as a statistical programmer. She attributed her master's degree to helping her obtain this position. The programming experience that she had in other languages also helped. This is where she learned about the ins and outs of clinical trials while performing analysis to produce tables, listings and graphs. She learned to structure her work and optimize programming by creating analysis files and working more with SAS macros. She attended SAS classes and learned from other senior SAS programmers who worked there at XOMA.

Suzy then moved to Genentech where she worked as a senior SAS programmer. She continued to learn new skills from SAS conferences and the additional classes she took. However, she found that the best way for her to learn new SAS skills was to work with another experienced programmer. Suzy is now doing work in the area of electronic submissions and Case Report Tabulations. This job utilizes her knowledge of clinical data, SAS, teaching skills, and the ability to work with diverse programming groups at Genentech. She enjoys being involved with projects where she can help to create the documentation for reviewers and deliver a user friendly submission to regulatory agencies. Upon reflection, there were two key moments for Suzy during her career that was pivotal. The first moment included taking the summer intern job at IBM and the second was getting a master's degree in statistics. She has been fortunate to have found a great job that combines her various interests and talents.

TELECOMMUTE PROGRAMMER - ANGELA RINGELBERG

Communicating effectively while adapting to changes are key attributes to becoming a successful telecommuting SAS programmer.

Angela earned a computer science degree in 1986 at the University of Mobile Alabama. She did not program in SAS during school, but did use PL1 as the primary programming language. She also did assembler programming and did not apply it towards statistical models such as in SAS. When she graduated, it was difficult to get a job since she was caught in the bind of not having the necessary prerequisite experience. Angela had wanted to do something related to her technical training in computers so she started to work through temporary placement agencies.

Angela started out as a data entry clerk for McDonald Douglas in Phoenix, Arizona. She continued to be shuffled around on various temporary projects doing data entry. These jobs were not within any specific career path or industry since the placements were more entry level. She then started to work through Jean Simpson, a local small agency in Shreveport, LA, which placed her at Boots Pharmaceutical. It was another data entry position but after three months on the job, she progressed to become a SAS programmer. She was able to accomplish this through talking to various people in the organization and in particular, the biostatistics and data management departments. Her first introduction to SAS programming was doing edit checks. This was related to what she was doing in that it included algorithms which check for the accuracy of the data which she worked with during her data entry position. Although she did not work on analyzing the data statistically, the data management tasks in conjunction with using the Clintrials database, gave her a better understanding of clinical trials data. Her programming tasks expanded into programming ad hoc requests for patient listings and data listings. Most of the knowledge was obtained on the job but she did also take some classes from SAS Institute which taught her more about SAS macros and SAS/Graph. Angela stayed at Boots for five years and worked her way up to becoming a supervisor.

Her husband then received a transfer in his job to Southern California at Edwards Air Force Base. It was about two hours away from Los Angeles but it was a smaller and more isolated community. The closest biotech company was Amgen but that

would have been a two and a half hour commute, so that was out of the question. Even though she was in California, Angela received a request from her former employer at Boots Pharmaceutical to work on a CANDA project. At the time, many companies were preparing a computer aided new drug application so that the FDA could review the information through the computer. It was a boon for programmers because many companies needed this solution. The problem was that each company had their own CANDA which made it challenging for FDA reviewers. There was a large learning curve for reviewers to use CANDAs between different companies. As a result, this method is no longer used but it did present an opportunity for Angela to work remotely at that time. She was able to use her own PC to log into the remote machine. The employer even gave her SAS locally to do additional development.

Angela began to explore other telecommuting projects through the placement firm NovaTech. She worked on projects for Knoll Pharmaceutical, Quintiles, Norvatis, and Norfolk Railroad among others. It worked well since she was able to do this job at her home. She began to master the art of telecommuting. Angela was then known as the queen of email. This was her main form of communication in addition to the phone. She worked for Novatech for six years. Near the end, she picked up a project for a CRO named PharmaNet. She was a contractor at first working remotely since Pharmanet is headquartered in New Jersey. They had delivered to her a machine and a printer with all the security and software pre-installed. With a DSL connection, she was able to log on via the VPN and she was able to do work from then on. There were some challenges at first since she had to sometimes wake up early to attend 6am meetings Pacific Time which was 9am on the east coast. She primarily communicated with the project manager and statistician remotely. All the annotated CRF were scanned electronically and emailed to Angela. If she needed to see it on paper, she could just print it out. She continued to do some validation programming but the majority of the time was spent developing summary tables, listings, and graphs.

Most of the meetings were done over the phone. However, Angela did also experiment with Net Meeting and MShow which allowed desktop sharing. Even though she started as a consultant, after 5 months, PharmaNet hired her on as a permanent employee.

Angela has a knack for working as a telecommuter. She feels that one of the primary skills needed is to have excellent communication skills. This can make or break the job since everything has to be communicated though the phone or email. She also has the passion for doing this since it gave her better control over her schedule and better quality of life by being closer to her kids. It also requires self-discipline since she has to construct her own self imposed 8 hour work days without supervisor enforcement. One skill she picked up was to keep tabs on her projects and communicate her status to various team members constantly. That way, they would know where she is at and send her the right amount of projects at the right time. Among these skills sets, she also had to gain a certain level of trust among her co-workers and supervisor. This was established at the beginning and worked out under the initial contract. During that trial period, if things didn't work out, PharmaNet could easily end the contract without any legal difficulties.

Angela has a good combination of communication skills along with being very adaptable in her work. She made the pivotal move from the data entry clerk into SAS programming by communicating to the right team. She then transitioned and adapted to the various programming requests that came her way even though she only had experience in data entry. When she was relocated to California to a small community, this outpost did not deter her from doing her work. She was able to adapt and re-invent herself as a telecommuting programmer. The technology in telecommunications combined with her talents enables Angela to be a productive and valuable resource no matter where she is located.

CONCLUSION

The more examples you see on how individuals become clinical SAS programmers, the more unique they appear. The stories of the four individuals in this paper are derived from a longer set of stories within the book Becoming A Clinical Trials Programmer. The book will explore in greater detail career paths along with technical information based upon valuable real world lessons. There is no one optimal path that you have to take in order to be successful in this career. The stories shared in this paper show how diverse the individuals are in the way they took their steps. Even with one individual such as Suzie Q, many turns were taken in her career before settling in this work. Part of the reason why this job is so diverse is due to the fact that the skill set required varies as well. There is the domain knowledge that is needed to understand the clinical data. This is combined with the technical skills of a computer programmer. It is the combination of these skills which creates such a diverse set of requirements. There is a certain level of aptitude that is required to perform well. The individual also needs to be interested and therefore maintain the tenacity necessary to overcoming challenges in navigating through the career path of a SAS programmer within the Biotech and Pharmaceutical industry.

REFERENCES

ABOUT THE AUTHOR

Sy Truong is President of MXI (Meta-Xceed, Inc.) They may be contacted at:

Sy Truong

1751 McCarthy Blvd.

Milpitas, CA 95035

(408) 955-9333

sy.truong@meta-x.com