

Strategic recruitment of SAS Programmers: Wisdom or Folly?

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ABSTRACT

This paper compares and contrasts two very different recruitment strategies for SAS programmers used by Oxford Pharmaceutical Sciences (OPS).

The first, adopted in 2001, was to recruit graduates with no SAS knowledge into the company and train them via an external training facility and subsequent place them at client sites. The process from interview to recruitment is described in detail.

The second, involving placement of SAS programmers in-house, is still currently being used. The process from interview to recruitment is described in detail.

The merits, or otherwise, of the strategies are compared, and the use of contractors versus permanent staff is discussed.

The paper finishes with the ultimate formula for the SAS programmer.

BACKGROUND

It is hard to quantify the number of SAS® or Statistical programmers in the UK and Europe, but with the shift to technical solutions and the emphasis of quality from the regulatory authorities, there has been a huge growth for this discipline, especially in the last 10 years. Oxford Pharmaceutical Sciences (OPS) based near Oxford, UK was founded in 1996 and has been involved as a recruitment agency in helping find these SAS programmers both permanent and contract placement since 1999, and employing SAS programmers since 1997 for in-sourced projects.

The aim of this paper is to compare and contrast some of the OPS strategies, past and present, and to provide some insight into future directions: OPS as a company has used two particular recruitment strategies for SAS Programmers in the last 4 years.

The shortfall of SAS programmers in the industry was acute in the summer of 2001: demand was insatiable and the supply limited. In conjunction with Sheffield Hallam University, OPS embarked on an audacious recruitment drive: to find 15-20 high calibre graduates wishing to take a programming route and enrol onto the Sheffield Hallam University MSc course "Business Intelligence (incorporating SAS Certification)". All graduates would attend a 9 month intensive course in Sheffield and be taught SAS as a programming language, whilst learning other aspects of business intelligence, including knowledge management, information and knowledge dynamics in organisations, data warehousing, strategic management and managing peoples/teams. It was intended that these highly-trained SAS programmers would then be placed around Europe in the pharmaceutical market, whilst remaining as employees of OPS – consolidating their knowledge and helping clients achieve their own goals.

GROW YOUR OWN

GROW YOUR OWN – THE RECRUITMENT PROCESS

The concept of "creating" SAS programmers meant that to enrol graduates for that academic year, it was imperative to find suitable candidates in a very short space of time, hence an accelerated recruitment process was required. The university, Sheffield Hallam, was involved in every step of the process and helped choose the graduates for the course.

The advertisement to entice the best candidates to apply was placed in the New Scientist, considered as the best weekly journal read by a wide variety of science-based graduates. The timeframe was aggressive, with the candidates given only 8 days to reply and submit their CVs to OPS for consideration. Despite this tight deadline, over 100 CVs were received. The next crucial step was to reduce the number of CVs to a suitable number for interview. Prior to reviewing the CVs, the

management team identified the method and scoring system to be utilised: Each CV would be scored by at least 2 people (1 recruiter, 1 manager) based on the following cascading scale:

- Relevant experience
- Qualifications
- Any other pertinent details.

Clearly, any experience related to programming, or within the pharmaceutical industry, counted highly in the scoring system. Candidates with first degree grades of less than III were not considered. The subject of the degree was also scored – mathematical/statistical and life sciences or medically-related rated with higher scores than other subjects.

The recruiters from the agency focused on skills that may be characteristic of a SAS programmer. All the managers reviewed the CVs to ensure that the scoring was as objective as possible. One week after receipt of CVs and review of the average scores for all the CVs, there was a management huddle with the shortlist agreed and invitations were submitted to the 30 highest scoring candidates successfully through the CV stage to the interview stage.

All 30 candidates were requested to attend the interview at either a suite of offices at the Institute of Directors in London or Wolfson College in Oxford on the following day. A batch of tests was devised in conjunction with the market leader of psychometric testing, SHL^{® 1}, targeted specifically at assessing characteristics of a SAS programmer. Given that specific SAS skills could not be tested, it was critical to assess the likelihood of the candidates to be able to grasp the intricacies of SAS and hence their ability to complete the course and of being high quality SAS programmers.

The psychometric testing was designed to test the following:

- Verbal reasoning
- Numerical reasoning
- Logical thinking
- Self-check ability.

The test scores were compiled and compared to previous ratings (being validated scales) as well as compared within the group. Of the 30 candidates being interviewed, there was a SAS programmer already in the industry, looking to expand their SAS knowledge and obtain an MSc. This candidate's scores were of particular interest, since their SAS programming skills were well known to the interview panel: He already worked for OPS, and could potentially validate the scales applied to SAS programming in particular. Fortunately for the candidate, and OPS, he achieved the highest scores of all, and within the top 5% of any completer of the tests. This gave OPS the reassurance that the appropriate tests were being applied.

In addition to the tests there were group exercises, with several observers considering their reactions and interactions. Naturally, a series of 1 on 1 interviews were conducted that involved 3 managers and the Sheffield Hallam course tutor.

OPS were very clear in their objectives: All candidates needed to be of high calibre and indicate the drive and enthusiasm to endure 9 months of full-time education prior to the real world of programming.

Selection for job offer was based on test scores, performance at interview and in the group exercises. Of the 30 interviewed, only 10 were considered to be of a sufficiently high standard to offer for the course – of which 9 subsequently accepted and enrolled on the course, as employees of OPS.

GROW YOUR OWN – THE TRAINING

The 9 embarked on the course, and received training in every SAS module available:

- Getting Started With Enterprise Guide
- SAS System Essentials For Programmers
- CRM and EPM Overview
- V8: SAS Programming
- Advanced SAS Programming and Efficiency Techniques
- V8: SAS Macro Language
- V8: Building a Data Warehouse using SAS/Warehouse Administrator Software
- Building Applications using SAS/AF Software
- Static and Dynamic Solutions using SAS/Intrnet Software
- Applying Data Mining Techniques using Enterprise Miner Software
- Developing Server-Side Java based Applications

The business intelligence MSc involved modules in the following:

- Information and knowledge dynamics in organisations
- Data warehousing
- Data management and data quality
- On-line analytical processing
- Practices and principles for web systems
- Applications development

- Issues in consultancy and research
- Managing people and teams
- Strategic management
- Business intelligence: Tools and techniques
- Delivering business intelligence

Clearly, this course, whilst being fantastic for the SAS knowledge gained would not cover any aspects related to the Pharmaceutical industry. Additional modules were specifically written by OPS personnel to cover these aspects:

- Introduction to Pharmaceutical Industry
 - 1 day
- SAS Programming in the Pharmaceutical environment
 - 2 sessions (1 week, then a further 3 days)
- Introduction to statistical concepts and techniques
 - 2 days

The “SAS programming in the pharmaceutical environment” course was the personnel’s first introduction to the role of a SAS programmer, pharmaceutical data, and types of data to expect and how to report them. This intensive course was to ensure that all the grounding work from the MSc was brought together to show how the SAS techniques could be applied, and covered:

- Introduction to Biometrics
- Introduction to Statistical Programming
- Description of outputs
- Database structures
- Simple programming procedures
- Programming of standard table types (demographic, lab, AE, ECG and basic efficacy reporting)
- Typical SAS reporting tools: proc report, proc print
- Standard data types – what to expect and how to report them.
- Documentation required/Regulatory requirements

Another course was also written internally to cover some of the statistical aspects of the pharmaceutical industry that these SAS programmers were likely to experience, so they had the on-hand knowledge and mental equipment to deal with programming of basic statistical tests. This course was written and delivered internally by James McDermott and Nancy Barker. This course was specifically designed for these post-graduates, entitled “Statistics for the terrified”, was highly detailed and covered a large range of topics:

- Clinical trials
- Data types and measurement
- Descriptive statistics
- Graphical summaries
- Inferential statistics
- Hypothesis testing
- Analysis populations
- Primary and secondary endpoints
- Analysis methodology

Of the 9 graduates enrolled on the course with OPS in October 2001, all 9 successfully completed the course in August 2002 with the dissertation to be completed within 12 months of leaving Sheffield. One of the post graduates, who had previous experience within OPS, was immediately placed at a company using their new-found skills. The remainder worked in-house in the CRO on ongoing projects consolidating their SAS and clinical trial knowledge for between 3-9 months, awaiting appropriate placements as consultants.

GROW OUR OWN – THE VERDICT

This method of recruitment was incredibly successful in many ways because the personnel had a wide range of SAS skills, not always available in the pharmaceutical industry, making them developer material as well as the more practical hands-on SAS programmer. These skills are also portable to other industries should the need arise.

The course itself covered the full SAS curriculum for business, but significantly did not emphasise many aspects of SAS/BASE used by the pharmaceutical industry. Thus, the internal courses run were adapted to cover the essential aspects of SAS/BASE that all pharmaceutical SAS programmers need in their kitbag – basic setup of a study, data manipulation, macro language, encyclopaedic knowledge for SAS functions and fundamentally creating outputs.

The SAS curriculum was in addition to the Business Intelligence modules and there was little integration of SAS into the exercises for Business Intelligence. Therefore, SAS was rarely used in between SAS training modules. This had a de-motivating effect on the 9 since they felt they had had little practice with SAS and lacked confidence. The internal courses

were important to reassure them that their knowledge was not lacking. This shortfall in the course itself, relating to the lack of integration of SAS, was subsequently rectified by the university based on OPS' recommendations.

However, with success does come some potential pitfalls....you can lead someone to SAS programming but you cannot make them like it. Of the 9, ultimately two decided that SAS programming was not for them (despite being good at it!) and subsequently changed career paths. This reaction cannot be predicted, and this should serve as a warning to anyone sponsoring a course with the ultimate aim of gaining personnel in a particular discipline. By the time that the personnel became comfortable with working in the pharmaceutical industry, they had been on the OPS payroll and not placed at client sites for a total of 15-21 months, representing a significant investment for any organisation.

The changing requirements in the industry indicated more experienced personnel were now needed and many clients were no longer interested in junior consultants with fewer than 12 months experience. This resulted in the personnel working on in-house projects for longer than was originally envisaged with a resultant and unexpected de-motivating effect on the personnel, who had expected to be working all over Europe within months of finishing their MSc.

In hindsight, there were signs of changes in the industry – and the one thing you can predict about this industry is that it is ever-changing. OPS, as a service organisation, have to be able to adapt to industry changes very quickly, and this recruitment drive was fixed to the extent that we couldn't undo what we had started. However, the long term benefits are being realised – we have 3 fantastic personnel in-house and a further 2 on the payroll from this recruitment drive and they continue to grow and thrive with the company.

RECRUITING FOR THE CRO

The “one-off” major recruitment drive, described above, was to facilitate the recruitment of high quality SAS programmers on the payroll for placing at client sites as consultants. This can be contrasted with the ongoing “routine” recruitment for in-house personnel, for which I have been responsible for the last 4 years within OPS. Up to 2 years ago, my recruiting procedure was tactical rather than strategic: review of CV via a recruitment company (usually our own in-house agency), then a joint interview with one of the HR personnel, using a standard list of HR questions and a standard list of my own questions, plus additional questions based on the specific individual (maybe relating to some aspect of their CV or previous career). A test of skills would be via the in-house SAS test (written down) which would interrogate fairly basic data manipulation and reporting knowledge.

CRO RECRUITMENT: 2003 ONWARDS

Our requirements had been mainly for permanent staff up to 2003, with little need to recruit short-term contractors. The approach to recruitment had been sufficient for our (limited) needs. However, with a bigger influx of SAS programmers anticipated into the company and set to increase over the following year, it became clear we needed a more robust recruitment strategy to enable us to measure the personnel being recruited via objective scoring as well as the more subjective interview approach.

Hand in hand with our HR personnel, the process was devised to enable us to identify the best SAS programmers for in-house projects. There were 3 major items to the interview process:

- Brainbench[®]
- Belbin[®]
- Interview

The Brainbench² organisation has devised tests for many disciplines and is specifically designed for companies from all industries to select a test suitable for their particular job specification. Clearly, the crucial skill for a SAS programmer to be tested on is their SAS programming. Brainbench have a test centred on SAS/BASE. It can be setup such that the person tested does not receive the results, but instead the results are sent to the interested parties (i.e. the interviewers in this situation). This open book test has 40 randomly selected questions for which the candidates have a maximum of 3 minutes for each question. The results sent back give the following: An overall score, areas of weakness and strength, plus a comparison of their score compared to the whole test ‘population’. It is particularly useful to compare the Brainbench areas of strengths and weaknesses against the candidate's perceived strengths and weaknesses from the interview. Clearly, the combination of Brainbench test and interview responses give a structure for training needs should the candidate be successfully recruited.

The Belbin³ self-perception inventory is a short questionnaire which is designed to assess an individual's behaviour in a team. How people behave in different situations can be the difference between the success and failure of a project. As well as having a balanced team, it is useful for colleagues and managers to know the individual's characteristics. The Belbin self-perception inventory was devised by Dr Meredith Belbin. He categorised behaviours from many years of experience into specific types. These specific types and brief descriptions are indicated below:

Table 1: Belbin Team roles

Type	Label	Description
Action-oriented	Shaper	Challenging, dynamic Thrives on pressure Drive & courage to overcome obstacles
	Implementer	Disciplined, reliable Conservative, efficient Turns ideas into practical actions
	Completer Finisher	Painstaking, conscientious, anxious Searches out errors and omissions Delivers on time
People-oriented	Co-ordinator	Mature, confident Good chairperson Clarifies goals Promotes decision-making Delegates well
	Team worker	Co-operative, mild Perceptive, diplomatic Listens, builds, avoids friction
	Resource investigator	Extrovert, enthusiastic Communicative Explores opportunities Develops contacts
Cerebral	Plant	Creative Imaginative Unorthodox Solves difficult problems
	Monitor evaluator	Sober, strategic Discerning Sees all options Judges accurately
	Specialist	Single-minded, self-starting Dedicated Provides knowledge & skills in rare supply

This particular Belbin self-perception inventory comprises many questions for which the answers need to be graded. Each answer is considered as indicative of one of the types listed above and scored as part of that type. The scores are then totalled and cumulative scores available for each type. Usually, there are 1 or 2 types apparent within the scores – it is rare for the scores to be equal across the groups.

For each type, there are allowable weaknesses, which characterise the likely behaviour of that individual. These must also be taken into account when assessing the individual for how they may fit into the team.

The interview process is controlled to ensure candidates are reviewed consistently and fairly. There are always at least 2 people performing the interview, with standard sets of questions, supplemented by additional specific questions for the individual. Interviews for contractors tend to be shorter, as there is more emphasis on skills, and address urgent needs of the company rather than career and future needs of the individual. For contractors, the Brainbench and Belbin tests are still performed.

IN-HOUSE RECRUITMENT – THE VERDICT

Recruitment of contractors to fulfil short-term needs could lead to friction. The perception of 'no responsibility and better pay' must be counter-balanced with all the advantages of the employment (training, career development and stability). Project management at OPS is restricted to permanent staff to ensure consistency (where possible) with client interactions. So, any short-term advantages of extra resource for a limited length of time must be counter-balanced by the group dynamics and increased revenue generation. The classic "brain-drain" must also be avoided – many companies achieve this very successfully by ensuring the short-termism of the contractors. If they are retained for too long then they may become involved in long-term projects with high impact. It has been OPS' experience that this approach to contractor usage is both appropriate and, more importantly, respected by our clients.

In contrast to the summer of 2001, the pendulum is swinging in the industry, with the number of contractors decreasing in the big pharmaceutical companies in the UK as the urge to out-source to Europe and beyond is increasing. The balance of contractors and permanent staff has been cyclical in nature over the last 10 years, and only time can indicate whether the current decline in contractors will be sustained.

This strategic recruitment, by using standardised and objective methods has enabled the CRO to recruit SAS programmers of high quality. Moreover, we have external validated measurements to show clients, as required, to demonstrate technical skills. OPS continues to 'grow their own' within the confines of "routine" recruitment, using internal training courses as the training methodology – these include but are not restricted to: training days, peer-peer mentoring

and targeted goals and objectives to continuously expand each and everyone's SAS expertise. Recruitment of more senior personnel has incorporated personnel from a wider industry net (such as consultants, data management) allowing other skills into the group to enhance and develop the growing team.

SAS PROGRAMMERS – THE ULTIMATE FORMULA

A comparison of the 2 recruitment strategies indicates that the MSc route was a good long-term investment although very high risk. The SAS programmers' emergent from the course had a superior SAS skill set, but totally ill-equipped to apply it in a practical setting and required further training and guidance.

The pharmaceutical industry is demonstrating a dichotomy in programming. No longer are SAS programmers required to be knowledgeable about all aspects of programming for their job. As the large companies hone their software capabilities, the majority of output programming is reduced to the 'point, click and tick' aspect, with only a small percentage of time spent on novel programming. This type of programmer, a practical SAS programmer, requires organisational skills and regulatory knowledge.

However, the skills relating to software setup require superior developer skills, not just in SAS programming (and related languages to interface with Web technologies amongst others) but also awareness of the software development life cycle and the associated onerous documentation requirements.

Good written and verbal communication together with excellent time and project management skills are necessary for any SAS programmer.

Increasingly, statistical programmers, with a good grounding in Statistics, at either degree or Master's level are in demand.

WISDOM OR FOLLY?

The 2 recruitment strategies described above both served their needs in their own way.

The "one-off" recruitment strategy enrolled highly skilled SAS programmers into the company, and the subset that remained with OPS continue to develop their knowledge, both of the industry and their SAS skills. This strategy may well be continued further on a smaller scale, to recruit new statisticians into the company. It is unlikely this strategy would be used again for recruitment of programmers because of the risk element, shortfalls of the university course itself and the change in industry requirements.

The routine recruitment strategy continues to be used and works very successfully. Within this process, OPS are able to:

- Test for objectivity in skills and personality
- Check team-related abilities
- Identify programmer type:
 - Developer
 - Practical programmer

Once in-house, the programmers have the opportunity for further development, using in-house training activities.

The routine recruitment policy allows the use of contractors, but these must be kept to the minimum, to cover peaks in workload and for short durations only.

CONCLUSIONS

The Pharmaceutical Industry has a changing market for SAS programmers, and OPS, as a service organisation, need to adapt to those needs. There is a tendency for the practical SAS programmer to feel de-valued as their skill set is eroded by lack of novel programming and challenging SAS programming.

OPS, as an employer, is providing our SAS programmers with a broad-ranging skill set to supplement their own skills and enhance their career. This includes providing opportunities such as project management and involvement in management activities, as well as all employees having specific targeted goals and objectives relating to expanding and enhancing their SAS knowledge. All of these add value to the standard SAS programming activities.

Novel programming is often in the statistical arena, such as programming of efficacy outputs: Very few post-graduates with MSc Statistics take the SAS programming route, and veer towards becoming Statisticians instead. Those with MSc qualifications in Medical Statistics are highly valued as SAS Programmers.

All companies are developing their own internal courses to cover the short fall of educational institutions. What we need for tip-top SAS Programming does not really exist – a combination of statistical training, practical usage and development of SAS programs, plus the understanding of the Pharmaceutical Industry and the regulatory requirements.

REFERENCES

¹ SHL: <http://www.shl.com/SHL/en-int/>

² Brainbench: <http://www.brainbench.com/>

³ Belbin: <http://www.belbin.com/>

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