



*Better Software Practice for Business Benefit,
Principles and Experience,
Richard Messnarz and Colin Tully*

CHAPTER 1

Road Map for Readers and How to Use the Book

*Dr. Richard Messnarz
Technical Director
International Software Consulting Network, Ltd., Bray, Ireland*

INTRODUCTION

This chapter deals with a classification of the experience presented in this book and provides a road map to guide the reader through the book and extract the experience which is most applicable and beneficial. It starts with a structural analysis of the book illustrating dependencies, links, relevance for certain phases of the improvement cycle, and finally offers a decision support for identifying which parts of the book are usable in the context of the reader's organization.

While Chapters 2 to 17 present principles and experience, chapter 1 will make it easy for different target groups in an organization to select reusable experience and to draw from a large set of data from European process improvement initiatives and projects.

MOTIVATION UNDERLYING THE BOOK

Combined Use of Methodologies

Many process improvement experts are too convinced from only one (their own) approach, leading to statements such as: Only Capability Maturity Model (CMM) will work; or, Only Bootstrap will work; or, Just skip all assessment methods and use goal-based metrics, and so forth. This book is a collection of different experiences with different projects and proposes a combined use of methodologies. This combined view, however, sometimes decides about success or failure in the business sense. It is senseless to make process improvement with just a pragmatic goal to formalize. Return on investment (ROI) and the support of the organization's business success must be the real drivers of any process improvement action.

A big electronics company in Europe, for instance, made an assessment resulting in

maturity levels for different areas of the organization and the identification of weaknesses such as unrealistic planning, no process for design reviews, and weak configuration management. The organization was already International Organization for Standardization (ISO) 9001 certified but only 30 percent actually accepted the guidelines due to missing practicability (formally good documented but not realistic for projects in the field [7]). A formal pragmatic assessment and improvement approach would then, for example, decide about introduction of configuration management and so forth, but does this really now meet the organization's business goals? Without any additional data than the normal assessment methodologies (CMM, Bootstrap, etc.) this unfortunately cannot be answered.

So this electronics company decided to run a goal analysis (based on the Goal Question Metrics Methodology [GQM[6] approach) in parallel interviewing business managers, department heads, Information Technology (IT) managers, and project managers and designing a consistent goal tree from top to bottom. See Fig. 1.1.

One of the specific business policies was to create a financial framework for the next years which allows to get a reserve budget to fight for a brand new product on the market. To get to the this marketing budget the business managers decided to stabilize the development effort from divisions at x percent so that with all other overheads and cost a certain percentage is saved every year to have the budget together right at the time when the product is announced. At this moment the divisions were certainly higher than x percent and the improvement actions (based on the previously identified weaknesses from the assessment) had to demonstrate after 3 years the success of achieving this business goal.

The technical staff were frightened and thought that people will be dismissed but the truth was that a proper interpretation of the business goals led to a completely different view. The business managers expected that process improvement provides a better work process and environment so that with the same staff more projects and tasks can be done and over time the development effort is stabilized at x percent. Under this perspective the three process weaknesses were again analyzed and further interviews showed a potential of reuse because in all systems in the sector nearly 80 percent of the functionality was always the same. So the improvement plan focused on an integration of design, configuration management, and review of a reuse pool of these 80 percent functions and to reduce the development for each project to the only 20 percent additions, thus enhancing productivity and achieving the effort stabilization.

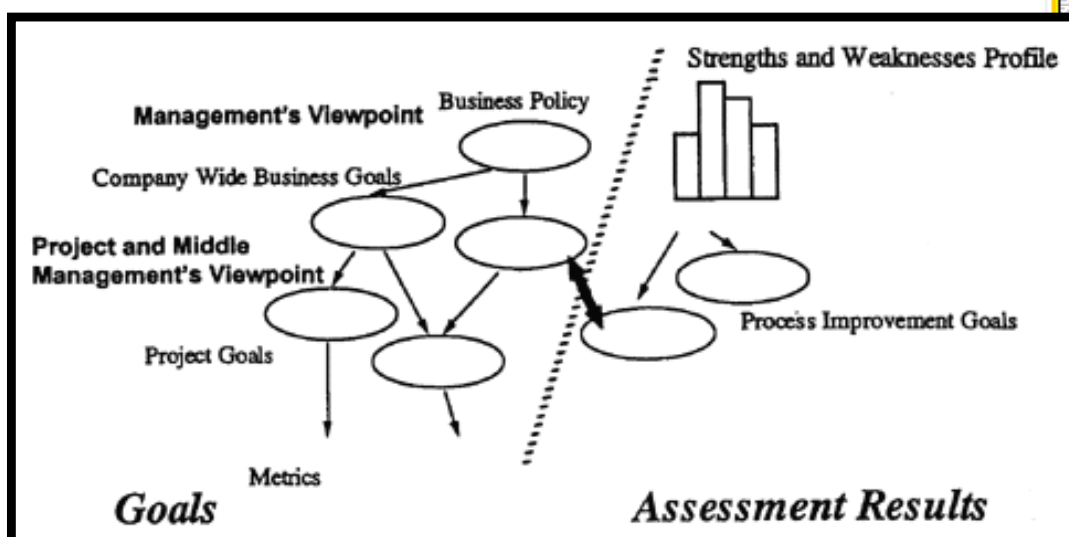


Figure 1.1 Aligning business goals [10] with improvement of weaknesses found in assessments [6].

Now, let us assume that only a pragmatic assessment would have been performed. Three weaknesses would have been identified and without reuse orientation would have led to a pragmatic proposal to first run a pilot project to identify a configuration management system and field test it, to disseminate it to other projects, and to help making it a division wide standard. Sounds simple, but unfortunately the business context is lost. What then happens is that management sees additional effort, the development effort further increases, and with no vision of decrease of the development effort the business manager after 1 year (before benefits can be made visible) would really decide about things like dismissals.

A More People-Oriented Process View

The book, of course, in general follows the principle that an improved process will lead to higher product quality. However, the book also adds to the statement “A fool with a tool is still a fool (so a tool is less important than having a process)” a further one, “A fool with a process is still a fool.” And it is not so much the maturity of each single person itself, it is the teamwork capability that is decisive.

Therefore, in Chapter 3 the book makes a teamwork scenario based definition of management processes in which people can identify themselves with roles, people in these roles communicate, and people work together in a team. The workflow (process steps) is then just a waste product of the information flows in the team work (Chapters 3 and 14).

An Inclusion of the Business Context in General

I sometimes heard from people that some improvement models are so nice because they are so pragmatic that everyone can use it and none can make anything wrong and follow a clear path?

Well, in this respect also the book demonstrates a number of different viewpoints might easily be misinterpreted as contradictions. Practice shows that the same strengths and weaknesses profile (as an output from assessments) at different organizations (depending on the business goals, the current infrastructure, the available resources, the cultural approach to change—very different in Japan and Germany compared to United States) leads to different action plans and results.

So my answer to the above opinion is: I sometimes see persons that accelerate to full speed with confidence although they are directed toward a heavy wall. These are different roads to follow, even with the same starting situation, in different organizations depending on a number of factors, and the most important one is the business context.

Different Process Improvement Languages and Target Groups

Business managers, project managers, and practitioners speak different languages and might have different viewpoints on the same situation [9]. Business managers speak about fixed cost, variable cost, return on investment, leveraging, market trends, product sales, and customer satisfaction.

Middle and project managers speak about budget, work plans, quality plans, configuration management, requirements analysis and structured analysis, and always fear to be delayed or to overrun the budget provided by the business managers. Practitioners deal with modules, design them, implement, and test them, and deliver them so that they can be integrated into the system architecture planned by the project manager.

It is the nature of process improvement methodologies that measurement and control functions are installed which again will be seen differently from the different target groups. Business managers not understanding that software process improvement (SPI) needs investment with a return on investment (ROI) in about 3 years sometimes demand that process improvement is performed without any assignment of budget to it: let's do quality but it should not cost any dollars. This certainly leads to a disaster and top management commitment is the number one success criteria for starting an improvement program. Middle managers will like the process improvement most because it provides them with methodologies and facilities to better define the processes, to better visualize the productivity and quality, and to improve the predictability which leads to the fact that schedules and budget are kept satisfying therefore the business managers. At the beginning the practitioners usually see the implementation of a process improvement program as a dirty trick of middle and project management to better control their performance.

However, after some time they start to realize that more reliable plans give them enough time for design, and that better design reduces the rework and maintenance stress. Formalized reports help them to identify the root cause of problems and to track the correction, and they can learn and improve themselves based on measures [5].

It is a key to success to have all groups behind the initiative and to act as a translator of the different viewpoints.[2]

STRUCTURAL ANALYSIS OF THE BOOK

Basically there are three types of relationships in this book outlined in Table 1.1.

Table 1.1. Types of Dependencies in the Book

Type of Link	Explanation
Principles \Leftrightarrow Experience	Linking principles with experience to have illustrations
Principles \Leftrightarrow Principles	Establishing a framework into which the methodologies fit and avoiding redundancies and contradictions.
Experience \Leftrightarrow Experience	Any variety is allowed. With the same starting situation sets of different improvement methodologies were used in the industrial cases.

STRUCTURE OF PART I — PRINCIPLES

Part I – Principles (see Figure 1.2) provides two basic clusters of chapters. A “process” cluster makes a role and teamwork-based software process definition (Chapter 3), introduces goal and process analysis, and provides an overview of currently existing models and methods for software process analysis and improvement (Chapter 4).

A “business” cluster describes the business managers views and return on investment principles (Chapter 2), approaches for goal analysis starting from business goals and breaking down into improvement goals (Chapter 5), and a set of metrics to quantitatively measure if the goals are achieved (Chapter 6). It also provides an overview of cost and benefits in software process improvement (Chapter 7).

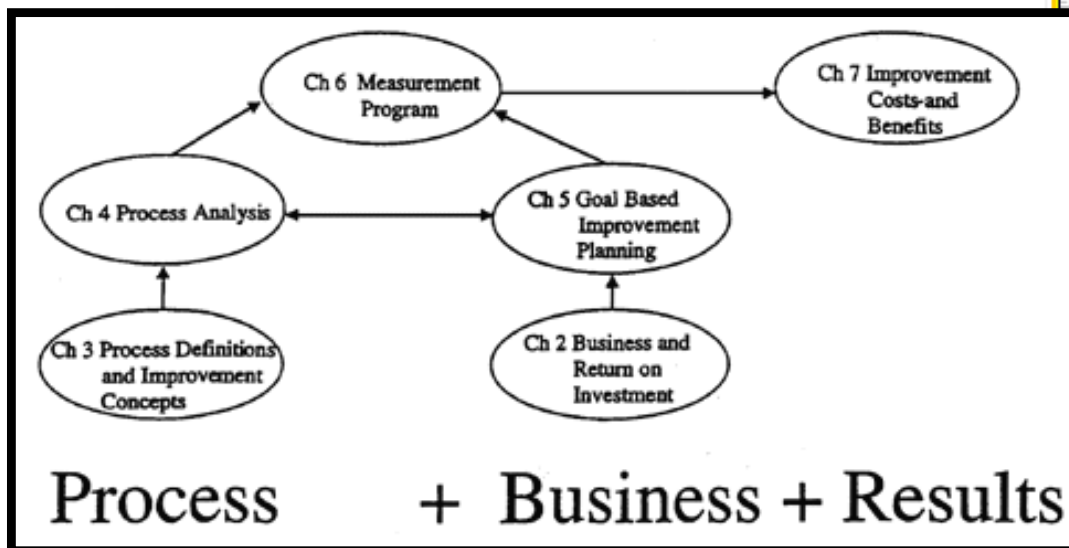


Figure 1.2. Principles \leftrightarrow Principles relationships in Part I.

It is important to note that (Figure 1.2) the process analysis results and proposed improvement actions must be aligned with the business goals (thus there is a double arrow between Chapter 4 and Chapter 5) resulting in ROI.

STRUCTURE OF PART II — EXPERIENCE

Part II experience three basic clusters of chapters (see Figure 1.3) Chapter 8 discusses Siemens's assessment and improvement program, and Chapters 9 and 10 illustrate the experience with improvement projects at Italtel, one starting with the Siemens assessment approach and one starting with the BOOTSTRAP assessment approach. Chapter 12 discusses Alcatel's experience in the same application domain as presented in Chapters 9 and 10 by Italtel.

Chapter 13 discusses experience with the I QSO) 12207 process modeling standard which formed the basis for the Software Process Improvement and Capability Determination (SPICE) methodology, and Chapter 16 presents the experience with the SPICE trials. Chapters 11, 14, 15, and 17 represent industrial case studies from (small- and medium-sized enterprises and medium-sized enterprises) (SMEs) and (very small and medium sized enterprises) covering process analysis, improvement planning, measurement, and benefit analysis.

Principles and Experience — Links between Chapters of Parts I and II

Table 1.2 illustrates which company contributed experience with which approach. AQT, APAC, CISI are company names. Plan Do Check Act Cycle (PDCA), Goal Question Metrics Methodology (GQM), and Application of Metrics in Industry (ami) are in one category. This is because practice showed that ami is a framework to do GQM and that goal-oriented methodologies usually refer to a general improvement framework like PDCA. This was the curious reason why these three categories are combined into one in this book



Figure 1.3. Experience \leftrightarrow Experience relationships in Part II. SME, small- and medium sized enterprises; SPICE, vs. ME, very-small and medium sized enterprises.

Table 1.2. Principles \Leftrightarrow Experience Relations**Table 1.3.** Process Analysis Approaches



TYPES OF IMPROVEMENT PROJECTS

There are different types of improvement projects such as

- technology transfer based process improvement
- process modeling based process improvement
- training-based process improvement

A process improvement project usually consists of a group of miniprojects combining the three types mentioned above. This could, for instance, be (1) to analyze and model a work scenario for configuration management, (2) to select and introduce a proper technology for supporting the work, and (3) to train the people to effectively follow the guidelines and use the infrastructure. However, in some cases you only need a better process model, or there might be a process already in place but the technology is missing, or there might be a proper technology in place but due to cultural issues the acceptance was missing. Thus, not always a process improvement project covers all three components.

Technology Transfer — Based Improvement

The selection and introduction of new technologies and platforms is a complex process and the required effort is often underestimated [2]. All recent improvement models emphasize that organizational aspects are most important, and that methodology is more important than technology. This means that before selecting any technology the work scenario must be designed and discussed with the engineers, and based on a defined organizational

process technology requirements are established to support certain process steps, and only then a technology is selected which satisfies the defined requirements. In BOOTSTRAP profiles, for instance, this becomes visible when the technology satisfaction is high, whereas the methodology level is low. Usually engineers also do not accept a new technology if it is not an integrated part of their work environment.

Therefore a technology transfer-based improvement project is like a professional development project, with phases like:

- Analyze and design the work scenario (process modeling based process improvement)
- Identify the process steps which should be supported by technology
- Identify quantitative goals (expected benefits) in terms of quality and productivity
- Establish a list of requirements for the technology
- Evaluate the technology available on the market against the established requirements
- Select one (or more) candidates and implement them in pilot projects
- Measure the impact of the new technology on quality and productivity
- Extract best practices from the pilot projects
- Prepare the best practice for internal dissemination and training
- Training and transfer of best practices to all other projects in the organization

Process Modeling-Based Improvement

Problems resulting from the increasing complexity of software systems were budget and schedule overruns, and reliability and quality problems leading to extremely high maintenance costs. In the early eighties Boehm [3] discussed the so-called “S-curve,” which shows that software is becoming increasingly expensive, whereas hardware is getting cheaper. The “S-curve” was investigated in the United Kingdom (U.K.) [4] and it was found that in 1985 the distribution of the percent of total cost was as follows: 10 percent hardware, 90 percent software, with about 60 percent of the software activities being maintenance related.

All approaches to process improvement at the beginning of the eighties to cope with the software crisis were of a technocratic type, and the promises of the CASE manufacturers (including analysis and design components as well as code generators and 4GL facilities) have not been fulfilled. The above-mentioned study [4] continued the analysis of the “S-curve” until 1991, and it was shown that the high maintenance costs of 1985 could not be reduced. Moreover, a Canadian study [1] pointed out that in 1989, due to the international software crisis, the distribution of the percent of total effort was: 55 percent maintenance, 35 percent enhancements, and only 10 percent for new applications.

Because of the failure of the technology-driven approaches the interest in process-driven approaches started to increase in the mid-eighties. This led to the SE1 technical report from Humphrey at 1987, the ISO 9001 standards, the IEEE software engineering standards, the ESA PSSOS software engineering standards, the different CMMs, methodologies such as

ami, BOOTSTRAP, etc. which were then developed between 1987 and 1993. And with SPICE this initiative still is continuing.

These 10 years of experience with organizational analysis clearly highlighted that the root causes of technical problems usually are organizational problems such as

- Unrealistic planning
- Unclear responsibilities and roles
- Inefficient work processes
- Missing motivation and cultural problems
- Missing quality commitment

Therefore all current improvement initiatives first start with an organizational analysis, identify weaknesses, define work scenarios (with roles, responsibilities, process steps, workflows, results, etc.) for missing processes, and only then introduce supporting technology.

Training-Based Improvement

From the technician's point of view the improvement is done when finishing the improvement experiment and by presenting the quality and productivity indicators. This, however, is not true for the business managers who have a much broader view of the improvement process. They provide resources to increase fixed cost to reduce in the long term variable cost caused by poor quality

The business manager sees the experiment as a multiplication factor for his organization. If by using a new process x in the domain y a productivity increase of z percent was shown in the experiment the next step will be to use this approach in all projects in the domain to multiply the z percent productivity increase. This finally helps to achieve a productivity increase of z percent for the entire domain y of the company and not only for one experiment. And this transfer process from the experiment to different sites and projects in the organization is also a very complex process.

Important factors here are:

- To create awareness before confronting the people with new processes and technologies
- To have quantitative and objective indicators to convince the managers
- To have process descriptions which are easy to understand
- Workshops—to let the experiment team present the project to other sites and projects and to discuss “But how will this work for me?”
- To provide training from practitioners for practitioners
- To found a kind of user club in the organization that continuously refines the process
-

To establish a close cooperation between the user club and the Software Engineering Process Group (SEPG).

- And so forth.

THE ESSI PROCESS IMPROVEMENT MODEL

It is important to mention this model because it provided funds to many hundred process improvement experiments across Europe up to now, and will still be used for further years in the fifth framework program of the European Union. Process Improvement Experiments (PIES) (see Figure 1.4) are forming the bulk of the Software Best Practice actions of ESSI European Systems and Software Initiative (ESSI)[8]. Their aim is to demonstrate the benefits of software process improvement through user experimentation. The results will be disseminated both internally within the user organizations to improve software production and externally to the wider community to stimulate adoption of process improvement at a European level.

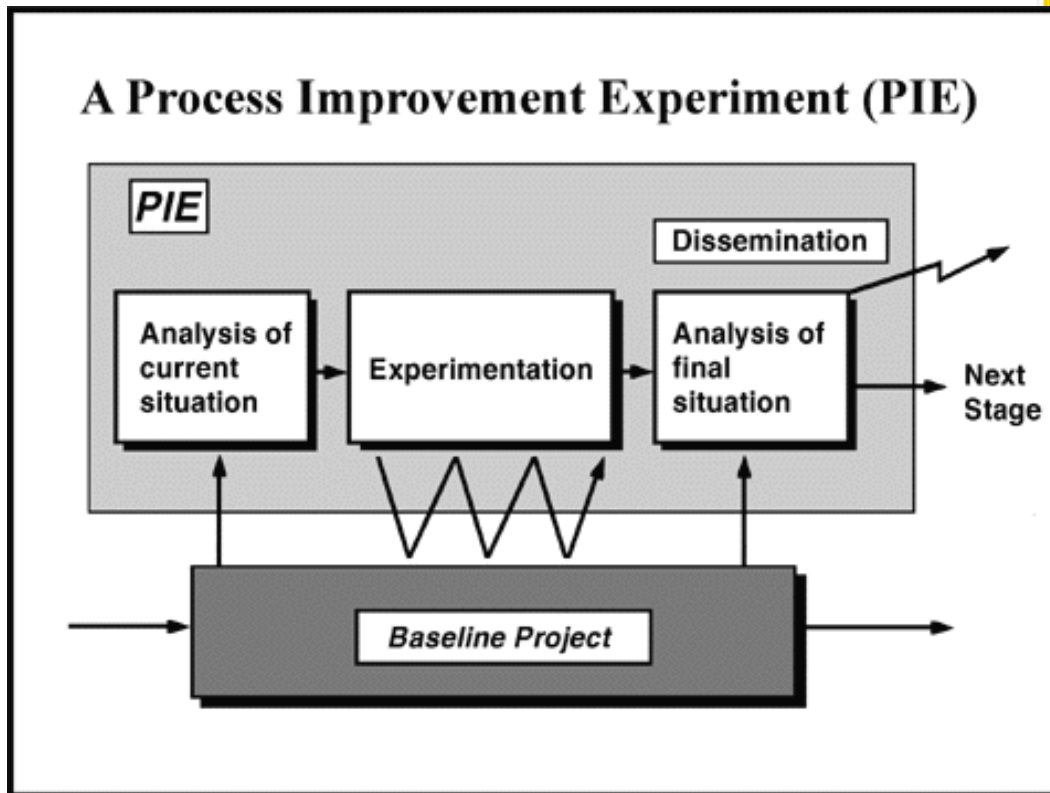


Figure 1.4. The basic architecture of a PIE.

The emphasis is on continuous improvement through small, stepped actions. During a PIE, a user organization undertakes a controlled, limited experiment in process improvement, based on an underlying baseline project. The baseline project is a typical software project undertaken by the user organization as part of its normal business and the results of the experiment should therefore be replicable.

For a PIE to be performed, it is required that the current status of software engineering be known (organizational process analysis) along with the organizational profile that one plans to achieve. The company's strengths and weaknesses profile is translated into a number of process improvement actions which are process modeling, technology transfer, or training based. The experiment (use of new work scenarios, technologies, know-how) is employed in a baseline project of the organization (a small and not too critical software development project) and the impact on people, process, products is measured. The analysis of the final situation (good and bad experience) is then disseminated internally as well as in working groups externally.

Chapters 11,14, and 15 document the experience with ESSI PIES. In Chapter 15 the PIES were running as TRI-SPIN projects which was a special Irish way of starting and performing mini-PIEs in Ireland.

ASSIGNMENT OF CHAPTERS TO PHASES OF THE IMPROVEMENT PROCESS

A major goal of the book was not to concentrate on one approach or on one aspect of process improvement but to discuss the process improvement issues from business to success. Therefore at least one chapter can be assigned to each of the phases of the improvement process (Figure 1.5), and Chapters 8-17 form a resource pool of experiments and reusable practice.

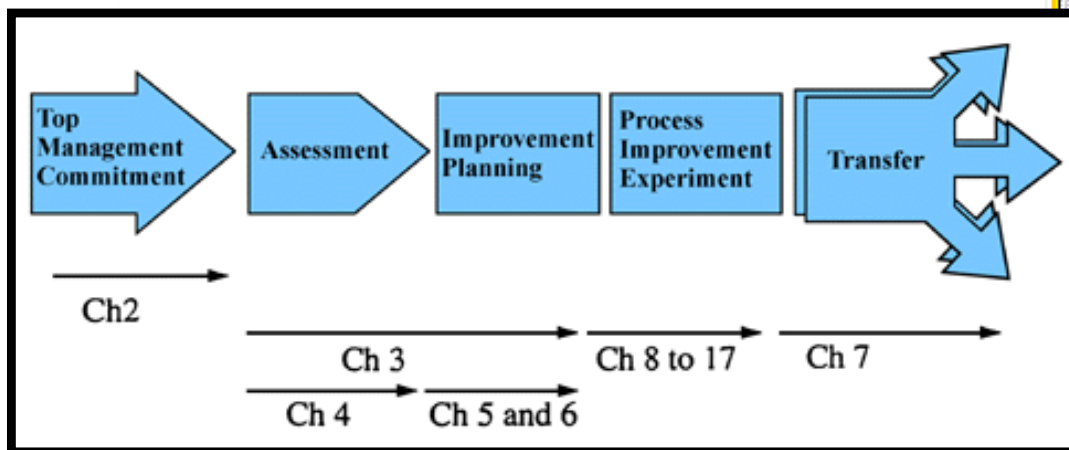


Figure 1.5. Phases of the improvement process.

DECISION SUPPORT

First, it is recommended that you read the book from the beginning to the end. However, a feature of the modern world is that time gets shorter and shorter and becomes more precious every second. The business processes are becoming faster and business managers no longer read entire books but select the ten most significant pages, and if these pages do not seem to be interesting they skip the book. This is the reason why in this section a road map is established for different target groups for selecting most interesting parts.

Target Groups

Table 1.4. Target Groups

Question	Characteristics
Are you a business manager?	Your day-to-day language contains words like: revenue, profit, fixed cost, variable cost, total cost, leveraging, break-even, customer satisfaction, return on investment.
Are you a project manager?	Your day-to-day language contains words like: requirements, work plan, quality plan, schedule, milestones, system architecture, etc
Are you a practitioner?	Your day-to-day language contains words like: module, design, unit test, problem report, correction report, version, test protocol, etc.

Road Map for Business Managers

Start with the business cluster to read about business and SPI, business goal driven improvement planning, improvement cost, and how to measure success. (Chapter 2 ⇒ Chapter 5 ⇒ Chapter 6 ⇒ Chapter 7).

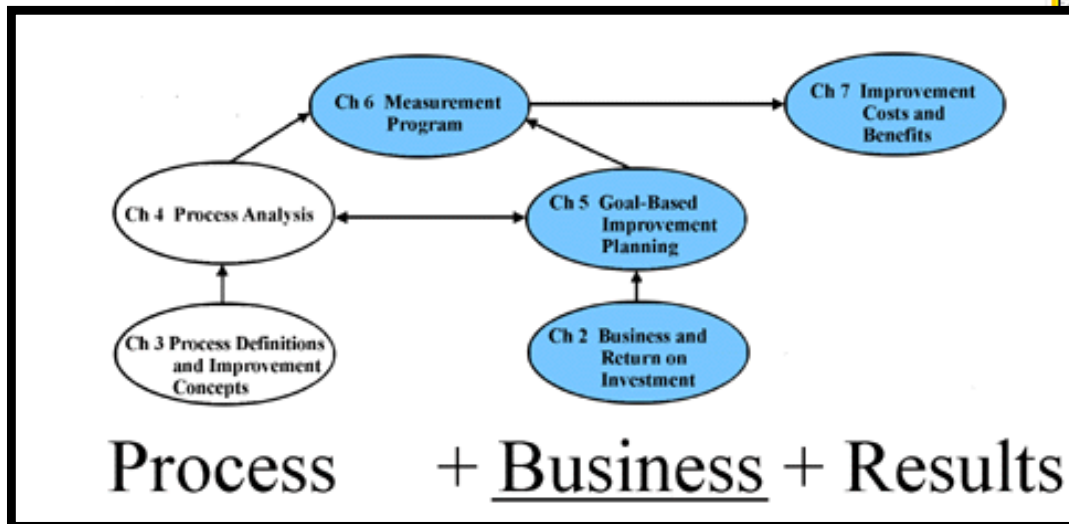


Figure 1.6. Principles path for the business manager.

In Part II, Experience (Chapters 8 to 17) read:

Are you a business manager from a large company?

Read Chapters 8 and 12.

Are you a business manager from a small company?

Read Chapters 14, 15, and 17.

Road Map for Middle, Project, or Quality Managers

Start with the process cluster outlined in Figure 1.7 to read about process models, process analysis methodologies, benchmarking approaches, and how to use the analysis results for goal-based improvement planning. Be aware that Chapter 5 forms the interface to your business manager and thus is the most important aspect when you plan to align your goals with that of the business manager (Chapter 3 \Rightarrow Chapter 4 \Rightarrow Chapter 5 \Rightarrow Chapter 6).

In Part II, Experience, read:

Are you a project or middle manager from a large company?

Read Chapters 8 to 10, and 12.

Are you a project manager from a small company?

Read Chapters 11, 13, 15, and 17.

REFERENCES

Chapter 1 is an overview of all the other chapters in this book, therefore it would be redundant to repeat here the references supplied in Chapters 2 to 17. Each of the chapters has its own reference list. Therefore only a few additional references are listed here, and the references deal with the different methodologies are omitted. These works are discussed and documented in detail in Chapters 2 to 17.

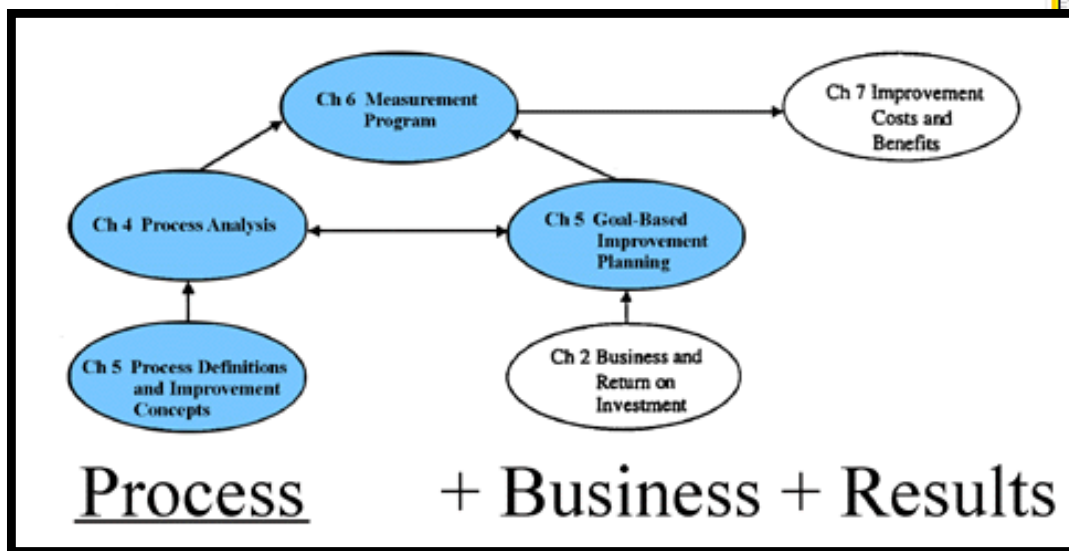


Figure 1.7. Principles path for the project, middle, and quality manager.

1. A Abran, and H. Nguyenkim, "Analysis of Maintenance Work Categories Through Measurement," *Proceedings of the Conference on Software Maintenance 1991*, J. C. Munson et al., eds. IEEE Computer Soc., Sorrento, Italy, Oct. 1991, pp. 98–103.
2. Andersen W.L., "Technology Transfer is a Social Phenomenon," *Transferring Software Engineering Tool Technology*, S. Przybylinsky and P. J. Fowler, eds., IEEE Computer Soc., 1987, pp. 56–57.
3. Boehm B.W., *Software Engineering Economics*, Prentice Hall, Englewood Cliffs, N.J., 1981.
4. Foster J., "Program Lifetime: A Vital Statistic for Maintenance," *Proceedings of the*

- Conference on Software Maintenance 1991*, J. C. Munson et al., eds., IEEE Computer Soc., Sorrento, Italy, Oct. 1991, pp. 98–103.
5. Humphrey W.S., “The Personal Software Process in Software Engineering,” *Proceedings of the Third International Conference on the Software Process*, Oct. 1994, pp. 69–77.
 6. Messnarz R., et. al., BOOTSTRAP: Fine Tuning Process Assessment, *IEEE Software*, July 1994, pp. 25–35.
 7. Messnarz R., Kugler H.J., BOOTSTRAP and ISO 9000: “From the Software Process to Software Quality,” *Proceedings of the APSEC '94 Conference*, IEEE Computer Soc., Tokyo, Japan, 1994.
 8. Rohen M., ESSI—“The European Systems and Software Initiative,” *Proceedings of the ESI-ISCN '95 Conference on Practical Improvement of Software Processes and Products in September 1995 in Vienna*, ISCN, Ltd., Dublin, Ireland, 1995.
 9. Thamhain H.J., Wilemon D.L., “Criteria for Controlling Projects According to Plan,” *Software Engineering Project Management*, E. Nahouraii et al. eds., IEEE Computer Soc., 1990, pp. 15–54.
 10. Messnarz R., Kuvaja P., “Practical Experience with the Establishment of Improvement Plans,” *Proceedings of the ISCN '96 / SP '96 Congress on December 1996 in Brighton*, ISCN Ltd., Dublin, Ireland, pp. 155–169.

**TABLE OF
CONTENTS**

PREFACE

**ORDER
INFO**



Return to: [Better Software Practice for Business Benefit](#)

Send general comments and questions about the IEEE Computer Society's Web site to webmaster@computer.org.

This site and all contents (unless otherwise noted) are [Copyright](#) © 2001, Institute of Electrical and Electronics Engineers, Inc.
All rights reserved.