*Astronomical Data Analysis Software and Systems IX*
*ASP Conference Series, Vol. 216, 2000*
*N. Manset, C. Veillet, and D. Crabtree, eds.*

# A "Scientific" Approach to Software Project Management: Part II: Results of a Survey of Scientific Computing

A. F. Granados

*National Radio Astronomy Observatory* [1], *Green Bank, WV 24944-0002, USA*

**Abstract.** We present the results of a survey on software development.

## 1. The Survey

The "Software Development Survey" contained 32 questions on topics of Software Development and Process Improvement. It was distributed to 1998 ADASS attendees via their registration materials packet (Granados 1999). There were 60 respondents, 75% (45) of whom classified themselves as staff and 25% (15) of whom classified themselves as managers.

```
1.  How many people are in your software development group full-time?
    a. 1-3                                                      40%
    b. 4-6                                                      28%
    c. 7-10                                                      3%
    d. less than 10 but more than 20                            17%
    e. more than 20                                             10%

2.  How many people are in your software development group part-time?
    a. 1-3                                                      62%
    b. 4-6                                                       8%
    c. 7-10                                                      3%
    d. less than 10 but more than 20                             2%
    e. more than 20                                              2%

3.  Does your software development Group have a designated group manager?
    a. yes                                                      88%
    b. no                                                       12%

4.  Are you a:
    a. development group staff                                  75%
    b. development group manager                                25%

5.  Do you feel that management of your development group is:
    a. effective                                                37%
    b. somewhat effective                                       40%
    c. somewhat ineffective                                     12%
    d. ineffective                                              10%

6.  How many software projects are you working on concurrently?
    a. 1                                                        32%
    b. 2                                                        20%
    c. 3                                                        25%
    d. 4 or more                                                23%
```

[1] The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.

7. Would you describe your workload as:
   a. Overloaded, working on too many projects. 48%
   b. underutilized, working on too few projects. 0%
   c. well balanced 48%

8. Is your primary job description:
   a. researcher who does some software development 8%
   b. software development 47%
   c. software maintenance 5%
   d. software developer who does some research 40%

9. Is the software that you write written for:
   a. your use only 0%
   b. limited group use 27%
   c. extensive third party use 70%
   d. commercial sale 0%

10. What is the primary purpose of the software that you write
    a. Data Analysis 52%
    b. Data Archive/Database 25%
    c. Education 0%
    d. Computational Research 13%
    e. Hardware monitoring and control 10%

11. Which of the following software development models do you primarily use?
    a. Code-and-Fix 23%
    b. Waterfall 5%
    c. Incremental 23%
    d. Iterative 37%

12. Do you feel that the development model you use is:
    a. Very useful 32%
    b. somewhat useful 45%
    c. nominally useful 12%
    d. not useful 5%

13. If the development model you use is not useful, is it because:
    a. the plan itself is poor 15%
    b. the plan does not fit my product/project 0%
    c. the plan is not properly implemented by my group management 15%
    d. scientific programming is mostly R&D and is hard to constrain 55%
    e. The project does not lend itself to any development model 10%

14. Which of the following development process activities do you follow?
    a. Requirements 43%
    b. Design 62%
    c. Unit/Component/System test 43%
    d. Project Tracking Meetings 27%
    e. Code Review 20%

15. What method do you normally use to obtain requirements? (check one)
    a. Use-Case scenario sessions with end user 17%
    b. Explicit Requirements provided by end user 27%
    c. Informal Feedback from Workshops/Surveys/Users 42%
    d. Borrowed from existing products 8%

16. What method do you normally use to schedule projects?
    - a. Top-Down (completion date handed down) 35%
    - b. Bottom-up (Completion date determined by requirements) 60%

17. Is your project schedule:
    - a. A fixed completion date to aim for. 15%
    - b. A completion date with major milestone dates. 27%
    - c. A completion date with major and minor milestone dates 30%
    - d. I don't normally have a project schedule 27%

18. If your project is behind schedule, is it usually because
    - a. Requirements weren't properly defined 25%
    - b. Requirements have changed 25%
    - c. Insufficient Resources were allocated to the project 23%
    - d. The original schedule estimate was unrealistic. 22%

19. If requirement changes are needed during a project, are they generally
    - a. Included, and the scheduled completion date is delayed 45%
    - b. Included, and resources are increased (either more people or more overtime) to maintain the schedule. 2%
    - c. Excluded, the schedule must be met. 3%
    - d. Inclusion/Exclusion is determined by change management which balances product features, development resources and schedule. 47%

20. Are your software development projects normally:
    - a. delivered on time. 23%
    - b. delivered a bit late (10% over schedule). 27%
    - c. delivered late (20% over schedule). 25%
    - d. delivered very late (>30% over schedule). 2%
    - e. not scheduled so I don't know if they're late. 20%

21. From the list of software tools, please indicate those that you use.
    - a. Bug Tracking 33%
    - b. Project Scheduling 38%
    - c. Debugger 70%
    - d. Memory Leak Checker 38%
    - e. CASE Tool 20%

22. Which operating system is your primary development platform?
    - a. Unix 90%
    - b. Windows NT/95/3.1 6%
    - c. Macintosh 0%
    - d. VAX/VMS 2%
    - e. VxWorks or other real-time system 2%

23. Which is your primary development language? (check one)
    - a. C/C++ 66%
    - b. ADA 0%
    - c. Fortran 10%
    - d. IDL 5%
    - e. Pascal 0%
    - Java or Visual Basic (write-in) 19%

24. If you program in C++, what percentage of your programming is "true" C++?
    - a. 0% (I'm really a C programmer) 35%
    - b. 20% (I use the occasional C++ construct) 10%
    - c. 50% (Isn't C++ still mostly C?) 1%
    - d. 75% (I know about iostreams and classes) 7%
    - e. 100% (I build classes with ease and use true OO methods) 15%

25. Which is your primary scripting language? (check one)

| | | |
|---|---|---|
| a. | Perl | 33% |
| b. | Tcl | 14% |
| c. | Glish | 7% |
| d. | Unix shell | 15% |
| e. | Other__________ | 15% |

26. Which is your primary web language? (check one)

| | | |
|---|---|---|
| a. | Perl | 16% |
| b. | Java | 28% |
| c. | HTML/XML | 52% |
| d. | Tcl | 1% |

27. Which object oriented modeling method do you use?

| | | |
|---|---|---|
| a. | OMT | 11% |
| b. | Booch | 11% |
| c. | UML | 15% |
| d. | other_______________________ | 8% |
| e. | I don't use object oriented methods. | 45% |

28. Is your formal degreed education in:

| | | |
|---|---|---|
| a. | astronomy/physics/math/science, etc. | 75% |
| b. | Engineering (electrical, mechanical, etc.) | 18% |
| c. | Computer Science | 2% |

29. Please check your highest education level

| | | |
|---|---|---|
| a. | High School | 1% |
| b. | Two-year college | 1% |
| c. | Four-year college | 23% |
| d. | Masters Degree | 27% |
| e. | Doctorate | 48% |

30. Does your company/institute pay for continuing education: (check all that apply)

| | | |
|---|---|---|
| a. | scientific conferences | 87% |
| b. | computer/trade conferences | 47% |
| c. | engineering/trade conferences | 17% |
| d. | Computer software/hardware vendor training on/off-site | 42% |
| e. | Company does not provide continuing education. | 10% |

31. How many times per year do you receive continuing education/training?

| | | |
|---|---|---|
| a. | 0 | 5% |
| b. | 1-2 | 75% |
| c. | 3-4 | 15% |
| d. | more than 4 | 3% |

32. If you receive continuing education/training, what is the average cost of this training? (not including travel and ancillary costs)

| | | |
|---|---|---|
| a. | less than $250 | 22% |
| b. | $250-$500 | 23% |
| c. | $500-$1000 | 21% |
| d. | $1000-$1500 | 10% |
| e. | more than $1500 | 13% |

## References

Granados, Arno, F. 1999, in ASP Conf. Ser., Vol. 172, Astronomical Data Analysis Software and Systems VIII, ed. David M. Mehringer, Raymond L. Plante, & Douglas A. Roberts (San Francisco: ASP), 19