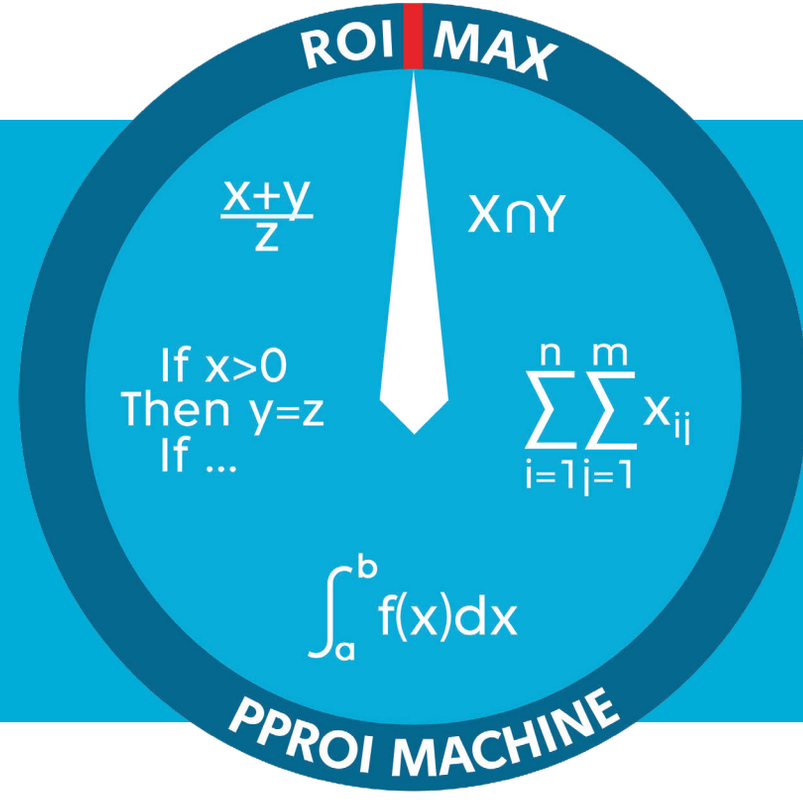
MODERN SCIENTIFIC ENTERPRISE MANAGEMENT to Maximum Efficiency

PPROI

Aligning Products,Processes and Resources to Maximize ROI



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THE TEN COMMANDMENTS

Prof. Milan Matějka

Published as series of articles in MM Industrial Spectrum 2019 / 2020

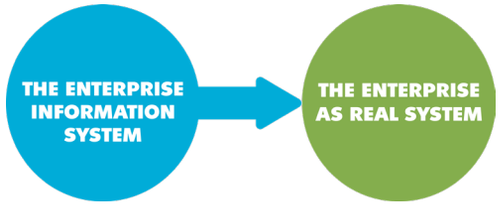
PPROI SUMMARY — COMPREHENSIVE CHANGE OF ENTERPRISE MANAGEMENT

Dear reader,

We have sent the English translation of the following series of articles "Modern Scientific Enterprise Management" to the editors of multiple academic journals, for review. Due to their reactions, I have extended the original text with these two introductory pages, summarizing the unique features of PPROI, and their benefits. I have also added an epilogue at the end of this extension. ***Milan Matějka***

KEY ROLE OF INFORMATION SYSTEM FOR THE BEHAVIOR AND RESULTS OF AN ENTERPRISE

We perceive the enterprise as a living and changing system, an organism, who's properties are created by people by deciding on the **structure** and **parameters** of **products** and **resources**, and on the **type** and **parameters of processes**. All these attributes should be oriented to **maximizing** the **enterprise value of ROI**. This requires **support from such a conceived IS**. The **information** should also be **comprehensive, accurate, inter-related, timely** and **obtained effectively**. The existence of such an information system is decisive for optimum physical properties and best possible financial results of the enterprise. **PPROI meets all** the above **requirements**.



PPROI BRAND. ONE ENTERPRISE AIM AND THE MEANS TO ACHIEVE IT

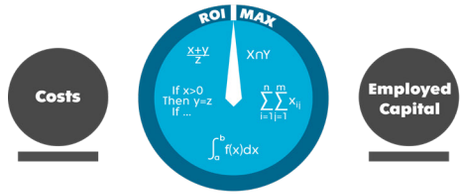
The **basic concept of PPROI** expressed in the motto **"Aligning products, processes and resources to maximize ROI"** connects the **enterprise aim** with the **means to achieve it**. This is **reflected in** the **PPROI brand**; the letter **R** symbolically joins the means with aim. This seemingly self-evident concept is actually unique. All other unique **PPROI features** are **derived from this basic concept**, which together represent a **comprehensive change** most of previous methods **of enterprise management**.

ROI AS RATE OF CAPITAL REPRODUCTION IRREPLACEABLE FOR CORRECT MANAGEMENT

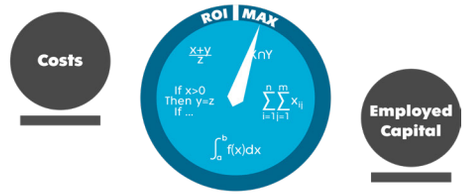
All financial variables are and should be interpreted as **parameters of capital: ROI** is a **rate of capital reproduction** calculated as ratio of profit to **employed capital**; **profit** is **increased capital** - the difference between price and cost of products, where **price** is **created capital** and **costs** is **consumed capital.**

Trade-offs very often exist **between costs and employed capital** ie lower costs are linked with higher employed capital. The **optimum** is values of these variables when **ROI value is maximum**.

Optimum costs and employed capital



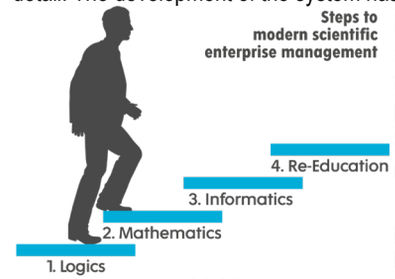
Unbalanced costs and employed capital



Ratio **Capital employed / Costs = Capital turnover time**. Its decrease increases ROI when Price > Costs. If Price < Costs, then decrease of Capital turnover time decreases ROI in negative values.

STEPS IN BUILDING AND UTILIZATION OF THE SYSTEM

Due to unique basic concept while meeting other demanding requirements on the information system it was necessary to build PPROI from scratch: to create its original architecture and technically implement it in every detail. The development of the system has proceeded in three partially overlapping phases:



First: All **PPROI information**, new in terms of content or detail and accuracy has been **logically justified**; **verbally defined, structured** into groups, **classified** and their **logical connections formulated. New terminology** has been **introduced**, where necessary.

Second: Verbally formulated solutions were **expressed mathematically**, by **variables** and their **functions**.

Third: Mathematical solutions became **binding prescriptions to programmers of IS.** The results of their procedures were thoroughly verified by logical tests.

The **utilization of PPROI potential** requires a **fourth step** - the **education of its users**. It is not just about controlling the system, but also about changing traditional management thinking which is based on many false axioms of partially oriented management disciplines. Therefore re-education is necessary.

APPLICATION OF PREVIOUSLY UNUSED POTENTIAL OF MATHEMATICS IN MANAGMENT

The universal condition of science is **respect for the laws of nature**. In the case of scientific management of the enterprise, it is necessary to respect both **physical** and **economic laws**. Failure to respect physical laws means that control information cannot be realized. If economic laws are not respected, control information may be feasible, but waste of physical resources and financial losses occur. **Respecting both types of laws** in management of the enterprise by numerical information requires the **application of mathematical tools beyond elementary algebra**, which are not used in ERP and in management theory and practice in general. **PPROI does so in several aspects**. Most striking is an **application of the definite integral** in measurement of states of items over time. It is a **mathematical pillar of modern scientific enterprise management**. Without the application of the definite integral, the information system lacks the mass of key information necessary for the proper management of the company, and managers are moving in the area of misleading chimeras. In some contexts, **conditional calculations "If then"** and **set theory** procedures are used.

All PPROI variables are interconnected by an **extensive system of mathematical functions**, which the physical parameters and prices of products and resources as well as parameters of processes gradually project into the company's ROI value. Also these functions are original. The imperative for their formulation has been **"Not to simplify!"**. Through a system of mathematical functions **PPROI behaves like a living, real system**.

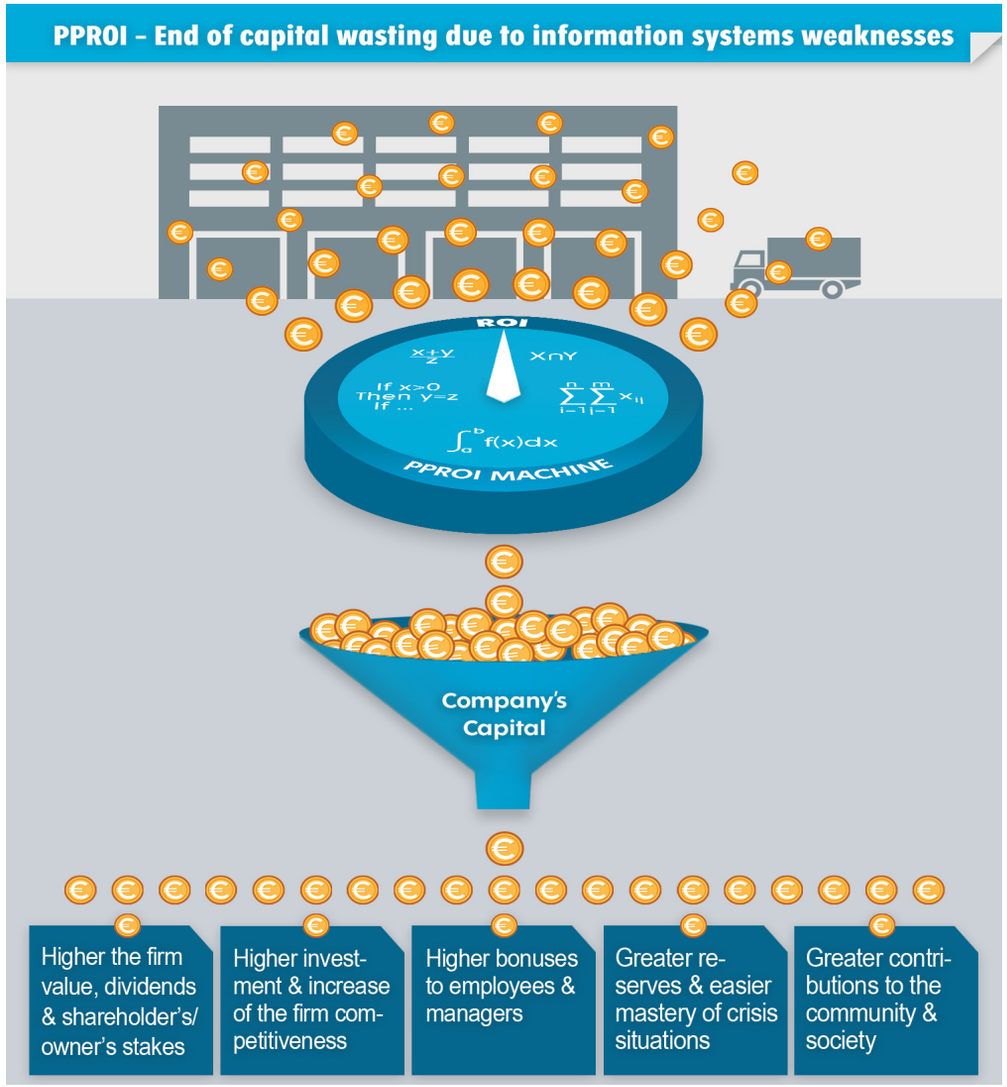
EFFECTIVE ACQUISITION OF PPROI INFORMATION

Compared to ERP, PPROI contains many times more management information. **Description of physical parameters of products and resources** is **customized**, operations of **production processes** are **split into microphases** each of them contains concrete information on used resources; **process standards** are calculated **in variants** for permissible numbers of operators. Full **information support** is provided to **lean manufacturing** and **other progressive solutions** that help maximize ROI. Content-wise **new, specific** and **detailed** are also **financial information** about processes according products.

This **information is obtained efficiently**, by **methods of science**, including IT science. PPROI denies the traditional hypothesis that the increase in the quantity and quality of information is always associated with increasing time and financial demands on their acquisition.

PPROI SUMMARY

PPROI – End of capital wasting due to information systems weaknesses



END TO CAPITAL WASTE DUE TO MISSING OR DISTORTED FINANCIAL INFORMATION

Capital reproduction takes place and varies in processes according products. The **enterprise ROI value** is the **weighted average of the ROI values in these processes**, where the **weights** of the partial ROI values are the **values of the employed capital** in these processes. The existence of this information is therefore essential for the management of enterprise products, processes and resources in order to maximize enterprise ROI value. However, **this information does not exist in ERP or in management theory and practice**. In this situation the truly scientific management to maximum efficiency of an enterprise can only be a utopia.

This situation is exacerbated by **distorted calculations of products costs** through overheads to direct labor or direct material. Contrary to the full name "Enterprise Resource Planning", the **main weakness of ERP is lack of planning information about resources** – missing information about machines, other equipment and space of buildings in direct production processes, and about all indirect resources. Often undervalued product costs tend to result in setting low product prices and calculated profits do not appear as an operation profit in financial accounting. **Managers** of products, processes and resources are financially blind and groping and **unknowingly waste employed, consumed and created capital**. New and accurate **PPROI financial information puts an end to all types of unknown capital waste.**

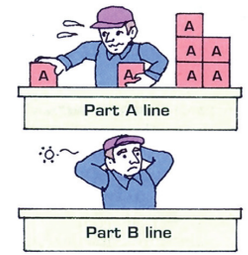
PPROI CONTRIBUTIONS TO CAPITAL GROWTH

BALANCING COSTS AND EMPLOYED CAPITAL IN ASSESMENT OF PHYSICAL ALTERNATIVES

The application of ROI as a criterion is necessary in all types of decision-making between alternatives, as the **potential trade-off between costs** and **employed capital** is **ubiquitous** and **in strategic alternatives** is even **logica**l. E.g. in a "**make or buy**" decision and optimizing the supply chain a larger scope of production processes within the given enterprise leads to the increase of fixed capital in machinery and equipment and in buildings for the products concerned and also the current capital increases. Higher employed capital is acceptable, when its impact on the product ROI is more than offset by lower product cost. It can be possible e.g. because cost of the produced part within enterprise do not include the profit of the potential supplier of the part. Big **trade-off between costs and employed capital** exists when **labor is substituted by machines**. Trade-off between costs and employed capital can exist also in **continuous improvement**. **PPROI** enables the enterprise to **calculate the impact of trade-offs on the company's ROI value before deciding on implementation of alternatives**.

CAPITAL SAVINGS THROUGH CONTROL INFORMATION OF PROGRESSIVE PROCESSES

Advanced manufacturing processes have an important role in the **reduction of capital waste**, esp. "**Lean production**". In comparison with traditional production described in ERP lean production reduces inventory, logistics equipment and work, and enables better utilization of operators. So it **decreases** both **costs** and **employed capital**. To utilize its potential, however, **lean production requires fundamentally new control information**, and **PPROI is providing it.**



A chronic problem of production plans is the overloading of some work centers or lines and the insufficient use of others. This is reflected in the **unleveled demands on operators**, as is illustrated by a picture taken from Toyota. However, in process standards for constant numbers of operators this **stems from demand**. **PPROI minimizes** this **problem through variant process standards for permissible numbers of operators**. In the example on the picture, at a time when the operator on line A is overloaded and on line B is nothing to do, PPROI plans 2 operators for line A working in shorter takt time then for one operator. Both workers are used and the demand for line A is manageable. **PPROI** thus **saves costs** for unused operators and **fixed capital** In lines. If this problem is not solved by an information system, it has chain consequences, production is carried by much larger capacities of workers and machines than objectively needed, waste of capital is huge.

CAPITAL SAVINGS DUE TO THE ELIMINATION OF INEFFICIENT INFORMATION WORK

Due to the weaknesses of ERP, a large part of the control **information** is **provided** by employees of various departments **outside of ERP**, most often in Excel. It is **expensive subjective work** with **unrelated** and **unsatisfactory results**. **PPROI reduces also this waste** of capital and the **total capital savings that PPROI generates** can be a **benefit for all-round** as illustrated by the image on the left side of this page.

Foreword by the editor-in-chief of MM Industrial Spectrum

Three years ago, in MM Industrial Spectrum, we published an eight-part series on the needs related to management of products, processes and resources, focusing on maximum Return on Investment (ROI). This material has met with unprecedented interest from readers - especially the manufacturing companies, which they're targeting. We have received a large number of responses to the editorial office with a predominantly common denominator: business representatives are aware of the need to maximize ROI, but due to lack of information they do not pay attention to it in product, process and resource management and thus in the practical management of the enterprise as a whole.

This series was followed by a conference held at the Technology Center of Academy of Science of Czech Republic with the partnership of the Enterprise Europe Network. Speakers first introduced the issue of ROI theoretically and then demonstrated in practical examples the possibility of deploying the PPROI information system. This system is the result of years of activity and development done by a Professor of Statistics, Doctor of Economic Sciences Milan Matějka and his team.

Among others, PPROI was awarded as the Visionary of the Year 2017 in the Czech Republic as a unique system for increasing the efficiency of business in the field of industrial production. In 2018, another important award for PPROI was the grant of the prestigious European SME Instrument, designed to support innovation with the potential to make a significant contribution to Europe's economic development. PPROI is an applied science and from this point of view we consider it necessary to present to our readers its cornerstones. This is the aim of the educational "The Ten Commandments", which prof. Matějka shares with you. This article is an introduction to the topic.

Ing. Roman Dvořák

Scientific management, ERP and PPROI

Few are aware that the core of today's industrial enterprise information systems, referred to as ERP, is by the umbilical cord connected with the concepts and practices of "scientific management" that were born in the US over 100 years ago.

Luis Brandeis, author of the term "Scientific Management" from 1909, accentuated the focus on reducing costs while increasing labor productivity and wages. The term has been taken over by Frederick Taylor, "Father of Scientific Management", who has already dealt at the end of the 19th century systematically with industrial production processes. The division of processes on BOM parts into operations carried out at specialized work centers, its setup, piece and inter-operation times, economic production quantities and lead times of parts, i.e. the basic variables of current ERPs were defined by F. Taylor, F. Harris and H. Gantt until 1919.

In the 1960s, these variables became inputs of the MRP production plan, conceived by Joseph Orlicki. The unrealizability of this plan, resulting already from its input information, is compounded by the lack of coordination of processes on BOM parts for different final products. More than a hundred years old, fundamentally flawed and confusing, ERP includes product cost calculations, through overhead surcharges to direct wages and materials. It's based on the theory of cost accounting (management accounting), which as a direct source of product costs does not register, among others, machines, what is a paradox in today's industry full of processing machines and robots. Another problem is the connection of ERP with the basic parameters of production described at the beginning of the 20th century. Production practices have progressed significantly since then, lean production has been established with interconnected operations in the same takt times, sometimes several different parts of a traditional BOM are produced together, optimal production lots of a given part are changing. ERPs are unable to describe this and are becoming a brake for the implementation of efficient processes. The main impetus for building PPROI was the absence of information in ERPs that our consulting team lacked in the restructuring of manufacturing companies in various industries, particularly in the introduction and management of lean production.

The most striking key weakness of ERP is the complete absence of the financial variables necessary to manage products, processes and resources in order to maximize ROI and thereby respect the basic economic law For removing these fundamental weaknesses of the ERP systems, it requires changing their core structures – content, width, depth, and relations of information. The superstructures over the rigid core of ERP, and / or the growing number of partial and subjective sets of information in Excel, created by individual companies, only exacerbate the confusing groping and contradictions. The result is a huge and mostly unnoticed financial losses. At PPROI, we have solved these issues using general principles and methods of science, while respecting the current trends of science. Therefore, among many positive reactions to the first PPROI presentation material from experts from different countries, we were particularly pleased with the standpoint of prof. David Burkus (USA), author of the book Under New Management and other management bestsellers: *''The conception of PPROI seems to me as an updated scientific management"*. From this aspect, we now characterize PPROI innovations.

Utilization of the IT potential

The vast majority of the new PPROI information is generated by the mathematical functions of a relatively small number of input data, using the potential of current IT; the authors of initial scientific management did not have it at the beginning of the 20th century. Regarding the obsolescence and malfunction of the core of the current ERPs, we attribute it to the fact that the programmers of these systems have not received new and correct scientific assignments.

The Ten Commandments

We chose the form of the Ten Commandments for brevity and memorability of the main characteristics of PPROI modern scientific management.

1. THINK ABOUT YOUR ENTERPRIISE AS A MANAGED DYNAMIC ORGANISM WITH THE AIM TO MAXIMIZE ROI

2. ACT AS AN INTRA COMPANY INVESTOR, USE MEASUREMENT IN MONEYTIME UNITS BY A DEFINITE INTEGRAL

3. BE AWARE OF THE VERSATILE IMPORTANCE OF SCIENCE FOR ENTERPRISE EFFECTIVENESS

4. EXCEED THE BOUNDARIES OF TRADITIONAL PRODUCTION DESCRIBED IN ERP

5. MASTER THE LOGIC OF PPROI ARCHITECTURE

6. DISTINGUISH RESOURCES ACCORDING TO THEIR IMPACT ON COSTS AND EMPLOYED CAPITAL

7. APPLY ROI AS THE KEY CRITERION IN ALL KINDS OF STRATEGIC DECISION MAKING

8. STRIVE FOR CONTINUOUS IMPROVEMENT OF ELEMENTARY FACTORS ROI

9. MANAGE PROCESSES WITH FLEXIBLE STANDARDS AND LEVELED PLANS IN REAL TIME

10. LEARN TO COMPREHENSIVELY MANAGE ENTERPRISE THROUGH A MODERN INFORMATION SYSTEM

We argue for each recommendation in the following articles.

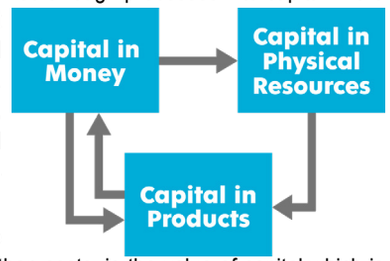
MODERN SCIENTIFIC ENTERPRISE MANAGEMENT COMMANDMENTS 1+2

1. THINK ABOUT YOUR ENTERPRISE AS A MANAGED DYNAMIC ORGANISM AIMING TO MAXIMIZE ROI

Enterprise capital reproduction and ROI

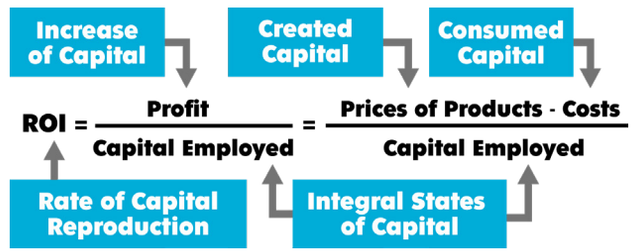
The enterprise is the basic organizational unit of the business and its natural goal is to maximize the return on unit of capital employed, i.e. value of ROI. It is important to perceive an enterprise as an organism that is currently defined more widely than as a biological entity "A living, self-sustaining system with properties and functions determined not only by the properties and relations of its individual parts, but also by the character of the whole, that they compose, and by the relationships of the parts to the whole." All this completely applies to the enterprise.

Continuous life of the enterprise takes place through the circulation of capital, in which capital changes forms and reproduces value. Capital in the form of resources is transformed through processes into capital in the form of products, and after the sale of products, its substantial part remains in a company in the form of money, which is converted into either capital in physical resources or in capital in products. Capital in the form of physical resources includes land, buildings, machines, other equipment and purchased materials. The capital used to compensate employees and services circulates only between capital in money and capital in products.



For an enterprise to be self-sufficient, the price of products, ie the value of capital created in the form of products, has to be higher than costs, ie the value of capital which is consumed in connection with function of resources; the operating profit of the company, ie the capital increase, must be positive.

ROI is the rate of capital reproduction in the any given relevant period and is determined by the created, consumed and employed capital. The higher the positive value of ROI, the more the enterprise from the capital unit contributes by taxes to the whole society, and creates more resources for its own development or for the immediate satisfaction of investors (by dividends).



Dependency of the enterprise ROI on the information system

Unlike biological organisms, the specific elements of an enterprise, and therefore the value of ROI, are not primarily given by nature, and the variability of the enterprise's elements over time is large. The products, processes and resources of the enterprise must be determined and managed by people in the enterprise in order to maximize ROI. But it is impossible only from the heads of people to determine the portfolio and characteristics of enterprise's products and resources, as well as the types and parameters of processes in their links which lead to maximum enterprise ROI. Necessary is the information system that fully and accurately describes the relevant parameters of the enterprise's products, processes and resources according to its territories and contains their mathematical functions resulting in the enterprise ROI. PPROI is so far the only information system with such properties.

2. ACT AS AN INTRA COMPANY INVESTOR, USE MEASUREMENT IN MONEYTIME UNITS BY A DEFINITE INTEGRAL

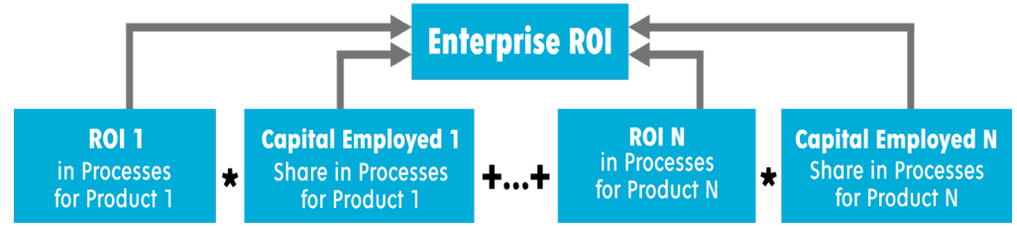
Economic law and comprehensiveness of ROI

Maximizing ROI is a basic economic law and its violation leads to a waste of enterprise resources and harms the whole society. The unique attribute of ROI as an economic variable is its comprehensiveness, the correct reaction of its value to the values of other variables.

Processes by products - areas of intra enterprise investment

Capital increases its value in processes defined according to products. These processes differ, create products with different physical features, prices, costs and employed capital, and therefore with different ROI values. The value of ROI for the whole enterprise is determined by the ROI values in processes for individual products and by shares of the capital employed in these processes within total capital employed in the enterprise. Processes defined for products need to be treated as in-house investment areas, aiming for high ROI values within each area and structuring capital in favor of areas (ie processes) with above-average ROI values. In doing so, it is necessary to respect the links of ROI and capital employed in different processes by products due to their partial sharing of resources. PPROI makes it possible.

Measurement of employed capital by the definite integral in money-time units



In PPROI, the capital employed in a certain space and time interval is measured by a definite integral in the money-time units. There's nothing revolutionary in the content. The basic financial principle, naturally applied from the origin of money, is the proportionality of the expected monetary yield to the amount and time of borrowed or invested money. A definite integral only mathematically simultaneously characterizes the amount and time of used money. It is expressed in different combinations of money and time units of measure, eg euro-minutes or dollar-years. These units are transferable.

The capital employed in the processes for a particular product is the sum of definite integrals, which characterize the states of capital contained in the objects relating to the relevant processes in the time intervals. In management accounting and in management theory and practice in general, the capital employed in processes for products is ignored. The cost of products does not have a time dimension, and the usual expectation of profit from cost is just as absurd as if depositors demanded from banks the interest from the value of deposits regardless of the deposit period. In contrast, financial accounting registers capital employed – in the balance sheet but does not contain information about processes. An enterprise products, processes and resources cannot be driven to the natural aim of an enterprise, either from management accounting data or from financial accounting data. PPROI information enables to solve this key chronic problem of financial management of an enterprise fundamentally and completely.

3. BE AWARE OF THE VERSATILE IMPORTANCE OF SCIENCE FOR ENTERPRISE EFFECTIVENESS

The primary role of science is to properly describe the essence of things given by nature. Science postulates arise on the basis of observation and / or deductive logic. They are not always correct, and the evolution of science is also tied to the refutation of previous false theories. This also applies to some theses of the initial scientific management of the enterprise.

The often quoted Lord Kelvin marked measurement as the condition of exceeding the threshold of science; He accented the necessity of proving verbal statements mathematically and warned against the fatal consequences of mathematical simplification of reality. Albert Einstein also warned against simplification. The current practices of enterprise management lack the necessary measurement; on contrary, there are a number of superfluous, simplistic and conflicting mathematical models. These arose and continue to arise in the partial disciplines of management theory and in the departments of practice without mutual links and without links to the ROI of enterprises. Enterprises are treated more like sets of fragments than as organisms.

Current trends of science in PPROI

Experts have identified two main trends of science on the threshold of 3rd Millennium

- Disappearing boundaries between disciplines
- The dissemination of the apparatus of mathematics that was previously regarded as useless in some disciplines.

Both of these trends are projected in PPROI. It works with concepts that crossed the boundaries of the original use – organism, architecture, reproduction etc. Definite integral, set theory and types of mathematical functions previously unused in management are applied in PPROI.

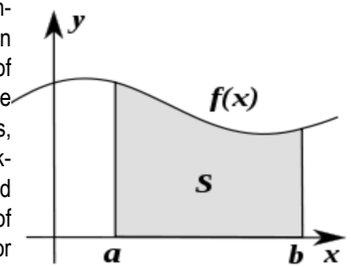
Application and understanding of a definite integral

The application of a definite integral is necessary to provide key management information, it does not have an alternative. However, there is no integral in ERP, and most managers do not understand it. All participants of the conference devoted to PPROI have admitted this. Unintelligible appears both the symbol of definite integral as well its link to the definition "area under the curve, limited by the graph of the f function, the x axis and the vertical lines x = a and x = b". (We cite Wikipedia, including the picture).

The mysterious symbol ∫ is a long narrow letter S, legible in the picture and stands for the sum. The question is how the area can become a sum. Possible explanation: when calculating a definite integral, small segments of the curve are represented by abscissas and the resulting faces of the rectangles are added together.

$$\int_a^b f(x)\,dx$$

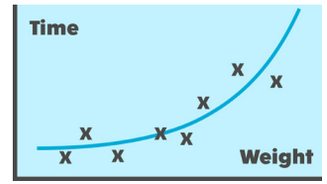
The y variable in the sections of x axis may be constant, linearly increasing or decreasing. Calculations of definite integrals are then simple. If the x, y variables are expressed in different kinds of units of measure, the area is characterized by a combination of the respective units. PPROI applies a definite integral not only in financial variables, but also in production planning, where the integral is measured in worker-minutes and line-minutes. The x axis (as well as in capital employed calculations) is the axis of time, the y axis is the axis of the number of workers or lines. Understanding the definite integral is necessary for proper business management.



Usefulness of the set theory

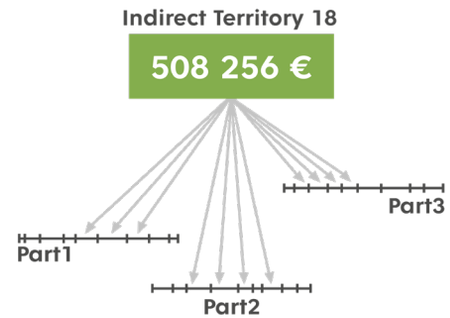
PPROI applies also concepts and operations of set theory in internal mathematics algorithms. These concepts are also important for understanding the properties of financial variables. Costs and revenues or prices contain intercompany intersections that differ in different enterprises and in different products within particular enterprise. The intersections and costs of the same items change when enterprises merge and divide without any change of products, processes and resources. In addition to the absence of a time dimension, intercompany intersections are another reason why costs cannot be an objective criterion of financial requirements of given products and why the ratios of profit to price (profitability) or profit to cost (cost-effectiveness) cannot be objective criteria of the effectiveness of different products.

Sorting, atomization, and functions



Sorting, atomization and the composition of basic elements into the new entities are classical methods of science. These methods sometimes need to be combined and PPROI does it. Processing operations are classified, their classes are atomized into microphase classes, each class containing specific sets of resources and their parameters from which mathematical functions within the microphase classes calculate times and other physical parameters of the microphases for specific parts. An example is the function of microphases times for BOM parts dependent on the parts weight (see figure). The function which can be relevant for manual work determines the times for any part weight and eliminates the discrepancies of the times found in the independent observations (displayed by the crosses) due to specific factors in each observations (operator's mode of work, various abnormalities). Unique process standards and production plans are created by downstream functions of PPROI.

The functions of physical parameters of microphases, physical parameters and prices of resources calculate direct cost of individual products within microphases, generated by a wide range of resources, including energy, gases, liquids, masses and consumable tools. PPROI thus eliminates the hazy, misleading and virtually non-existent production overhead which distorts product costs. PPROI also determines capital employed in specific resources.



Allocation to process phases for manufactured parts

Most of the functions in PPROI compile the sub-information into the information of more synthetic content. Reverse procedure, i.e. decomposition is mainly applied in the logically justified allocations of financial parameters of resources in indirect territories into the phases of direct processes involving processes on direct materials, manufactured parts and finished products.

This replaces traditionally calculated non-production overheads, another cause of dramatic distortion of product costs. The capital employed in indirect territories is also allocated to direct processes. Allocations on direct processes for specific products are dynamic, dependent on the volume and structure of all products in the rated period.

PPROI's new, accurate and linked information is thus generated by methods of science very effectively.

4. EXCEED THE BOUNDARIES OF TRADITIONAL PRODUCTION DESCRIBED IN ERP

ERPs are limited to processes with isolated operations on individual BOM parts in fixed production lots. The inability to describe a more efficient solutions in ERP is a brake to the implementation of these solutions. If implemented, the absence of control information leads to inconsistencies and losses. PPROI contains the necessary information.

Associated BOM parts. Production processes in ERP are defined for individual parts of BOM without links to other parts. In practice various parts of BOM are sometimes processed in fixed ties for economic or technological reasons; in a given machine, different parts are processed concurrently, at other cases, the processing of the combination of individuals of different parts is sequential. PPROI keeps records of these associations and projects them into process routings, process standards and production plans.

Lean Production. In ERPs, the processes on BOM parts are divided into operations with independent piece times and also setup times. It results into inventories and logistics works between operations, however, the current phenomenon is a lean manufacturing in which the subsequent operations in the line arrangement of work centers take place in the same takt time. PPROI contains comprehensive control information of lean production, among other things it determines the permissible takt times.

Flexible production lots. The third basic feature of production in ERP - condition of the MRP plan are fixed production lots. However, these often lead to surplus stocks and inappropriate capacity utilization. Some firms reject fixed lots and production planners or managers determine the production lots of different sizes at the last minute ad hoc from the head. Such determined lots cannot be in supplied in time by lower parts from previous processes and chaos arises. PPROI generates flexible lots systematically with the necessary timing.

5. MASTER THE LOGIC OF PPROI ARCHITECTURE

The concept of Aligning products, processes and resources for maximizing ROI in the management of enterprise organism (formulated in the motto of PPROI and in the concept of enterprise) creates the basic assignment for the information system architecture. The architectural solution has three levels:

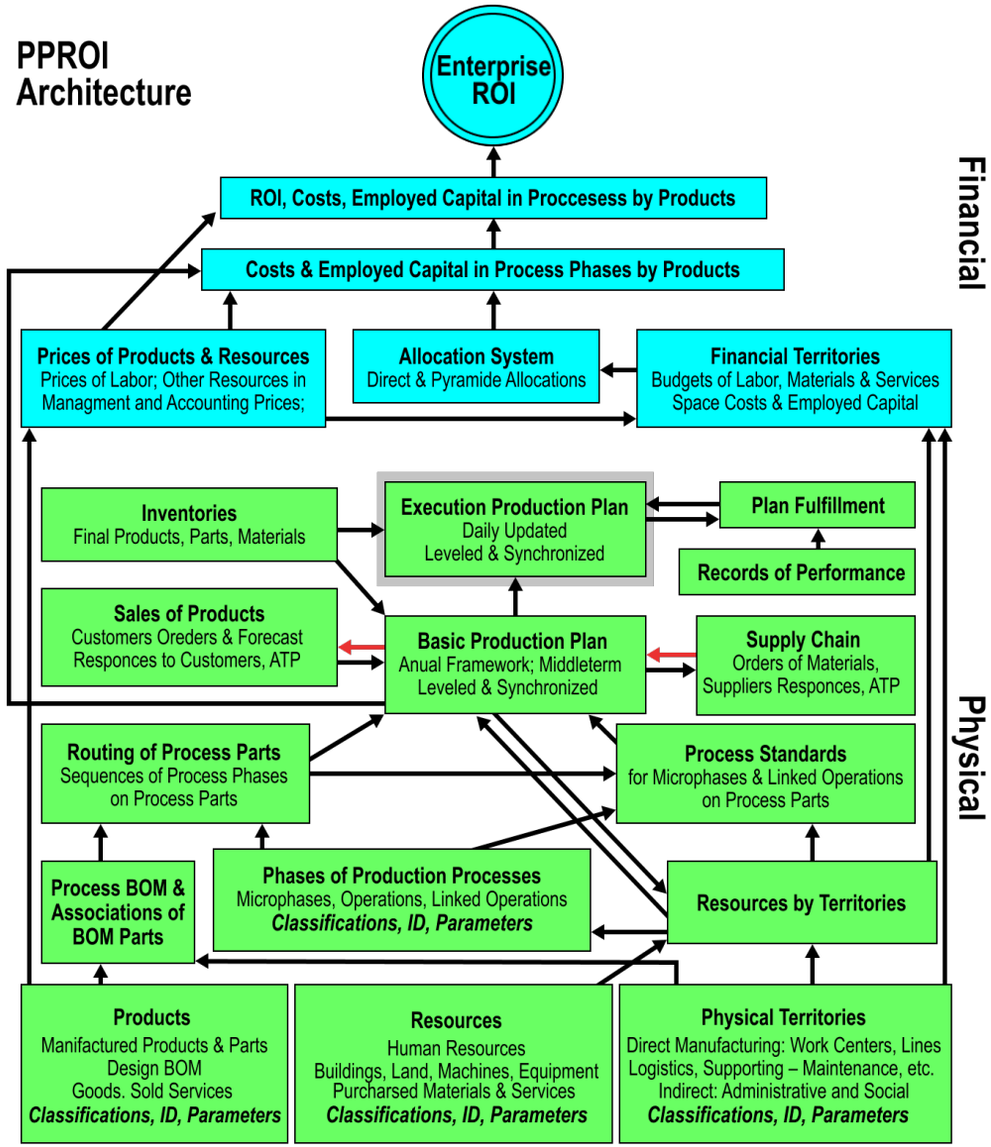
1. Logical definition of structures and links of information from the content point of view
2. Expression of content-defined architecture in the language of mathematics - variables and their functions
3. Projection of math solutions into language of computer science - data, application and user IS layers

The groundbreaking features of PPROI information are at levels 1 and 2. Their projection to level 3 has resulted in an information machine that has no competitor. Changes in elementary parameters of products, processes and resources automatically change the values of subsequent variables and finally the enterprise ROI. PPROI acts as a living system, a changing organism.

Information structures and their links

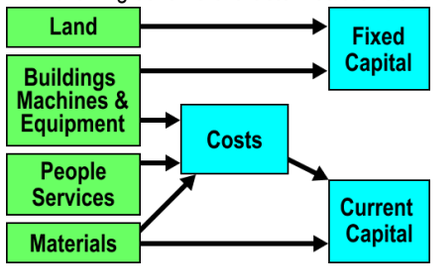
The content of the PPROI architecture is displayed in schema. Groups of information are shown in rectangles, links of groups are represented by arrows. The top arrows in pairs indicate feedback, the red arrows limit the requirements by production and suppliers capacities. Links also exist between information within groups. Physical information of the part “Physical” serves for direct management of the enterprise’s products, processes and resources by newly designed process standards and production plans and is projected into the financial information in the part “Financial”.

Here, the financial parameters of direct processes by product are calculated in a descriptive way, other costs and capital employed in intra-company financial territories, mostly indirect, are allocated to direct processes by the allocation system. New financial data evaluates in detail existing physical solutions and alternatives to their replacement in strategic decision making and continuous improvement. The enterprise’s ROI fulfills the criterion function, navigating managers to optimal physical solutions.



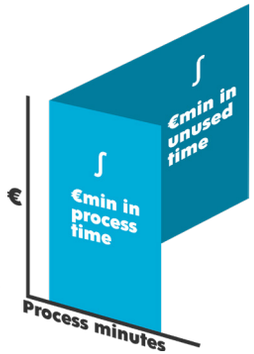
6. DISTINGUISH RESOURCES ACCORDING TO THEIR IMPACT ON COSTS AND EMPLOYED CAPITAL

The most striking PPROI innovation represents its financial section. Except of PPROI, the key control financial information - capital employed and ROI for processes according to products do not exist, calculation of total costs are dramatically distorted by overheads. The basic economic law is ignored, oversimplified mathematical models are applied ie the requirements of science are not respected. We have stated, on page 3, that overheads are eliminated in PPROI and all costs and capital employed are generated by specific resources. The following scheme characterizes the relationships of individual types of resources to costs and employed capital. It is clear from the diagram that the impact of different types of resources on costs and employed capital is different. Fixed capital, which usually forms the bulk of total employed capital, does not reflect people, purchased services and materials. But these resources usually generate the decisive part of costs. The ratio of capital employed to costs, which is the time of capital turnover, always changes when the resource structure changes. The following table illustrates the possible evaluation of process alternatives for a given product. Alternative A has lower costs, higher profitability, but requires higher employed capital and has a longer capital turnover time and the ROI value is lower than in alternative B. Different times of capital turnover can also cause contradictory evaluation of processes for different products according to profitability and ROI.



Alternative	Price €	Costs €	Profit €	Profitability € / €	Capital employed €years	Capital turnover time Years	ROI € / €year
A	100	92	8	0,08	160	1,74	0,05
B	100	94	6	0,06	80	0,85	0,075

Calendar time is decisive for the employed capital. In the calculations of fixed capital in direct processes for products contained in machines, other equipment and parts of production halls it is necessary to reflect the time utilization of individual items. Detected integral of fixed capital in a certain item at a certain phase of the process it is necessary to increase by integral in the proportional unused time of given item (see picture). PPROI does so automatically. Current capital included in inventories of materials, work in process, semi-finished products and finished products, is measured by definite integrals below the cost functions of individual items over their inventory time.



Information on buildings, machinery and equipment necessary for the quantification of employed capital and ROI in the processes by products are also essential for proper costing. Buildings, machinery and equipment generate depreciation and other cost components. Depreciations of items are fixed costs and their values in processes are in PPROI increased according to unused times of items (fixed capital analogy). Machines and equipment in direct processes in active times generate also variable costs for various types of energy, water, steam, technical gases, lubricants, drills and other consumables and for maintenance. The structure of these costs and their amount per unit of active time for different types of machines vary. PPROI calculates these process costs by products descriptively and records them as direct machine costs, the costs generated by parts of production halls are calculated and recorded as direct spatial. Each component of these costs is autonomous and independent of others. Their usual replacement by overhead surcharges to direct wages is a logical nonsense; all methods of overhead calculation and other management accounting models are therefore fictions, leading enterprise astray, sometimes to bankruptcy. The well-known label of management accounting as "the enemy of enterprise No.1" has reasons but correct costing of products is only possible through a conceptually new enterprise information system.

7. APPLY ROI AS THE KEY CRITERION IN ALL KINDS OF STRATEGIC DECISION MAKING

The opposite evaluations of product, process and resource alternatives by employed capital and costs exist in all kinds of strategic decision making. The criterion for evaluating alternatives should therefore be ROI.

Mechanization, automation, robotization. In all these kinds of substitution of people by machines, the fixed capital and costs generated by machines are increasing. The other process costs should fall.

The scope of processes for the product within the enterprise. Realize the parts of BOM for a product and/or other activities within enterprise or to buy them? Purchasing reduces employed capital but, as a rule, the costs of products increase because they include the profit of the supplier of the purchased objects or activities; that profit is not included in the costs of these items when they are realized within enterprise.

Work centers within production lines. Lean manufacturing connects work centers into lines. In diverse production with different sequences of operations, lines with many work centers lead to low time utilization of machines and plant and generate high fixed capital; this can more than negate lower costs and current capital.

Ownership and rental. Owned buildings, machines and equipment are projected in fixed capital, leased objects only in the costs of the enterprise. Rental costs include the profit of the owner and are generally higher than the costs generated by resources owned by the particular enterprise.

Pricing. Traditionally a minimum profit-to-cost ratio is required. However, the yield ie profit should be proportional to the capital employed and the formula with the required minimum ROI is therefore relevant.

Price = Cost + Capital employed * ROImin

Although prices must respect the marketability of individual products, the above calculation is essential for deciding whether to produce a product or not.

Product portfolio. ROI ranks individual products differently than profitability for all previous reasons.

8. STRIVE FOR CONTINUOUS IMPROVEMENT OF ELEMENTARY FACTORS ROI

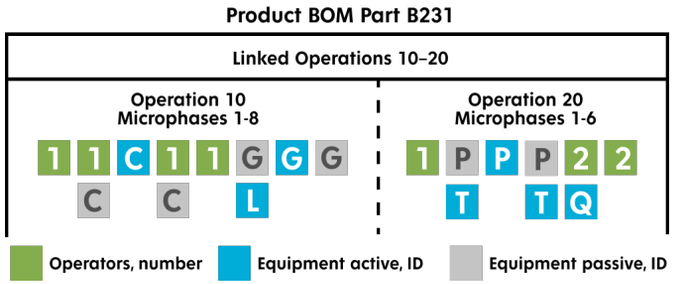
For continuous improvement, PPROI provides unique support in recording the elementary parameters of products, processes and resources as objects of improvement, disseminating improvements designed for a specific situation, and projecting improvements to the enterprise value of ROI.

Continuous improvement is usually aimed at reducing defects and decreasing process times. It is also important to improve the properties of resources from other aspects, such as reducing the power consumption of a particular machine per minute of full performance. PPROI this improvement automatically projects into the reduction of power consumption for all parts of BOM processed by the machine, increasing the ROI value of respective final products and ROI value of the enterprise. In doing so, PPROI combines and processes information recorded as parameters of resources, microphases of operations and prices. Improvement is closely related to standards. Existing standards are subject to improvement, and accepted improvements become new standards. PPRO also records resource savings in indirect territories. Comparing the enterprise's ROI after improvement with the pre-improvement ROI value quantifies the financial benefit of the improvement.

9. MANAGE PROCESSES WITH FLEXIBLE STANDARDS AND LEVELED PLANS IN REAL TIME

Three-stage description of the phases of processes in PPROI

In ERP, elementary process information is defined for operations on BOM parts. There is no information about what is happening within operations. As a rule, time standards are determined by fact-finding for each operation and part. It depends on subjective and random factors in specific surveys - the way the operator works, the state of production facility, etc. and for comparable parts tend to be contradictory; they are most criticized by operators, rewarded according to compliance with standards. The introduction of operations microphases (MF) fundamentally deepens, expands, specifies and refines information on production processes.



PPROI automatically integrates MF parameters into the standards of linked operations (LO) that are necessary in lean production. Isolated operations are special cases of LO; standards for traditional and lean production are in one file. The process description is characterized by the diagram on the left.

Definition, parameters and importance of microphases

The objects of microphases are manufactured parts, lower parts of BOM and materials entering the manufactured parts. The registered resources are operators, machines and other equipment eventually parts thereof, wherein at least one of the resources is active. Resources are either separate (operators, automatic machines, robots) or in combinations. Within the microphase, the definition of resources is immutable. MF classes make up the same MF for different objects. Within classes, MF times for specific objects can be determined by mathematical functions, depending on object or resources parameters. The functions save the work associated with measurement of times for individual parts within a class and prevent the randomness of times in individual surveys (See example on page 3). Models respect the specifics of the enterprise, users determine and write them to PPROI; in doing so users are navigated by the system. The importance of MF introduction and classification is multifaceted; functions can only be used for MF of different parts with the same resources (not for operations), only the MF parameters can correctly determine LO standards. MF parameters for active equipment are inputs for calculating direct costs generated by machines and other equipment.

The MF application is also useful in standardization of changeovers of equipment (setup times), maintenance, logistics and administrative processes.

Variant standards for linked operations

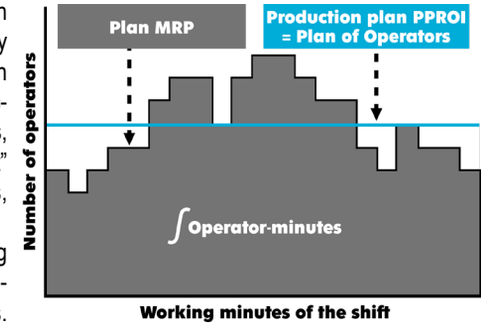
Standard times of LO are takt time and lead time. Takt time is defined as the average time between two LO outputs. Lead time is the time for which one item of BOM exists within the LO; it may can be much longer than takt time and both times are necessary to apply in the production plan. If the time requirements of LO for operators are higher than the time requirements of any device, PPROI generates variants both of takt time and of lead time for permissible number of operators. The variants support the flexibility of production response to demand and ease the creation of leveled production plans. Variant standards for LO can also be directly set into PPROI, which is necessary when introducing new parts of BOM.

Production plan tasks, MRP and alternatives

The main task of operational management of the enterprise is to determine what – operations for BOM parts and their quantity, where – work centers or lines, and when – in minutes of real time, is to be carried out. MRP plan determines this in ERP. But planners complain massively about its unrealizability. Characteristic quote: *"Although I know how to work in ERP environments including SAP, I never got a real production plan from them. I have had no choice but to rely on my own Excel file and years of experience. I see in it the risk of human mistakes."* A viable plan cannot be delivered from the MRP especially for fluctuations in its demands on operators both between and within working shifts. The contradiction between the demands of plan on number of workers and possible states of workers is violation of physical law. Production planners and managers have to give to operators other tasks than in MRP, overall production loses any coordination, material supply misses actual needs and incurring losses are large. However, planning in Excel lacks even the links and horizon of MRP. The problem cannot be resolved by superstructures over MRP. And TOC plans are defined only for one or a few work centers in processes. All of these MRP alternatives also generate big losses. Whether and how the problems of creating a feasible production plan addresses the individual APS requires deep analysis.

Properties of PPROI production plans

PPROI production plans are leveled in the demands on operators - aligned with the plans of the number of operators according to the production territories in which the operators work – and do not overload the capacity of production lines (work centers). Between production territories they are time-synchronized and have other necessary properties: go beyond ERP production boundaries, are different in the systems "Make to stock", "Lot for lot" and "Make to order", in case of multiple substitutable lines, individual lines are planned.



An example is monthly production plan for assembling dozens of final products at 20 partially substitutable assembly lines overall assigned by hundreds of operators. PPROI generates the flexible economic lots of individual final products from monthly orders, deploying them into individual lines. In doing so it alternates different products for equalized production requirements for lower parts of BOM and ensures leveled use of active lines during the month. The input parameters are time standards and priorities of the lines for parts registered in PPROI. Planners activate the lines for the portfolio of final products in a particular month, set constraints and trigger calculations. Prior to PPROI, this plan was created very laborious, subjectively, with many weaknesses, by planners in Excel spreadsheets.

Basic and execution plan

Basic PPROI production plans (and also MRPs) are often developed long in advance of the planned completion of the final products. This is due to long lead production times and supplies of materials. Already these plans should have attributes of feasibility. On the current day, however, it is usually not possible to release them to production shop-floor for their non-fulfillment in previous days, and other "abnormalities". Therefore, PPROI creates leveled and synchronized plans for shorter periods, deviating from the basic plan and on the current day released into shop-floor as execution plans. Deviations of the execution plans from the basic plans are minimized. PPROI also includes tools to quickly modify execution plans by users.

10. LEARN TO COMPREHENSIVELY MANAGE ENTERPRISE THROUGH A MODERN IS

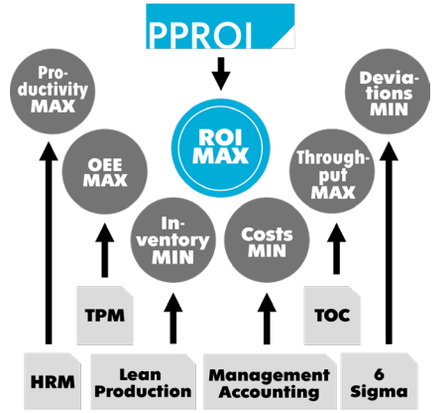
Summary of unique scientific attributes of PPROI

The primary requirement of science is to respect natural laws. Solutions not respecting the laws of physics are unrealizable or inoperable. Solutions that do not respect the basic economic law within the laws of physics are possible, but generate large financial losses. PPROI respects both kinds of laws and is already unique from this point of view. This has been not the case before PPROI. Financial management of products, processes and resources has not aim to ROI maximization, the physical management of products, processes and resources by MRP has not respect the laws of physics.

The enterprise is conceived in PPROI as a controlled organism reproducing capital, whose all elements in the links should ensure the maximum rate of reproduction, ie maximizing ROI. Since the reproduction of capital takes place in processes defined according to products, information on ROI and employed capital in these processes is necessary. This requires the application of a definite integral. For the sake of detail, accuracy and links of information, as well as the efficiency of obtaining information, also other methods of science, especially mathematics, not used in traditional management, are applied in PPROI. PPROI also describes progressive processes beyond ERPs increasing ROI values. Structures and links of PPROI information are formulated in architecture, unique in content and mathematical aspects. Through conversion into the IT properties of PPROI architecture, a revolutionary information machine was created, automatically projecting elementary parameters of products, processes and resources into the enterprise value of ROI PPROI thus navigates the enterprise to the systematic fulfillment of its natural mission.

Maximizing ROI versus extremizing other variables

Unlike PPROI the management theories are focused on the best possible - either maximum or minimum values of the partial variables. The picture right illustrates this.



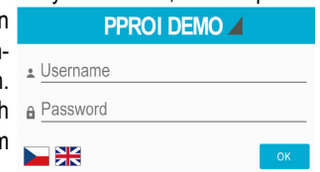
The implicit assumption that better values of individual variables lead to better overall enterprise results is wrong. We have already explained that lower costs and higher profitability may be linked to lower ROI value. The same applies to the relation of the values of all other sub-variables to the value of ROI. This is because contradictions already occur when focusing on different sub-variables. Sometimes there are conflicts of protagonists of partial theories. Objectively optimal are the values of the sub-variables that together result in the maximum enterprise ROI value. These optima are different in different situations. Eg the time utilization of machines should correspond to customer demand; higher utilization leads to overproduction - production to stocks. The same is the case with the throughput. Minimization of deviations ie excessive accuracy is also un-economical. It has already been pointed out by Toyota in 7 types of waste. (Method 6 Sigma is moreover a misuse of statistics because the quality attribute values are not random and do not have a normal distribution).

The artificial synthesis of partial variables applied in the framework of the so-called Balanced Scorecards is also absolutely incorrect; they always result in meaningless and misleading numbers. The possibility of optimizing the values of sub-variables, however, exists only in PPROI because in ERP (or anywhere else) the influence of sub-variables on the enterprise's ROI is not recorded. The traditional management of products, processes and resources, focusing on partial variables implicitly means contradictions between thinking of managers and investors, and contradictions between thinking of different groups of managers. If the investor and the manager is one person, there is a schizophrenia of his thinking (picture right). The manager's thinking mostly outweighs and the person concerned manages the enterprise contrary to self-interest. Mostly he is unaware of this and, if so, without PPROI he has no way of managing the enterprise to ROI MAX. Information about the ROI in financial accounting is of little use, since it is only symptomatic; it reports about the results, not about the main causes of ROI.

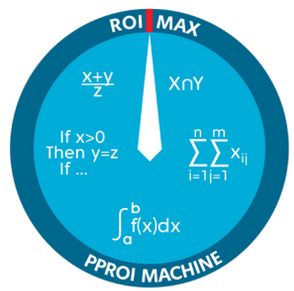
Before PPROI

PPROI School

PPROI features are described in more detail than in these articles in other documents available on our Web. But it is essential to get to know the system in reality - to see in practice what the system allows, how to operate it, and to have the opportunity to try its use yourself. The practical application of PPROI is also essential for gaining new theoretical knowledge. One understands the theory best when he/she has the opportunity to see it in action. To enable this to the wider public, we have prepared, in cooperation with the Technology Center of Czech Academy of Science the training program through the Demo version of PPROI.



The application of PPROI recalls the transition from manual work with simple tools to the control of automate machine, which requires a new level of skill. The immediate effect is the increase of labor productivity of specialists dealing with information. Usual cost calculations of products or creation of production plans in Excel in response to insufficient and / or unrealistic information in the ERP, draw a lot of time of production planners and financial controllers. If the PPROI is filled with the necessary input data, the users then only needs to set the parameters relevant to specific calculations, trigger the calculations and use their results.



But the higher quality of PPROI output information is much more important for the efficiency of the enterprise. The information generated by PPROI is new in terms of content, scope, depth, accuracy and links, and fundamentally changes the strategic and operational management of real objects within the enterprise. As a result the value of the enterprise's ROI increases sharply.

Data processing takes place in phases, for some also in variants. This allows the application of PPROI modules relevant to certain user groups. This is illustrated by the production planning example presented in the previous article. PPROI can communicate with ERP and other IS, including Excel, where PPROI usually receives input data from.

Environmental and social aspects of maximizing ROI

Environmental and social constraints must be respected when aiming at maximizing ROI. This should be the case in any economic focus. Focus on ROI MAX leads to minimum drawing natural resources for the given products and from the various economic focuses is environmentally and socially most considerate.

EPILOGUE

OUT OF BOXES OF TRADITIONAL MANAGEMENT THEORIES AND INFORMATION SYSTEMS

The expected rejection of the PPROI presentation in academic journals for its broad focus did not materialize. On the contrary, the editors of some journals which we sent an English translation of a series of articles, published in MM Industrial Spectrum for assessment, were particularly positive about the fact that **PPROI addresses issues across traditional management and economic disciplines,** in addition **within the information system**. One of the reactions has stressed that *"the concept of interdisciplinary research is very much alive across university faculties and is a core requirement of many research funding bodies"*. Some academic journals are also leaving the former highly specialized focus. We are particularly pleased with the interest in the application of PPROI in **teaching in management schools** and with the offer to present PPROI at a prestigious international conference in a separate panel, under the same name as a series of articles, ie "Modern Scientific Enterprise Management". Even in these contexts, the disappearance of boundaries between disciplines should be a central issue.

Excessive specialization has two types of **weaknesses**. First: **The subject of the given specialization may not be solvable within it.** This is a burning issue in the control of any organism. The issue in the treatment of the human body was aptly characterized by professor of medicine Karl Lewit: *"Forever lost is who heals the pain where the patient feels it"*. Secondly: **Interdisciplinary contradictions arise** that are not perceived by narrowly focused theorists and the practitioners are clueless towards them.

Isolation and its consequences can be well illustrated in financial and management accounting, ie the disciplines between which there should be a close connection. Financial accounting records company- wide data on revenues, costs, profit and employed capital. These are sometimes used to build a pyramid of financial ratios created by the gradual decomposition of ROI. Ratios separately record revenues requirements on cost and on employed capital. The main aim of the pyramid is to increase the company's ROI value by decreasing values of sub-ratios. However, this is not objectively possible, as all ratios are the result of enterprise processes according products, not directly controllable data. In addition, among the sub-ratios, at the given pyramide level, there are many trade-offs, about which there is no information. On the other hand, the pyramid is very useful for elucidating the types and hierarchy of financial variables, including the comprehensive, criterion function of ROI. It is therefore surprising and logically unjustifiable that management accounting ignores employed capital and ROI.

But even the close link between the financial variables of management and financial accounting does not lead to maximum of the enterprise ROI value unless relevant physical information about the enterprise products, processes and resources is available and mathematically reflected in the financial variables. The causes of financial numbers recorded in management and financial accounting are beyond the boundaries of these disciplines. However, the necessary **integration of all physical and financial variables means the elimination of the boundaries of all specialized management and economic disciplines.** And it is necessary to proceed **in the information system** as well.

ERPs do not fulfill the integration role. Information on machines and equipment in processing operations has there the character of technological prescriptions. They are freely recorded in the IS text fields and are not usable for any calculations. There is no information on the financial parameters of processes and products generated by machines and other production equipment in ERP. There are also no links between data on resources in indirect territories and on product costs. Groups of information are isolated in IS boxes and a large amount of information necessary for proper, truly scientific management of the enterprise is completely missing. **PPROI changes this situation from the ground up** without changing the content of technological prescriptions and financial accounting required by legislation.

USE AND MISUSE OF MATHEMATICS INCLUDING STATISTICS

We have already stated that all **mathematical solutions** of PPROI are **preceded by their logical justification** and subsequently the mathematical **calculations performed by IT tools are verified by logical tests. If this is not the case,** there is a risk of either **non-functional or misleading mathematical solutions.** On the other hand, **only verbally formulated logical solutions** can be a **utopia** if they are not transferred into the numerical methods of mathematics.

E.g. the absence of the application of a definite integral can explain why management accounting ignores employed capital and ROI in processes according products, and why production planning theory is unable to formulate procedures for creating leveled and feasible production plans - which are key weaknesses of financial and physical management of industrial enterprises. The roots of this problem maybe lie in the **classification of economic variables** (also called quantities, or indicators) into flow and stock and in the statement that the values of stock variables in a period of time are characterized by a chronological average of the values recorded at certain moments of the relevant period. The possibility of applying a definite integral is not mentioned. In practice, however, a definite integral is implicitly used whenever the chronological average is multiplied by the length of the period. This is common in banks when calculating interest. In manufacturing companies this is the case when calculating the turnover time of capital and ROI from company data defined for sections of the year.

Inappropriate use of mathematics resulting from conceptually erroneous or oversimplified logical solutions exists in various contexts. And it grows, which makes Excel easier.

Within the vague models of management accounting, there are many misleading mathematical variants of product costing in practice. Large corporations require potential suppliers of components to prove their costs according to the method of the respective corporation. The manufacturer of a given component in its offer to different corporations is forced to calculate its costs according to different methods leading to different results, the correctness of which is mutually exclusive. In addition the manufacturer of the component uses its own, also incorrect calculation method. There is big information confusion and waste. Different, subjective and unsatisfactory are also the calculations created in Excel by production planners, most of whom are aware of this. These calculations cannot be criticized, as they are emergency responses to ERP shortcomings.

Due to the ability to calculate employed capital by products, we were repeatedly asked whether PPROI also calculates an economic profit or its offshoot EVA by products. Even though it is mathematically possible, we do not see logical reasons for doing this. The values of these indicators depend not only on ROI, but also on the amount of employed capital and on the alternative value of ROI, which is a speculation. The EVA indicator is particularly misleading. This also applies to company-wide values.

Repeatedly, we were also asked about the relation of PPROI to 6 Sigma and to statistical quality control in a broader context. PPROI does not work with these procedures again for logical reasons. We consider it a misuse of statistics. The values of the quality characteristics of processes and products are not random and do not have a normal distribution. We also do not agree with the rejection of permissible tolerances of quality parameters set by technologists. In the dispute 6 Sigma vs. quality management in Toyota, we are clearly on the side of Toyota, which, among other things, describes excessively accurate processing, ie minimizing deviations, as one of the main types of waste. In PPROI, the description of manufacturing quality respects defects of setup and processing of operations sorted into repairable and scrap. Frequencies and standard quality control times are recorded for microphases of operations. Losses due to defects are reflected not only in costs, but also in employed capital and in ROI values. Thus PPROI is also unique in the financial evaluation of defects.

PPROI presentation by Prof. Matějka
The conference at the TC Czech Academy of Sciences

From the responses of academics to the previous PPROI presentation

The topic will fit the aims and scope of the **Global Business and Finance Review**. We have historically focused on issues of pure finance, but have over the past few years, moved towards a generalist business journal where the outcomes of the research have financial implications.

Prof. Daniel Friesner, Executive Editor, GBFR

Thanks for your presentation. At a guide for authors you can see how articles at EMJ look like. Perhaps, a student of yours could rewrite the whole research in the acceptable form.

Prof. Minas N. Kastanakis, Editor-in-Chief, European Management Journal

I would like to congratulate you for making such an interesting and insightful concept. I and Prof. Yadav would like to teach this as a part of the course in our department at IIT Delhi. For this, I need some comprehensive document explaining in detail the PPROI concept and its application.

Vikas Gupta, assistant of Prof. S.S. Yadav, Journal of Advances in Management Research

If possible, you may kindly conduct a special session/panel discussion at **ICO'2020** in Thailand on the topic MODERN SCIENTIFIC ENTERPRISE MANAGEMENT to Maximum Efficiency.

Dr. Pandian Vasant, Editor-in-Chief, International Journal of Computing and Optimization

From the opinions of insider professionals in properties PPROI

Technology Centre of the Czech Academy of Sciences provides Czech progressive innovative companies with maximum organizational and promotional support. PPROI is one of our well valued clients as we consider their novel approach to be a real game-changer in the field of enterprise management.

Petr Hladík, Head of Business Development Department, TC CAS

After a detailed acquaintance with the content and functions of PPROI, I consider it the total bomb, the revolution in enterprise information systems.

Anton Staš, ERP implementer

PPROI's characteristics describes our production processes economically with amazing precision by methods of science - mathematics in particular, in a way we had never heard of, had never thought about, had never dreamed of. The true integration of data navigates everything in the company to the same financial aim.

Radek Páleník, CFO, HZP Prostějov

I have long admired the author's analytical thinking and mathematical skills, which allowed him to very quickly understand the production and technological context and reveal weaknesses in existing management systems. Everything indicates that he is at the finish line. Milan, congratulations. However, management by PPROI will meet the resistance of all those accustomed to established practices. Primarily, it is necessary to enlighten investors and top managers of companies, few of whom have a deep understanding of enterprise information systems.

Jan Vrba, Former Minister of Industry of the Czech Republic