2011 JOINT ISPA/SCEA CONFERENCE

Albuquerque 2011
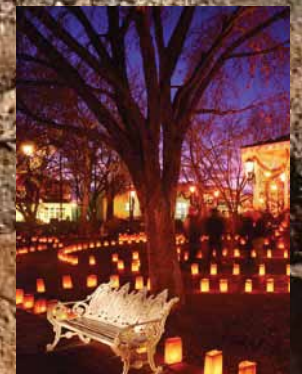
LETTER FROM YOUR EDITOR

It is with a great deal of sadness that we recently accepted **Nina Tahir's** resignation as Editor of *Parametric World*. Nina has served as Editor for many years and has done a fantastic job in producing a quality periodical 4 times a year. Our new editor, **Charlie Hopkins**, is no stranger to ISPA or editing. Charlie is a charter member of ISPA and the 2002 Freiman awardee. He served as the editor of *ISPA News*, which was a combination newsletter and journal. I am looking forward to working with Charlie to continue to produce our outstanding periodical.

Madeline Ellis
Chairperson, *Parametric World*
madelineellis@socal.rr.com

When I turned over the editorship of the *ISPA News* over twenty-five years back, I little realized how excellent that document could become. In our Fall issue Hank Apgar showed step-by-step how the News grew into two publications: 1) *Parametric World* and 2) the *Journal of Cost Analysis and Parametrics*. The upshot is that a long line of caring editors (and members) have brought *PW* to the form that you see today. Nina has culminated the achievements of that line of visionaries.

As to my vision for *PW* (these days everybody needs a vision statement, it seems), let's start with the world that Frank Freiman created. That world is populated by special people and special analytical tools. ISPA and its members represent a unique set of analysts. They are part cost analysts and part engineers. Frank called this discipline 'parametric analysis' to reflect the fact we did not use cost to forecast cost. Our European colleagues alternatively label the discipline 'cost engineering'. Regardless of semantics, the goal is the same. My vision for ISPA and *Parametric World* is for them to continue serving as a beacon for this special constituency both in America and worldwide.

The preferred path for *PW* content follows from the vision and emphasizes how technology affects cost. Since ISPA is the only organization focusing on the underlying forces that drive cost, we thrive on technical subjects. This is because we know that how much a hardware or software item costs depends on how complex it is. We also recognize that, as is true in science, time is the fourth dimension in cost analysis. So we explore time as yet another explanatory variable for cost.

Parametric World's publication policies must continue

BY JASON DECHORETZ

Fellow ISPA Members,

Whoa! It is a good thing that the *PW* contributors have no fear of old man winter! Despite the crazy weather we are having, our dauntless staff of editors and society volunteers continue to work in support of ISPA. Your Board of Directors just wrapped up the Winter meeting which was hosted by El Milton (Operations Manager) and Donna Schuyler (Associate Administrator) of Tecolote Research, in Albuquerque, NM. This was the first ISPA BoD meeting hosted by Tecolote and they did a fantastic job. Here are some highlights of developments since the last issue of *PW*:

- *2011 Conference Planning:* Mr. Richard Harwin and his co-chair from SCEA (Mr. Melvin Etheridge) are in the process of finalizing the plans necessary for our upcoming Joint Conference and Training Workshop which will take place in lovely Albuquerque, NM. The Board completed a tour of the facility and we believe you will find the venue both relaxing and conducive to professional development. They have provided you a more complete update in this edition of PW and real-time update can be found on our Website.

- *Elections:* We recognize the value of volunteer support to the Society and continue to seek a diverse membership to the Board of Directors. Mr. Kurt Brunner is guiding us through the formal Election process. Your vote is important so let's BRING OUT THE VOTE! I'm finishing my sixth year on the Board and I can tell you it is a very rewarding experience. However, if you did not get nominated for a Board position we have numerous committee positions that support the International Board and local chapter bodies, so please seek out ways to help ISPA become a better organization.

- *Awards:* Innovations in practice and advances in theory are hallmarks of ISPA, and we want to continue to recognize these efforts through our two-part Awards program. Dr. Christian Smart has formed a committee that will work with SCEA representatives to evaluate the technical papers submitted as part of the Professional Development and Training Workshop. The competition is expected to be fierce! Concurrently Dr. Joseph Hamaker has formed a committee that will evaluate the merits of the Society Award nominations.

Please see the article for additional details and get your nominations into Joe as soon as possible!

- *Professional Development:* Mr. Doug Druley, with the support of Ms. Sherry Stukes and Dr. Roy Smoker, is continuing the improvement of our training and educational material. This work is also being done in coordination with Mr. Peter Braxton and other SCEA representatives. These changes will make our gathering in Albuquerque one of the most robust training experiences we have ever provided. The Board feels this is one of the best services we can provide our members since it contributes to your self improvement, benefits your employer and where appropriate adds to the value your bring to your customer.

- *Society Finances and Long Term Planning:* Mr. Bruce Minett reviewed the Society's 2010 year-end results and reported that the Society continues to operate in a fiscally responsible manner. In addition, the Board revisited and updated the five-year operating plan. While our financial reserves remain healthy we continue to realize gradual increases in the operating costs of the Society (notably Member Services and publication costs).

- *Publications:* As always Ms. Madeline Ellis and Mr. Charlie Hopkins (your PW Editors) and Dr. Stephen Book (your JCAP Editor) are always looking for written contributions from you. If you have any ideas for improvement please forward them along.

I look forward to seeing you in Albuquerque. Please hunt me down and let me know what you like about ISPA but more importantly what improvements you would like to see made. As always you can reach at the contact information below.

Jason Dechoretz

ISPA CHAIRMAN OF THE BOARD
jdechore@mcri.com
703-506-4600 x0322

Deadline for Award Nominations: May 1

The Awards Committee is now soliciting nominations for ISPA's society awards described below. You must be an ISPA member to nominate a candidate. Nominations will be verified and reviewed by the Awards Committee and final approval will come from the ISPA Board of Directors. Nominations must be submitted not later than **May 1, 2011**.

• The **Frank Freiman Award** is our highest honor and is presented to an individual who has made outstanding contributions to the theoretical or applied aspects of parametric modeling or cost estimating, promotion of parametrics, or applications of parametrics over a significant amount of time. A Freiman candidate is expected to have left a legacy to the profession for at least five years and can receive the award only once in a lifetime. This award was named to honor Frank Freiman for his pioneering work in the development of parametric models and for his role in the founding of the Society. The recipient need not be an ISPA member. The recipient may qualify for this award only once in a lifetime.

• The **Clyde Perry Parametrician of the Year Award** is presented to an individual or group who has made outstanding contributions to the profession of parametric cost analysis during prior years, but for a minimum of two years. This award typifies a leader in the activities of practicing or promoting the use of parametrics. This award was renamed in 2004 to honor Clyde Perry, an ISPA Founder. The recipient need not be an ISPA member. The recipient may qualify for this award only once in a lifetime.

• The **Keith Burbridge Service Award** is presented to a Society Member or participating group who has provided substantial volunteer service to ISPA in a manner supporting the principles and goals of the Society. This award was renamed in 1996 to honor Keith Burbridge, an ISPA Founder. Repeat awards are allowed.

Instructions:
Provide the following information **by May 1**:
• Full name of the nominee plus professional affiliation, postal address, and telephone number.
• Full justification for the award with factual and concise substantiating information. Identify previous awards, society affiliations, publications, and professional achievements.
• Full name of the nominator plus postal address, email address, and telephone number.
• Submit nomination (and endorsements, if any) by postal mail or email to:

Joseph Hamaker
2011 ISPA Professionals Awards Chair
joseph.w.hamaker@saic.com

Previous ISPA Award Winners

Year Presented	Clyde Perry Parametrician of the Year Award	Keith Burbridge Service Award	Frank Freiman Award
1981	Robert Gafney		
1982	Keith Burbridge		
1983	Jim Wilder		Larry Putnam
1984	Darryl Webb		Randy Jensen
1985	Sylvan Pinsky		Bill Cheadle
1986	Henry Apgar		
1987	Clyde Perry		
1988	Alan Mayer	Jack Griffin, Seb Botta	Barry Boehm
1989		Henry Apgar	
1990	Dan Ferens	Cindy Castellana	Gerald McNichols
1991	Marilee Wheaton	Clyde Perry	Don Reifer
1992	Peter Korda	Charles Mauro	Keith Burbridge
1993		Nina Tahir	Peter Korda
1994	Gary Constantine	Madeline Ellis	
1995	Bruce Fad	Seb Botta	
1996	Meinolf Wenzel	Marilee Wheaton	
1997	Sherry Stukes	Ron Larson	Tony DeMarco
1998	Pierre Foussier		Henry Apgar
1999	William Rutledge	Paul Lubell	Dan Ferens
2000	Georg Reinbolt	Sherry Stukes, Karen Davies	Don MacKenzie
2001		Tom Brents	Dan Galorath
2002	Arlene Minkiewicz, Karen McRitchie	Gary Constantine	Charles Hopkins
2003	David Eck	Clyde Perry	Darryl Webb
2004	Jairus Hihn	Giancarlo Filippazzo	Joe Hamaker
2005		Georges Teologlou	Steve Book
2006	Richard Stutzke	Quentin Redman	
2007	William Brundick	Diana Patane	Humbolt Mandel
2008	Hérve Joumier	George Stratton	
2009	Christian Smart	Hank Apgar, Madeline Ellis	Dale Shermon
2010	Tom Coonce	Kurt Brunner, Sherry Stukes	Neil Albert

The initial nomination period for the ISPA 2011 International Board of Directors Elections has now closed. Please see the ISPA website (www.ispa-cost.org/elections.htm) for the candidates' biographies and pictures. Additional election information may also be found there. The candidates currently (as of 20 January 2011) are:

- Brian Glauser (new candidate)
- Rich Harwin (incumbent)
- Herve Joumier (new candidate)
- Steve Sterk (incumbent)
- Lisa Yedo (new candidate)

There will be an additional period for nominations that will end 17 March 2011. Please see the accompanying Petition for Nomination which must be submitted to the Elections Committee Chair.

The Elections Committee consists of: Dara Billah, Kurt Brunner and Doug Howarth

ISPA Members will be able to vote for up to five (5) candidates either by mail or in person at the ISPA/SCEA Joint Conference. A postage paid envelope will be sent out with the ballots to facilitate voting by mail.

The Elections Committee looks forward to your participation in this election!

Kurt Brunner
Chair, 2011 ISPA Elections Committee
kbrunner@tecolote.com
(310) 536-0011 x144

The Elections Committee is following our established schedule for conducting the 2011 elections:

Initial Nomination Period	Opens: 1 November 2010, Closes: 31 January 2011 (Now Closed)
Nominee Biographies and Photographs Posted	15 February 2011
Additional Nomination Period	Opens: 1 February 2011, Closes 17 March 2011
Ballot Distribution	Starts: 20 April 2011
Voting Period Closes (By Mail)	24 May 2011 (Must be received no later than this date)
Voting Period Closes (At Conference)	8 June 2011 (at 12:00 noon, if voting at the conference)
Newly Elected Board Members Announced	9 June 2011 (at the ISPA/SCEA Awards Banquet)

Elections Committee: Kurt Brunner
2158 West Crestwood Lane, Anaheim, CA 92804-6439, Fax: (310) 536-9922 [Attn: Kurt B.]

Dear Election Committee:

I would like to nominate _____to serve as **Director** of the International Society of Parametric Analysts (ISPA). A copy of his/her qualifications and photograph is attached. The Nominee is a member in good standing and is willing and able to contribute his/her time and talents to ISPA. In accordance with ISPA bylaws, a total of (5) ISPA members must sign this petition, affirming the nomination.

1. _____, Member in Good Standing
   Signature   Printed Name

2. _____, Member in Good Standing
   Signature   Printed Name

3. _____, Member in Good Standing
   Signature   Printed Name

4. _____, Member in Good Standing
   Signature   Printed Name

5. _____, Member in Good Standing
   Signature   Printed Name

Continuous Function Algorithm to Calculate Degrees of Freedom

RAYMOND P. COVERT
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Introduction

In the course of deriving estimating relationships (ERs), MCR developed an algorithm that helps determine the optimal form, coefficient and variable selection for ERs derived by the zero percentage bias — minimum percent error (ZMPE) method [Ref. Book and Lao]. We have applied this algorithm to several programs in order to overcome the observed inability of common coefficient gradient-search techniques (e.g., Excel Solver) to handle particular searches for optimal coefficient values.

The ZMPE Optimization Technique (ZOT) allows simultaneous solution of the ZMPE optimization for multiple ER forms, candidate drivers, and coefficient selections, thereby eliminating the need to test multiple ER and multiple drivers separately. From an error perspective, the best cost and schedule models should have the following properties: (1) estimating relationships whose drivers have little or no uncertainty; (2) lowest possible total estimating error, including the error associated with the drivers; and (3) small values of correlation between additive element residuals (i.e., WBS elements or successive durations) for risk analysis. The estimating relationships in the model should have the following characteristics: (1) parsimony (frugality) in the use of drivers to increase degrees of freedom (DoF) and widen the domain of applicability; (2) coefficients derived with high statistical confidence; (3) small standard errors; and (4) evidence that the 'actual' data points on which the model is based are highly correlated with the model's estimates of those data points.

Constrained Optimization

ZMPE is an optimization technique with a constraint that is applied to find coefficients of estimating relationships that minimize standard percentage error (SPE), subject to zero percentage bias. The algebraic definitions of these key metrics are:

$$\text{Standard Percentage Error (SPE)} = \sqrt{\frac{\Sigma_{i=1}^{n}\left[\frac{y_i - f(x_i)}{f(x_i)}\right]^2}{n - m}} \qquad \text{Percentage Bias} = \frac{1}{n}\sum_{i=1}^{n}\left[\frac{f(x_i) - y_i}{f(x_i)}\right]$$

Components of the metrics are the following:

n = number of data points
m = number of coefficients in the regression model
DoF = $n-m$

By minimizing the SPE, we can [potentially] trade the R^2 value and percent error for DoF by adding or removing regression coefficients. For example, in the equation

$$y = a + bx_1^c x_2^d e^{x_3}$$

(where x_1, x_2, and x_3 are independent variables representing the ER drivers and that a, b, c, d, and e are the regression coefficients) if we have 15 data points (n = 15), Table 1 displays the various situations that can occur.

Table 1. Various Situations Regarding Inclusion and Exclusion of Coefficients

If	Then	Number of Coefficients	DoF
$a = 0$	$y = bx_1^c x_2^d e^{x_3}$	4	15 - 4 = 11
$b = 0$ or $e = 0$	$y = a$	1	15 - 1 = 14
$b = 1$	$y = a + x_1^c x_2^d e^{x_3}$	4	15 - 4 = 11
$c = 1$	$y = a + bx_1 x_2^d e^{x_3}$	4	15 - 4 = 11
$c = 0$	$y = a + bx_2^d e^{x_3}$	4	15 - 4 = 11
$e = 1$	$y = a + bx_1^c x_2^d$	4	15 - 4 = 11

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In the example $y = 2.534x_1^{0.65}1.001^{x_2}$, the base of the indicator (aka 'dummy') variable counts as a coefficient.

Removing the term involving the indicator coefficient will not significantly change the estimated values of **y**, but it will increase the DoF and therefore reduce the SPE [Ref. Anderson].

Typically an "IF… THEN…" (I-T) test is used to determine whether or not a coefficient should be used in the regression. The I-T test returns a logical value (i.e, 1 or 0) when the test conditions are true or false. This produces a discontinuous function for the DoF, **n- m**, because

$m_i = 1$ if the coefficient is used,

$m_i = 0$ if the coefficient is not used, and

$$m = \sum m_i$$

The derivative is undefined at the discontinuity when the coefficient nears 0 or 1 (see Figure 1 below.) Since the gradient is a discontinuity, discontinuous functions are difficult for gradient-search techniques (like the ones used in Excel Solver) to navigate.
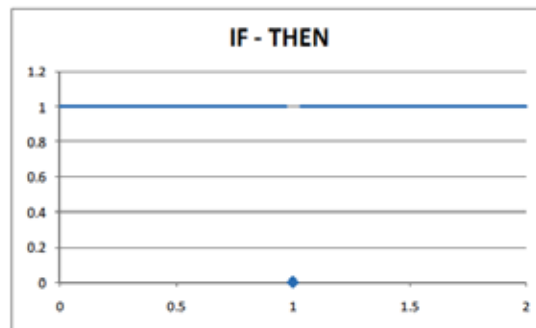

Figure 1. The Discontinuity at 1.

Instead, we can use a continuous function to determine whether a coefficient should be used in the regression. This eliminates the discontinuity (see Figure 2 below) and allows Excel Solver to easily navigate the gradient and determine whether a coefficient should be used or not.
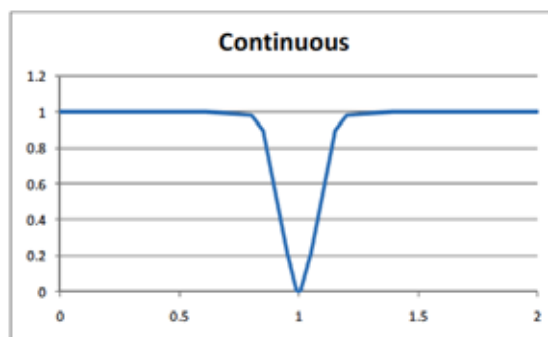
Figure 2. No Discontinuity Here

Rather than using I-T tests to count each coefficient and then sum the number of coefficients, **m = SUM(mi)**, we can apply the following calculation around each discontinuity[1]:

$$m_i l = 1 \mid e^{\dagger}[(-\square(coef - \square coef \square_{\downarrow} 0)\square^{\dagger}2)/\square}$$

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[1]We chose the form of the equation for calculating **m** because: 1) we can calculate the derivative of the function for any coefficient value that is a real number, 2) the slope equals zero when the coefficient equals its null value, 3) provides a continuous and smooth curve as the absolute first-order distance from the coefficient and its null value increases; and 4) it allows us to "tune" the shape of the curve using a single value, **ή**.

Continued from page 7.

where,

coef = the value of the coefficient

coef₀ = the value of the coefficient that renders it negligible (1 or 0), or "null value" of the coefficient

$\acute{\eta}$ = the absolute first-order distance from **coef₀** at which **coef** becomes negligible

This setup allows us to both (1) test multiple CERs with one form, eliminating many ZMPE runs; and (2) build parsimonious equations using as few statistically significant variables as possible.

Demonstrating the Algorithm

To demonstrate the use and benefits of the algorithm, we constructed a set of fictional, but realistic, data and derived coefficients for an estimating relationship using both methods of determining DoF: with the algorithm and with I-T tests.

The fictional example data are shown in Table 2. In this table, the first column contains the identifiers for 15 data points. The next four columns contain the potential cost drivers, X_1, X_2 and dummy (i.e., indicator) variables D_1 and D_2. The sixth column contains a normally distributed multiplicative error with mean = 0 and sigma = s. The seventh column contains the unitless 'actual' Y value we wish to estimate, $Y_{(ACT)}$.

Table 2. Example Data Set

Point #	X_1	X_2	D_1	D_2	Err	$Y_{(Act)}$
1	156.80	46.31	1.00	0.00	0.479	2957.1
2	168.60	14.64	1.00	0.00	0.774	3400.6
3	23.60	14.91	1.00	0.00	0.843	692.8
4	196.61	87.22	0.00	1.00	-1.323	1000.9
5	158.10	27.72	0.00	1.00	-0.237	1279.3
6	26.31	86.10	0.00	1.00	0.319	409.2
7	4.41	59.60	1.00	1.00	-1.347	138.2
8	2.33	73.30	0.00	1.00	-0.634	139.5
9	59.40	7.73	0.00	1.00	-1.030	438.3
10	184.30	40.31	1.00	1.00	1.259	4118.8
11	114.50	53.51	0.00	0.00	-0.009	1050.5
12	241.41	80.52	0.00	1.00	0.608	2347.1
13	45.85	5.27	1.00	1.00	-0.631	735.6
14	177.20	84.31	0.00	0.00	0.959	1954.6
15	220.50	62.02	1.00	0.00	-0.029	3486.7

The data for each of the columns in **Table 2** were defined by the following Excel formulas:

- X_1 = ***ROUND(RAND()*250,1)*** , which generates values of a uniform distribution of variables between 0.0 and 250.0
- X_2 = ***ROUND(RAND()*100,1)*** , which generates values of a uniform distribution of variables between 0.0 and 100.0
- D_1 = ***ROUND(RAND(),0)*** , which generates values of a uniform distribution of variables between 0 and 1.
- ***Err*** = ***NORMINV(RAND(),0,1)*** , which generates values of a normal distribution with mean = 0 and sigma = 1. Note the value for the value for the first point in the sixth column of Table 2, ***Err***, was adjusted to create an unbiased distribution.
- $Y_{(ACT)}$ = ***(A+B*X₁^C*X₂^D*E^D₁*F^D₂)*(1+(Err*ş))***, which generates a set of data based on values of X_1, X_2, D_1, D_2, ***Err,*** six coefficients (***A*** through ***F***), and a noise multiplier, ş for the normally distributed multiplicative error.

We chose the following coefficients to derive $Y_{(ACT)}$: **A** = 150, **B** = 10, **C** = 0.95, **D** = 0, **E**= 2, **F** = 1. A range from 0.0 to 0.55 was used for the noise multiplier, ş, to simulate data with increasing levels of noise.

Derivation of coefficients

We wish to derive coefficients ***a, b, c, d, e*** and ***f*** for the equation:

$Y_{(EST)} = (a + b * X_1^c * X_2^d * e^{D1} * f^{D2}) * \varepsilon$

using the ZMPE technique. The percent error, *(A-E)/E*, and percent error squared, *[(A-E)/E]2* of each data point are calculated in Table 3 for the first case using the coefficients a = 150, b =10, c = 0.95, d = 0, e = 2, f = 1, and a noise level, s = 0.20.

Counting Coefficients, *m*

The Excel equations used for counting the number of coefficients used in the regression using the algorithm and I-T tests are shown in Table 4. In our test case we chose a decay constant that was very small (h = 0.001) to allow rejection of coefficients that differed from their null value by values approximately 0.1%.

Table 4. Equations Used to Calculate Number of Coefficients, *m*

Counter	Algorithm	If, Then
m_1	$= 1-EXP(-((a-0)\wedge 2) /h)$	$=IF(a=0,0,1)$
m_2	$= 1-EXP(-((b-1)\wedge 2) /h)-EXP(-((b-0)\wedge 2) /h)$	$= IF(OR(b=1,b=0),0,1)$
m_3	$= 1-EXP(-((c-1)\wedge 2) /h)-EXP(-((b-0)\wedge 2) /h)$	$= IF(OR(b=0,c=1),0,1)$
m_4	$= 1-EXP(-((d-1)\wedge 2) /h)-EXP(-((b-0)\wedge 2) /h)$	$= IF(OR(d=1,b=0),0,1)$
m_5	$= 1-EXP(-((e-1)\wedge 2) /h)-EXP(-((b-0)\wedge 2) /h)$	$=IF(OR(b=0,e=1),0,1)$
m_6	$= 1-EXP(-((f-1)\wedge 2) /h)-EXP(-((b-0)\wedge 2) /h)$	$=IF(OR(b=0,f=1),0,1)$

The DoF = n-m, and in both cases, n = 15, so DoF = 15-m.

We then solve for coefficients *a, b, c, d, e* and *f* using the Excel solver routine and specifying the target cell, the SPE, equal to "MIN" by changing cells *a* through *f* subject to the constraint, bias = 0. The solver options are set to the following: (1) The amount of time to spend iterating, "Max time" = 100 seconds, (2) the total number of iterations, "Iterations" = 10000, (3) the precision of the coefficients, "Precision" = 0.000001, (4) tolerance = 0.0001%, and (5) convergence = 0.00001.

The first set of trials tests the performance of the algorithm and the I-T test, as represented by SPE, under different noise conditions, s, versus a control condition using the true values, *A, B, C, D, E* and *F*, for the six coefficients *a* through *f*. The initial conditions a = 1, b = 1, c = 1, d = 1, e = 1 and f = 1 were used in this case.

The SPE results in Figure 3 and Table 5 show the algorithm produces an equal or lower SPE in all cases except at a noise level, s = 0.35, which is highlighted in red in Table 5.

At a noise level of s = 0.35 the coefficients differ significantly. We believe this is caused by Solver's finding a solution for the coefficients that represent a local minimum for the SPE goal. The enhanced sensitivity of the algorithm has uncovered a local minimum that is overlooked by using I-T tests.

Figure 3. SPE Results with Initial Condition a=1, b=1, c=1, d=1, e=1 and f=1
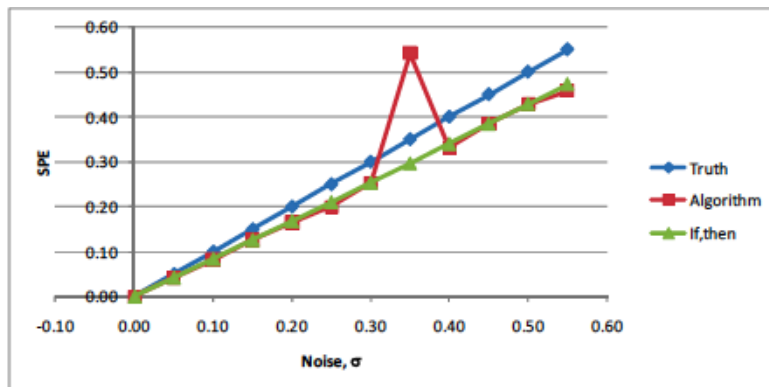
The algorithm also produces an ER with an equal or greater number of DoF (highlighted in red) than the I-T test. This is caused by the algorithm's rejecting coefficients that differed from their null value by 0.1%, in this case, since these coefficients add little statistical benefit to the estimating relationship [Ref. Anderson].

Table 5. SPE Results with Initial Condition a=1, b=1, c=1, d=1, e=1 and f=1

	SPE				DoF		
Noise, σ	Truth	Algorithm	If,then	Noise, σ	Truth	Algorithm	If,then
0.00	0.00	0.00	0.00	0.00	10	10	9
0.05	0.05	0.04	0.04	0.05	10	10	9
0.10	0.10	0.08	0.08	0.10	10	10	9
0.15	0.15	0.13	0.13	0.15	10	9	9
0.20	0.20	0.16	0.17	0.20	10	9	9
0.25	0.25	0.20	0.21	0.25	10	11	9
0.30	0.30	0.25	0.25	0.30	10	9	9
0.35	0.35	0.54	0.30	0.35	10	11	9
0.40	0.40	0.33	0.34	0.40	10	10	9
0.45	0.45	0.38	0.38	0.45	10	9	9
0.50	0.50	0.43	0.43	0.50	10	9	9
0.55	0.55	0.46	0.47	0.55	10	10	9

In the second set of trials, the initial conditions were set to the truth condition, a = 150, b = 10, c = 0.95, d = 0, e = 2, and f = 1. The SPE results in Figure 4 and Table 6 show the algorithm produces an equal or lower SPE in all cases. In fact, at noise levels, σ > 0.20, the Solver solutions for coefficients using the I-T test were identical to the initial (truth) condition. Again, as shown in **Table 6**, the algorithm produces an ER with an equal or greater number of DoF (highlighted in red) than the I-T test by rejecting coefficients that add little statistical benefit to the estimating relationship.

Figure 4. SPE Results with Truth Initial Condition
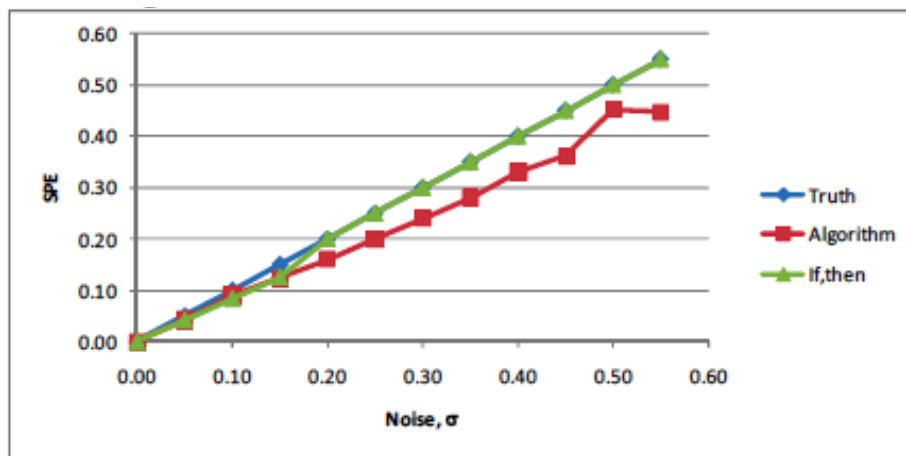
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Table 6. SPE Results with Truth Initial Condition

Noise, σ	SPE Truth	SPE Algorithm	SPE If,then	Noise, σ	DoF Truth	DoF Algorithm	DoF If,then
0.00	0.00	0.00	0.00	0.00	10.0	10.0	10.0
0.05	0.05	0.04	0.04	0.05	10.0	9.0	9.0
0.10	0.10	0.09	0.08	0.10	10.0	9.0	9.0
0.15	0.15	0.12	0.13	0.15	10.0	10.0	9.0
0.20	0.20	0.16	0.20	0.20	10.0	10.0	9.0
0.25	0.25	0.20	0.25	0.25	10.0	11.0	10.0
0.30	0.30	0.24	0.30	0.30	10.0	11.0	10.0
0.35	0.35	0.28	0.35	0.35	10.0	11.0	10.0
0.40	0.40	0.33	0.40	0.40	10.0	10.0	10.0
0.45	0.45	0.36	0.45	0.45	10.0	11.0	10.0
0.50	0.50	0.45	0.50	0.50	10.0	10.0	10.0
0.55	0.55	0.45	0.55	0.55	10.0	11.0	10.0

In both test cases, the algorithm produces (with one exception) better results, as indicated by lower SPE, than the I-T test. It produces ERs with greater DoF by eliminating coefficients that differ from their null values by less than 0.1%, which result in equations that minimize the number of variables to only those that are significant and add statistical benefit to the estimating relationship.

Conclusion
The algorithm described in this paper creates a continuous function of degrees of freedom based on the number of coefficients used in a regression, which allows constrained optimization to work more efficiently than a simple 'if-then' test. Further study has shown that it eliminates variables and their respective coefficients that add little statistical benefit to the estimating relationship. Using the algorithm with a large number of candidate estimating relationship drivers can result in a solution with the minimum number of cost drivers with the minimum percentage error.

References
1. Book, S. and Lao, N, "Minimum-Percentage-Error Regression under Zero-Bias Constraints", Proceedings of the Fourth Annual U.S. Army Conference on Applied Statistics, 21-23 October 1998, U.S. Army Research Laboratory, Report No. ARL-SR-84, November 1999, pages 47-56.

2. Anderson, T., "A Distribution-Free Measure of the Significance of CER Regression Fit Parameters Established Using GERM (General Error Regression Methods)," *Journal of Cost Analysis and Parametrics*, 2:1, (Summer 2009): 7-22.

The Venue

Welcome to Albuquerque NM! Come join cost community experts from government, industry, and academia to share ideas while attending stimulating keynote speeches and panel discussions and training. Register online at *www.sceaonline.org/events/conference/2011splash.cfm* and click on 'Conference Registration'.

Planning.
Dates are Tuesday June 7th through Saturday June 11th. Conference attire is Business Casual. Albuquerque in June is warm with the average high of 90 deg, and low humidity. The city is also at an altitude of 5300 ft so remember to drink plenty of water.

Hotel.
The Hyatt Regency Hotel is the ideal conference location. With spectacular views of downtown, this hotel will allow attendees to unwind after a day of learning and networking. In addition to 120,000 square feet of meeting space and over 300 guest rooms, the hotel features a spa and fitness center and pool. The hotel is perfectly situated for convenient access to all of Albuquerque's attractions. Attendees can walk 2 blocks to the old Route 66 streets to go dining and shopping. It is a short ride to Old Town, Museums, Zoo, Science Center, Tram, Hot Air Ballooning and much more. Self-parking at the Conference hotel is available for $12 per day, with in/out privileges. And a valet parking option for $16 per day The hotel is just minutes away from the Albuquerque International Airport (ABQ), with airport shuttles providing service to the hotel ($11 each way).

Reservations
There are two ways to register in advance. Online, reservations can be can be made by the following link: *https://resweb.passkey.com/Resweb.do?mode=welcome_ei_new&eventID=3229958*

Be sure to choose 'Attendee' in the guest type drop-down menu. Reservations at the government per diem rate can be made by clicking the link above, choosing 'I have access code' from the guest type drop-down list, and entering 'Govern' as the access code. Show a valid Government ID or travel orders upon check-in.

You can also make reservations by calling the hotel at 505-842-1234 or 1-800-233-1234, and requesting the 'ISPA/SCEA Conference'. The room rate is $161 per night which includes wireless internet access. Please take advantage of any corporate rates your company may offer in addition to the conference rate.

The Program

Conference Speakers.
There will be keynote addresses and panels speakers from both Industry and Government on topics relative to our businesses.

Training Workshop.
We plan to again offer the successful training program and to have 12 sessions in each of three tracks: Fundamentals, Practitioner, and Integration. ISPA Specific Training based on the Parametric Estimating Handbook 4th edition will be offered to attendees to learn parametric estimating techniques and also prepare for the CPP exam. The exam will be held Saturday morning June 11.For the first time ever, CEU credits will be given not only for training but also for certain professional presentations.

Proceedings.
There is a presentation for every cost estimating discipline. This is a larger number of presenters than last year's conference, so plan to stay for all the whole time or you will regret not having heard in person the paper that will help you solve your work problems.

Exhibits & Sponsors.
A number of companies will be exhibiting and will have representatives available for discussions of their products and services

Banquet.
We are arranging for the banquet to be at Albuquerque Museum of Art. At this Museum you will have admission to tour the museum exhibits before and after the banquet. A reception will be held on the upper balcony that provides a spectacular view of the Sandia Mountains. Our dinner will be in the vast museum amphitheater. This museum is also adjacent to Old Town district and many downtown activities. Busses will be provided from the hotel to the museum and back.

Conference 2011 Workshop Papers

BY SHERRY STUKES AND PAUL MARSTON

The Conference 2011 Call for Papers has yielded an unprecedented number of high quality abstracts with a wide range of interesting cost-related topics. Over 150 abstracts were received. With only 94 speaking slots available, it was a daunting task to select the top abstracts.

The Workshop Papers Selection Committee has completed the review and selection of abstracts for presentation at the 2011 Conference. Authors of the accepted abstracts have been notified. We also have an outstanding list of standby presentations available in the event that an accepted author is not able to make their presentation.

The Committee has established the following presentation tracks:

- Applications
- Management and Decision Making
- Models and Methods
- Research Topics
- Risk Analysis
- Software Estimating

The abstracts are in the process of being allocated to tracks. Track chairs have been identified and will be assigned to tracks in the near future. Titles and authors for the accepted abstracts are listed below. If you have any questions regarding workshops, please feel free to contact us. We'll look forward to seeing you in Albuquerque!

Sherry Stukes
Conference 2011 Workshop Co-Chair
sherry.a.stukes@jpl.nasa.gov
(818) 393-7517

Paul Marston
Conference 2011 Workshop Co-Chair
pmarston@mcri.com
(978) 528-4394

Title	Main Author	Co-Authors
Novel Application of Data Mining Algorithms for Shipbuilding Cost Estimation	Bohdan L. Kaluzny	
Selection of Data Source for Systems Contractor Labor Rates and Overheads and Their Application	Brian Wilkerson	Wallace Riggins
Minimizing Maintenance Costs Using Beyond Economic Repair Analysis	Jerry Le May	
Earned Readiness	John Williams	John Scardino
LORA — Impact on life Cycle Cost	Manmeet Grover	
Mahalanobis Distance: Shortening the Distance Between You and Clean Data Sets	Mike Manchisi	Blake Boswell, Eric Druker
Use of JCL Data and Information for Programmatic Success	Rey Carpio	
Cost Estimating of NASA Crewed Spacecraft Systems for Development, Production and Operations Activities	Rick Battle	Oscar Gutierrez, Michael Jansen, Lance Cole
Budgeting to the Mean	Rick Garcia	Casey Wallace
Projection of AEDC Pumping Water Electric Costs	Robert Nelson	Dan Wyman, Marcheta Darnell
Evolved Expendable Launch Vehicle (EELV) Discrete Event Simulation: Ensuring the Buck Results in a Bang	Scott DeNegre	Colleen Craig
Multiply or Divide? A Best Practice for Factor Analysis	Shu-Ping Hu	Alfred Smith
Interconnected Estimating Relationships: Their Derivation and Application	Stephen A. Book	Amanda J. Feather

Title	Main Author	Co-Authors
Using the New 881 WBS/CES for ERP Acquisition: Lessons Learned	Virginia Stouffer	Gerry Belcher
Determining Cost Estimating Relationships For Nine FAA WBS Solution Development Elements	William Barfield	
Targeting Affordability and Controlling Cost Growth through Should-Cost Analysis	Anthony A. DeMarco	Bob Koury
Rolling On The Affordability River (While Managing The Acquisition Program In The Rapids)	Christopher S. Svehlak	
Commercialization Activities at NASA and Resulting Cost Implications	James Roberts	Torrance Lambing
Affordability from a Systems Engineering Perspective	Joseph Bobinis	Edwin B. Dean
Cost by Capability: Funding the Right Mission Capabilities in a Cost Constrained Environment	John Scardino	Eric Williams
Mathematical Lessons Learned from a Year's Worth of ICEs	Ryan W. Boulais	Brett Dickey
How Cost Arises — How We Can Reduce Cost	Edwin B. Dean	
Lessons Learned: Independent Assessment of Code Counts and Productivities	Betsy Legg	Alex Ante, Justin Greene
Life Cycle Cost Growth for 20 NASA Science Missions	Claude Freaner	Robert E. Bitten, Debra L. Emmons
Constructing a Price-to-Win	Frank R. Flett	
EELV Should Cost Review Overview and Lessons Learned	James Smirnoff	Karen Schaben, Joe Kabeiseman, Bill Bartlebaugh
What to Know When Estimating Virtualized Environment Costs	Jennifer Woolley	Ryan Boulais, Sandra Williams
Building a Cost Analysis Improvement Group — Best Practices and Lessons Learned	Keith Robertson	Linda Williams, Erik Burgess
Lessons Learned: A Case Study in Labor Cost Estimating in a Data-Poor Environment	Kevin Schutt	
How to Estimate and Use Management Reserve in an EVM System	Mark Infanti	
Enhanced Cost Analysis in Support of Aerospace Corporation's Decision Support Framework (DSF)	Mel Broder	Lubo Jocic, Inki Min
Federal Budget Process	Michael Brozyna	
You Really Don't Have to Lose a Million Dollars a Year, a Cost/Price Analytical Journey through the World of Winemaking	Michael Thompson	
Cost Analysis Process in Manufacturing Industry	Mostain Dara Billah	
Best Practices in Aerospace Cost Estimation: Observations from US Air Force and NASA	Robert Georgi	Benjamin Watson
Integrating Earned Value Analysis and Independent Cost Estimating for Large, Multi Year System Procurements	Ron Weimar	Cole Kupec, Eric Mosier, Chris Massey
PARS II: Redefining Program Oversight & Assessment at the Department of Energy	Simon Dekker	
Improving Baseline Execution — A Parametric Approach	Steve Sultzer	Dan Galorath
NASA Implementation of JCL Policy	Thomas Coonce	James Johnson
Obtaining Greater Efficiency and Productivity in Defense Spending	Tom DuPre	Lisa Keller, Kirsten Schulte
The Growing Pains of Small Cost Shops	Tucker Moore	

Title	Main Author	Co-Authors
Comprehensive Assessment of Program Performance using Earned Value Management Data	William Laing	Colleen Craig, Richard Lee, Scott DeNegre
Overcoming Challenges in Estimating Advanced Technology Programs	Zachary Jasnoff	Dan Nussbaum
A Comparison of Military and Commercial Submersible Systems Cost Environments and Methods for Estimating Submersible Development and Production Costs	Janet Vacca-LeBoeuf and Greg C. Bell	Brian Harris, Ryan Shakley
Trade Space, Product Optimization and Parametric Analysis	Doug Howarth	
Objective System Acquisition Decision Making utilizing the Analytic Hierarchy Process (AHP)	Hisham Abel-Jalil	
A Probabilistic Approach to Determining "How Many Widgets to Build"	Timothy P. Anderson	
Assessing Impact of Funding Constraints to Cost and Schedule	Darren Elliott	
Analysis of Parametric and Database-driven Cost Estimates in the Transit Industry	L. Brian Ehrler	
Operating and Support Cost Estimating Methods: An approach to estimate the US Navy's future cost of Ballistic Missile Defense	Brian A. Welsh	Elizabeth A. Koza, Paul L. Hardin III, and Marc W. Greenberg
"How Should I Know What the Shape Parameters Are?" An Elicitation Method to Generate an Unbiased Beta Distribution	Marc Greenberg	
Extending FEA and DODAF to Support Cost Modeling	Andreas Tolk	Resit Unal, Charles Keating, Johnny Garcia
Utilizing The Capabilities Knowledge Base for Cost Benefit Analysis and Analysis of Alternatives	Chadd Sibert	
Applying Development Cycle Electronics Hardware Sub-Product Parametric Cost Models to Project Execution	David Bloom	
QuickCost Suite of Space Project Cost Estimation Models	Joe Hamaker	
Cost Analysis using Random Forest Prediction	Karen Mourikas	Denise Nelson and James Schimert
The Information Technology Infrastructure Cost Model	Kyle Thomas	Belinda Nethery, Carol Wilson
Cost Estimation During Early Project Planning	Leigh Rosenberg	
Economic Elasticity of Tactical Missile Costs	Raymond P. Covert	
Modeling to Establish the Affordability KPP	Samuel Toas	Greg Hogan, Gabe Rutledge
Dynamic Helpdesk Resource Modeling	Sujoy K. Roy	Nolin Huddleston, Steve Sheamer, Ron Beheler
A methodology to improve the predictability of CER with insufficient data in Korean weapon system R&D environment	Yong Bok Lee	Sung Jin Kang, Dong Kyu Kim
What Measurement Theory Tells Us about Quantifying Intangibles	Mitch Robinson	
Enhancing Cost Realism Through Risk-Driven Contracting: Designing Incentive Fees Based on Probabilistic Cost Estimates	Sean P. Dorey, Maj, USAF	Dr. Josef Oehmen, Dr. Ricardo Valerdi
Using Project Performance Data in Cost and Schedule Analysis	Fred Kuo	Mike Stelly, Darren Elliott
Joint Cost Schedule Model — Recent AFCAA Efforts to Assess Integrated Cost and Schedule Analysis	Antonio Rippe	Greg Hogan, Darren Elliott

Title	Main Author	Co-Authors
NRO CAIG O&M WBS and Duration Guidance	Ryan Timm	Gary Kanady, Jenny Moose, Sara Wise, Lori Zondlo
Developing a tool to answer metrics related questions in RFPs	H.S. van Heeringen	
Parameters in Parametric Cost Estimating	Myung-Yul (M-Y) Lee	
Fuel Cells turn up the Heat	Arlene Minkiewicz	
An Approach to Estimate the Life Cycle Cost and Effort of Project Management for Systems Centric Projects	Leone Z. Young	Dr. Jon Wade, Dr. Ricardo Valerdi, Dr. John V. Farr, Dr. Young Hoon Kwak
Patterns of Resource Expenditure: New Approach for Cost Phasing	Dr. Will Jarvis	Dr. Paul Oleson
Testing S-Curves for Reasonableness	Richard L. Coleman	Peter J. Braxton, Richard C. Lee
EVM Trends to Forecast Cost Risks	Roy Smoker	
Effective Use of Cost Risk Reports	Alfred Smith	
Quasi-Monte Carlo Methods: Combating Complexity in Cost Risk Analysis	Blake Boswell	
Covered with Oil: Incorporating Realism in Cost Risk Analysis	Christian Smart, Ph.D., CCEA	
Joint Confidence Level Analysis and the Dynamic Integrated Cost Estimator (DICE) Model	Graham Gilmer	Colin Smith
Risk Based Estimating and Alternative Selection Using Value Analysis	Gregory Brink	
A Call to Please Stop Abusing the Central Limit Theorem	John Sandberg	
Real-time Risk for the Operations Environment	John Teal	
Multicollinearity in Zero Intercept Regression: They Are Not Who We Thought They Were	Kevin Cincotta	
The Implementation of Crystal Ball in Proposal Evaluations and Cost Models	Marcus Oberholzer	Travis Winstead
Joint Probability of a Parametric Software Cost and Schedule Estimate: Method and Example	Michael A. Ross	
Understatement of Risk and Uncertainty by Subject Matter Experts	Peter J. Braxton	Richard L. Coleman, Paul Casas
Enterprise Resource Planning Systems: Sizing Metrics and CER Development	David Brown	
The Challenge of Agile Estimating	Heather Nayhouse	Christina Donadi
Estimation Challenges for 21st Century Software Systems	Barry Boehm	Bradford Clark, Ray Madachy, Wilson Rosa, Thomas Tan
Primer for Analyzing SLOC Counts	Brian Opaska	Ben Netherland, Max Hodal, Rich Bethea
Function Point Analysis: One Size Fits All	Dan French	
Is There Magic Associated with Software Benchmarks?	Donald Reifer	
Software Cost Estimation Using A Decision Tree Process: A Knowledge Engineering Approach	Sherry Stukes	Dr. John Spagnuolo
SEER-SEM to COCOMO II Factor Convertor		Dr. Derrick Tate, Dr. David A. Wyrick, Dr. Ricardo Valerdi
What Does a SLOC Look Like?	Steven W. Oxman	

Estimating & Pricing Specialists

HISTORIAN REPORT

As the ISPA Historian, I enjoy a vantage point for viewing contemporary events, such as the appointment of Charlie Hopkins as our newest *PW* editor to replace Nina Tahir. In welcoming Charlie to the job, I am reminded that he actually was the launching editor of the *ISPA News* (inaugurated in 1979 as a replacement to the PRICE Users Bulletin) and our first Editor of the *ISPA Journal of Parametrics*. (Volume 1, number 1, was published in the Summer of 1981).

In his the first ISPA News, Charlie proclaimed *"My hopes for the News are my hopes for ISPA as a whole: that it will be technically oriented, excellent and provocative. That it will promote a dialog between parametric model builders, model users, and customers that will lead to widespread acceptance of parametrics."*

In addition to several newsy articles about our just-completed first conference (1979, Washington DC) and plans for our second conference (1980, Cherry Hill NJ), the News included two feature-length articles: the first by Noel Hargrove (Bunker Ramo) recommended a management strategy for describing your parametric estimate and the second by Bob Seldon (General Dynamics) dissected the contractual implications of life cycle costing.

Just two years later, Charlie began development of a new standard and vision for our fledging society — the very professional *ISPA Journal*. In his Editor's Welcome to the Journal, Charlie greeted the reader to our flagship publication by pronouncing *"The Journal of Parametrics will be focused on membership-generated papers; these papers are our lifeblood and the Journal can be no better than ISPA members make it."* That first issue, which set the standard for 52 more issues to follow, delivered three articles: the first by Air Force Captain Bob Gaffney, our first Parametrician-of-the-Year, placed parametrics in the greater perspective of acquisition management; the second, by Tom Tracey of Perkin Elmer, described how parametric estimates apply to small quantity production (optical devices); and the third by Robert Lavoie and James Lawlor of TASC, described a model for developing life cycle cost estimates.

Was it really thirty years ago — or was it just yesterday? Welcome back, Charlie.

Hank Apgar
ISPA Historian

By Steve Sterk

The Membership team saw 49 new members in calendar year 2010. This is a good achievement in economic hard times when jobs are scarce. However, the Membership Team along with key players in upper-management and various executive leadership teams see the value in having their workforce belong to a professional society. The Membership Team — which is made up of Siobhan Kernan (PRICE Systems), Lisa Yedo (Ball Aerospace), Karin DeGraffenreid, (Independent Consultant), Erica Wilkening (Joint ISPA/SCEA Business Office) and me — has broken last year's record.

Our society (ref. chart) is built on a legacy of lifetime members who had a common vision 33 years ago.

So why is there a 200% increase from 2008 levels? The first explanation is that our Society brings people together who have a common interest in cost estimation methods and techniques. They are backed by an array of expert researchers, who have dedicated their lives and leveraged their careers to the community of best practices. I applaud you all! It's the interaction and training that allows our society to become internationally acclaimed.

Today, ISPA has members in thirteen countries which include: Australia, Belgium, Canada, France, Germany, Italy, Japan, Ireland, South Korea, Sweden, the Netherlands, United Kingdom and the United States.

The new 'Defence Acquisition Reform Programme' in the United Kingdom aims to improve and increase cost estimating capability. Cost estimators and analysts will be required to be certified. This is a step farther than any other country, and it aids future budget setting and reduces cost overruns. From ISPA's perspective, those members of the UK Ministry of Defence staff who will acquire CPP status will — within two years — number more than 80 (double that of previous years). And the recommendation is that, as development progresses, they become ISPA members to ensure later re-certification and other benefits. Also for the first time,

PRICE Systems International will be offering a 1-year membership as part of its training course for parametric tool trainees who are currently non-members.

To sum up my membership article for this edition, membership is on the rise for both professional cost societies. As the Membership Chair I am always willing to voice your concerns and comments to the Board of Directors for their consideration. From my perspective awareness of Training and Certification is required for career advancement and growth. This in turn overcomes 'credibility issues' when presenting cost estimates and analysis to the decision makers, and thus reduces cost overruns! I hope to see everyone reading this article at the upcoming conference slated for Albuquerque June 7 – 10, 2011. Please stop by the ISPA Membership booth and introduce yourself. More importantly consider taking the training classes for the practitioner exam.

See you there!

Steve Sterk (CPP)
ISPA Membership Chair
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(661) 276-2377

New Members

Jeff Bullock — The Boeing Company
George Culver — SAIC
John Gyamfi — Graduate Student
Rochelle Hodgson — The Boeing Company
Kevin Kracinski — The Boeing Company
Mark Ling — The Boeing Company
Joanne Mc Cool — PRICE Systems
Eric Shulman — USAF
John Sullivan — Federal Aviation Administration
Jacques Virasak — Sikorsky
Jesse Womack — The Boeing Company
Nelson Yockey — The Boeing Company

Membership Timeline based on "Join Date"
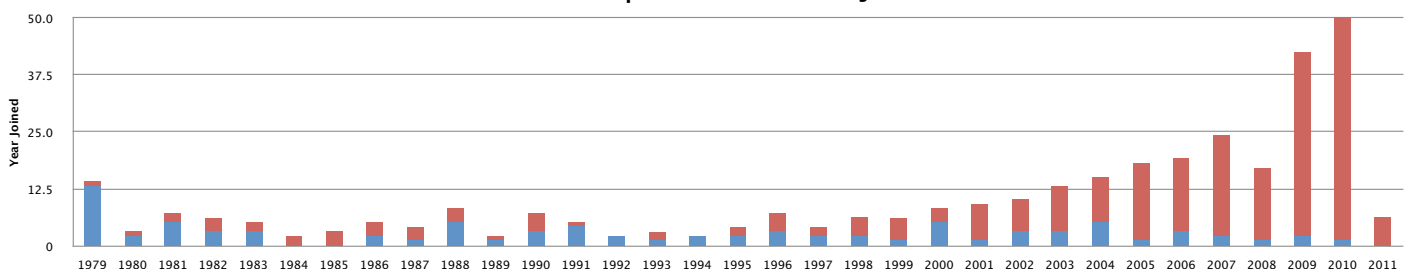
Notes from René Berghuijs — *Brussels, Belgium*

In 2011 we can expect the NATO reform to take shape, as nations at the Lisbon Summit have adopted the vision for a leaner and meaner NATO in next decade. Target for the new NATO Command Structure is a 35% savings, or 5,000 posts less. Another decision is to expand the ALTBMD program beyond deployed forces to also protect European NATO populations. Plans for Agency Reform are expected by March 2011.

A total of 4 meetings for the BeNeLux Chapter are scheduled for 2011. We have established an interesting program and hope that more people will join us. I intend to visit some meetings of fellow organizations in other countries this year (UK and Germany), to see what is going on over there. I also joined a few cost estimating groups on LinkedIn and to my surprise found myself quickly involved in some discussions on parametrics.

I wish you all a happy and busy 2011!

Réne Berghuijs

NATO Air Command and Control System (ACCS) Management Agency

Notes from Arthur Griffiths — *The UK*

Birds, Twitchers and Cost Analysts. It was a few days before Christmas and I woke to a cold, crisp morning. In opening the blinds I expected the frost or even a bit of snow. However, blinking with surprise, what I saw were dozens of people in front of the house with cameras and binoculars all looking in my direction. Feeling rather bemused I opened the front door to greeted with a Sssh! from the crowd. Very excitedly they pointed to a large flock of birds that had descended to eat the berries from the trees at the front of my house. They told me that the birds were 'Waxwings' that had migrated from Scandinavia and that it was very rare to see them in Southern England.

I must say that I had to admire the watchers' enthusiasm, dedication (it was very cold) and sheer joy they showed in practising their hobby. Particularly, when they were recording flock numbers, characteristics, size, behaviour, movement, etc. It reminded me of a few cost analysts who are similarly dedicated and enthusiastic about their profession. These are inspirational people who have introduced us all over the years to best practice, accuracy and governance on everything we do when we produce cost estimates and business analysis.

In October the UK Government announced its austere budget and warned of large cuts to programmes and services across all business sectors. Following this, each Department had to provide a case for how the cuts would be achieved and provide an implementation plan that would demonstrate the cost savings made. However, when we look at this with hindsight many of the programme overruns and failings were due to unexpected growth in costs and schedule due to changed requirements, increased raw material and the need to balance the books by delaying programmes and manipulating cash profiles. Notwithstanding all this, the key to success is about getting the Baseline cost and schedule right at the outset. Recently, some new departmental policies are being introduced on the budget setting and approval for future procurements. This requires much more use of quantitative risk analysis (a good thing) and more aggressive budgets (not targets) based around the 50% point of the cumulative probability curve (a bad thing). Just like the red berries are bad for us so is this latest thinking. Being told to set a cost and schedule budget at the 50% probability point on a Post-Mitigation cost and schedule risk curve is asking for trouble. This assumes that all risk will be mitigated, no delays will be incurred and, a best, the project manager has to accept a 50% chance of failure before starting. No project manager in his right mind would accept this as a sound basis for setting the baselines and some might even call it gross negligence at the very least. One thing is guaranteed, the estimators are in for a rough ride if this becomes accepted practice.

Arthur Griffiths

Decision Analysis Services Ltd.

Jointness Committee Report:

By Hank Apgar, Member, ISPA/SCEA Jointness Committee

The Jointness Committee includes Hank Apgar, Andy Prince, and George Stratton. Since my last report, the committee has continued to nurture two opportunities for ISPA members: 1) A commercial publishing contract for the *Joint Journal* and 2) A recommendation for a common dues structure.

COMMERCIAL PUBLISHER

The six members of the ISPA-SCEA Jointness Committee (three each from ISPA and from SCEA) have selected the international firm of Taylor and Francis (T&F) to publish the *Journal of Cost Analysis and Parametrics (JCAP)*, starting in 2011. T&F already publishes more than 1000 professional journals and over 1800 technical books every year. As discussed before in *PW*, the advantages of relying on a prestigious international publisher (rather than continue to self-publish) is to improve the visibility of our work (through peer recognition) and to increase the scope and readership of the Journal.

Our lawyers are currently reviewing the terms of the contract, which includes the following general provisions for our membership:

- ISPA and SCEA members will receive both a printed version and access to an on-line version of each *Journal*, as it is published. In addition, members will have access to digital copies of all back ISPA, SCEA, and joint journals with full-text search capability. For ISPA, this means that a member may search early ISPA Parametrics Journals as far back as the summer of 1981.
- ISPA and SCEA will retain ownership of *JCAP* and will continue to exercise executive control through the appointments to the following positions:
- Two Co-editors (one from each society)
- One Managing Editor
- Editorial Advisory Committee
- Associate Editors Board
- The process for members to submit papers and the peer-review process for reviewing papers will be essentially the same, but the time-lines are expected to shorten based on technical support from T&F.
- T&F will be primarily responsible for *JCAP* production, distribution, marketing, and sales while the societies will retain responsibility for content.

COMMON DUES

Some 120 of us are proud members of both societies. But the increased benefits of dual membership today may not justify paying double dues. So, your Jointness Committee studied the opportunity and made a recommendation to both boards for the following changes during 2011:

- A member of either society will automatically become a member of the 'other' society and will begin receiving newsletters from both societies. The incremental cost to our joint office is just to print and mail additional newsletters.
- Members of both societies already enjoy other common benefits including the joint Journal, merged training, and joint conferences.e the combined memberships their continued access to the best cost analysis journalism available anywhere.

Hank Apgar
Member — ISPA/SCEA Jointness Committee
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to represent the Society's outreach. We provide a vehicle for cost topics that are beyond the mainstream at any time. This is how we came to publish the early papers on Technology Forecasting. *PW* must provide budding authors a place to get published for the first time. Our articles are technical working notes and need not be as rigorously documented as full *Journal* articles. In the same vein, *PW* doesn't use referees to select papers.

I am saddened to hear that my old friend and mentor Peter Korda has died. This issue is too close to publication to celebrate Peter's achievements. So we will try to do justice to his memory in the next issue.

Charles Hopkins

Editor, *Parametric World*
charlesvhopkins9@aol.com

EDITED BY JOSEPH W. HAMAKER, PHD, CPP (JOSEPH.W.HAMAKER@SAIC.COM)

Do you have a knotty cost analysis problem? Something that you have been wrestling with but don't feel you know the best-practice answer to? Well our *Ask a Parametrician Q&A* column is an opportunity for you to get considered answers from senior cost analysts. It is an especially good opportunity for analysts new to parametric costing to get their difficult questions addressed by the top experts in our field. So send me your best conundrum to the email address below. Send your question to me at **joseph.w.hamaker@saic.com**.

And in this issue we announce a new twist to this column for the next issue. Where in the past we have solicited questions from more less experienced analysts and sought answers from those more experienced, I thought it might be fun to turn things around for a column. So for the *next* issue of *Parametric World*, I would like to ask you veteran analysts to summon the meekness to **ask a question** to be fielded by one or more readers new to parametric costing. So, fellow senior cost analysts: who has a good question that we can pose to the newer/younger crowd? Maybe something where old age and trickery aren't as important as fresh ideas and new techniques? So this is your chance veterans — send me your question to my email address above.

But continuing in this issue with our historical setup of a question from a more junior analyst and answers from veterans, this issue's question comes from Krista Stroh of NASA Johnson Space Center/Barrios Technology. Krista asks:

"How do various senior estimators use performance measurement techniques, such as Earned Value Measurement or the performance baseline, against their parametric estimates to develop better budget estimates or spend plans on to-go costs? I've seen EVM basis used. I've seen a couple of other methods with more manual analysis of cost and schedule. I'm just wondering what the general consensus is (if there is one)."

The answer to this question is jointly provided by David Graham, just retired from the Air Force Space and Missile Command at Los Angeles Air Force Base and Kristen Kehrer at NASA's Kennedy Space Center. They write:

*"First, do not look at **Budgeted Cost of Work Performed, BCWP (Planned Value of Work Accomplished**, as NASA used to call it). Also, do not consider **Budgeted Cost of Work Scheduled, BCWS (Planned Value of Work Scheduled)** at all. Just use **Actual Cost of Work Performed, ACWP** (same term in old NASA parlance). **ACWP** gives values that any cost estimator would use as actual data. Such date would be collected for a Cost Analysis Data Requirements (CADRe) document or any other data collection exercise. Keep in mind that the costs are in 'Then Year' dollars so data has to be brought back to some constant year dollar by using an inflation factor. There's always the problem of quality of the data when dealing with EVM data; so-called 'discipline' is often an issue on the EVM reviews.*

*An **Estimate At Complete (EAC)** developed using EVM data can serve as a comparison or cross-check against a parametric estimate; it can also as help provide a cost range. Put the EVM metrics to work and come up with an EAC if the performance of the work is still going on. The estimator has to be careful not to use an EAC that is based on a project that is less than 50% complete. Various researchers have concluded that the projections don't 'stabilize' until 60% or greater percent complete has been achieved. Some analysts have argued that space projects are an especially contrary breed and may not stabilize until about 80% complete (but remember that many space projects are "one-off" or very low production runs). Parametric estimates tend to work better very early on and can be used to supplement an EAC when the project or WBS being estimated is less than 20% complete.*

Since EVM data is reported monthly, it is pretty straightforward to develop 'burn rates' to use as the velocity at which money is being spent. If you have an idea of the period of performance of the project being estimated, one can extrapolate the burn rates for the elements in question. Since the EVM data starts early in the project and continues over time, the estimator can pick different points in time as the contractor ramps up, goes peak and then ramps down his resource expenditures. Using this data stream makes the analyst's estimates more credible.

To get really fancy, the estimator can examine what kind of function the burn rate data resembles for specific project category types, e.g., space, tanks, airplanes, etc., after collecting a lot of actual EVM actual data. DoD did just that in the 1990's and came up with RDT&E actual burn rate data resembling the Rayleigh Curve. By sampling early actual cost data (minimum of three data points for example), and fitting the data to a Rayleigh Curve, estimates of final costs (and even final duration) can be projected. The more data points, the more accurate the projections. No one has done this yet with just space data to our knowledge.

Training Material Use

At its January 2011 meeting the ISPA Board of Directors voted to adopt a training material use policy. The need to have a policy on how the Society's material should be used came about after a commercial company contracted with the UK Ministry of Defense. The firm asked to teach Parametric Estimating and planned on using Handbook based training material as part of the course. The directors were informed of the company's plan to use the training material and ISPA subsequently drafted a policy that covers this first-time commercial use and any future use outside of a conference.

ISPA has developed training material that is based on the Parametric Handbook 4th edition and has used this material to teach classes at the annual conference since 2002. The same material is also incorporated in the combined training class conducted at ISPA/SCEA conferences since the first 2005 joint conference in Denver Colorado. ISPA does not charge separately for this material when it is part of the conference material available to paid attendees. The major points of the new use policy are:

Non Profit Entity: An individual or company may use the training material on a no-fee basis to improve the professional abilities of themselves or others when there is no fee or cost to the attendees beyond actual costs. ISPA members in good standing are allowed to download from websites, print, and copy the training material for personal use. ISPA members in good standing may copy, distribute, display, and incorporate the ISPA training material in customized presentations for non-profit use as long as the source of the material references ISPA and written permission is obtained from ISPA.

For-Profit Entity: Firms must first receive written permission from ISPA. Any organization wishing to use the ISPA training material to train others for profit must have an ISPA member in good standing that is responsible for ensuring that the proper controls are in place for maintaining the ISPA copyright and that all the provisions of this policy are followed. An annual license fee of $2,500 will be paid to ISPA.

Conditions of Use: Various restrictions on keeping copyrights and material unaltered are covered in the policy.

The full policy is available for review.

Doug Druley

Planning and Governance

By George Stratton

Governance:

A year has gone and we are without a request for changes to the Society governing rules as contained in the Bylaws or Constitution of the society. That's progress. Over the last few years we have been trying to bring the language and means of these documents into today's modern political world and digital society.

Planning:

The Society's five-year operating plan, normally prepared in the Fall, is taking longer to prepare this year than normal. We are hoping to have it ready for presentation to the Society at the conference annual business meeting. Decisions that are in process of being made concerning the journal, potential changes to the dues structure and our contract with the business office all will affect this plan. So, look for the updated plan at the conference business meeting.

By Greg Kiviat

Recently (Jan 19, 2011), more than 60 persons attended the third Aviation Cost Integrated Product Team (IPT) meeting in Fort Worth, TX hosted by Lockheed Martin. The Aviation Cost IPT is one of several government/industry Cost IPTs dedicated to creating long term industry/Government relationships to develop common understandings for acquisition and cost tools and methods. This meeting's focus was on efforts to implement the 'Will Cost' and 'Should Cost' memos of Dr. Ashton Carter (Undersecretary of Defense for Acquisition, Technology and Logistics).

Rene Wood, Air Force Cost Director outlined a draft of a multi-service effort to define how 'Will Cost' and 'Should Cost' are defined and implemented to better manage DoD acquisition costs. While details are not yet final, Ms. Wood provided preliminary guidance for implementation. One key feature is that government-estimated Will Cost and Should Cost analysis will be required for all CAT I, II and III programs and would be updated each year and for each program milestone event.

Will Cost was defined as a 'non-advocate' estimate at 50% confidence to ensure that funding for programs will not experience significant adjustment. This approach uses past program cost, technical, and program history as the basis for predicting the next program cost. Will Cost does not assume any significant cost savings due to increased cost management such as Design to Cost, CAIV, new manufacturing technologies, or other cost mitigation techniques.

Should Cost intent is to set program execution baselines assuming success oriented outcomes and leveraging lessons learned from past programs. Should Cost values would nominally be assumed to be lower than Will Cost as and would serve as a goal for the program. One recommendation is that the Will Cost values would be considered the baseline for 'Should Cost' specific savings initiatives.

Interestingly, the government team's presentation specified that a 'bottom up' approach should be used in developing will and Should Costs. When asked about the use of the term 'bottom up' and its definition in this case, Ms Wood noted that this reflected that the analysis must be based on actual past program data and that use of 'parametric estimates' which are calibrated to past data would be an acceptable approach. We all should be aware of potential confusion in the use of 'bottom up' and 'parametric' estimate terms and should seek additional explanation when the meaning may not be clear.

At this point Operating and Support (O&S) cost considerations have not yet been defined for Will Cost/Should Cost, although will likely be addressed in the future. One question from the audience concerned how contract awards will be affected based on Will Cost or Should Cost. Ms. Woods replied that the use in the contract decision process is not yet clear and that the government is developing a template to show budget, Will Cost, Should Cost, current cost, and adjustments for standard use at reviews across all services.

The increased and required use of Will Cost/Should Cost will likely expand the role of cost analysts both within the government and industry. Parametric estimating practitioners and estimators in general should try and keep up with the changes in the acquisition process as the new guidelines are developed.

Greg Kiviat
ISPA Secretary

Finally, EVM data is a valuable source to support the development and update of the parameters used in parametric cost estimating and analysis. EVM data is usually collected and stored in a database (such as wInsight®) within government organizations. A project or contract with an EVM System will maintain budget logs and prepare variance analysis reports that describe the reasons for cost and schedule growth. This information can be used to help us identify typical drivers of cost overruns at NASA to help build better parametric estimates and better cost estimates."

So thank you Krista Stroh for the question and thanks to Kristen Kehrer and David Graham for teaming up to provide this issue's expert answer. **And remember readers, in the next issue we are looking for questions from seasoned analysts that can be fielded by analysts with a little less time in our discipline.**

Joseph W. Hamaker, PhD, CPP

ISPA Southern California Chapter News

By Kurt Brunner, Chapter President and Sherry Stukes, Chapter Vice President

Our last joint ISPA/SCEA workshop of 2010 was hosted by Boeing at their Huntington Beach, CA facility on December 7th 2010. There were 97 attendees (including 10 virtual attendees) who participated in the workshop as shown in the photo below.

The workshop began with an overview of the **Boeing Network and Tactical Systems** presented by **Dr. Naveed Hussain**. Next, our keynote speaker, **Steve Miller**, from the Office of the Secretary of Defense conducted an informal interactive discussion session where attendees were invited to discuss issues and ask questions about policy affecting our profession. We were fortunate to have two Best Paper presentations from the 2010 Joint ISPA SCEA Conference. A full listing of the December 7th program is provided below.

Rick Cline, Associate Technical Fellow, Effectiveness & Affordability Analysis, Boeing Research and Technology, *"Cost is the Cinderella of KPPs"*

Tour of Boeing facility
1. Autonomous Systems Laboratory (demonstrations)
2. Composites and Manufacturing Area (demonstrations)

Dr. Shu-Ping Hu, Chief Statistician, Tecolote (Santa Barbara), *'Simple Mean, Weighted Mean, or Geometric Mean?'* (Best Methods Track Paper, 2010 ISPA/SCEA Conference)

Dr. Christian Smart, Chief, Test and Targets Cost Analysis Division, Missile Defense Agency (Huntsville, AL), *'Here There be Dragons: Considering the Right Tail In Risk Management'* (Best Overall

Conference Paper, 2010 ISPA/SCEA Conference)

Doug Howarth, ADP Parametric Estimating Lead, Lockheed Martin Aeronautics Company (Palmdale), *'Commercialization of Aviation Designs'*

Dr. Stephen Book, Technical Director, MCR LLC (El Segundo), *'Statistical Foundations of Adaptive Cost-Estimating Relationships'*

Don't miss our next joint **ISPA/SCEA Spring 2011 Workshop** which will be hosted by **Galorath Incorporated** in El Segundo, CA, 16 March 2011. We have e-mailed out copies of the agenda to members and previous attendees. You may contact the Galorath Inc. registration point of contact **Kelly Timko** at: *ktimko@galorath.com* or (310) 414-3222 x632. An excerpt of the agenda is as follows.

Keynote Address: **Dan Galorath, President, Galorath Inc.**

Speakers: **Karen McRitchie, Vice President Product Development, Galorath Inc.,** *'Behind the SEER-SEM 8.0 Updates'*

Training Topic: **Mike Ross and Tony Dietl, Tecolote Research Inc.,** *'Anatomy of a Software Estimate'*

Pierre Foussier, President, 3-f (Paris, France), *'How to Deal with Qualitative Variables'*

Robert Koury, Solutions Architect/Senior Operations Research Analyst, PRICE Systems, LLC (Mount Laurel New Jersey), *'Controlling Cost Growth through Will Cost/Should Cost Management'*

Dr. Neal Hulkower, MCR LLC, (Springfield, VA) Vice President, Technical Planning and Quality Support, *'Numeracy for Cost Analysts, Doing the Right Math, Getting the Math Right'.*

Also, at the 16 March 2011 workshop the Southern California Chapter Elections Chair, **Madeline Ellis** will be announcing the results of this year's election. Madeline will introduce the new officers and board members. These elected positions are for two-year terms.

Our **Fall 2011 workshop** will be conducted in September at **USC** and our host will be the award-winning software engineering and estimating expert, Dr. Barry Boehm. Additional details about these upcoming workshops will be posted to the ISPA web site under the Southern California Chapter section.

If you would like a copy of the workshop briefings please go to our website (www.ispa-cost.org) and login as either a member or a guest and look for the Southern California Chapter. Then, locate the workshop of interest.. You may also contact the workshop program coordinator, **Henry Apgar**, at *hapgar@mcri.com* for copies of the presentations.

Please consider hosting a workshop or presenting at a workshop! It will be a rewarding experience. If you are interested in hosting a workshop, please contact **Kurt Brunner** or **Sherry Stukes**. Also, if you are interested in presenting at a workshop please contact Henry Apgar.

We look forward to seeing you at the next workshop!

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CALENDAR OF EVENTS

February 8, 2011
SCAF Workshop
Royal Institution of Naval Architects
Victoria, London
Information: Max Murray Brooks
mmbrooks@dstl.gov.uk or www.scaf.org.uk

March 16, 2011
ISPA So Cal Workshop
Galorath, Inc.
El Segundo, CA

March 28 – 29, 2011
SSCAG
Jet Propulsion Lab
Pasadena, CA
Information: www.sscag.saic.com
David Pine: dpine2@cox.net

April 12, 2011
SCAF Workshop
The BAWA Centre, Filton, Bristol
Information: Max Murray Brooks
mmbrooks@dstl.gov.uk or www.scaf.org.uk

April 15 – 16, 2011
CSER2011 — Ninth Annual Conference on
Systems Engineering Research
Crowne Plaza Redondo Beach and Marina
Hotel, Redondo Beach, CA
Information: www.incose-la.org/events/
conferences/cser-2011.html

June 7 – 10, 2011
ISPA & SCEA Conference & Training Workshop
Hyatt Regency Albuquerque, New Mexico
Information: scea@sceaonline.org
or 703-938-5090

June 20 – 23, 2011
79th MORS Symposium (Classified — US Only)
"Developing the Next Generation
of National Security Analysts"
Naval Post Graduate School
Monterey, California
Information: www.mors.org

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