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Interview with Jim Morin
Earned Value Pioneer

Jim Morin worked in the U.S. aerospace and defense industry for over 45 years, beginning at LMSC shortly after graduating from Santa Clara University in California. He was a part of the small core of industrial engineers that formed Performance Technology Corp. and was instrumental in the development of Earned Value Management (EVM) in the 1960s. He spent 15 years in prime contractor line, staff management and executive positions in the US defense industry, and has over 30 years in program management consulting, owning his own firm since 1986.

*Editor's note: Jim Morin was there when earned value was created and implemented within the US Department of Defence in the 1960s. We are honoured to have him share his knowledge about the early days of the EVM movement. Portions of this interview were included in an article by Michael Hatfield that was previously published by the Project Management Institute (PMI). The answers to questions below were provided by Mr. Morin and are published with his consent. For more information about the early days of EVM, please read the paper by Mr. Morin entitled "How it all Began: The Creation of Earned Value and the Evolution of C/SPCS and C/SCSC", published in the December 2009 edition of **PM World Today** – at <http://www.pmforum.org/library/second-edition/2009/PDFs/dec/SE-Morin-HowItAllBegan.pdf>.*

On the Background and Evolution of Earned Value

PM World Today (PMWT): Jim, given the fact that you were involved in some of the early developments of what is now known as earned value management (EVM), can you tell us what, if anything, preceded the Cost/Schedule Control System Criteria (C/SCSC)?

Jim Morin: The DoD-wide C/SCSC was the third earned value system. The first was Minuteman Earned Value, which was the basis for the Air Force's Cost/Schedule Planning and Control System (C/SPCS), which, in turn, was the basis for C/SCSC.

PMWT: Can you elaborate about some of those predecessors of C/SCSC? How did they come about?

Morin: Earned Value was the creation of A. Ernest 'Ernie' Fitzgerald. In 1965, he founded a consulting firm by the name of Performance Technology Corporation (PTC), the core of which was a group of industrial engineers, including myself, who worked together at Lockheed Missiles & Space Co. (LMSC).

In the early 1960's, Ernie was with Arthur Young. He had helped sell the Air Force and the Navy on the development and implementation of an 'Indirect Work Measurement' methodology that could be used as a basis for staffing the indirect organizations. The program was implemented as the Group Attainment Program (GAP) at Lockheed, Boeing and other companies, and as the Performance Attainment Program (PAR), which I developed and implemented at McDonnell Aircraft after working with Ernie and the team at LMSC.

Work measurement programs all have the same basic components: the definition of the work to be performed, the establishment of standards, the measurement based on application of the standard(s) to the work completed, and the comparison of the standards earned to the resources consumed to complete the work. I mention the indirect measurement programs because they were the stepping stone, so to speak, from the typically detailed direct work measurement used in factories to the large scale work measurement that is Earned Value.

PTC's challenge was to convince the U.S. Government that the construct we had developed under Ernie's leadership, Earned Value, would make a significant contribution to improved visibility and control, and to eliminating the continually inadequate estimates-at-completion (EAC's) that plagued the large national asset programs, such as Polaris and Minuteman.

Since we knew the Polaris folks quite well, one would have thought that would have been the entry point, but the Navy was wedded to PERT/Cost, a competing approach that we had strongly criticized. So we turned to the Air Force. Ernie successfully convinced the Air Force's Ballistic System Division (BSD) to enter into a study contract with PTC to define and explain Earned Value and eventually to do a proof-of-concept engagement.

The product of the study was the seminal Earned Value Summary Guide, submitted in draft by Ernie on February 25, 1965, and in final form on April 30th. Page 2 of that document contains the earliest published reference to what became the classic definition of earned value: "...the planned value of work performed to date." On March 21st, the first earned value 'criteria' were formally transmitted to BSD. This consisted of 11 criteria and 57 items to be used to determine compliance.

It should be noted that initially we thought of earned value in the context of a defined system, as was PERT/Cost. But it became obvious that the resistance to government-defined systems was rapidly growing throughout the industry, so Ernie revised the approach to that of defining criteria to be applied to the contractor's systems to determine compliance. Thus was born the 'spec' approach that was also used in C/SPCS and C/SCSC.

Secretary Marks, the Assistant Secretary of the Air Force for Financial Management, was sufficiently impressed with PTC's work to date to authorize a Proof of Concept at North American's Autonetics Division in the summer of 1965. Ernie, Myrt Tyrell and Joe Wolters took the contractor's budget, schedule and cost data, and created a detailed baseline. Once that was coordinated with management, they determined the earned value based on the data reported to the Air Force.

The result was a dramatic EAC overrun that was suspected by some, but definitely not documented or reported. The result was the decision to implement earned value on all eight Minuteman Associate contractors. PTC's contract was expanded to define and coordinate the contract clauses and to provide support to the contractors and to perform an audit/validation of the eight contractors.

By the end of 1965, Secretary Marks had decided to proceed with Earned Value across the Air Force, and offered Ernie the position of Deputy Assistant Secretary of the Air Force for Financial Management, which he accepted. Dave Howard replaced Ernie as the 2nd President of PTC. Dave was one of the authors of the draft C/SPCS criteria, along with Mert, Phil Carter and Ernie.

The C/SPCS criteria were a synthesis of the Minuteman Earned Value criteria and specifications that were published the previous March. In early 1966, PTC's contract was amended to include development, training and implementation support for C/SPCS

The transition to an Air Force-wide requirement entailed a lot of additional considerations. Unlike Minuteman, C/SPCS was not applied to existing contracts, so there were questions to be resolved over how to specify it in RFP's, how to score the responses, etc. While the draft C/SPCS criteria were completed in late 1965, they were not promulgated until August 1966. During this period there was one other issue that needed to be resolved – whether the solution should be Earned Value or PERT/Cost.

There were some strong advocates of PERT/Cost in the Air Force, led by the PERT Coordinating Committee. It was being used on some programs and it was clear that the two approaches were not compatible. Throughout the Spring of 1966, there was continuous pressure to reject the Earned Value approach and craft a version of C/SPCS that specified, or at least embraced, PERT/Cost. That was not to be.

PERT/Cost was rejected as the solution for three primary reasons: 1) it embodied a flexible budget baseline resulting in seriously understated EAC's - it was the ultimate flexible baseline, the opposite of the earned value concept of defined standards (work packages) that could only be revised with a change to the scope of work; 2) it was a specified government system, not a criteria based approach, and 3) the data processing capabilities of the time had no chance of properly supporting the system.

The C/SPCS criteria were promulgated as Annex 4 to AFSCM 70-5, Work Statement Preparation Manual, in the Air Force Deputy Director of Procurement, Herbert L Repetti's letter, of 1 August 1966.

PMWT: So what led to the change from C/SPCS to C/SCSC?

Morin: C/SCSC was a logical extension of C/SPCS. Assistant Secretary of Defense (Comptroller) Robert N. 'Bob' Anthony was sufficiently impressed with the Earned Value approach to support implementing it DoD-wide. I'm reminded of the words that are often used in the TV show Top Gear before the team takes on some impossible task with cars: 'How hard can it be?' As it turned out, a lot harder than it looked.

Many folks quote the December 22, 1967 issuance of DoDI 7000.2 (Department of Defense Instruction 7000.2) by Bob Anthony as the issuance of C/SCSC. The criteria were an attachment, but the directive stated that a Guide for Performance Measurement would be distributed separately from the Instruction. Further, there were several high-level approvals required for the criteria if there was an intent to apply it before the Guide was promulgated. Clearly, the issuance of the Instruction was just a first step. The first coordination draft of a C/SCSC Guide was published on June 28, 1968, and others followed, but the format most of us would recognize,

signed by the General Officers of the appropriate commands, was not published until January 27, 1972.

The cover letter to the release of DoDI 7000.2 contained a recognition of the heritage of C/SCSC: “The new instruction is based on an approach initially taken by the Department of the Air Force and has been under development in the Office of the Secretary of Defense since 1965.” The only earned value approach extant in 1965 was Minuteman Earned Value.

It’s one thing to announce the policy and quite another to get a consensus among all three services, particularly with the Navy still advocating PERT/Cost. Ernie and his aide, Maj. Hans ‘Whitey’ Driessnack, rose to the challenge. Not only did they have to contend with the preferences of the three services, CODSIA, the Council of Defense and Space Industries Association, also wanted to influence the outcome. While it took a lot longer than anyone expected, eventually agreement was reached and a set of criteria common to all three services became fact.

PMWT: Was C/SCSC an improvement over C/SPCS and Minuteman Earned Value?

Morin: Definitely, if for no other reason than the fact that so much was learned from the prior two efforts. The criteria didn’t change, but the expression of them was greatly improved. When I went to look at the Annex 4 criteria a few days ago, I was amazed at how jumbled they looked, and how hard it was to quickly refer to items.

The one area that was a failure was the conversion of key terms, such as ‘earned value’ to ‘planned value of work accomplished’ in C/SPCS, and to ‘budgeted cost of work accomplished’ in C/SCSC. My first reaction was that it was cosmetic and unnecessary. I had a suspicion that it might cause some confusion, but I never imagined how much. Most of those in the industry hated the new terms, especially executives who only came in contact with them in briefings. BCWA just didn’t communicate, then or now.

PMWT: Were you involved in each of the three earned value initiatives and, if so, in what capacity?

Morin: I was totally involved in Minuteman Earned Value and C/SPCS; my involvement in C/SCSC was significant, but different – I was in the industry rather than being a part of the government team.

In the case of Minuteman, I returned to the team when Ernie went off to Washington. Mert Tyrrell and I became the EV core, hiring others to support us in the execution of

our contractual requirements. There was a flood of inquiries that required our guidance and interpretation, but the major Minuteman task was conducting the audits/validations.

Mert hated auditing; I took to it easily. Accordingly, Mert shifted to the formal C/SPCS Class Training task that we knew was coming. Mert's training programs were well received and became the standard for government practitioners for many years.

In the meantime, I focused on the System Validations/Audits. I executed and/or managed the eight Minuteman audits, performing and writing the reports for the first three and performing oversight and editing the balance.

During this time we had to continually clarify what was meant by each criterion. As an example, the reporting level to the customer was set at level 3 of the WBS. Immediately, the question came up about how far down the WBS the cost accounts should be set and the variance analysis performed. By May 1966, it was clear that a definitive answer was needed.

I firmly believed that regardless of the program organizations, the real control in the companies was through the functional organizations. The WBS should function as the structure for authorizing work from the program office to the functional organizations. The work moved from multiple tasks assigned to an entire function, down to specific manageable tasks.

From a control standpoint, the key was to go down to a point where virtually all of the work in the task would be performed by a single department (first-line manager) that was responsible for the work. At that point, the variance analysis would be meaningful. That point would be the cost account, with the work packages planned within that organization. I coined the term 'organizational integrity' to embody the principle. The "integrity" was the performance of the work by that single authorized and responsible organization.

Recognizing that there would be cases where minor elements might be done by other organizations, we set the limit for work being done outside the performing organization at 15%, i.e. 85% or more of the task would be done by the performing organization. If it was more, a further delegation and authorization of work and a new cost account for the other performing organization was required. While the percentages have faded away, the organizational integrity principle remains a key element of EVMS.

As it turned out, the Air Force decided that they needed not only a formal classroom training program, but also an OJT manual that laid out the process and steps to conducting a validation, and also included the guidance and interpretations to date.

Accordingly, I authored the 273 page C/SPCS On The Job (OJT) Student Training Manual, published on June 5, 1967, and briefed it to the AFSC Commanders over two days. Following that, I worked with selected government personnel to prepare them for supporting the OJT program.

In June 1968 I left PTC to become Manager, Program Control, Maverick Program, Hughes Aircraft. In January 1969, we conducted a rigorous System Demonstration for the combined DCAA/Air Force team. The debriefing occurred in June 1969 and we learned that we had satisfactorily passed, with zero exceptions or action items, a first in the industry. That resulted in numerous invitations to speak and to confer with others in the industry.

In 1971, I became responsible for the C/SCSC and Program Control functions within Hughes' Ground Systems Group. In 1973, I joined Arthur Young to develop an Aerospace & Defense practice, and over time my involvement in C/SCSC diminished, and my expertise in performing large program independent EACs expanded. In time I developed considerable expertise in regulatory compliance, including Assessment Reports and System Demonstrations in a number of major areas, establishing my own Firm in 1986, and retiring from it in 2009.

PMWT: In EVM, it seems that the formulas sometimes garner the most attention. Who did the seminal work in developing the formulae for calculating EAC?

Morin: The primary formula, today commonly called the cost performance index or cpi, was a natural fallout of the earned value concept. I'm a bit surprised at the extent to which folks work at trying to conceive a new combination that will be better than the others.

We did not regard the projection of a contract-total EAC based on performance-to-date as a prophecy. We regarded it as an excellent forcing function. We recognized that as the contract progressed, the likelihood would steadily diminish of recovering the overrun-to-date in addition to turning the performance positive. Accordingly, we felt that with the cpi-based EAC facing them, management would be compelled to acknowledge the magnitude of the task facing them and deal with it in a credible manner, beginning with their most realistic EAC. I'm generally a bit skeptical of one mechanical EAC being that much more precise than another, but they can contribute to the forcing function role.

PMWT: Over the years, what would you regard as the most significant improvement to earned value?

Morin: By far, the biggest improvement was the introduction of the IBR – the Integrated Baseline Review process. From the beginning, one of Ernie’s concerns was the adequacy of contract definition at the time of award. Poor definition can only result in poor standards for measurement. The IBR does not completely resolve that, but done right, it can dramatically improve the quality of the planning of the baseline.

PMWT: Do you believe that Earned Value is serving its purpose today?

Morin: Not really. That the concept is sound has been proven repeatedly. Nonetheless, inadequate EAC’s and unexpected cost overruns continue to occur on major programs. So the question is whether the problem is with Earned Value or with the inappropriate use of the tool, or ignoring the data it produces.

Clearly, industry failed to bear the responsibility for adequate EVMS implementations for the better part of a decade, and they are still in no position to fend off unreasonable government demands because of it. Most seriously, the failure demonstrated the extent to which earned value tools were not being embraced by executives in the industry, despite statements that they were.

And the Government isn’t helping much of the time. As in the past, there continue to be the egregious imposition of government representative preferences – not requirements – preferences, in the pretense of being requirements. In many cases the contractors agree to these in an effort to get the DCMA (Defense Contract Management Agency) off their back, leading the auditors to the mistaken conclusion that their demands were appropriate and consistent with the criteria. That an auditor gets away with it does not make it right. I’ve witnessed these cycles over and over during the past 45 years. Failures in one direction often result in exaggerated compensation in the opposite direction, and that appears to be where we are now.

Earned Value has still not been internalized by the government or the industry. At this point, common sense causes one to realize that the problem is not the concept, the approach or the methodology, but the fundamental framework of aerospace and defense contracts. Government officials and company executives, together as a team, are sometimes still motivated to mask and manage the exposure of overruns just as they were 45 years ago. There’s still a lot more work to do, but it isn’t in the EVMS criteria or the validations.

PMWT: Contractors often resist more requirements and oversight from the government. What was the resistance to EVM from industry when you were active?

Morin: It varied. Some did everything they could to make it as difficult as possible for us to get data and even provided false and misleading data (DCAA was

just coming into existence). Meetings were scheduled and then cancelled just as they were about to begin. Some of the companies with strong functional organizations had set up 'Program Offices', ostensibly to shield the contractor's status from the eyes of the customer – some even boldly stated that was the purpose of such organizations.

Others made it clear that they had no intention of dealing with us. Their approach was to use lobbyists or company executives to take the issue to Washington and to argue their case – which was basically that everything was just fine and all of this earned value nonsense was unnecessary. I ghosted a number of notes and introductory comments for 'Come-to-God' meetings, at the Pentagon and at the companies, for Secretary Marks and Ernie to make it clear that compliance would occur and time was running out.

If nothing else, things were at times colorful. On one occasion in 1967, Mert Tryrell and I were having lunch at Charlie Brown's in Marina Del Rey, California. We were seated at a table next to a table of four strangers, who were finishing their meal with a few drinks. All of a sudden we heard the phrase 'C/SPCS.' Naturally we tuned in. They were in a fury over the perceived arrogance of the government in attempting to require compliance. The Company's name was mentioned (a prime, but not one of the Minuteman contractors). They were just not going to tolerate it. One of them asked who was responsible for C/SPCS, and PTC's name came up. The remainder of their discussion focused on how to cause the most damage to PTC.

Mert and I were genuinely concerned because we had no idea whether these were senior executives of the Company or just some blowhards. We soon found out through inquiries that they were long-term company staffers with little influence in the Company, let alone outside it (as a footnote, the Company soon became a leader in compliant Earned Value primarily because of the support of its senior executives). But the episode had made it clear that C/SPCS and PTC were not universally loved and appreciated.

PMWT: You mentioned that you were active in reviewing contractor program management systems. How did "validation" of contractor systems get started?

Morin: It started at the very beginning. Once we had made the decision to take the 'spec' approach, the most immediate issue was how the Air Force would be able to determine that a contractor was compliant with the criteria. There was a need to 'validate' the implementation as being compliant. The most obvious way to do this would be to audit the systems being used to support the Earned Value criteria.

We knew that the contractors would fuss a lot about the audit requirement, so we offered an alternative – an opportunity for the contractors to demonstrate that their

systems were compliant (coining the term ‘Systems Demonstration’), with a degree of validation to subsequently occur based on the data presented (thus coining the term ‘Systems Validation’). Once the validations had been successfully completed, the systems would be documented as compliant. In many cases the first day or two of the validation steps revealed so many problems that the validations turned into full scale audits – but they were still referred to as validations.

PMWT: Why did C/SCSC and EVM gain a reputation for being bureaucratic requirements?

Morin: That is a particularly interesting question. There was never any question about PTC turning the entire Earned Value approach, methodology, etc., over to the Air Force at the appropriate time (which turned out to be once we had defined C/SPCS and developed and implemented the training programs). But what Mert and I also recognized was that by choosing the spec approach, the interpretations, such as adequate organizational integrity, amount of level of effort (LOE), work package definition, etc., would pass from just the two of us to many – all with different backgrounds, experiences and biases. That worried us a lot, but there was no way around it.

Within a few years of the turn-over, we realized that in our wildest dreams it was never as insane as it was becoming. Some of the interpretations were patently absurd, and the contractors had to deal with them. Eventually, each of the three services tightened up its practices and consolidated the interpretations in the hands of a small number of competent professionals.

That helped, but it also created the problem of field personnel not wanting to appear stupid by asking for help when the contractors didn’t roll over and accept what they were directing. Before long you had delays and ‘red tape’ in the form of formal requests to Headquarters for answers, and the need to document and circulate the response before it could be given to the contractor. It’s fodder for any organization which tends towards bureaucracy.

And the bureaucrats, as might be expected, continually redefined their responsibilities over time, demanding more and more of the contractors and pressing for the simplistic ‘cookie-cutter’ approach. As an example, in the beginning, the review teams gathered the Company’s policies and procedures, executed transaction tests, and to the extent a system description was necessary, the audit team wrote it. They asked the contractor to concur in their definition of the system, as they proceeded with the audit. That’s not new; the Big 4 auditors don’t take the position that they cannot perform audits until they receive elaborate system descriptions from each company.

The advantage of the original approach was that the auditors had a thorough understanding of the system(s) before they audited them. Today, contractors spend outrageous amounts of money on system descriptions that they don't need – they use the policies and procedures and are intimately familiar with the transactions. But time and again, government auditors have insisted that it is not possible for them to perform their work without an elaborate system description, in color, with extensive diagrams done to their specification, in conformance with a 'cookie-cutter' structure. That's bureaucracy – and it's the expensive kind.

Another maddening change over the years is the failure to recognize material deficiencies as opposed to minor issues or technical non-conformances that have minimal impact. A finding is a finding, regardless of whether it significantly impacts the cpi or not, regardless of whether it impedes reliable variance analysis or not, etc. This issue continuously frustrates most executives when it comes to EVMS. When executives try to focus on the 20% that will get an 80% return, they are told that it's all important. As a bureaucrat, how can you risk focusing an executive when you might later be criticized? The inability of government teams to separate the wheat from the chaff is so counter productive that it is not reasonable to assume that A&D industry support will be ever be robust.

Editor's note: We want to thank Jim Morin for sharing some of his personal experiences and opinions with *PM World Today*. For more colourful history about the early days of EVM, please read the paper by Mr. Morin entitled "How it all Began: The Creation of Earned Value and the Evolution of C/SPCS and C/SCSC", published in the December 2009 edition of **PM World Today** – at <http://www.pmforum.org/library/second-edition/2009/PDFs/dec/SE-Morin-HowItAllBegan.pdf>.