



**Presents
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**Focus on Grant Rule, Expert Software Metrics Practitioner
A CAI State of the Practice Interview
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Biography of Grant Rule

Grant Rule is a founder of Software Measurement Services Ltd, specialising in project and process appraisal, performance measurement, estimating, benchmarking and continuous improvement. Grant has some 34 years experience in IT. He is a recognised authority in using quantitative methods to continuously improve the quality of the software process and its products. Grant worked with Ken Dymond to introduce the Software Engineering Institute's 'Capability Maturity Model' into the UK, and helped bring to Europe the first public 'Introduction to the CMMI®' training. He has contributed to structured methods and to ISO standards, and helped improve the inter-counter consistency of counting practices for IFPUG and MkII Function Point Analysis. Grant is now leading SMS' mission to help clients deliver value to their stakeholders by implementing lean, more agile practices. Our interview between Grant Rule and Michael Milutis, Executive Director for the IT Metrics and Productivity Institute, took place in August of 2006.



CAI: Tell us a little about yourself, how you got started, and what you are working on today?

GRANT RULE: Originally, I worked for the Daily Telegraph, one of the early users of computing on Fleet Street back in 1972. I quickly discovered that I had an affinity for computing, which was something that I had actually fallen into accidentally. Eventually, I worked my way up to data processing manager and shortly thereafter, I entered the world of consulting.

It was during this time that I developed an interest in structured programming. Essentially, I felt that the world was split into two types of programmers - those who were disciplined and those who were not. I was interested in finding a more disciplined

approach.

Consequently, I started working for Michael Jackson – not the singer, but the inventor of structured methods such as Jackson System Development (JSD) and the Jackson Structured Programming (JSP) method. We did consulting and development work for a wide variety of organisations using the JSD and JSP methods and related systems development tools. I found myself in charge of a new application development facility performing fixed-price contracts for major companies such as banks and computer manufacturers. We utilised both real time and business world software. It was at this point that I came to the realisation that - despite all of the different methods available - few people in the industry were actually estimating properly.

This is what originally motivated me to start my own company with a small group of friends and colleagues. We wanted to build a company that was focused on measurement, estimation and software process improvement. We later joined together with a group of other small companies to form the Guild of Independent Function Point Analysts (GIFPA). The purpose of this group was to promote function point analysis, which is a disciplined approach to sizing, measurement and estimating.

I am currently the managing director for the same company I helped create over a decade ago. The name of the company is Software Measurement Services. We help software and IT organisations quantify their performance and improve their processes for delivering optimal value to their customers.

CAI: Why is software measurement so important? Why should IT executives care about this?

GRANT RULE: Various reports have shown that an overwhelming percentage of projects in the IT and software world fail in some way. Some studies cite failure rates of 3 or 4 out of every five projects. Either the projects overrun their budgets by significant figures, fail to adhere to their time schedules or fail to deliver their contracted requirements. Commercial organisations suffer financially from failed projects like this and, in the public sector, this kind of waste can get into the billions. Just think what else those funds could be spent on.

However, the argument for software measurement and software process improvement should revolve around more than just money; it should include quality and reliability, too. If the computers on the London Stock Exchange were to go down it would not be long before the entire economy would come to a grinding halt, with all the practical and social effects that would have. That's just one example, but many software failures have social as well as financial effects.

Faulty or poorly constructed software puts everybody at risk. There have even been instances in the medical field where software has killed patients – thankfully, that number has been relatively few. Nevertheless, for this reason alone people should take an interest in developing a more professional approach to the engineering processes behind software production.

CAI: How would you quantify the difference in performance between organisations that are developing software effectively and those that are not?

GRANT RULE: Benchmark data consistently shows that there is a difference of three orders of magnitude separating the productivity and speed to market of the best and worst performing software companies. This makes choosing the right software company all the more critical.

Some of these disparities in performance result from disparities at the individual level. It's well known in our industry that a good programmer is about five times better than a poor or average programmer. When you start to factor in the analysts and the entire business organisation as a whole this performance gap starts to multiply upwards exponentially. The result is that some organisations on certain types of projects can produce software at a rate of 10 function points per hour, whereas the average rate is more like 10 hours per function point! There are actually some organisations that are measuring their productivity in terms of weeks and months instead of hours. One company earlier this year reported that it was producing software at a rate of 54 days per function point. The difference in terms of cost between an organisation like this and a 10 function point per hour organisation should be pretty obvious.

CAI: Could you quantify the potential return on investment that results from a typical software process improvement initiative?

GRANT RULE: The highest estimates I have seen are 1,900% percent. In other words, for every pound or dollar spent by a company on an improvement activity, the company receives 19 in return.

If one were to average out all of the various studies, however, the typical process improvement initiative would probably produce an average return of 5-to-1; in other words, a 500% return on investment. If there were a bank out there that would pay you \$5 dollars for every dollar you invest, wouldn't you be depositing your money there?

CAI: What are some of the most well known and effective software process improvement methods in use today? How would you differentiate them from each other? How do organisations determine which approach is best for them?

GRANT RULE: In my opinion, the most well-known method is the Software Engineering Institute's Capability Maturity Model, in particular the integrated version known as the CMMI. The CMMI provides an excellent scale whereby organisations can measure themselves in terms of their capability and maturity.

You will frequently find organisations that will select a maturity level of 3, 4 or 5 as a business goal, yet this way of thinking is completely dysfunctional. Business goals must be set in terms of what the business is specifically trying to achieve. You must keep the focus on the business and on doing those things that are a priority for the business.

Another group with several measurement improvement models is ISO, the International Organisation for Standardisation. These models are quite popular in Europe. In parts of Scandinavia, such as Finland, for instance, they are overwhelmingly used. ISO/IEC 15504 is similar in scope to the CMMI[®] assessment model. And of course, the ISO 9001/2000 quality model is widely used and can provide a good foundation from which to start.

Six Sigma, which originated at Motorola in 1986 as a methodology for reducing defect levels, has become a broadly applicable statistical process and engineering approach in manufacturing. It continues to grow in popularity and appeal not only in engineering organisations, but also within the financial and commercial communities as well. The groups that are actively promoting Six Sigma have made an effort to broaden it so that it can be useful and functional for individuals who are not experts in the science of measurement.

Another useful model is ITIL, or the Information Technology Infrastructure Library, which covers service delivery. The CMMI, for instance, extends from the acquisition phase through development but does not reach to post-production service delivery. The ITIL model, on the other hand, is focused on what is necessary for keeping services up and running. I should note that ISO recently released ISO 20000 as the international standard for IT Service management. It also appears that the CMMI model may be expanded to include service delivery in the near future.

Of the above models, most serve as useful criteria against which to assess your processes, but they do not focus on process performance (with the exception of Six Sigma). Organisations need to consider not only **what** processes they perform, but also to quantify **how well** they perform. So of recent years, we at SMS have developed a keen interest in the ideas of Lean Management coming from Toyota and others. Lean and agile approaches seem to offer a great return and are highly focused on implementing change and delivering value to the end customer.

CAI: How do software and IT organisations actually measure what they are producing and how they are performing?

GRANT RULE: Most organisations outside of the software industry generally have some measure of what they produce. A car manufacturer can count the number of vehicles that come off the production line or the number of cars that are sold. A retailer can measure the amount of merchandise sold or the number of purchases returned. A service business, such as a shipping company, can count the number of shipments completed or the amount of goods transported.

In the software field, most organisations continue to measure inputs. They measure the amount of effort expended or how much it costs, but few will measure the size of the product being produced. The majority of those that do measure the size of production will measure the lines of code produced. The irony about this, however, is that the more advanced languages generally produce less lines of code. In other words, the lines of code method can make a more productive environment seem like it is producing less!

CAI: Could you outline a few of the most important metrics that organisations should be tracking?

GRANT RULE: Without a measure of productivity, a company has no idea whether its actions are enhancing or deterring production. Productivity is calculated in terms of output (what you produce) divided by input (either the effort or the cost expended). However, if you cannot measure the size of your project in a meaningful way (i.e. what you produce) you will never be able to produce a meaningful measure of productivity.

Speed is another key measurement. In our dynamic world, attributes such as flexibility, agility and speed of response are very important for a business. Speed is a measurement of the distance travelled – or the output produced - divided by time. However, once again, we come up against the problem of measuring the size of the delivered functionality.

A third important measure is product quality, often expressed in terms of defect density, or the number of defects for a certain sized product. In this manner, the quality of one product can be compared to another, simply by examining the density of defects. However, as in the previous two examples, you must still have an appropriate measure of size.

These three measurements are critical for defining the operational environment within a project—or within an entire organisation—and all three come from the permutation of a small set of core metrics. This set includes size, effort expended, the cost related to effort, time and defects.

CAI: How does an organisation get started with a software process improvement program? What are some first steps and critical success factors?

GRANT RULE: A first step is to secure commitment from senior management. If senior management is not committed the likelihood that others in the organisation will be committed is low. We often see groups of engineers make tremendous efforts to try to improve things and then fail because their efforts have been frustrated by a disinterested middle management layer or an outright lack of support from senior management.

A second step would be for the business to understand their business goals, to determine exactly where they are and where they would like to be. From there, they can start to build a detailed plan that maps out how they are going to get where they want to go.

Finally, you've got to understand your customers. You need to find out exactly what they want and how they measure value. You can start by thinking about the various forms of work they perform themselves to deliver value to their own customers. If you conduct this exercise, you will often find activities that do not add much value from the perspective of the customer. Businesses should only select those processes for improvement that focus attention on delivering value to their customers.

CAI: What are the key metrics that an organisation should be tracking in order to demonstrate the value of a process improvement program upwards, to the executive management team?

GRANT RULE: Most senior executives are still focused on the bottom line. They are most interested in how much it will cost and how much money will be saved. Therefore, the best way to communicate process improvement activities to upper management will be in terms of the savings that have been achieved or that will be achieved. It should not be difficult to establish baseline measures that can demonstrate how much the current process is saving.

CAI: For those who are just getting started, is there an easy way to calculate such savings or returns in order to make such a case to the management team?

GRANT RULE: I think there are two good ways of doing this.

One way is to look at the cost of quality. That means calculating the cost of products that were never shipped or the cost of repairing defective products that were. In general, it is important to have a rigorous approach for detecting and removing defects both before and after product release. Focusing on the potential savings that come from preventing downstream defects will provide a quick snapshot of your potential return on investment.

Another way is to look at the opportunity side. If the company were able take advantage of certain opportunities, such as getting software to market quicker or developing more products because time was being used more efficiently, what would be the business value of those new opportunities? At SMS we have found that examination of the actual value stream – not the theoretical software development life-cycle, but the activities truly resourced and performed – usually highlights many opportunities to remove or avoid waste. The resulting improvements can be measured in terms of increased 'first pass yield', quicker responses to customers, and faster turnaround times.

CAI: How would you characterise the level of awareness, in the UK IT community, of software process benefits and methodologies?

GRANT RULE: There is a growing awareness, but I think there is certainly a long way to go. We have been promoting the CMMI and other models for about 15 years now, so there are many people out there who have heard of these terms or at least can spell CMMI or ITIL. However, few people actually know what these terms really mean and fewer still understand the philosophy and spirit behind it all.

Unfortunately, there is still quite a lot of backward thinking. The interest in these models is often limited to the desire to put a certificate on the wall in order to gain a

marketing advantage for selling products and services. Many people actually believe that they can adopt a software process improvement approach without actually doing anything different.

I think the main problem here is that people are genuinely very busy. The CIOs and the IT Global Project Managers are very focused on the short term survival of their companies. I suppose that there is simply not enough time to stop and think about service delivery demand over the next 1-5 years.

However, this is what differentiates European and UK businesses from other global organisations. Companies like Toyota have done marvelous things with process improvement. They have made a point of finding the time to focus on the long term. Organisational thinking in these kinds of companies is not limited to a weekly or quarterly perspective. The culture of improvement is endemic and engages all the customer-facing and creative staff.

CAI: Do you feel that the "manufacturing revolution" is an appropriate metaphor for where we currently are, and for the challenges we are currently facing, in the software and IT industry?

GRANT RULE: A lot of manufacturers, and retailers too – companies like Toyota and Tesco – have used these exact same process improvement tools and techniques to reduce the amount of time it actually takes to design a new vehicle or to design a new store. They have adopted lean approaches for manufacturing, for administration, for product development, and for service delivery... and they have achieved spectacular results. Certainly, the knowledge required for producing new product designs is very similar in nature to that involved in designing new software architectures.

CAI: So much is made of offshore outsourcing these days. What are your thoughts on this and how do software metrics and software process improvement methodologies play a part?

GRANT RULE: I would venture to say that an organisation without a disciplined approach onshore will not achieve desirable returns simply by sending their work offshore. Not in the long term.

A case in point is a large governmental department I am working with that has outsourced its projects to an extremely well-known and respected supplier. The supplier was recently assessed by the SEI as an organisation with a CMMI maturity level of 3.

Nevertheless, the customer on the business-side had many users who were extremely dissatisfied. After an investigation, it was concluded that the problem was that the client had not developed a disciplined approach when dealing with the outsource partner. This problem was compounded by the fact that the supply-side was focused primarily on the technical issues of writing code faster. As we have stated above, your primary focus should be understanding the customer requirements and ensuring deliveries are of value to the end-user. In short, there were a lot of talented software engineers who were working really hard and producing a lot of great stuff, but unfortunately – it was the wrong stuff!

Questions? Suggestions? Comments? Please contact the IT Metrics and Productivity Journal Editor at michael_milutis@compaid.com.