

CHAPTER IV: RESULTS

This chapter contains the results of the grounded theory methodology study conducted to answer the research questions:

RQ1: What motivates women in STEM professions to stay in their profession long term?

RQ2: What motivates women with non-linear careers in STEM professions to return to their profession after at least a 6 month break from their profession?

This chapter also includes discussion that the analysis conducted was consistent with grounded theory methodology and how the analysis ties back to the research questions. Additionally, this chapter includes sample demographics, using tables to complement the summary. The process used to analyze transcripts from the 20 individual interviews conducted to uncover codes and themes is described in detail in this chapter. There were three levels of analysis: (a) open coding, (b) selective coding, and (c) theoretical coding. At each level of analysis, constant comparison was used to distill the data further, until themes emerged from the data. Included in the chapter are tables and graphics used to present detailed code and theme data, as well as graphics and vignettes from the individual interviews used to emphasize key themes and the resultant theory.

Sample

Twenty participants were interviewed for this study. Appendix F indicates the participant demographics that represent minimum requirements sought as described in Chapter III. All four STEM professions are represented in the sample, with seven (35%) engineering, five (25%) math, four (20%) technology, and four (20%) science professionals. Three engineer participants and one science participant had non-linear career paths, as

Restate the research questions.

Throughout this section, describe the sample using any relevant demographic information gathered.

Tip: For rules related to how to present numbers, please see pages 111-114 in the APA Manual.

defined in this dissertation as a career path, where the participant left the STEM workplace for more than 26 weeks and then returned to continue working in a STEM field.

The total years in STEM professions varied among the 20 participants sampled. Those participants with over 30 years of experience represented 30% of the sample size. Those participants with 10-15 years, 15-20 years, and 25-30 years of experience represented 20% of the sample size each, with the group having 20-25 years of experience representing 10% of the sample size.

Ten participants, or 50% of the sample size, were employed in the private sector. The remaining participants either worked for the public sector (25%) or declined to answer (25%). Company size also varied among participants. Nine of the 20 participants sampled were from companies with over 50,000 employees. The next largest sample population by company size was 20% of participants from companies with 50-999 employees. All other company sizes were 10% or less (see Appendix F).

Tip: Include supplemental materials in the Appendix.

Seventeen of the 20 participants shared their race information, all identifying as White, non-Hispanic. The ages of the participants varied. Participants who were 60 years or older represented 10% of the sample, 35% were between 51 and 60, 20% were between the ages of 41-50. The 31-40 age group was also 20% of the sample and 15% of the participants declined to answer. Graphic displays of demographics on company size, work status, age, and industry sector are provided in Appendix F.

Briefly summarize the logistics of the data collection.

Data Collection

The 20 research interviews with women currently employed in STEM professions served as the primary source of research data. The demographic questionnaires served as supporting research data. After every four interviews, the batch of four interviews was coded

manually and reviewed for emerging themes. Following this method, the researcher ensured grounded theory methodology was embedded throughout the data collection part of the research process. The original interview protocol and the subsequent interview question changes through the course of the study are provided in Appendix D.

Data and Analysis

All interviews were coded manually during open coding. The interviews were analyzed in batches of four participants, allowing analysis time before moving on to additional participants. The researcher coded each batch and analyzed for categories or themes. Questions or clarifying questions were added to the interview method following the completion of the eight interviews, or second interview batch. Details of additional questions and from open coding analysis throughout the interview process are in Appendix D.

Transcripts were uploaded into computer software, NVivo 10, for further analysis. Each interview was coded again manually using the software and then compared to the manual coding initially completed during the interview collection. Coding the interviews again, having all 20 interviews to compare, aided constant comparative analysis techniques critical to grounded theory methodology. This process helped the researcher to remain consistent in emphasizing key points during coding. The open coding results included 42 codes from manual coding, as shown in Appendix G.

In the next analysis phase, selective coding, the researcher searched to find categories emerging from the similarities in the open codes. Using mind-mapping software, the researcher took all the vignettes and the open codes and mapped them into a mind-map. Figure 1 includes the summary of the data and analysis process for open, selective, and theoretical coding.

Use numerals for numbers 10 and above. For additional rules on numbers, see pages 111-114 in the APA Manual.

Refer your reader to Figures and Tables within your text.

Open Coding

- Each line of transcribed interview text was coded line by line manually
- Each vignette from manual coding was entered into NVivo and either coded with a unique new open code or linked to an existing open code

Selective Coding

- Mind-mapping software was used to group open codes into categories. All vignettes were transferred into the mindmap, linked to an open or selective code
- NVivo word-counts of transcribed interviews were used as second check for additional codes or categories

Theoretical Coding

- Mind-mapping software was used to help discover themes by linking codes and vignettes from open and selective coding where a direct relationship was clear
- Selective codes with the most relationships formed the foundation for theoretical coding

Figure 1. Data and Analysis Process.

Using NVivo 10 software, the researcher used word-count queries and source code data as another tool in discovering selective codes from the data. In analyzing the depth of codes, or the quantity of vignettes assigned to a group of code, or grouping of open codes, selective codes emerged from the data. For the purposes of this study, the researcher defined *depth* as having 10 or more vignettes assigned to a code.

Theoretical coding resulted from the relationships both within and across the open codes and selective codes. The researcher used mind-mapping software to aid this analysis. Relationships across the selective codes were analyzed across the mind-map. When building the mind-map, each time a vignette linked directly to a code, the researcher reviewed that vignette for relationships with other codes. If there was a relationship, the researcher connected the codes with an arrow. The selective codes with the most relationships formed the start of theoretical coding.

Tip: For help with formatting Tables and Figures, see this [resource](#).

Tip: Don't overuse the phrase "the researcher." Instead, focus on what you did.

For example: If there was a relationship, the codes were connected with an arrow.

Adhering to grounded theory methodology, some questions were asked of some participants but not of others. Constant comparison was exercised to ensure that additional weight was not added on a per code basis only. For example, every participant was asked questions regarding what they enjoyed most about being a STEM professional, but not every participant was asked questions about the importance of technology to the workplace culture. The latter was a question only asked of participants 9 through 20, since technology began to emerge as a code after the first eight participant interviews were complete. The paragraph section headers that follow indicate the selective codes that emerged. There were three distinctions in the selective codes: individual-centric codes, workplace-centric codes, and individual and workplace dependent codes.

Individual-Centric Codes

Tip: Organize your findings by major themes or codes. Use appropriate headings to help your reader follow the organization.

Career fit. Career fit is an umbrella term used in this dissertation to describe opportunities for being challenged, problem solving, achievement, having variety in work, continuously learning, and opportunities to be creative. Over 15 open codes were assigned to the umbrella term of career fit. One hundred percent of participants mentioned at least three of these descriptors for the umbrella term of career fit.

Two participants notably capture the essence of what the participants shared when asked what they enjoy about the STEM profession they have chosen. One enthusiastically shared her interests in her profession.

Include specific quotes or data to support your findings.

I really liked math. And I always liked word problems. I love the technical aspects of being an engineer. I love trouble shooting. I love the technical aspect of troubleshooting and fixing a problem. (Participant 7)

Another participant shared the multi-faceted aspects of what she likes about STEM professions, expanding the emphasis to exposure to various industries.

So there's always something new coming up. And lots of problems to solve. And as the industries have been changing and as policies change, (you know), there's a need for new data. And so there's a challenge in how we collect it. (Participant 19)

Some participants shared further detail as to what they liked in their chosen STEM profession. An example of this follows for each of the science, technology, engineering, and math participants.

When asked what she enjoys about being in the sciences, one participant excitedly spoke of what it is like to discover a solution to a problem with her team. Problem solving, a challenge, and creativity are central to her answer. She describes how the problem solving as a team adds to the excitement of her work.

I like hands-on bench work and that's what I like. So if we are doing a scale up of a certain protein and it needs to be, it's not soluble at a certain temperature then we get to fool around with it. So, so there's a little bit of creativity with that. And then when you finally get it, you're part of a team and everybody gets excited. (Participant 12)

A technology professional discussed the creativity, challenge, learning, and problem solving aspects of writing new code. She emphasized that while she enjoys this challenge and creating, the participant also enjoys seeing how her work contributes to business changes.

I liked writing code. I like the fact that my job is never the same every single day. My job constantly shifts. Every day's a new challenge....I also like the way that technology has allowed process to evolve and how we've been able to take something

that would take a really long time to do it without technology. And be able to kind of transform it so that it operates more efficiently, more effectively. (Participant 6)

An engineer described some of her considerations when taking a different position within her company and reflected on what she really likes about operations. She emphasized problem solving, particularly under the challenge of time constraints, as something she likes. Similar to Participant 6, Participant 4 is also motivated by the change that her work creates for the business.

I really like the hands on activity. So I like the startup aspect when you can do testing in the field of equipment. I like working in operations where you're like close to the product. I like to be where the action is.... It's energizing to kind of have that. Again it kind of comes back to impact, just being close to the action, and realizing that what you do matters. (Participant 4)

A math professional shared her interest in learning, problem solving, and data analysis, indicating that she finds it hard to believe she gets paid for something she enjoys so much. She described at length her desire to analyze data and the energy that she gets from her analysis and discoveries.

I absolutely loved the idea of problem solving and data analytics. I mean anything in life, it doesn't have to do with work, I mean if I can put it into a spreadsheet, there's this never ending desire for me to sit down with the data ... having someone to pay you, to give you the time to sit with data for hours, and look at it from many different aspects, has always been a wonder to me. I am addicted to learning. (Participant 18)

Priority is family. Over 10 vignettes were assigned to this open code, elevating to a selective code. The participant responses when talking about family priorities were largely

about having a flexible schedule. Participants were not shy about their choices, often expressing pride in their choices, especially choices made when their children were young. The women made adjustments to their career schedule to ensure they spent time with their children. Participant 15 discussed how she approached her work schedule when she came back from maternity leave so that the schedule helped her align her priorities and responsibilities at home and at work.

When I had my daughter and came back from maternity leave. And the first thing I did when I came back is started working four 10-hour days instead of 5 days. So that I could have one day other than the weekend when I was running around doing grocery shopping and other things just have one day of the week at home. When I could just spend with my daughter, and make sure we had that kind of bonding time.

(Participant 15)

Participant 6 emphasized a similar sentiment about flexibility in the workplace and workplace policies, that she found supportive in attaining work-life balance. The workplace policies included options for nursing at work and flex-time.

I just had a baby very recently. My organization has been extremely supportive of allowing me to continue nursing....They've also been very flexible with time off. So if I need to take time off, my kid's sick, or if I need to work off because my kids are sick or I need to take them to a doctor's appointment or something like that, they've been very flexible about that. (Participant 6)

Another participant went to work part-time after having kids and remained part-time for the rest of her career.

I went part time after I had kids. So I appreciated the fact that I could do technical work part time. It was priority for me was for somebody to be home with the kids. If I only had the choice of full or no time, I would have probably gone to no time. And that would of course impacted me financially, but that probably would have been my decision. (Participant 8)

One participant, who notably was in a senior position at the time of this interview, shared that she made sacrifices early in her career to be with her children.

I haven't taken some roles, and I haven't applied for certain roles because I knew it would have, I wouldn't have as much time with my kids. And I wouldn't get to go to any of their extra school activities or do anything. (Participant 3)

Self-efficacy and self-confidence. There were over 15 open codes within this selective code. One of the self-efficacy open codes was *expressed having a niche*, with more than 10 vignettes, and the second open code was *expressed believing in capabilities*, with more than 15 vignettes assigned. There were over 10 of which were linked to the open code *expressed confidence throughout career*. Additional codes included assignment to *expressed maturing into confidence*.

One of the ways a participant expressed having a niche was developing a specialty in a certain aspect of her profession. Participant 17 specialized in (technical specialty name) which, the participant emphasized, is a niche for women in STEM.

I do (technical specialty name) and I have a couple guys working for me. I run my own company. So I, a women in (technical specialty name) is an anomaly. Because there's not a lot of women that do that. (Participant 17)

Other women expressed believing in their capabilities in a more general sense, without notation of a specialized niche. One participant talked about entering a new industry under a mentor and the confidence she had in her data modeling skills in this industry. She referenced the weight she feels her capabilities have in sustaining her in this field. She suggests that the niche capability she affords her confidence.

That part (the data modeling) came (you know), it just came very easily...Presenting to a room of 20 people ...And to feel like you know the answers. So I, I don't know, the amount of stimulation that comes from being well prepared and having done thorough research in particular areas, I'm assuming it will sustain me all the way till the end in terms of keeping me in what I do for a living. (Participant 18)

Some participants talked about their belief in their capabilities in terms of achievement, where even if something was an unknown, they knew they could figure it out. This vignette relates to both self-efficacy and self-confidence.

I think part of it (you know), I don't like not being able to do something. So I think that was definitely a motivator in the beginning that, okay, (you know), I can do anything I set my mind to. (Participant 5)

The participants spoke about having confidence in different ways, but with each example of having confidence throughout their career, it was evident that their confidence came from within. Participant 11 said this directly and emphasizes that all positions are a little different and one has to adapt to the environment with the confidence one finds within.

I think your confidence has to come from within. You need to be confident with yourself and your abilities. And I think that's what provides that confidence and ability to adjust to whatever that environment is. (Participant 11)

Tip: Present your data so it is easy to read. This author used italics so the participant responses are easy to distinguish from the text around them.

Some participants talked about how they dealt with changes imposed on them through organizational restructuring and other business changes that affected their careers.

Participant 12 spoke about a specific example, where although she was scared, she had the confidence to take the risk on secondment position where she would be in a position that was considered a leap for her. Participant 12 explained that the company offered these opportunities, but it is up to the individual to take the risk.

Tip: Omit information that might compromise the confidentiality of participants, as you see here.

So one of the things that <my company> offers every once in a while is they have something called a secondment where you can go into a different department and try a different job. And it was really, really, scary and I really didn't want to do it. But I knew I had to. So again I just made the leap. And again now I'm visible....And the secondment was the best thing I ever did. (Participant 12)

While all participants expressed confidence in themselves at the time of being interviewed, some participants indicated their lack of confidence in their career early on. Confidence was something they built and something that got stronger over the years.

I think that might be something that I've grown into also. I probably wouldn't have been as maybe not as vocal about it early on. But I think (you know) you know what is right for you, and you just have to be strong enough to make that decision.

(Participant 20)

Workplace-Centric Codes

Direct managers. Over 15 vignettes were assigned to this open code, elevating the code to a selective code. Several participants discussed the importance of managers in being supportive in finding opportunities for further growth.

I think your direct manager really has the ability to influence at least here what projects the group gets assigned and then more importantly what projects you get assigned. I've really been (you know), lucky or fortunate that I've worked for people that have said, hey (you know) what? I'll give you this opportunity and if you do a good job then that will open doors to try this, this or this. (Participant 4)

Other participants discussed the key role of the manager in setting the tone for a flexible, performance-based work culture.

I basically, with the exception of a two-year stint in there, worked for the same boss since I started. And he's just, he's a great man. He's very family-centered. (you know) He's always been there when I've had issues. And (you know) he understands that my family comes first. (Participant 5)

Some participants discussed the bias a manager's perspective could have on their own views of the workplace and of themselves, good or bad. Participant 13 discussed how one manager helped encourage her to go into management, while another said that management was out of reach for her. She spoke about the negative influence the first manager had on her, particularly because she was in the beginning stages of her career. She actively sought other positions and her new manager was very supportive of her career aspirations into management.

I think the manager that I had at the time was so supportive and really believed in me so that helped a lot. In the past I'd had a lot of managers that would say things like (you know) I can't really see you being a manager... So you kind of internalize that and kind of believe what they're saying even though maybe initially you thought

something different...I think having somebody else that I respected a lot that saw that in me and encouraged me to do it that was a big part of it. (Participant 13)

Performance-based policies. The open code *recognition and reward* had 15 vignettes. Some of the vignettes were evidence of fair rewards system, where as some vignettes leaned more towards a lack of evidence. One participant enthusiastically endorsed performance-based policies.

I love being in a performance-based platform. (Participant 14)

One participant shared more detail as to how the performance based systems work in terms of compensation and retention.

You get a number. You get ranked every year at the end of the year. And if you haven't met those goals then your ranking is low. So not only is your bonus really low but chances are if you're ranked low 2 or 3 years, you're not going to be there the fourth year. (Participant 12)

Performance-based culture. More than 10 vignettes were assigned to the open code of flexibility. Flexibility/predictability included citation by more than 10 participants as being part of a culture that cared more about performance (getting the work done on time and to a quality standard) than being at the office for a set period of time every day. There are two general ways that the participants described flexibility. One way was the flexibility that certain roles provided, where they did not necessarily have to be at the office to perform their job. These women emphasized the importance of having a generally predictable schedule for their 40-hour or more job was important to them. Other women preferred flexibility in terms of job structure, such as being able to work part-time or having a flexible schedule beyond the traditional work week.

One participant described her considerations in her job role when she became a parent and her observations of different company cultures in her experience. She shared that she was not looking for less hours. She was looking for a different schedule of hours so that she could balance her new priorities and responsibilities as a parent. The participant also shared that the culture of the company was something she would pay attention to if looking for a career change, as the family focused culture of her current company is very important to her.

I was like, well I'm not going to start a family and have to be at a job site at 5 o'clock in the morning....That's when I took the office position of being an <role> before I became pregnant ...The company I work for now is less than twenty employees. So it's very family oriented and family focus.....And I think that's definitely been a contributor to things that I would seek out if I were to ever change careers or change companies. (Participant 7)

Another participant echoed the concept that flexibility in some respects is earned, as when you have to get something done, you are trusted to put in the extra hours. In return, one's manager may be flexible during the times when you have a commitment to attend during working hours.

I've been fairly lucky throughout my career in that I've never really had a boss who stood there and said oh well you're supposed to be in a 9:00 and here it is 9:01....But they knew that when push came to shove if something had to be done, I would be here to do it. And I think that they appreciated that. And in turn, (you know), gave me a fair amount of flexibility. (Participant 19)

One participant described that she did not really enjoy her job that much at a certain time in her career, but because her part-time work schedule helped her balance her family

responsibilities, she stayed. The flexibility was very important to her family and this benefit outweighed the negative aspects of her job.

The job share I really, I stuck with it because of that flexibility. So I was 3 days a week. And eventually what I was able to do was I went in 4 days a week...I went in Monday through Thursday and left every day at three... that flexibility meant everything to our family. I feel like I was really lucky. (Participant 11)

Individual and Workplace Dependent Codes

Influence of changes for the individual and in the workplace over time. The open codes of *technology advances and how the workplace is affected* and *changes in workplace culture—not hostile now* combined to emerge to this selective code, having over 15 vignettes assigned to the two combined open codes. Also, over 10 vignettes included assignment to the open code *what motivates me has changed over time*.

For some participants, no change in motivation existed along the journey. These participants say that the problem solving, analysis, and technical work is what they enjoy.

I do still enjoy analysis but that's actually one thing about switching from (career type) to consulting; that's, that was important for me to make sure that I still enjoyed analysis. Because as you go up the ranks in a (career type) company, you start doing less and less analysis and more and more sitting in meetings. (Participant 15)

For others, the motivators changed over time. One of the factors that helped Participant 6 stay motivated was in adjusting her approach over time, as she began to put more ownership on her own values rather than reacting to others. She described how early in her career, she expressed feeling like building her credibility took effort. As her career

progressed, she spent less energy on having to prove herself. She has more confidence in her work and her motivation now is more intrinsic.

I think, early in my career there was definitely a lot of camaraderie. I think in a way, at least for me, I think that that was almost a driver for me, because I felt like I had something to prove early in my career. Now at, later in my career... I feel like I just have to ensure that I'm making myself accountable...and what I feel is right really drives me. (Participant 6)

Several participants noted the advances in technology in enabling flexibility for both men and women. They cited fairly recent changes such as companies providing laptops and people generally having good Internet connections in their homes, as enabling the virtual workplace.

I've been in the workplace 18 years. So we certainly had computers when I started, but companies didn't hand out laptops back then. We had desktops. So I wasn't working from home ever, (you know)? My work was on the computer, but my computer wasn't with me. So I did not work from home for the first probably five years of my career. (Participant 15)

One participant mentioned the opportunity that a flexible work environment offered to men too. The flexible environment has helped both men and women who are caretakers.

I think men tend to be more (you know) it's okay for them to say I'm going to work from home today, you know? My child is sick and my wife needs to go into work. I've heard that many times, you know? So I like that aspect of it too. (Participant 20)

When asking one participant about the flexibility of work culture, she quickly emphasized that flexibility, although existing today, did not always exist in the workplace.

Throughout this section, the author is sharing the results and then supporting them with specific participant responses.

I wouldn't say flexibility. That didn't exist until the last couple of years. I mean I think that, (you know), the millennial generation and working from home; I mean that is a new concept... I had to take a vacation day every time my kids were sick.

(Participant 3)

Reputation as a credible professional. Over 10 vignettes included assignment to the related *reputation* and *credibility* codes, elevating to a category and selective code. The first vignette below includes the description of a personal journey in discovering the multi-faceted elements of building a good reputation, emphasizing that building a reputation is not just about performing well, but having others know about your performance.

I've obviously struggled in the beginning trying to get recognition for the fact that I was competent and, and capable, and working at an appropriate level. And I think that's a challenge for a lot of people starting out in a technical career. I thought that my management should be psychic and should know exactly what's happening, and everybody else should be psychic and know what I'm doing...I looked around and realized that the people who were really being successful were the ones that weren't just coming in heads down doing their work and leaving, and they were getting involved in the community. They were talking to people... I kind of looked around ...and then tried to mimic some of that. (Participant 13)

Another participant emphasized the need to be credible, even in a situation where you've made a mistake. By being brave enough to admit your mistake, the participant emphasized that one creates trust, essential to building a good reputation.

And so you start building your reputation and (you know) you start to learn it's very simple. If I do something wrong, they're going, people are going to tell 11 people I

messed up. If I do something right I'll be lucky if they tell one person. So that's why your reputation is so important ... really want to make sure if you do something wrong, you immediately address it. (Participant 17)

Growth and advancement. More than 15 vignettes were assigned to the selective code of growth and advancement. This selective code is an umbrella term used in this dissertation to capture participants' views on *evidence of advancement opportunities, lack of evidence for advancement opportunities, investment via training is available, lateral moves are good capability building* and other general perceptions of growth or barriers to growth in the workplace.

One participant's perspective was that growth was not necessarily advancement, but learning something new.

Looking for a different opportunity, in some cases it was even potentially like a lateral move. So it wasn't necessarily a promotional opportunity. But in some cases it was a chance to get just a different experience at the same level. (Participant 12)

As participants shared their career journey, where several cited evidence of attaining senior level positions.

I started out at <the company> which is now part of <the company> and worked as an actual individual contributor. And then I moved into a management role. And I've been managing people for the last, oh, wow, since <year>. I will be the < a senior role in her next position>. (Participant 3)

Other participants simply stated directly that they have opportunities to grow and that there were no barriers that they saw.

I feel like I've been given plenty of opportunities, that's for sure. I don't feel like there's any, anything stopping me from having opportunities. (Participant 13)

Some participants cited something specific about their career journey that gave them the perspective that no glass ceiling existed. One referenced her own success to reinforce her point.

The first, of the three companies that I worked at, two out of the three including the first one 18 years ago had women as the <most senior role>. It's like typically the top role <in that specialty>. So I came into my first job with a female <in the most senior role> and never had any impressions that there were any barriers for women from that perspective. I've been here now with, in this location with my current company for six years. I'm now <in a senior role>. (Participant 15)

Several participants interviewed in this study worked at some time as a part-time worker or managed part-time workers that were women. While those participants who worked part-time did not feel that the company limited their growth or advancement, they did acknowledge that their choice to go part-time had some career implications.

One participant indicated that she was not chosen for some projects because of her part-time status. She reinforced that being a part-time employee was her choice. She noted that if she wanted to advance and go full-time, the opportunity was there. Overall, though, this participant expressed a lot of satisfaction with her career and what her career offered her life. She referred to the cost of being part-time. This participant also emphasized her gratitude to the company, for allowing the part-time working arrangement for technical work.

Sometimes I think I wasn't given the most cutting edge projects because I couldn't travel. That was I thought the cost, I mean I was okay with that because I'm the one

who made the decision to go part time.... I feel indebted to them and more loyal to them because of the support that I, to let me be able to still work, be pretty technical and only be part time. I think if I had been looking to be promoted the first thing my supervisor would have said to me was you need to go full time. It was my choice.

(Participant 8)

Another participant's perspective was that if an employee was performing well and they deserved a promotion, that the part-time versus full-time aspect should not be a factor. Growth and advancement should not be limited for the part-time worker, in her opinion.

I was kind of disappointed that <my line management> wanted to write her off for this promotion just based on her working the (part-time) workweek. And not being open to just what her skills and abilities were. (Participant 4)

NVivo Analysis Results

A word frequency query was also conducted in NVivo 10 on the group of 20 interviews, following the manual coding to check for any additional themes. Word frequency queries were performed at different ranges to see if any differences existed regarding queries that search for the exact same word, queries that searched for similar word groups, and a search frequency in between these two extremes. Table 1 indicates the results of the word frequency query. With the exception of the words: *number*, *work*, and *change*, the word query search resulted in modifiers. The word *change* was the second most frequently referenced word type in the query search for similar word groups, behind the word *really*. A total of nine Selective Codes emerged from the manual and NVivo analysis as shown in Table 2.

Tip: Place tables and figures as close as possible to the first mention within the text. In this case, the author has included Table 1 and Table 2 on the next page.

Table 1

NVivo Word Query

Exact Query	Between Exact and Similar	Similar Query
Know	Know	Really
Like	Work	Change
Just	Like	Work
Really	Think	Number
Think	Just	Think

Table 2

Selective Coding Results

Individual Centric Codes	Workplace Centric Codes	Individual and Workplace Dependent Codes
Career fit	Direct managers	Reputation as a credible professional
Priority is family	Performance-based policies (rewards)	Growth and advancement
Self-efficacy and self confidence	Performance-based culture (flexibility)	Influence of changes for individual and in workplace over time

Tip: For help with formatting tables, please see this [resource](#).

Theoretical Coding Summary of Results

Five motivating factor themes emerged from the mind-mapping and NVivo analysis.

The themes resulted from the theoretical coding. The researcher used mind-mapping software to further understand relationships both within the open codes and across the selective codes and aid theoretical code discovery. Relationships across the selective codes were analyzed across the mind-map. The selective codes with the most relationships formed the start of theoretical coding. The motivating factor themes that resulted from theoretical coding included: (a) interest in STEM is the constant as individual needs and priorities change, (b) direct manager influence on development is critical, (c) performance-based workplace policies and culture are continuously sought, and (d) moving towards a no-bias workplace remains important, and (e) the career growth path at life's crossroads remains a challenge.

Tip: In APA style, you can separate items in a series using lowercase letters within parentheses.

The themes are a result of reviewing the relationships in open and selective coding. The first two themes focused on the individuals who make a key difference, the participant and their manager. The themes have a direct tie to the selective codes of career fit and direct manager. The primary difference between the selective code and the themes is the dimension of time and the emphasis on individual needs. The last three themes are also a result of selective coding with a more direct tie to the overall workplace.

Performance-based policies and culture emerged in both open and selective coding and carried through here as a theme to emphasize their importance throughout the career journey. The fourth and fifth themes are a resultant a multiple relationships and concepts within those relationships. For example, for the fourth theme, the concept of bias emerged as important, looking at relationships that impacted reputation, credibility, culture, and opportunities for advancement.

The last theme summarized many relationships across open and selective codes. The concept of being challenged continuously was strongly emphasized in open coding and was captured in the umbrella term of career fit during selective coding. During constant comparison, it became evident that creating this challenge throughout the career for participants was inconsistent, particularly as the participants started families. More discussion follows on each theme on the next pages.

Tip: Use appropriate headings to discuss each major theme and any sub-themes.

Interest in STEM is the Constant as Individual Needs and Priorities Change

Career fit was the only code that had a 100% response rate, indicating that for all participants throughout their career, their genuine interest in STEM was key to motivating them to stay. Career fit is essential and related solely to the individual's interests. Top individual needs cited by participants included having a challenging career related to math and science and the ability to meet family priorities, balanced with work priorities.

A dichotomy emerged with roughly half of the participants interviewed. Throughout the interviews, participants often cited that their self-efficacy and self-confidence also contributed to their success. All women expressed having self-efficacy, either through sharing that they had a niche or sharing that they believed in their capabilities. The inference was that this self-efficacy was throughout their career. However, approximately half of the women indicated confidence throughout their career, with the other half explaining that they matured into the confidence they have today. All women expressed having confidence in themselves in the present day.

Family is a priority for participants. Most participants shared that the *caretaker* identity is prominent in their lives. Most heralded their spouses as supportive partners, but they still shaped their careers to meet their needs at home. Over 15 vignettes had content

where the participant expressed their individual needs as a primary component of a decision they made or sought to make.

Influence of changes for individual and in workplace over time had over 15 vignettes and is therefore a key to consider in theoretical coding. The code most closely links to individual needs and priorities over time, particularly during drastic caretaker responsibility changes for women, in becoming a partner, mother, or when aiding with elderly parental care. One participant discussed that what motivated her throughout her career was different at every stage. She emphasized her responsibilities at home changing as she grew in her career.

I think it's different at every age. At <company> there were a lot of young people and I enjoyed the people that I worked with. Eventually with a family and a mortgage and (you know) you kind of feel like even if you didn't like your job you'd sort of be stuck there, because now you need to produce and you need to get paid. (Participant 12)

One participant shared the struggle she had in maintaining her individuality as she juggled work and family, implying the importance for women to ensure that they maintain who they are as individuals.

I think sometimes women throughout their career can lose their own individuality or maybe suppress that based on environmental factors, family factors, things such as that. So for me I think just re-finding the individuality of, I never truly lose myself. (Participant 14)

Having a trusting relationship with one's direct manager, so that one feels understood and heard, was emphasized by a few participants. This point is mentioned here, as it is just as important for the individual to understand their needs and wants and have the confidence

to voice them to their manager, as it is for the manager to listen and help support those needs. Participant 20 best illustrated this point.

I've had just great bosses who I can really talk to, I can really tell them what my needs and wants and everything are, you know? . . . I tell them what I want. And I find that they work for me to get those new opportunities and those new challenges and I just really trust, I trust them. I've just been really lucky. (Participant 20)

Direct Manager Influence on Development is Critical

Managers, the data suggested, have both a present day and a future growth component to their relationship with employees. The data suggested that it is critical for managers to help equip employees' everyday needs to help them balance work and home as much as the employee's role and the workplace environment will permit. Participants cited their direct managers repeatedly, as essential to helping them grow or helping them gain exposure to new opportunities. The emphasis on the influence of the direct manager as a motivating factor was clearly in terms of moving towards the future.

Direct managers were specifically cited as being great coaches to those participants that struggled with confidence early in their careers. Some participants referenced how their manager helped them build their capabilities and reputation.

I had a manager very early on who was a female in the IT area, and (you know) the IT area tends to be mostly male dominated field. And so I had this one manager who she definitely served as a mentor to me. She definitely took the time, invested, to make sure I understood things. She also made sure that I knew people, too, that I made the personal connections to people in the organization. (Participant 6)

Others shared that their managers helped them leverage their good reputations as top performers to move into different roles within the organization.

And if you are a, if you're a top performer and you kind of make clear what your one to 2 year and 2 to 5 year and maybe even longer term goals are, I've really had managers that will work with me to kind of get where I want to go. (Participant 4)

One participant discussed how her managers worked with her during life changes in her career and opened up options for her that she did not know existed. This participant emphasized the point that individual have to communicate their needs to their managers so that the managers could work with them to shape their positions.

When I lived in <State Name> and I wanted to work part time because my husband was going back to school. And my first thought was I'm going to have to quit because I worked at a plant and they didn't have any part time engineers, you know? ... I went into my boss and I told him what I had decided I needed to do. And he said well we don't want you to do that right now... Would you consider part time? And I said I had no idea that was an option, you know? And so we talked about it and I was able to work 3 days a week. (Participant 20)

Performance-Based Workplace Policies and Culture are Continuously Sought

Participants indicated that compensation was a factor in staying in STEM long-term, particularly as the participants reached stages later in their career. Several participants agreed that they valued the performance-based evaluation system in their workplace. One participant cited her company development plan when asked about policies that aid growth, leading to more opportunities for jobs with more compensation.

Our company has a pretty good like employee development plan, process.

(Participant 4)

A few participants talked about the importance culture played as they have matured in their careers. The participants mentioned that they were naïve to the importance of culture early. Several participants mentioned not liking politically driven cultures. Participant 19 articulated this sentiment well.

I think at this point I would be interested in the culture. That's really interesting that you mentioned that because when I first started (you know), I didn't think anything about work cultures ... I certainly didn't think that they could be different; (you know) it just seems to me an office was an office. But yeah I certainly would want to be in a place where you could work collaboratively with others. (Participant 19)

Several participants shared that workplace politics were a barrier to gaining a top performance rating. Performance-based policies with barriers are not necessarily a dissatisfier. Although participants often shared their dislike for politics, workplace politics was not cited as a cause for leaving. Some flexibility in interpretation of workplace policies, as they apply to recognition and rewards, seems tolerable but not necessarily ideal. For all workplace policies, the availability of the policy was one aspect. The other aspect was the employee taking advantage of all of what the policy had to offer to improve their opportunities for growth.

As discussed previously, the hostile environment that women historically met in STEM professions is not generally the environment that women in STEM face in the workplace today. Some bias does still exist. This topic will be discussed in the next motivating factor theme, Moving Towards a No-Bias Workplace Remains Important. The two themes are separated as while the participants generally cited fair workplace policies and

culture, there was some variability in participant responses related to the workplace environment when discussing building a credible reputation.

Moving Towards a No-Bias Workplace Remains Important

All participants were asked if they experienced gender-based hostility in their workplace today. The majority of women rejected the notion that they work in a hostile environment today. There were generally three answers to the question on the existence of a hostile environment: (a) they had never experienced a hostile environment throughout their career, (b) hostile environments used to exist but do not today, and (c) hostile environments still exist in pockets in the workplace or in specific industries.

There is evidence in the data for this research that the workplace changed in the last 20 years. The broad bias towards women in STEM in the past hindered women STEM professionals, particularly their credibility. Reputation connects to credibility. Although all participants expressed self-efficacy, believing in their capabilities, throughout their career, they were conscious of their credibility as professionals. Having a credible reputation is based on another's judgment of your capabilities. Some participants, when discussing the existence of hostile environments of the past or the hostile environments that still exist in the early 2000s in pockets of the workplace, shared stories of how their credibility, at times, was diminished simply because of their gender. As hostile environments still exist in pockets in STEM professions, and reputation is essential to being considered for growth opportunities, it is considered core to keeping women in STEM professions.

Many participants talked positively about their work environment and expressed no hostility throughout their career. Participant 1 shared that she thought her workplace has been very progressive in that sense, citing the emphasis on work-life balance before it

became a norm for companies to consider. She also cited how supportive her workplace was with regard to flexibility, especially when she had children.

But I've never had a, I've never had a problem with feeling like, oh, I was being discriminated against, because I'm a lady... I mean never have had that feeling at all. Especially in the office that I'm in, the people that were here, everybody's very helpful and supportive. I mean never, ever have had an issue, (you know). If your kid gets sick at school and you need to leave, everybody's like yeah, fine, whatever, (you know), as long as you get your work done, we don't care when you do it, how you do it... I mean everybody's always, and so as far as the work life balance it's been phenomenal. (Participant 1)

Participant 12 simply rejected the notion that her gender plays a role for her or other women she works with.

I don't really feel like I've seen women held back just because they're women.
(Participant 12)

One participant cited that perspectives of women changed during her career. Her perspective is that competence, above gender, is viewed more today. She implied that view was not always the case in the earlier years of her career. She also shared that she thought it would be hard to stay in the profession if the environment had not shifted as it has, where women are more respected.

There were some men that didn't like females or didn't think females could do the job. Much more 25 years ago than do it now. I think that there's a lot more respect given to women whether it's me after being there a long time or even new graduates when we hire a new graduate. We look for competence, and I don't believe that the gender,

that gender is an issue at all. There were things that happened early on that maybe if they were still happening as far as that went with (you know), real male dominant opinions that would have been hard to stay with for a long time. (Participant 8)

Other participants cited the male / female bias as a factor existing in certain industries or certain pockets of jobs. One participant shared her perspective on a company she worked with, citing the existence of an *old boy's network*. This participant shared that she did not even realize what a bad experience it was until she left and had another company experience to compare to.

I would say I hated working at <company name>. It was a horrible place to work for a woman.... If I were to have the opportunity to influence some 20-something-year-old who got her first job at <company name>, I might say hey look, this looks great on your resume. Stay there, get the training that you can, learn what you need and get out of there... it's an old boy's network. It's a man's world there. It is unfair....And I don't even know that I realized it while I was there. (Participant 18)

One participant acknowledged that sometimes she encounters a client with bias because of her gender. This participant did not internalize these occurrences as her performance review had never been impacted. Her manager was very supportive of her decisions to work with her peers on shifting clients when she encountered bias. She also implied that the biased clients are not the majority, they are the minority.

There's been certain customers where there's just not a connection. They don't want to deal with a female... I've been able to in maturity just step back and be like you know what? This just isn't a fit...and just go to my peers. And be like, hey, do you want to take over this account because I'm just not getting anywhere. (Participant 5)

One participant broke the biased group down to an age group. She shared that the majority of men that she worked with had no bias because she was female. The exception was a group of men that were older than her by 10-15 years, who, she felt, were not as open to her.

I used to explain to people that in my career men that I've had success with are either older men that see me as their daughter and want me to succeed or men of my own age that see me as an equal because they've seen women in their field. And then there's this group that are like 10 or 15 years older than me that don't want me here.

(Participant 7)

The Career Growth Path at Life's Crossroads Remains a Challenge

This theme captures the sentiment that many participants expressed as they described their career journey. The participants emphasized that continuously challenging them in their respective professions through growth opportunities was essential to them staying in STEM professions. The participants also emphasized that as their personal responsibilities grew, particularly with having families, it was essential that they had good career options.

The participants acknowledged that their family and career choices impacted their ability to move up the corporate ladder at the same pace as some of their peers, but expressed no dissatisfaction with the workplace, despite implying their personal career sacrifices. There were four participants who expressed being limited in their career options at times in their career as they balanced family. Three out of 4 of these participants also worked part-time. While they did not fault the company, they did position their family work-life balance choices as career sacrifices. One participant expressed working in a biased environment early in their career, particularly during child bearing years. She emphasized having to work


harder to eliminate the negative bias that being a mother carried in the workplace at that time. She also mentioned having a paid maternity leave, albeit a shorter amount of time than the unpaid time under the Family Medical Leave Act.

I had a lot of limitations...I only had 6 to 8 weeks paid time off. And I think that now it's more accepting to take a nice long maternity leave...When we had our kids 23 years ago, we worked even harder so that no one would have ever said, oh, she had a, she became a mother now and she's not going to be committed. (Participant 3)

A workplace that offers a challenging job with variety, and where growth opportunities are apparent, is essential for motivation to stay with a company. The exception to the rule is when family priorities (young kids, being sole wage earner) trump the individual needs. Whereas performance-based culture and performance-based salaries seem a little more transparent now, career growth seemed still like a struggle. Participants were generally satisfied with their success, but some of the growth aspects seems to be a guess. For example, as this relates to reputation, some cited navigating politics as a barrier. Those who made the choice to go part-time often spoke of the assumed career growth options limiters, whether in the form of lack of promotions or lack of the best projects. Still others emphasized the changes in their schedules they made when having children. This theme had the most variable data. Everyone talked about the importance of growth, but no clear recipe seems to exist. Women STEM professionals ideally want to be employed in a challenging job while ensuring their priorities as a parent and spouse are met. They want to continuously grow.

Additional Data Collected

Non-Linear Participants



Tip: Avoid back-to-back headings without any text in between. To fix this, write a short introduction for the section.

Four of the 20 participants had non-linear careers. A non-linear career path is defined in this study as a career path where the participant left the STEM workplace for more than 26 weeks and then returned to continue working in a STEM field. As this data set is small, future research may be required to further validate the data collected in this study.

Three of the four participants left and came back because of deciding to stay home with children. All three of these participants were engineers. All three transitioned as part-time workers at some stage as part of easing their transitions. The fourth participant lost her position as result of downsizing and took 6 months off before returning to work. She was in science and was full-time her entire career.

There were no differences in what motivates linear participants versus non-linear participants. The responses of non-linear participants reflected the selective codes and theoretical codes with regards to motivation to stay in STEM. As with all of the study participants, the non-linear participants emphasized family priorities. The non-linear participants did emphasize workplace policies, relationships with their direct manager, and staying connected to their network as factors that helped ease their transition back.

Two participants that left and came back emphasized their priorities and values they shared with their husbands in having one parent at home when the children were young. One of these engineering professionals left and came back twice, the second time being away for seven years before returning to work full-time.

They both emphasized their satisfaction with their life and shared a common-spirited sentiment that women can have a challenging STEM career and be fulfilled as a parent too. Similar to linear participants, the participants acknowledged that their family and career choices impacted their ability to move up the corporate ladder at the same pace as some of

Tip: All paragraphs should contain 3-5 sentences that support a single idea.

their peers, but expressed no dissatisfaction despite expressing making career sacrifices. They saw their career sacrifices as choices they made because they wanted to, not because the opportunity was not there.

(you know) I think it's good to see the girl, (you know) the young girls coming up through the ranks and you hear people want to have it all. You can have it all. But sometimes you have to put things on a scale of priorities. You can have all of it but maybe not a hundred percent of all of the time, you know? And my 100% may be a lot different than another person's hundred percent. And balancing and making sure that you stay happy and (you know) that not everything's going to work right all the same time. Women need to understand that you can set the balance depending on the situations in your life and your interest. (Participant 9)

Another non-linear participant shared her perspective on opportunities with work and balancing home priorities.

The whole thing about glass ceilings and all that. I just, in my personal situation I didn't see it. I feel like the reason I didn't move up as fast as others, (you know) men my age, is because I made the choice to stay at home and be with my kids. Which I'll never regret. You just have to make the right decision for you at the time. And we are smart women, and we can make opportunities. (Participant 20)

Participant 4 shared that there was really no question that she would come back to work after having children either time. She mentioned that her support structure at home helped with the decision.

I thought I would definitely come back to work. I just, I like it. But if I came home and had to do 100% of the cooking and cleaning and taking care of the kids and

picking them up and dropping them off and all that?...I would definitely be limited to what I could do at work. (Participant 4)

Participant 11's reason for leaving and coming back was different from the other three non-linear participants.

My entire team was outsourced. So I was pounding the pavement looking for another job. And at that time I realized I really didn't want to pursue a career in the same industry. I have to go back to work because I need benefits. (Participant 11)

Three of the four non-linear participants came back to the same company or same parent company. There were two items mentioned by at least half of the participants that helped their transition back. One was keeping her network alive while she was out of work, and another was being able to come back to work part-time at first.

I took two leaves. In both cases, I was working, (where) I think I was working for the same manager. But he made it very easy. He was very flexible. Let me have some flexibility to kind of return back to work part-time and then eventually to full-time. (Participant 4)

One participant joked that when she was called by her company to come back for a temporary and part-time assignment, she never planned to still be working for them, now full-time. She emphasized that part of the reason she felt confident coming back was that she was coming back to a network that she knew and that knew her work. A key component of her coming back was that she kept the network with this company alive while she was not working there.

I always kept in touch with the <company> after I left. And then when there was an opportunity where they said hey, do you want to come in and work for two weeks and

help us out? ...And I took it, and I tell several people it's been the longest two weeks of my life. That was back in (the early 90s).... I was going back to a company and to colleagues that I knew. I knew how they worked. I knew what their expectations were. And they knew me. I was going into a very comfortable zone. (Participant 9)

Similarities and Differences Across Demographics

There were some trends in age groups and in STEM Profession Types where the data may prove interesting for further research. There seems to be a factor, either in society or in the workplace, that changed within the past 25 years that helped women integrate their life and work priorities better. This trend is potentially more prevalent for Engineering and Science professionals, although the data set is relatively small. The motivations later in participants' careers included a split between professional types. Again, the data set to compare is relatively small, making this an option for future research.

There were seven participants, who, when asked about hostile environments, answered that they experienced hostile environments generally in their early career, but did not view their current work environment as hostile. Every participant who answered in this fashion was at least 25 years into their career. No other participant interviewed agreed that the environments being hostile early in their career was more the norm than the exception.

Each STEM professional type represented in the response that early in their career, a hostile environment was the norm, with Engineering having the highest response with 3, Science second with 2 and both Math and Technology with 1. Table 3 includes these results, comparing responses with those who did not experience a hostile environment or who have

Table 3

Summary of Results on Experiencing a Hostile Environment

STEM Profession Type	Total Years in STEM
Experienced hostile environment early in career	
Engineering	25-30
Science	25-30
Engineering	25-30
Technology	>30
Science	>30
Math	>30
Engineering	25-30
Never experienced hostile environment in career	
Math	15-20
Math	15-20
Technology	20-25
Engineering	15-20
Engineering	10-15
Technology	10-15
Engineering	>30
Observed hostile environment in pockets of industry or company sub-cultures	
Science	>30
Technology	10-15
Math	15-20
Engineering	10-15

Tip: Limit a table to a single page.

experienced a hostile environment in industry pockets or subcultures. There was no vignette mapped during open coding for two participants that directly correlated to one of the categories in the table. All of the participants who expressed career sacrifices being needed to maintain a work-life balance were Science and Engineering professionals at least 25 years into their careers.

When asked about motivations that changed over the course of their career, the professionals that leaned more towards compensation as a motivator were Engineers. The professionals that leaned more towards culture were Math and Technology professionals. Science professionals were motivated by both compensation and culture later in their careers. References to the impact of politics were made only by participants who spent time working in large companies.

Support at Home

Several participants emphasized that a factor in enabling their success in the workplace is a strong home support structure. Some emphasized their personal relationships with sisters, brothers, fathers, or spouses who were also in STEM careers and the camaraderie that offered them in their personal lives when discussing work.

My family was very supportive. (you know) I have to credit my parents. They had six kids, three girls and three boys and they never treated the girls any different than they treated the boys. And so (you know) when my sister and I both said we were going to math majors, that was perfectly acceptable to them. (Participant 2)

A few participants stated during the interview that they were surprised there was not a question on support at home because their husband's support was a key factor to them.

I have a very supportive husband...we balance both of our careers.

And I think that that's an absolutely huge contributor to whether women stay working or stay dedicated to their fields and dedicated full force, is what's their support structure like at home. (Participant 7)

One participant mentioned that maternity leave and staying home when the kids were young was not a huge consideration for her because of the flexibility of her husband's career.

My husband stayed home when the kids were little. Every time I would take my maternity leave and then he would take off up to a year because he could do that. (Participant 12)

Societal Factors

Other data that transpired as a result of questions in changes over time in the workplace were very specific to changes roles of women and men in society. Societal factors that have influenced the environment both at home and at work for women to pursue and stay in challenging STEM careers may be an area for future research.

I think the men in the technical engineering environment have come a long way to respecting women when they come back part-time or even full-time with kids. And now that the roles at home are changing, I think men have a better idea what it takes to work outside of the home but still maintain the level of family that all families need and kids need today. (Participant 9)

One participant reflected during the interview that perhaps as women were having children later now, they had time in the workplace to demonstrate their value early.

I was 9 years into my career before I even got married. And 12 years in when I had a child. So at that point, it's probably harder to hang it up when you've already had success. And you see the earning potential. (Participant 18)

Conclusions

This chapter contains the results of the analysis, connects the analysis back to the research questions, and demonstrates consistency of the analysis with grounded theory methodology. Twenty participants were interviewed for this grounded theory methodology study. Interview questions were structured to understand what factors contribute to motivating the modern woman to stay in STEM professions long term. All participants were women with a minimum of 10 years of experience in STEM professions. Four of the 20 participants had non-linear careers, as defined in this dissertation as a career path where the participant left the STEM workplace for more than 26 weeks and then returned to continue working in a STEM field.

Consistent with grounded theory methodology, there were three levels of analysis, open coding, selective coding, and theoretical coding. Forty two codes emerged from open coding. Constant comparison analysis was exercised using mind-mapping and NVivo 10 software to discover nine selective codes, emerging into categories from the open codes.

Additional constant comparison analysis was used to discover the relationships between and within the open and selective codes, leading to five themes. The five themes resulting from this study summarize the contributing factors that motivate women to stay in STEM professions long-term: (a) Interest in STEM is the Constant as Individual Needs and Priorities Change, (b) Direct Manager Influence on Development is Critical, (c) Performance-Based Workplace Policies and Culture are Continuously Sought, (d) Moving Towards a No-Bias Workplace Remains Important, and (e) The Career Growth Path at Life's Crossroads Remains a Challenge.

Briefly
summarize
the key
findings.

There were no differences in the factors that contribute to a woman's decision to persist in STEM professions via a linear career path versus a non-linear career path. Additional data on the similarities and differences discovered across demographics, how support at home contributes, and what societal factors contribute are also found in this chapter. While great strides have been made in creating good opportunities for women in STEM, it is evident in the research results that there is variability in how participants manage career growth while managing family priorities. Chapter V includes the summary for the critical analysis and discussion on the five themes.



Bridge to Chapter V.

Tip: The length of Chapter IV varies, depending on the type of study and nature of the data.

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