

The Source of Software Productivity



Some observations on software productivity from Corvus International Inc

Typical savings for a small software development project:

Cost: **\$700,000**. 40%
 Schedule: **3 months**. 14%
 Headcount: **5 people** 30%
 ROI: **3,500%**

Using nominal figures for a 63KLOC Telecommunications Engineering project

The Productivity of Teams

	Low Capability	Medium/Nominal	High Capability
Schedule (how quickly they will build the system)	23-30 months	20-22 months	17-18 months
Effort (Person-Months)	300-700 staff-months	185-336 staff-months	89-140 staff-months
Cost	Appx \$2.7m	Appx \$1.7m	Appx \$1m
Peak Staff (headcount)	21-27	15-17	7-11

Source: QSM SLIM-Estimate™ and COCOMO II project calibrations, Telecommunications system around 63KLOC. These tools give estimates in *ranges*. Assigned nominal values

Where can we *really* achieve productivity and cost improvements in software development?

Is it in using software tools?

Is it in programming language expertise?

Is it in methods and process management?

Is it in hiring experienced people?

The answer is in developing and optimizing your technical

Team Capability

Recent research from USC supports the view that developing effective technical teams is *by far* the most effective place in which to realize true productivity improvements.

Research conducted by Dr. Barry Boehm at TRW and at the University of Southern California shows conclusively that the most important factor in measured productivity of software organizations is their team-oriented capability.

This observation is wholly supported by a variety of software estimation and project management tools over databases of tens of thousands of projects across the entire range of project and systems types.

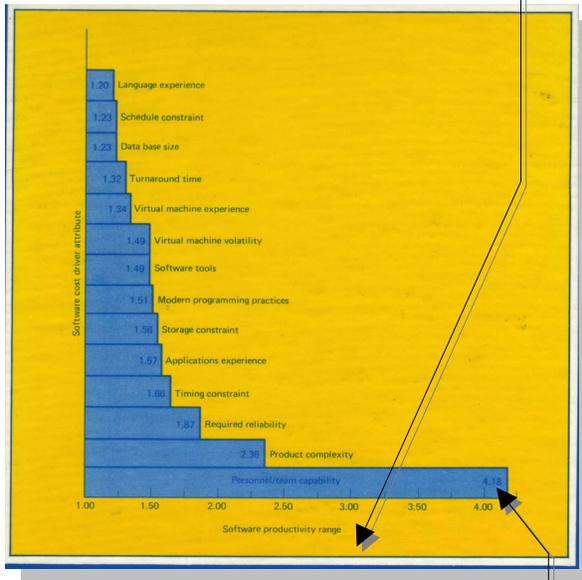
Despite this overwhelming evidence, the software industry continues to invest most heavily in the development of their technical staff in areas that do not show a fraction of the productivity improvements obtainable through effective technical team development.

Sources and Analysis:

The X-axis represents the measured effect of these factors on software productivity

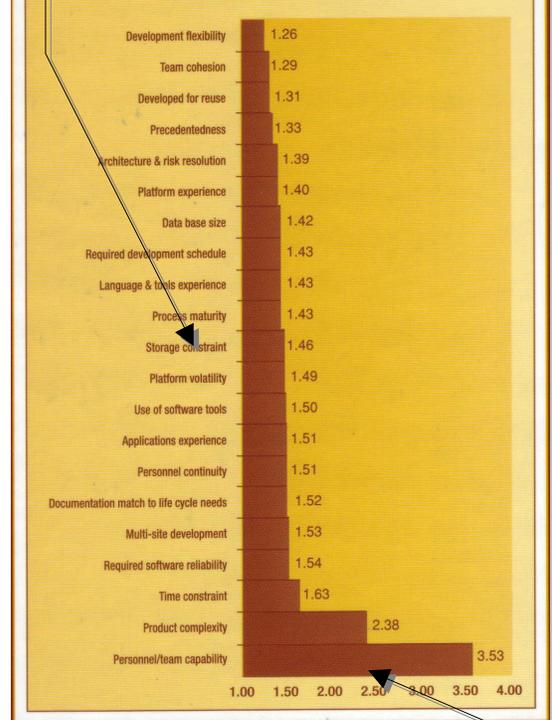
The Y-axis represents the factors that were shown to have effects on measured software productivity

1980 Research Base



In 1980 the most important factor *by far* in determining the productivity of organizations was...
Team Capability

Software productivity range



In 2000 the most important factor *by far* in determining the productivity of organizations was...
Team Capability

Sources (actual cover pages of):

Software Engineering Economics:

Boehm, Barry. Prentice Hall 1980
Englewood Cliffs, NJ 07632
ISBN 0-13-822122-7

Software Cost Estimation with COCOMO II:

Boehm, Barry, et al. Prentice Hall PTR 2000
Upper Saddle River NJ 07458
ISBN 0-13-026692-2



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The results of these two studies, published 20 years apart, support each other, as does the ongoing research conducted at USC and results from thousands of estimation projects.

Team Capability is between **two** and **fourteen times more important** than any other factor.

It is up to seven times more important than traditional "technical" factors such as Programming Language Experience, the use of software tools, and even Application Experience