

# LEAN BASICS

The Foundation for Industry 4.0



Jan Pedersen & Daniel Litwin

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**Lean basics**  
the foundation for Industry 4.0

Jan Pedersen and Daniel Litwin

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## **PREFACE:**

This book is written on the experiences for more than a decades teaching of engineering students, and more of 15 years practical work in a number of companies with Lean and productivity optimisation.

This English edition of the book is co-written with Daniel Litwin, who besides is able to write an excellent English, is a very bright young engineer, who is able to challenge the traditional way of thinking and to dig very deep down into the theoretical aspects of a problem.

This book is excellent as a textbook on engineering studies on university level as well as on lower level educations and courses.

The book is also an excellent self-study book for those who work with Time and Method Studies in their daily work, but who have been so unfortunate that they have not been part of their basic education.

This book links the classical discipline of Time and Method Studies, which is rooted in Frederic W. Taylor's work at General Electric and Ford Motor Company, along with the LEAN philosophy's data base, thus lifting the subject into 21. century.

Solhøj, October 2018

Jan Pedersen

Daniel Litwin

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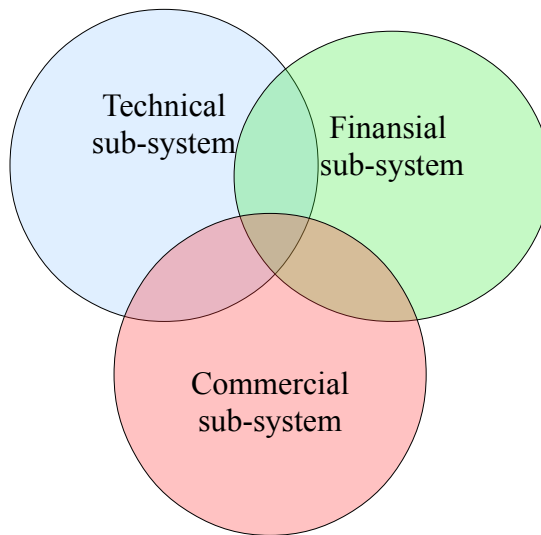
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## 1. INTRODUCTION:

A company is an organization that is build up by a lot of sub-systems, which altogether makes it possible for the company to fulfil the mission that the board of directors has planned.

These sub-systems compose separate parts of the company, which is filled-in with specialist within their specific areas. It is then the duty of the management, to make these special competences to interact in a way such that the company becomes successful.

Below is shown an example of a sub-system.



*Figure 1: The company's sub-systems*

**The financial sub-system** deals with the general financial management. Their main task is to secure that every bill is paid; and to collect the money that the costumers owe to the company for the services that the company provide. Furthermore the financial sub-system also has to provide key-figures to the management, which makes it possible for the management to run the company in a financial responsible manner.

**The sales department's** duty is to sell the products that the company offers, whether it comes from their own production or the company is a trading company.

The sales department is very dependent on that there exist a stable and reliant time registration in the company's production system, so they are able to price the company's products on a realistic foundation. It can be fatal, if you think there is a fine earnings on the products, if the case is actual the opposite, just because you weren't able to calculate costs that were related to producing the products.

**The technical sub-system** is directly affected by our effort in relation time and method studies. The technical sub-system is in general the production system of the company, inclusive storage and other logistic facilities. Though how the company's technical sub-system is constructed and configured, depends on what type of company you are referring to. If it is the home care in a municipality, it will look a lot different than one at a machine works.

The technical management in a company has its roots in the strategical objectives, which the board of the company has defined for the period of time to come. The technical management of the company can further be divided into list of smaller units, as figure 2 shows:

The individual elements is managing the tasks shown below:







*Figure 2: Elements in Technical Control*

<i>Typical elements</i>	<i>The elements deals with:</i>
Product Management	Products, range and models
Quality management	Quality level and service level
Method management	Processes, methods and equipment
Facility management	Production facilities: type, size and location
Supply Chain.	Product- and material administration
Production management	Production planning, and capacity management.

In this book, it will mostly be within the field of **Method management**, we will be working. But when things are as inseparable as they are, we will be touching the other managements too. Before we will go into details with this, let us take a look back in time and see how the field, we will be working within, has been treated in the past. It is actually quite interesting, and it can put our own self-sufficient time in perspective.

## 2. HISTORICAL BACKGROUND:

To understand the meaning and necessity of using method management and time management, first we have to take look far back in time. In contrast to what many believe, time and method management is not something that came as a result of the industrial revolution in Europe in the 1800. Newer research shows that it has it's roots much further back in history.

### *Casestory Pyramids:*

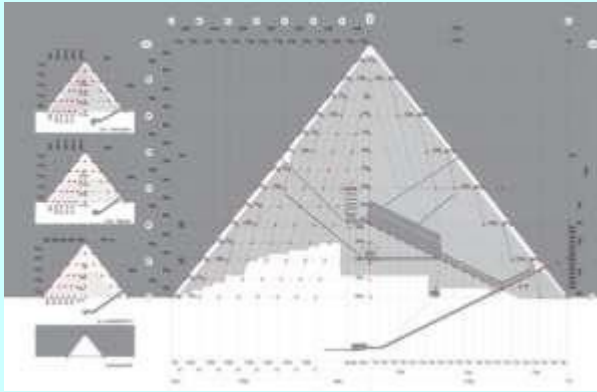
According to the known Norwegian Scientist Ole Jørgen Bryn, the pyramids are not just coincidental buildings, which occurred spontaneously. He has spend a lot of years and much energy, trying to analyse all the known pyramids in the world, and he has been able to infer a long list of tracks, which together indicates that there has been put a lot of work in both the planning the design of the pyramid and planning the execution of the work.



*Figure 3: The Pyramid of Khafre (photo Digr)*

As Ole Jørgen Bryn says “The probability that 10.000 workers gathered up at the Giza-plateau one morning to pile up stones, which 20 years later should reach a high 146 meters from where they started without having a detailed plan of how to do it, is minimal.”

Bryn has chosen another approach to the mystery of the pyramids, instead of the traditional point of view, which involves a lot of mathematics as background for the pyramids design. He has chosen to use an approach in his analysis of the designing of the pyramids, based on his background as architect.



*Figure 4: Illustration by Ole Jørgen Bryn*

His method is to recreate the principles for the construction of the pyramid by working out working drawings for the pyramids in detail himself.

According to Bryn you just have to know the pyramid's main dimensions, then you can reuse the principles from pyramid to pyramid.

From his own architectural experience Bryn has studied the planning of the pyramids and rediscovered the precision system, which made it possible for the Egypt's to reach the last and highest point, *the apex-point*, with an impressive accuracy.

By exploring the planning of the pyramid, it is possible to work out a modern project documentation of, not just only one, but all the pyramids from a given period of time.

“As long as the architect knows the pyramid's most important dimensions, he can plan the building. Just as he would do with a modern building, but with the building methods and same units of measurement, as they knew in the ancient Egypt” Bryn says. (Published with permission from Videnskab.dk, Source: Videnskab.dk and Forskning.no)

## ***2.1 The foundation of data has to be in order:***

As we are told in the case story about the pyramids, Ole Jørgen

Bryn's theory is actually build on that the Egypt's were able to make, what we today call a good foundation of data for the project.

Therefore you need to know the following.