

Mainframes Are Not Going to be Replaced

Are There Enough Mainframe-educated People?

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Abstract

The mainframe workforce is dwindling as the baby boomers look to retire. The problem is we do not have enough mainframe-educated people to replace the retirees. A survey to businesses will show a continued need for mainframe education. Academic institutions and accrediting bodies may see from these results the need to adjust the curricula concerning mainframes.

Keywords

COBOL, curriculum, legacy system, enterprise system, mainframe

1. Introduction

There is a shortage of skilled workers in the Information Technology (IT) field when it comes to mainframe technology and languages [1]. The shortage is going to be magnified within the next five years when retirement aged people leave the workforce [11]. It is the hypothesis of the authors that businesses are not going to replace their mainframe technologies, but add to them. A survey to businesses will be analyzed to prove or disprove the hypothesis.

We will be using COBOL as our main example of mainframe technology. When we speak of COBOL, we are talking about mainframe COBOL. It has been thought in the past that COBOL is dying. That since it is dying it should not be taught or emphasized in education. This could not be further from the truth. COBOL is the most prominent language alive today [7].

The rest of this paper is laid out in sections. Section 2 summarizes related research. Section 3 states our research methodology. Section 4 concludes the paper and presents future work.

2. Related Research

It is the general consensus from many articles that the baby boomers are going to retire and leave the mainframe field and the younger IT people are not going to have the knowledge to fill the gap [1, 4, 14]. This could be destructive. Gartner states that more mainframes are being brought into play, particularly in non-mainframe businesses [6]. Also according to an AFCOM survey, Linux is being adopted on the mainframe [6]. It is not really an issue to hire people with mainframe skills right now, companies just are not finding young people with the knowledge or skills. This is becoming a crisis when mainframe business encompasses 95% of Fortune 1000 business and computer science graduates are not being educated about enterprise computing [5].

According to an article from 1999, the Army Air Force Exchange Services (AAFES) was the “eight-largest retailer in the world” [18]. They used a web-based interface that talked to a COBOL backend to create an internet segment of their catalog business. AAFES converted to an object-oriented COBOL to be able to operate on a PC and Web

level. Extending the COBOL to the web did not require a large personnel investment. The system was a huge success in handling the large number of hits. From Christmas-time in 1998 to May of 1999, the site had 16 million hits. The system was amazingly successful in terms of profit as well. The first year showed a ten percent increase and by the second it was 21 percent. By September of the third year, the web-based portion of AAFES' business was 31 percent. This is a great story of integrating the future with a legacy system that is 20-years-old.

One of the greatest assets COBOL has to offer is that it can be transformed. You can take a COBOL backend and allow it to talk to a web-based front-end. Transforming the COBOL data and processing to something that can be viewed and manipulated over the internet is a powerful thing. Being the "most successful language in the history of computing" [2], is a position a language holds when it is alive, not dead or dying. With an estimated \$1.5 trillion invested and greater than 30 billion daily transactions, COBOL is not going in the grave anytime soon.

Mike Murach states that "with tens of billions of lines of COBOL code still in use" [7] the question of COBOL being dead is silly. Every day billions of online transactions are processed by COBOL and the Customer Information Control System (CICS) program. Banks, airlines, insurance companies, and hospitals all use COBOL/CICS for the processing. For instance, when a customer uses an ATM machine or makes a purchase online of either a service or a product. Ninety percent of a COBOL programmers work is in maintenance and the other 10% is in new development. This alone should tell academia the continued need for COBOL education. Mike Murach is not suggesting COBOL should replace the Object-Oriented education of programs like Java or C++, but it should be taught side-by-side to round out the students' knowledge base.

Donald Carr and Ronald J. Kizior conducted a survey in 1999 to answer their hypothesis "to what extent COBOL will continue as a major programming language for business applications over the next 10 years" [14]. They surveyed 2965 institutions in the United States that would teach COBOL and 5000 employers who use COBOL. They received 3.7% response from the academic group and 2.8% from the employers group. They did send different surveys to each group to obtain the data related to that group.

Carr and Kizior tracked the business type, size of business in gross dollars, and size of business by employee number. They also tracked the size of the businesses by the number of IT professionals. They asked businesses how much and for what they used COBOL. Also the level of education they would want new-hires to possess, ranging from zero semesters to three semesters of COBOL instruction. They also inquired about their views on object-oriented or web-based features being included in education and the continued inclusion of COBOL in academia curricula. The survey to the academic institutions inquired about what languages were being taught and the potential changes in COBOL instruction. They also tracked the type of institution, the number of undergraduate students, and the number of graduate students.

A breakdown of the Information Systems (IS) managers view on the business usage of COBOL over the next 10 years [14] is in Table 1. Almost 90% of these managers believe that COBOL should continue to be taught in academia [14]. Nearly 50% of the academic respondents stated that a two semester COBOL sequence is required for graduation [14]. The academic view of continued COBOL education [14] is shown in Table 2. The IS managers that responded also stated that 50% of programming resources are directed at application maintenance [14]. New hires will more than likely be used to maintain COBOL-based applications [14].

Table 1

COBOL Usage Over Next 10 Years			
Same	Replace / Elimiate	Decrease	Increase
>45%	<15%	>30%	5%

Table 2

Length of COBOL Education in 5 Years		
Same as Current Length	Less than Current Length	To be Deleted
30%	28%	17%

Carr and Kizior did a follow-up study to trend the data and presented their finding at the COBOL Expo 2002 [15]. Their hypothesis question was "Will the COBOL language continue to be a major programming language for development of business applications over the coming decade?" [15 pg 8]. Response was solicited from 4700 businesses and 2000 academic institutions. They received 208 responses from businesses and 68 responses from academic institutions. A point of interest is 56% of respondents reported using COBOL, of those 60% reporting in

excess of 5 millions line of code and 30% reporting in excess of 20 million lines of code [15]. That is approximately 1.86 billion lines of code in this very small sample size of companies.

The IS managers were asked about their perception of the future. Over 35% of IS manager respondents stated there was a shortage of employees with sufficient COBOL skills [15].

Of the academic respondents, nearly 30% still require a two course COBOL sequence is required for graduation. This is a decline from the 28% reported in the 1999 study. Also, nearly 55% require a two semester COBOL sequence which is an increase from the 47% in the 1999 study. Table 3 shows the academic view of continued

Table 3

Length of COBOL Education in 5 Years		
Same as Current Length	Less than Current Length	To be Deleted
11%	47%	17%

COBOL education and we can compare this to Table 2. When asked about the likelihood of COBOL being eliminated from the curriculum in the next 5 years, 49.0% stated not likely, 39.2% stated possible, 9.8% stated very likely, and 2.0% stated that it is already underway. When asked about the likelihood of COBOL being replaced by another language, 40.4% stated not likely, 34.6% stated possible, 15.4% stated

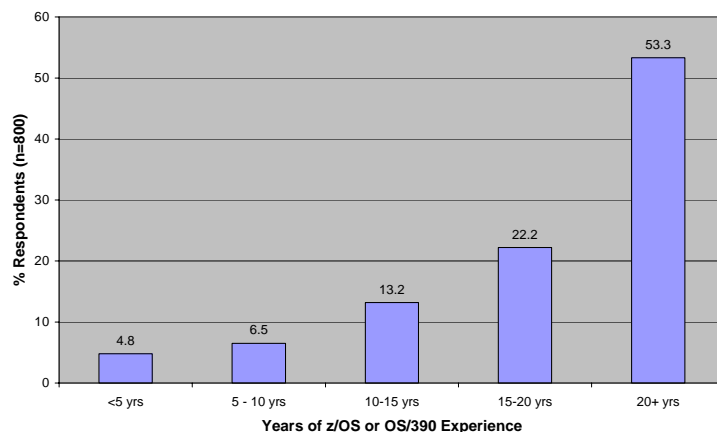
very likely, and 9.6% stated that it is already underway [15].

We see some problems with this research. In the 1999 study, Carr and Kizior surveyed businesses that “currently” use COBOL. In the 2003 study, they surveyed businesses that “may or may not” use COBOL. They stated that only 56% of the IS managers who responded use COBOL. They did not stay consistent. This has the potential to significantly alter the results. Not only looking at the statistics by themselves, but when compared to the 1999 study. Also, they did not break the data down into the size of the businesses or the size of the IS shops. The data should be compared to large, medium, and small shops. Comparing a small shops view on COBOL to a large shops view on COBOL is not relevant.

Fifty-three percent of mainframe workers have more than 20 years experience with z/OS or OS/390 systems (Figure 1) [13]. When these people retire, the mainframe industry will be in a crisis and academia is not listening.

Figure 1

53% of Mainframe Workers Have 20+ Years Experience



In an article by Roggio et al, they discuss the trend of COBOL in accredited IS programs [16]. They looked at seven universities that were up for accreditation by the Computing Accreditation Commission (CAC), which is one of the commissions of ABET [20]. Of these seven universities, two universities required COBOL, one university offered COBOL as one of the languages to be chosen from for the required

programming language, and the other four universities either did not offer COBOL or eliminating it from their curriculum [16]. ABET states in their criteria for accreditation that there “must be a cohesive body of knowledge to prepare the student to function effectively as an IS professional in the IS environment” [17 pg 9]. When COBOL is running in more than 70% of businesses worldwide [2] and there are approximately 200 billion lines of COBOL code in use [19], this tells me that mainframe should be taught in all accredited programs order to effectively prepare students. The IT professional have declared the “immediate and projected needs” [16 pg 8] for COBOL programmers, yet the research of Roggio et al clearly states academia is not listening. Roggio et al conclude by stating a crisis is near, only to be magnified by the retiring generation [16]. In fact, “... this has already started.” [16 pg 9].

3. Research Methodology

A short internet based survey will collect data from businesses with regard to the current technology uses and their perceived future technology uses. Demographic information questions will be asked to learn the size of the company and the size of the IS department. This survey will identify the need not only for mainframe and enterprise education, but for the education of bridging software. We will divide the results into three categories by size of IS shop and analyze the significance of the results based on the category. By separating the data into small, medium, and large categories, we will not have the problem of comparing small shops with no need of mainframes to large shops that are mainframe dependent. The other research presented their data in percents and medians. We will do this also but expand it to show the mean, standard deviation, and confidence interval. We would like a sample size of at least 30 respondents. Our survey audience will be those who have access to the Association of Information Technology Professionals (AITP) website.

4. Conclusion

Mainframes are not going away. There is a gap between what the IS field is demanding and what the IS educational entities are supplying. The related research section of this paper shows the demand for mainframe technologies, specifically COBOL. It describes the massive amount of code that is being generated and maintained. But the number of skilled mainframe professionals is diminishing [4]. The studies [10, 14, 15] show that IS managers are sure there is a need for continued COBOL education. There is a real necessity for bridging software to be taught as well.

On the other side of the spectrum, the academic world still thinks mainframes are dying and therefore the need to continue offering and requiring courses like COBOL is dying. This could not be farther from the truth. Our future survey will show the absolute need for mainframe, enterprise education and the bridging software education to meet the demand of the IS field.

The future work will include the survey described in the research methodology section of this paper. Extensive statistical analysis will be applied to the data to determine the reliability and validity of the data and results. The mean, standard deviation, and confidence interval will also be found. We also want to find, as a corollary hypothesis, to what extent is the need for integrating or bridging software to be taught. We intend to show with our future work that there is a gap between the Information Systems field and the IS educational curriculum. This gap will be magnified then the baby boomers retire.

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