



Future Directions

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Theme

We have an extraordinary opportunity.

Survival: mankind first used its intellect to build survivable groups.

Civilization: people next used their skill and imagination to build empires and make conquests.

Industrialization: humanity then developed and applied scientific principles to the production of physical goods.

Intellectualization: the next great challenge is applying scientific principles to intellectual products and services.



Intellectualization

Intellectualization is the application of scientific methods to the large-scale production of intellectual products.

Can we, with these methods, achieve something like the 50-times productivity gain in hardware production achieved in the 20th century?

Software development is the first step in this direction.

While prior experience has not been encouraging, recent history is much more promising



The Three Questions

The premise of intellectualization depends on three questions.

1. Could the cost and schedule management methods that have worked successfully for hardware also work for software?
2. Could the quality-management principles that have been applied to hardware also succeed with software?
3. Could we devise, for intellectual work, a way to overcome traditional management-labor antagonisms?

The answers appear to be yes!



Questions - 1

Can the cost and schedule management methods that have worked successfully for hardware also work for software?

The first large-scale application of traditional hardware management methods to software was in 1966.

Starting in 1986, these methods were codified and more broadly disseminated with the CMM, ISO-9000, etc.

Now, traditional hardware cost and schedule management methods are generally accepted as effective for software.



Questions - 2

Can the quality-management principles that have been applied to hardware also succeed with software?

The results from Cleanroom, Praxis, and the PSP show that these principles are applicable to software.

The principal difference between hardware and software quality methods, however, is in the use of personal quality measurement and defect management.

Based on current experience, personal quality measurement and defect management, in turn, require significant changes in management priorities and style.



Questions - 3

Can we devise, for intellectual work, a way to overcome traditional management-labor antagonisms?

Deming and others showed how to do this for hardware.

The key is putting the workers in charge of their own work.

While it is early yet, TSP results show that software teams can successfully negotiate with management.

While continued team coaching and management support is required, the results appear to be long lasting.



Implications

Software development may well be a precursor to the large-scale intellectual work of the future.

- complex business systems
- weapon-system development
- perhaps even for building political systems?

By broadly applying these methods to intellectual work, we might possibly achieve enormous benefits for mankind.



Challenges

Hopefully, the following steps will demonstrate the benefits of using scientific-management methods for software.

1. Get these methods generally understood and accepted in the software community.
2. Build the management, academic, and government support required for widespread use.
3. Demonstrate the applicability of these methods to other fields of intellectual work.



Personal Agenda

My initial focus is on building widespread understanding and acceptance of these methods for software.

The steps I plan in this direction are as follows.

1. Move from a focus on TSP transition to a focus on the principles, regardless of the method.
2. Discuss future implications with opinion leaders in government, academia, and industry.
3. Develop and promulgate an agenda to foster broader acceptance and implementation of these principles.



Conclusions

We in the software community have the opportunity to pioneer a new direction in management methods.

To capitalize on this opportunity, we need to get this opportunity understood and accepted.

To do this, we must build a growing community of interested and supportive opinion leaders.

I look forward to working with you to do this.



Scientific Principles

The scientific method relies on controlled experiments, precise observation, and analysis.

Controlled experiments are repeatable: a defined process.

Precise observation: measurement.

Analysis: process improvement.

Experimentation: trying new methods to find those that best meet the experimenter's objectives.