If time is money, accuracy pays!

An Overview of Past and Future Project Management Research

Mario Vanhoucke
Ghent University
Vlerick Leuven Gent Management School
University College London
OR-AS Operations Research - Applications and Solutions
www.or-as.be

Stephan Vandevoorde
Airport Systems Division,
Fabricom N.V./S.A.
Mario Vanhoucke (PhD)

Academic career: Ghent University (Belgium) and University College London (UK)
Vlerick Business School (Belgium, Russia, China)

Professional career: Director EVM Europe
Partner OR-AS (Belgium)
Why do we need research?

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science."

Albert Einstein
Scientist
Maybe also a Project Manager
Why do we need research?

QUOTE

... Professor Vanhoucke's summary chapter in his new book "Measuring Time:..." provides an interesting twist to this discussion.

... Professor Vanhoucke's work is shedding a new light on using EVM for me. In retrospect, this has helped me understand better why EVM worked so well in some cases and failed so miserably in others.

...
Presentation: “Research meets Practice”

Outline

Overview of research
- Published in “Measuring Time”
- Four EVM hypotheses

Quick preview of future research
- The 1 mio € project
- Further integration

Overview of projects
- Used in the research
- Different sectors

Quick preview of future work
- EVM Europe
- Further collaboration
Assumptions

- Main focus on controlling time
  - Four studies
- Known
  - Earned Value Management is quirky
  - Earned Schedule is not quirky
  - Schedule Risk Analysis
- Refresh
  - Project life cycle
Project Life Cycle

Concept → Static phase → Dynamic phase → Project delivery

Feedback
Project Life Cycle

Dynamic Scheduling

Baseline Scheduling

From simple PERT/CPM to advanced resource leveling

Schedule Risk Analysis

Concept

Static phase

Dynamic phase

Project delivery

Feedback
From basic simulations to advanced risk profiles

Project Life Cycle

Baseline Scheduling

Dynamic Scheduling

Schedule Risk Analysis

Concept

Static phase

Dynamic phase

Project delivery

Feedback

Project Control
Project Life Cycle

Concept

Static phase

Dynamic phase

Project delivery

Baseline Scheduling

Dynamic Scheduling

Schedule Risk Analysis

Project Control

Feedback
Dynamic Scheduling

Baseline Scheduling

Schedule Risk Analysis

Project Control

Integration!

Project Life Cycle

Concept → Static phase → Dynamic phase → Project delivery

Feedback
Study 1

Understand why EVM works so well in some cases and fails so miserably in others.

Study 1
static EVM measurement study

Concept → Static phase → Dynamic phase → Project delivery

Feedback
Study 2
Recognize the dynamic use of EVM information to measure project performance and predict future project behavior.
Study 3

Master the schedule risk analysis technique to support corrective actions during project progress.

Study

Concept ➔ Static phase ➔ Dynamic phase ➔ Project delivery

Feedback

Study 1
static EVM measurement study

Study 2
dynamic EVM measurement study

Study 3
dynamic project control study
Recommend a set of best practices to use EVM during project control.
The results
**Study 1**

*Understand why EVM works so well in some cases and fails so miserably in others.*

**Which technique for which project?**

<table>
<thead>
<tr>
<th>Future assumptions</th>
<th>Planned Value Method</th>
<th>Earned Duration Method</th>
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**Forecasting methods**

- IT
- Research
- Satellite
- Tunnel
- Water Production Centre
- Airport Infrastructure
- Bridge Construction
- Maintenance
- Satellite
- Tunnel

100% Parallel至100% Serial
Study 1

Understand why EVM works so well in some cases and fails so miserably in others.

Which technique for which project?
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Which technique for which project?

Forecasting methods

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Accuracy along the completion stage (early, middle or late)

Early stages
Low accuracy for all methods
Study 1
Understand why EVM works so well in some cases and fails so miserably in others.

**Which technique for which project?**

### Forecasting methods

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### Accuracy along the completion stage (early, middle or late)

- **Early stages**
  - Low accuracy for all methods
- **Middle/late stages**
  - ES method is the best
- **Mistake starts from**
  - From 50% to 60% completion
Study 1
Understand why EVM works so well in some cases and fails so miserably in others.

Which technique for which project?

Forecasting methods

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The network structure has an impact on the accuracy

- Close to parallel: EVM won't work
- Close to serial: EVM performs very well
Study 2
Recognize the dynamic use of EVM information to measure project performance and predict future project behavior.

Accuracy ≠ Stability
p-factor - schedule adherence
Study 2
Recognize the dynamic use of EVM information to measure project performance and predict future project behavior.

![Graph showing accuracy (EVM) versus stability (p-factor) during night shift with different samples.](image)

**EVM**
- Average accuracy

**p-factor**
- Schedule adherence
Study 3

Master the schedule risk analysis technique to support corrective actions during project progress.

When management has a certain feeling of the relative sensitivity of the various activities on the project objective, a better management’s focus and a more accurate response during project tracking should positively contribute to the overall performance of the project.

Mario Vanhoucke
Omega - International Journal of Management Science

Effort
The lower the better

Results
The higher the better
Study 3

Master the schedule risk analysis technique to support corrective actions during project progress.

**management focus versus accurate response**

[Diagram of schedule risk analysis and management focus with accurate response]
Study 3
Master the schedule risk analysis technique to support corrective actions during project progress.

management focus versus accurate response

Schedule risk analysis

Criticality index, sensitivity index, cruciality index, schedule sensitivity index, ...
Study 3

Master the schedule risk analysis technique to support corrective actions during project progress.

management focus versus accurate response

Schedule risk analysis

management focus

low impact = safe

High impact = dangerous

Study 3

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management focus versus accurate response

Schedule risk analysis

management focus

No control | Control
---|---
1 | 1
2 | 2
3 | 3
4 | 4
5 | 5
6 | 6
7 | 7
8 | 8
9 | 9
10 | 10

low impact = safe

High impact = dangerous
Study 3

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management focus versus accurate response

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No control | Control
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management focus versus accurate response

Schedule risk analysis

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management focus versus accurate response

Schedule risk analysis

Accurate response
Study 3

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The network structure has an impact on the EVM accuracy.

- Close to parallel: EVM won't work
- Close to serial: EVM performs very well
Study 3

Master the schedule risk analysis technique to support corrective actions during project progress.

The network structure has an impact on the SRA accuracy.

- Close to parallel
  - Low effort $\rightarrow$ high results

- Close to serial
  - High effort $\rightarrow$ low results

low effort / high results

high effort / low results
Study 3
Master the schedule risk analysis technique to support corrective actions during project progress.

low effort / high results
high effort / low results

100% Parallel 100% Serial

Water Production Centre
Airport Infrastructure
Research
Satellite
Bridge
Tunnel

CI SI SSI! PMBOK CRU(r) ...

Research meets practice!
Study 4

Recommend a set of best practices to use EVM during project control.

WBS levels

- Project
- Work item
- Work package
- Activities

SRA: bottom-up

- Negative effect on project performance?
- Highly sensitive activities in trouble!

EVM: top-down

- Project performance problem!
- Which activities are critical and responsible for the problem?

Mario Vanhoucke - Ghent University
Study 4

Recommend a set of best practices to use EVM during project control.

If time is money, accuracy pays!

![Graph showing tracking efficiency for Parallel and Serial networks using Traditional EVM, Earned Schedule EVM, and Schedule Risk Analysis.]
Recommend a set of best practices to use EVM during project control.

If time is money, accuracy pays!
Research study 1
= accuracy study
Integration of dynamic scheduling

Awarded by
IPMA (Rome, Italy)
PMI (Brussels, Belgium)
American Accounting Association (Denver, US)

Research study 2
= project success study
Integration of project life cycle
Future research

- The *more than a million euro* research project

“*In projects, there is no substitute for delivery*”

Kym Henderson
Future research

• Searching for **static** and **dynamic** project drivers to **predict** and **control** the impact of management/contingency **reserve** on a project’s **success**

• Over a million euro project funded by the Flemish Government

• Synergy between Ghent University (Belgium), University College London (UK) and George Washington University (USA)

• Scope
  • Further integration
  • Further validation (Stephan Vandevoorde)
  • Further commercialization (www.ProTrack.be en www.p2engine.com)
Results (Phase 1)

New book

“Project Management with Dynamic Scheduling” available at Springer
See: www.or-as.be/bookstore

Preliminary results (Phase 2)

Wednesday presentation

“An integrated project control process for research and practice”
Jeroen Colin and Mario Vanhoucke

Share your ideas for all other phases!

@ORASTalks
Presentation: “Research meets Practice”

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Research Meets Practice!

How relates the research with the real world?

- 2007-2010: students collected real life data
- 8 different Belgian companies
- Total 48 projects types
Research Meets Practice! Finding 1

- Schedules sorted by SP Indicator
- Each sector has a proper network structure
- This explains “why EVM works / fails on projects”
Which control method is the best?
ProTrack’s Assistant

Bring research results to professionals
Cashflow Modelling – AD = 19%
Cashflow Modelling – AD = 29%
Cashflow Modelling – AD = 49%
Cashflow Modelling – AD = 59%
Cashflow Modelling – AD = 68%
Cashflow Modelling – AD = 79%
Cashflow Modelling – AD = 89%
Cashflow Modelling – AD = 100%
How It Started

• Up to 2003
  • Lots of EV Research done mainly in U.S.
  • But only cost related

• 2003 – 2004 The Measurable News
  • March 2003, Forecasting Project Schedule Schedule is Different, Walt Lipke
  • March 2003, Completion with EV Metrics, D.S. Jacob
  • Spring 2004, Further Developments in Earned Schedule, Kym Henderson

• 2005 – 2006
  • Discussions in London about time related EV Research with CPM members Walt Lipke & Kym Henderson
  • First Academic Publications on “EV Time Related Research”
How It Started

- 2007 PMI Belgium Chapter Event: EV / ES
- Speakers: CPM Members Walt & Kym
- Mario received Research Collaboration Fund of 5.000 €
EVM Landscape in Europe

• No real statistics / research available

• Some sensitivity to sharing information
  • Companies using see EVM as part of their competitive advantage

• No imposed EVMS guidelines (apart from MOD / UK)

• Evidence of increased interest / usage of EVM across many countries:
  • CERN, (no EVM regulatory mandate)
  • General Dynamics Land Systems Europe (Required to follow US ANSI and Australian EVM standards, sometimes Concurrently)

• Google: EV papers from many European countries
EVM Europe

• A growing need to bring “European EV users” together

• Summer 2008: London
  • CPM Member Kym Henderson called in a meeting
  • Decision to create “EVM Europe Association”

• Spring 2009: EVM Europe officially created

• Mission:
  • to promote EVM usage in continental Europe
  • to combine academical / practitioners experiences
  • to collaborate with other organisations such as CPM

Research meets practice!
1. Yearly Conference

• Conference to be hosted with Universities / Colleges

• A dedicated academical track unique for EVM conferences

• So far:

  2009: Geneva, Switzerland – University of Geneva / Lausanne
  2010: Ghent, Belgium – Ghent University
  2011: Valencia, Spain – Polytechnical University of Valencia
  2012: Twente, The Netherlands – Twente University
2010 Ghent Conference

• Working session on the PMI PS EVM 2nd Ed.

• Chaired by P.M. Greg Schmidt

• “Europeans” advocated strongly on inclusion of ES Method as an extension to EV

• Accepted by the committee

• Global standard which will benefit European users and promote adoption of EVM in Europe
2. Student Involvement

- Student presentations at all EVM Europe Conferences
  - European student presentation at this EVM World Conference
  - PS-10 An Integrated Project Control Process For Research and Practice *Ir. Jeroen Colin*

- 2011 PMI Belgium Best PM Dissertation Price (University Contest)
  - Using EVM and Earned Schedule to assess project maturity in Belgian companies.
3. PM Knowledge Center

- Spread the message: [www.pmknowledgecenter.com](http://www.pmknowledgecenter.com)
- Free online information tool
- Can readily be used in courses

**PM Knowledge Center**

**EVM Forecasting**

- Earned Value Management: Forecasting project outcome
- Earned Value Management: Forecasting time
- Earned Value Management: Forecasting cost
- Predicting project performance: Evaluating the forecasting accuracy
4. Practitioner Review Committee

- GOA Research Project
  - September 2012: kick off
  - September 2014: 1st review, topflag academic publications.
  - September 2016: 2nd review, topflag academic publications, a project control book.
  - September 2018: 3rd review, academic paper, implementation in ProTrack.
  - September 2019: final review, delivery of PhDs and ProTrack and P2 Engine.

- January 2012: decision to form a P.R.C.
  - Chaired by Prof. Pierre Bonnal, founder & director of EVM Europe
  - To translate, publish and present the research findings to the practitioners

- Stay tuned with Twitter: @ORASTalks
Thank You CPM

• For publishing “The Measurable News”

• For bringing the Europeans together

• For continuously supporting the EVM Europe Initiative

• For having us here
Follow us

@ORASTalks

The Netherlands, November 2012
www.evm-europe.eu