

Software Practitioners Dropping-out: A Research Proposal

Abstract

This paper proposes an exploratory study to determine why some computer science or software engineering graduates abandon their careers in software to pursue radically different paths. While these people may be experiencing a generic mid-life crisis, is it possible that the tremendous technical focus of their work means they are ill-prepared for the senior roles on offer, roles that involve interpersonal as opposed to technical skills?

1. Introduction

For university educators in the computer science and information systems fields, the need to produce employable graduates is vital. To that end, much work has gone into understanding the skills potential employers require of graduates (Trauth, Farwell and Lee 1993; Lee, Trauth and Farwell 1995, p.247; Sawyer, Eschenfelder, Diekema and McClure 1998; Shi and Bennett 1998; Noll and Wilkins 2002). The impression given by industry is that it wants graduates who can hit the ground running and be productive as soon as possible.

As well as canvassing industry directly, researchers have also studied the job adverts for computer personnel. These adverts emphasize the technologies required without much regard for the soft skills or the potential of the candidate to develop into senior roles (Litecky, Arnett and Prabhakar 2004; Downey 2007; Downey 2008). Given the emphasis placed on specific technologies by industry, it is no surprise to find that computer science and software engineering programmes are weighted towards technical subjects.

However, there seems to be little concern for software developers in the years following graduation. Studies in traditional engineering disciplines show how important hands-on technical work is to engineers. For instance, Bailyn and Lynch (1983) report that “the unambiguous and immediate gratifications obtainable from solving concrete technical problems” (p.281) are key motivators. This love of technical work has also been seen in the software world (Gallagher, Kaiser, Frampton and Gallagher 2007; Downey 2009). In fact, so strong is the interest in technical aspects that none of the managers interviewed in Downey’s study (2009) expressed any staff motivation issues.

However, Allport’s warning that “[w]hen skills are mastered they have no longer any motivational character” (Allport 1937, p.247) is very relevant to software developers. Once expertise is acquired in a particular language or technology, the developer will want to move on to a new area. This is shown by a tendency towards what Schein (1990) calls a ‘circumferential’ career path. Thus software developers have been seen moving from group to group within an organization in order to learn new technologies (Downey 2009). If such opportunities do not exist within the organization, then software developers will move to other companies. For instance, Gallagher et al discovered that if their informants “had to do the same work for an extended period, they would rather change jobs or even work for another firm” (2007, p.17).

Unfortunately, such a circumferential career path is not sustainable. Although “[i]n most professional fields experience makes a difference” (Shapiro 1985, p.169), there is a perception in the software industry that experience in previous equipment, languages or operating systems is not valuable (McGovern 1998). Thus a middle-aged programmer learning a new language or software package will be perceived as offering similar value to the organization as a graduate developer. As well as being in competition from recent graduates, the software developer who stays too long in a programming role will also find competition from experienced people in low-wage economies.

Therefore highly skilled technical workers are forced into managerial or customer-facing roles that they are ill-prepared for or which do not suit their personalities (Downey 2009). For instance, people with Asberger's syndrome can make excellent programmers, but lack the people skills needed for the other roles (Silberman 2001). Alternatively, software developers leave the industry, returning to academia or embarking on radically different career paths.

Given this general agreement that a technical role only lasts through what Dalton, Thompson and Price (1977) call stages I and II of their careers, there seems to be a problem in the transition to stage III. In other words, software people have difficulty going from achieving through their own efforts, to achieving through the efforts of others.

Of course this stage transition problem may simply be a generic mid-life crisis. According to Golembiewski (1978) this "is a pivotal time between two more stable periods, which period usually peaks in the early 40's. The transition can be smooth or turbulent. The central issue is the disparity between what has been achieved and what is desired" (p.217).

However, Golembiewski cites rapidly changing technology as contributing to the confusion experienced at this point, so software developers, being close to these technology shifts, may have an increased "sense of being out of control over central life events, of being the acted-upon rather than the actor" (p.218).

Given the lack of research on mid-career software developers, this paper proposes an exploratory study of people with computer science or software engineering degrees who have dropped out of the industry and are now occupied in totally different ways. The research question being: why do well-educated software developers leave the profession?

2. Theoretical Background

Because this is an exploratory study, interviews are suggested to gain insights into this phenomenon. This is one of Lethbridge, Sim and Singer's "inquisitive techniques" (2005). A grounded theory approach will be followed in that no pre-conceived hypothesis is postulated that might bias the findings. Or as Strauss and Corbin (1998) advise, the process will be one of building rather than testing theories.

Following Miles and Huberman's (1994) recommendation that a data collection instrument must be designed and, at the same time must not be completely prescriptive, a semi-structured interview seems a sensible compromise. However, there is a serious issue: how to design an interview instrument that captures all the necessary data, without knowing precisely what data needs to be collected.

Downey's (2009) previous work on software skills also used interviews to elicit data. In that study, Bandura's social cognitive theory (1986) provided the theoretical framework on which the interviews were based. Given that this new study also concerns individuals, it is expected that social cognitive theory will be applicable here as well. This theory postulates that a person is influenced by three factors: their personality, their behaviours and their environment, with these factors affecting each other reciprocally. Designing an appropriate interview instrument, based on this theory, involves identifying aspects of personality, behaviour and environment relevant to the overall research question: why do well-educated software developers leave the profession?

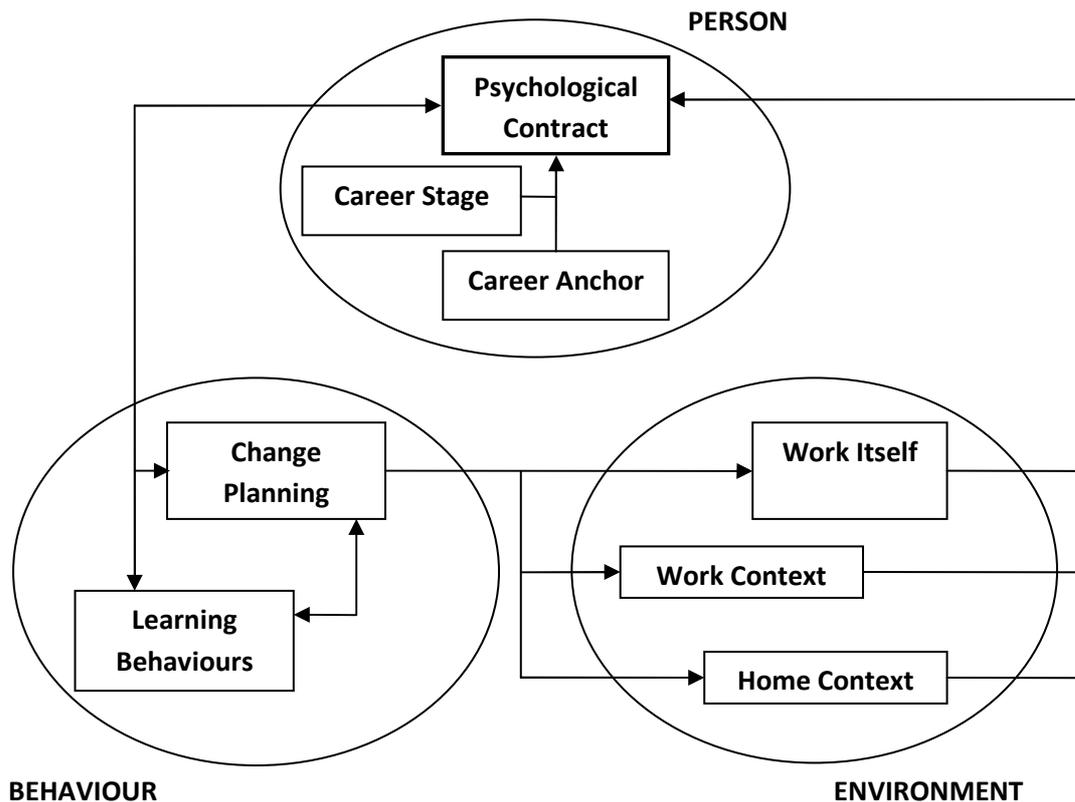


Figure 1: Social Cognitive Theory

Personality

Why does someone leave an organization? An important factor could be a perceived breach in that person's psychological contract with the organization (Meland, Waage and Sein 2005). A psychological contract concerns the expectations an employee has of the place s/he works as well as the expectations the employer has of the employee.

Such a contract is implicit and can be quite dynamic (Kolb, Rubin and McIntyre 1974). Agarwal and Ferratt's (2000) research suggests that a person's career anchor (Schein 1990) as well as their career stage (Dalton et al. 1977) will influence the psychological contract. For instance, it has been observed that people with a technical career anchor are "often found in systems programming, applications programming, and software engineering positions" (Igbaria, Greenhaus and Parasuraman 1991, p.162), whereas those with a managerial career anchor tend "to

cluster in such positions as systems analyst, project leader, and computer manager” (p.162). Thus the move from a programming to a project leader role may cause two changes in the person’s psychological contract. In one sense, the move could upset someone with a strong technical career anchor while, at the same time, fulfilling a need to move to the next career stage.

For the purposes of this research, the psychological contract between the individual and the software industry in general, as well as the person’s perception of self need to be explored. Thinking of this in terms of Maslow’s hierarchy of needs (Maslow 1970): was work in the software sector contributing to the person’s sense of esteem or feelings of self-actualisation? Or had it simply become a way of paying the bills?

Another useful area to explore would be the person’s original career motivation – this would also help to understand any subsequent breaches in the psychological contract.

Behaviour

“As open systems, human beings as well as work organizations, need to grow and develop” (O’Connor and Wolfe 1986, p.64). Despite this, change is difficult and people tend to resist it. According to Schein (1999), there are three steps to making a change. Firstly, the motivation for change must be created – the person must realize that something is wrong with the status quo. There must be a feeling of survival anxiety, where the person feels s/he will not survive unless s/he changes; or a feeling of guilt, where s/he feels that important goals will not be achieved without change. Change tends to be resisted and the person needs to build up the confidence to overcome anxiety about learning new ways.

The second step is learning new concepts and new meanings for old concepts. This is done by identifying new role models and starting to imitate them. A lot of trial and error learning is required at this stage. Finally, the new concepts and meanings have to be internalized – i.e. incorporated into the person’s self concept and identity, as

well as into ongoing relationships. In some occupations, the person may be expected to undergo some sort of rite of passage before being admitted into the new role (Trice and Morand 1989).

Thus changing careers is something that requires planning. Handy (1994) argues that change cycles span two or three years and recommends research into the next cycle well before action needs to be taken. So it would be expected that anyone who has made a major career change has planned it. The interview needs to explore the point where the person has realized that something is wrong with the status quo and has experienced survival anxiety or guilt. Then the steps taken to research their new career have to be teased out.

Learning behaviours may also offer insights into the person's willingness to change occupations. It has been shown that people who lack confidence in their ability to do one job will be less likely to abandon it for another, different form of occupation (Otto, Dette-Hagenmeyer and Dalbert 2010). However, if the person receives training in the new role (perhaps by attending a night class or signing up for a distance learning course) they might gain the confidence to make the transition. Similarly, exploring a possible career change might cause the person to re-evaluate their psychological contract and conclude that there are worse things out there than their current role.

Environment

There is widespread agreement that it is the work itself that provides the main motivation for employees (Herzberg, Mausner and Snyderman 1959; Vroom 1964; Hackman and Oldham 1980; Thatcher, Liu and Stepina 2002). A decision to leave the software industry could come about because of boredom with the work (the person has achieved mastery of a particular technology and there are no opportunities to move to different technical work (Allport 1937)) or a change to a new role that does not engage the employee as much as technical work (e.g. management or sales roles).

Other work-related factors could be a lack of training and continuous professional development (Sumner 2001), or even the lack of social supports – i.e. supervisor and co-worker supports (Yoon and Thye 2000). However, an increasing concern, at least in the information systems world, is the affect of burnout on the individual (Moore 1998). Therefore, both the work itself and the work environment need to be explored to identify factors contributing to the person’s decision to leave the industry.

Of course the person’s home environment can come into play as well (Bailyn and Lynch 1983; Scholarios and Marks 2004). Changes in family circumstances, such as marriage, the birth of children, divorce, or the need to care for sick or elderly relatives can all influence a person’s decision to change career – particularly if the career places significant demands in terms of long hours and extensive travel. Indeed, Heppner and Heppner’s research (2009) suggests that the stress associated with traditional male roles may contribute to the seven-year shorter lifespan men can expect on average.

3. The Interview Instrument

The people selected for interview will be those who have:

1. Obtained a third-level degree in a software-related discipline – e.g. computer science, software engineering or information technology. This study is concerned with people who have made significant educational investments in their software careers (Becker 1975). Because the barriers to obtaining software employment are low, unqualified individuals who have knowledge of a particular technology can easily obtain a software development role. However, because of their limited educational investment, leaving the industry at a later stage is not a significant issue for them (Joseph, Ang and Slaughter 2005). Such a person “is characterized by retraining, continuing education, and transitions to different occupations” (Otto et al. 2010). This is called a ‘protean’ career path – the “term is derived from the Greek god Proteus, who

could change shape at will” (Hall 1996). These people - who have dipped into the industry for a time - are not of interest here.

2. Taken the above course because it is their first choice. The reason for this is an attempt to control against generic mid-life crises. If a person was unable to do what s/he really wanted – because of parental pressure or being unable to meet the entrance requirements – then s/he is more likely to decide later in life to pursue the original goal. The people required for our study should have had a genuine interest in computing at the very start.
3. Worked as software developers. This reflects another investment in a software career – the apprenticeship, or experiential learning phase.
4. Are now working in a totally different area, both in terms of role and business – i.e. they no longer work in the software development arena.

It is anticipated that these people will be found through the network – former colleagues who have moved on to non-software work. Preliminary investigation reveals stories of software developers becoming house husbands, working as porters or being employed in the leisure industry. These people will be approached to take part in the study.

The key behavioural event in this study is the transition from being a software developer to something else. Thus, we need to understand the personal and environmental circumstances of the informants before and after the change. To make the interview flow in a logical fashion, a chronological approach is appropriate. The interviewees will be guided through three stages of their lives as follows:

1. Original Career Choice

- What attracted you into software development in the first place?
 - Did you think you had an aptitude for this sort of work?
- Did you consider other alternatives?
 - What would you have really liked to do?
- Did early work experiences live up to expectations?
 - What sort of goals did you have back then?

- What was it about software work that you liked?
- Were there any sacrifices involved – long hours, travel?

2. Decision to Change

- Roughly how long were you working in software when you decided you needed a change?
- Was there a moment or specific incident that made you re-evaluate your career?
 - Change of role at work?
 - Change of boss, key co-workers?
 - Redundancy?
 - Changes in family circumstances?
 - Gradual dissatisfaction with the job?
- How did you go about making the change?
 - What options did you feel you had?
 - Did you have any support in deciding what to do next?
 - Did you expect that a time would come when you would have to consider a career change?
- Why did you choose a non-software role?

3. Current Role

- How does your current role fulfil expectations?
- How does it compare with your original role?
 - Financially?
 - Socially (work-life balance)?
 - In terms of personal satisfaction?
- If you could rewind the clock, would you have been better off opting for this role at the start of your career?
- Do you feel qualified for your new role?
 - Have you completed formal courses?
 - Have you gone through any rites of passage?
- How have your ambitions changed over time?
- Is this a temporary position?

- Do you foresee other changes in the future?

Relating the questions above to the theoretical background given earlier, it can be seen that the psychological contract is being explored at both the original (software) career stage and at the current stage. Also, some feeling for the person's career anchor should be obtained by comparing the attractions of software work to those of the new role.

The only behaviour the study is concerned with is the actual career change event and this is explored in depth. It will be interesting to see if this change is time-related – a gradual realization that software work is not satisfactory – or due to a cathartic event, such as redundancy or a change in family circumstance. Another important insight concerns how the person went about exploring the options available and preparing for the change.

The environment is crucial to this study. It is likely that the decision to change will be influenced by changes in either the work or domestic environments. Indeed, an environmental upheaval might just be the catalyst to set the person on a new path. For instance, employment in a secure, well paying software role might be enough to offset growing feelings of discontentment with the job. However, if that company shuts down, the option to change careers may be a viable alternative to finding a similar role in another company. In other words, a situation may arise that creates "survival anxiety" (Schein 1999) and triggers the change process.

Once the decision to change is made, how the person chooses a new path and makes the steps to become qualified for that path are of interest. How easy is it for someone to change career? Is it necessary to make a similar investment in preparing for this new career as they did for their original, software developer role?

Finally, the sense of self after the transition must be related back to the psychological contract and the person's career anchor. Is this new role a better fit for

that person? Or is this only an intermediate step to an ultimate goal? Was the interviewee in control of the change process – resigning from software development because the role was not fulfilling their higher-level needs (Maslow 1970)? Or was s/he forced into change through environmental circumstances – the need to care for relatives, redundancy, job stressors, etc. In these latter circumstances, it is possible that the new role is not ideal for the person, but is the best possible in the circumstances.

4. Possible Outcomes

Being an exploratory study, we cannot predict the outcomes of this study. The hope is to learn why the informants have made a radical change in their career paths or as Patton (1987) put it: “[t]he mandate of qualitative methods is to go into the field and learn about the program firsthand” (p.17). In the worst case scenario, it might become obvious that radically different environmental factors triggered these changes. However, it would be interesting if there is something inherently lacking in the software developer’s career that prompts people to leave the profession, despite having invested so much in getting into it in the first place.

If there are particular criticisms of the software career coming out of the study, these can be fed back into both academia and industry, in order to address possible deficiencies in undergraduate curricula and to inform companies on how software people need to be developed throughout their careers. Golembiewski (1978), for instance, recommends that the person’s employer needs to “assume primary responsibility for helping directly with the mid-life transition, and especially for funding ameliorative efforts” (p.221). Fast-paced software organizations might not appreciate this and, as a result, not give sufficient support to their staff as their needs change.

Similarly the outcomes can help individuals make early career choices. For instance, it might be the case that particular career anchors are totally unsuited for software work.

Another possibility is that people could be ideally suited to technical work, but are not compatible with senior roles in the computing industry. Transitions to people-oriented roles, like management and sales, may not suit those who lack communication and collaboration skills. It would be interesting to learn what choices those with strong technical/functional career anchors make to avoid management roles. It has been seen that opportunities on the technical career ladder in subsidiaries to large multi-nationals involve extensive people-interaction and sometimes management responsibility (Downey 2010). The findings of this study could inform a revised technical career path that would suit technical people better.

If there is a common thread to these interviews and a plausible theory emerges, it will not be easy to follow up with a quantitative study. For instance, to poll a representative sample, researchers would need to know how many people have given up professional software employment. While universities should have figures relating to their software graduates, their alumni associations may not have as accurate a picture of what all these graduates are doing today.

Such a study would also need to consider other professions. Are the factors identified for software people also relevant for those in other professions, or are software people unique in some way?

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