TOTAL METRICS WWW NEWLETTER SEPTEMBER 1998

Welcome to this months newsletter which focuses on the international level of cooperation between metrics bodies to advance the role of software measurement in Information Technology. We have covered an in-depth review of presentations by the metrics gurus Capers Jones and Charles Symons at the recent IFPUG Orlando conference in which they both discussed the future of Functional Size Measurement and the need for a review and standardisation of current methods. The most significant news this month is the planned release of the new IFPUG Counting Practices Manual, scheduled for January 1999 and the remarkable impact that Full Function Points is having on the metrics world.

CONFERENCES

United Kingdom Software Metrics Associations 10th Anniversary Conference *Measurement in Practice October 28th to 30th 1998*

The conference begins on Wednesday the 28th of October with full day and half day tutorials on a variety of metrics topics ranging from basics such as an Introduction to Software Metrics and Estimating for Projects to Preparation Tutorials for the Mark II and IFPUG CPM 4.0 certification exams.

On the second day, Thursday 29th of October, the conference starts with a keynote presentation by the well-known software metrics author Tom Gilb who will be presenting "*Powerful and Pitiful Measures of Software Metrics*". The afternoon session closes with another keynote speaker from Canada, Professor Alain Abran, who will be presenting a new functional size measurement technique, called ' Full Function Points'. The technique was specifically developed to measure Embedded and Real-time software. The Full Function Point (FFP) technique is again discussed by the Keynote speaker on the Friday morning 30th, Pam Morris. Ms Morris will be present an industry case study, which demonstrates how FFP was used to measure the 'middleware' typically, found in an organisations software portfolio and included in the outsourced applications inventory. Carol Dekkers the current President of IFPUG will be closing the conference with a presentation on "*Functional Size Measurement and Software Metrics – A vision of the Future*" If you are interested in attending the conference please contact Sue Rule email 113444.430@compuserve.com.

Netherlands Software Metrics Associations (NESMA) *Software Measurement Conference and Workshop – Benchmarking November 1998*

NESMA will be hosting the next International Software Benchmarking Standards (ISBSGs) meeting in Amsterdam in November. In order to take full advantage of the international participation they are holding their NESMA Fall Metrics conference to coincide with the ISBSG meeting. Their conference is dedicated to benchmarking related topics. They have developed a new benchmarking workshop to be held at the conference. If you are interested in attending the NESMA conference contact Martin Hooft van Huysduy on email :100671.1446@compuserve.com

International Software Benchmarking Standards Group (ISBSG) ***November 9th –12th 1998***

The ISBSGs meeting will be held from Monday 9th of November to Thursday 12th of November 1998 in Amsterdam. Representatives from the 12 countries that participate in ISBSG will be attending including those from Australia, USA, UK, Netherlands, Canada, Italy and Japan. This meeting will aim to finalize the management structure of ISBSG and focus on the production and marketing of The Benchmark Release 6.0. The group will also consider proposals for changes to the standards for collecting and reporting metrics data. They will investigate strategies to liaise with other standards bodies including ISO/IEC WG13 and Research Organisations such as the University of Quebec in Montreal and Monash University Melbourne Australia. If your metrics association is not already involved in ISBSG and you would like to participate, please contact Terry Wright on terry.wright@mmv.vic.gov.au. If you want to find out more about ISBSGS then visit their www site at : http://www.isbsg.org.au.

NEWS AROUND THE WORLD

IFPUG announces the new release of their Function Point Counting Practices Manual - Version 4.1

The IFPUG Counting Practices Committee (CPC) met again at the Orlando conference last week to put the finishing touches on the latest version of the IFPUG Counting Practices Manual. Mary Bradley the new chair of the CPC announced that the new version of the Counting Practices Manual Release 4.1 will be available in January 1999. The recent impact study indicates that no conversion factor will be necessary to convert from the CPM 4.0 counts to those performed under the new rules. The new manual has concentrated on refining the text of 4.0 and incorporating examples to illustrate the rules. There have been changes to the way enquiries and outputs are counted. The similarities and differences between these two function types have been clarified. The main area of change include clarification and guidance on the following:

- Elementary process
- Boundary and scope

- Definition of user
- Control information
- Identification of DETs
- Differentiation between EO vs Eqs – more similar and easier to distinguish
- Rating of EO and EQ

IFPUG Investigates New Function Point Methods

The IFPUG 'New Methods' Sub-committee met for the first time at the IFPUG Orlando conference to review new proposed extensions and variants of Functional Size Measurement Methods. The first task the group has been assigned is a review of the Full Function Point Method. Some of the review areas to be covered include the research design quality behind the method, validation process used to verify the method, compliance to ISO 14143-1 and its capability to measure functional size effectively in the Real-time functional domain. They have completed a preliminary review and the final review is planned to be completed by February 1999.

New release of Mark II Function Point Counting Manual

The UK Counting Practices committee promotes both IFPUG function points and Mark II function points. They have just finished updating the Mark II manual to bring it in line with the ISO standard 14143. It is due to be posted on the WWW (http://www.uksma.uk), at the end of October, in PDF format. The manual will be available to download free from the WWW. Copyright will remain with UKSMA. This latest version of the manual also looks at the application of Mark II to domains other than the traditional MIS domains. UKSMA encourage metrics practitioners to download the manual and try some of their ideas, they are looking for feedback. If you would like further information about Mark II and the manual contact Peter Fagg at pentad@compuserve.com

Function Points Discussion Group is increasingly popular

The Canadian Software Metrics Group (CIM) has reported that they are close to signing their 1000th sub-scriber to their Listserve. The CIM Function Point Listserve has been in operation for nearly five years and provides a discussion forum for all those who need to discuss software measurement issues with other interested parties, world wide. If you are interested in helping them achieve their subscriber target and also in having a daily update on current metrics issues and access to assistance on all your metrics needs then why not subscribe now? Each e-mail (in this case messages about Function Points) sent to the mailing list is re-routed through the mailing list to all subscriber addresses. If you are interested in Function Points and Software Measurement and if you have an e-mail address, you may want to subscribe. Here's how:

Send a message to:

CIM@CRIM.CA

SUBJECT:
"none" (this field must be empty)
CONTENT:
SUB FUNCTION.POINT.LIST "Your name"

You will receive a confirmation from the list and you will also receive a copy of messages about Function Points sent by other subscribers. Once you are on the list, the only way to change your e-mail address is to unsubscribe (SIGFUNCTION.POINT.LIST) and to subscribe again.

You can also send mail (your own input about Function Points) to the subscribers. Here's how:

Send mail to:

FUNCTION.POINT.LIST@CRIM.CA

Content:
"The information you want all the subscribers to read."

Messages about Function Point variations and extensions are welcome, e.g.: Backfire, Mark II and Full Function Points (real-time).

All messages sent to this mailing list must be in English, translations can also be included. Feel free to distribute this message to anyone who is interested in Function Points.

This LISTSERV on Function Points is managed by CIM, an Interest group on software metrics based in Montreal, Quebec, Canada. The technical facilities are operated by CRIM (Computer Research Institute of Montreal). Function Points LISTSERV server is provided by SUN Canada.

For more information: on this facility contact Denis St-Pierre at Denis.St-Pierre@CRIM.CA

New ways to measure Enhancement Projects and Operational Metrics

The Netherlands Software Metrics Association (NESMA) has just released two new manuals to assist organisations in the practical application of measurement and Function Point Analysis. Both manuals have only been produced in Dutch. NESMA is seeking sponsorship from organisations interested in using the manuals to assist in or fund the translation of the manuals to English. The manuals are:

- *Function Point Analysis in Maintenance*. The NESMA working committee who developed the manual researched this topic for five to six years in order to find rules to weight the extent of the enhancement. They have changed the weights from those used by IFPUG in the CPM 4.0. Instead the weights used are proportional to the extent which the function is changed. The research was performed with the cooperation of a number of IT organisations to ensure the results were practical and effective.
- *Determining the Operational Costs of IT* - includes a number of metrics which are applicable in the operational side of IT. This manual took 3 years to develop. It will be officially released in November.

If you are interested in finding out more about NESMA and the work that has been done visit their www site at : http://WWW.nesma.nl.

REVIEW ARTICLE

FUNCTIONAL SIZE MEASUREMENT A LOOK TO THE FUTURE

Functional Size Measurement from Vision to Reality – the IFPUG 1998 Conference

The recent IFPUG conference in Orlando Florida USA (September 21 – 25 1998) focussed on the future of Functional Size Measurement and the vision for Software Measurement towards the year 2000. Almost 300 delegates participated in the conference representing over 15 countries internationally. The keynote speakers included Capers Jones from SPR in the USA and Charles Symons from Software Measurement Services in the UK. Capers Jones is an industry guru in software measurement and many people know him through his numerous books and papers. Charles Symons is renowned for being the author of the Mark II[1]. Function point method, which is the second most commonly used function point method.

The conference , set in the middle of Disney Village, was by popular vote the best IFPUG conferences held in recent years. The number, variety and quality of presentations was excellent. The pre-conference workshops covered the usual introductory software measurement courses with a number of workshops covering topics for the more experienced metrics practitioners, such as Statistical Process Control and Validation of Function Points. However the content of the conference and wonderful location was marred by the close proximity of the hurricane 'Georges'. Although Orlando was not directly in the hurricane's path, its resulting weather patterns caused a week of torrential rain and high humidity. Unfortunately Georges impacted more than the weather , as the conference progressed the overall participation was reduced as many local delegates departed early to evacuate their homes and families. Orlando airport was chaotic with many flights cancelled, those flights actually taking off were doing so

[1] For more information on Mark II visit the UKSMA WWW site (http://www.UKSMA.uk) A full copy of the manual will be available for download at no cost from late October 1998.

sideways due to wind shear. It was a difficult decision about whether you wanted to stay or take the risk of leaving.

But hurricanes aside, lets get back to the conference……...the following is a synopsis of the main points addressed by these two measurement experts.

Key Note Address 1

Capers Jones (Software Productivity Research USA)-*Function Points the past and the future*

Capers Jones summarized the role of Function Points within organisations today and what he perceived to be their future. He described how the penetration of function points had increased over the last 20 years so that on latest figures, 487 of the fortune 500 companies were now using Function Point Analysis, in some capacity. He estimated that the use of function points was growing at a rate of about 40% per annum and in his experience Function points are being used in over 25 countries including Cuba and Bulgaria.

Function points are migrating away from their original stated purpose to enter the main stream of business decision making . They are being used in much more innovative ways to address real business concerns. The main areas of penetration of Fps include their use to monitor and control outsourcing contracts, measure the value of software portfolio assets and more recently as a method of quantifying software delivered in contracts involved in litigation.

However, Jones expressed a concern that the number of variants of function point techniques was growing. Metrics experts were developing their own FP techniques to address perceived limitations in existing methods. He felt that the credibility and strength of the FP concept would be eroded if the world cannot agree on an international standardized method. He challenged the audience to work towards this goal.

Despite the perceived high penetration of Function Points, benchmarking data indicates that it is still only being used on less than 1% of all the worlds currently developed projects i.e. estimates indicate it to be used on about 125,000 of the 36 million projects installed for 1998. This means the IT industry has a long way to go with the use of software measurement to manage and control software development.

New ways to use Function Point Metrics focussing on the business needs

Jones explored some of the more innovative ways function points are used as a 'business metric', such as its use in value analysis and usage studies. These studies quantify the amount of functionality needed to support an organization's individual, organizational and enterprise users. The figures presented showed that in order to fulfil their responsibilities, Managers need access to the functionality delivered by 30,000 function points of software, whilst software engineers need 90,000 and sales staff need 15,000 function points. His experience has shown that 'best in

class' organisations have about 10 times the software tools capacities of lagging organisations when usage is examined in function points.

What makes a successful project ?

Jones identified the attributes of successful projects and compared them with the attributes of unsuccessful projects. One of the major contributors to a project being successful was the use of a broad spectrum of measurement data both 'hard' data such as function points, staffing, schedules, effort and cost and 'soft' qualitative data such as staff skills, environment characteristics and audit trails. He emphasized that it is the qualitative data that provides the input into process improvement strategies. He quoted the following characteristics of projects that had a high correlation to the eventual failure of the project:

- Geographic separation of team members
- Management structures which were a matrix rather than a hierarchy
- Sub-contractors involvement
- Extraordinary storage or timing constraints
- Legal or statutory constraints
- Projects which use 'low bid' as a sole contract criterion
- Staffing build up which exceeds 15% per month
- Staff attrition of more than 40% per month
- Abrupt introduction of new technologies
- Careless usage of 'lines of code' metrics
- Projects run by organisations currently involved in 'downsizing'

Rules of Thumb - using Function Points to estimate projects

Jones is well known for his 'rules of thumb' metrics using function points. These 'rules of thumb' are quite effective as a means to quickly calculate project parameters and get a 'sanity' check on project estimates. Jones shared the following rules with the audience and noted that all function point figures assume the use of IFPUG CPM 4.0.

- Number of function points raised to the power of :
  - 0.4 equals the number of pages of paper documents
  - 1.15 equals the number of elapsed calendar months of the project schedule
  - 1.20 equals the number of test cases needed to test the software
  - 1.25 equals the number of defects predicted to be in the software
- Number of function points divide by :
  - 150 equals the number of technical staff needed for development
  - 750 equals the number of technical staff needed for maintenance of the delivered software.

Function Point Metrics and the CMM

Jones emphasized his long held view that 'defect removal efficiency' is a very powerful metric and not used often enough as a quality metric. Defect removal efficiency is the number of

defects found during development and subsequently removed, divided by the total number of defects found (including those found by customers after delivery). The 'best in class' performance is 95% efficiency. A strong correlation has been observed between this metric and an organization's capability as measured on the SEI CMM scale. Most CMM level 4 companies have less than 3 defects (bugs) per function point and 95% defect removal efficiency. The USA average is 4 to 5 bugs per function point and only 80% defect removal efficiency.

Backfiring not the way to go….

Jones is recognized as being one of the first people to propose the use of 'backfiring' from Lines of code to function points. The backfiring method uses the total number of lines of code, multiplied by a predetermined figure to calculate the number of function points, within an application, for a particular coding language. Jones explored the limitations of the backfiring technique saying that the method has inconsistent published data and it is very ambiguous. Different vendors of the method use different conversion factors adding to the general lack of credibility surrounding its use. Other problems with the method result from the prevalence of hybrid software and redundant code. I.e. At least 33% of applications in the USA are written in at least two different languages and most applications have a significant level of 'dead code', which inflates the backfired function point size estimate.

Function Points alone are not enough…

In order for software engineering to become a true engineering discipline many metrics and measurement approaches are needed including:

- accurate effort, cost and schedule data
- accurate defect and quality data
- accurate user satisfaction data
- source code volumes for all languages
- types and volumes of paper documents
- volume of data and information stored
- consistent and reliable ***complexity*** information

Jones expressed a concern that the functional size metric did not adequately address the different types of complexity inherent in software. He identified complexity as being the 'emerging gap' in currently collected metrics data. Of the 24 kinds of complexity noted in engineering and scientific studies none are currently included in function point methods. These different types of complexity include for example computational complexity, flow complexity, cyclomatic complexity and syntactic complexity.

He noted that, particularly for engineering projects, which incorporated the integration of software into hardware, our current metrics set did not adequately cover the scope of the activities involved. He felt that as software engineers we had 'tunnel vision' when it came to metrics for these integrated projects and we needed to look at metrics from broader business base. He proposed the use of *engineering points* that measure hardware size for software-hardware integration projects.

New types of projects emerging need new metrics

In recent years we have seen less of new development projects and more projects which impact *en masse* across all our legacy systems. The introduction of the Euro dollar, the Year 2K project and the additional digits to phone numbers all come under these types of projects. They all have characteristics in common i.e. they all need to update a multitude of applications without having a net impact on the functionality delivered by the applications. As software metrics practitioners we have not addressed the need for a different set of metrics to monitor and control these 'mass update' projects. These projects are usually associated with high costs and high risks of litigation if the project is late or imperfect. Function points alone are inadequate for mass update estimation or measurement. Jones proposed the introduction of a 'Data Point' metric to monitor these projects. Data points measure the data base size. He justified his perspective by saying that businesses and government agencies own more data than they own software and there are no known metrics for measuring data base size or data quality, although data is a critical corporate asset and even harder to control than software. Data points would include measurement of objects such as entities, sets, attributes, interfaces and constraints.

Jones concluded his address by re-emphasizing the need for functional size measures that are standardized and convertible. They need to address scientific and engineering complexity in their size and be able to adequately measure software built in new emerging technologies. He proposed that the power and utility of function points could be extended to data, services, engineering and value analysis and beyond!

Key Note Address 2

Charles Symons (Software Measurement Services UK)-*The Achievement and Future of Function Point Methods*

Charles Symons has been very active in the development of the ISO functional size measurement set of standards. He, like Jones, sees a strong need for a rigorous standardized functional size measure that moves beyond those available today to address the different characteristics of software functionality delivered by software in different functional domains. However Symons, unlike Jones, talked of more than one functional size measure, the selection of the method used would depend on the type of software being measured and the purpose for measurement. He emphasized that there is *a* functional size of software rather than *the* functional size. Which size you measure depends on the *purpose* for measuring.

Need to move away from use of theValue Adjustment Factor

Symons presentation looked at the achievements and challenges faced by the most commonly used functional size measurement (FSM) methods, IFPUG, Mark II and Full Function Points. Each of the methods had their strengths and weaknesses. He identified the need to remove the Value Adjustment Factor (VAF) from the functional size result saying that it was not only invalid

from a measurement theory perspective but it did not adequately cater for the impact of technical and quality features on the software development. Many of the features such as 'backup and recovery' which in the past had a strong negative impact on productivity rates, no longer had the same impact and cause estimates, based on adjusted size to be inaccurate. Newer technology features such as WWW development are not catered for by the VAF at all. He suggested that we move towards other methods for measuring the impact of quality and technical constraints on project productivity rates and use the base unadjusted functional size as the measure of size.

Need to encompass other Functional Domains

Symons highlighted the fact that despite being around for 20 years, functional size measures have not been able to infiltrate military, real-time, embedded or operating systems software development measurement programs. Most of these developers still use Source Lines of Code (SLOCS) as their size measure and we as metrics practitioners have to ask ourselves why? He suggested reason for this phenomenon was that the most widely used FSM Methods deal specifically with data rich domains and ignore function rich and control rich software characteristics. He noted however the recent move to address these limitations has been the development of the [2]Full Function Point Method. It has been recently been introduced specifically to measure the *control* rich domain.

However before we move to develop methods for these different domains we need to step back and look at the methods we have and standardize on a method for a particular domain and measurement purpose. He suggested that we need a 'family of self consistent' standards' to cater for each functional domain identified within ISO 14143 Part 5, this may mean refining the current methods to be consistent under the ISO 14143 framework. He felt that such a set of standards would enable easier automation of functional measurement and facilitate conversion between measures.

International Software Metrics Initiative

To achieve the goal of as set of rigorous FSM Methods for different domains and purposes, Symons has worked with international metrics bodies to establish the International Software Metrics Initiative (***ISMI)*** project. But as he says " Vision without funding is hallucination". He is seeking international cooperation to participate in building these standard methods and international sponsorship from organisations, which seek to solve their FSM issues. The ISMI proposal has been test-marketed with several major software producers and users in Europe and North America. A number of organisations have expressed interest. If a standardized rigorous FSM method is essential to *your* organisations metrics program and you want more information about the progress of ISMI or can provide financial or resource support to the project then Symons asks that you contact him on: Charles_symons@compuserve.com or Pam Morris on Pam.morris@totalmetrics.com.

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[2] For more information on the Full Function point method visit the University of Quebec in Montreal WWW site. http://saturne.info.uqam.ca/Labo_Recherche/lrgl.html