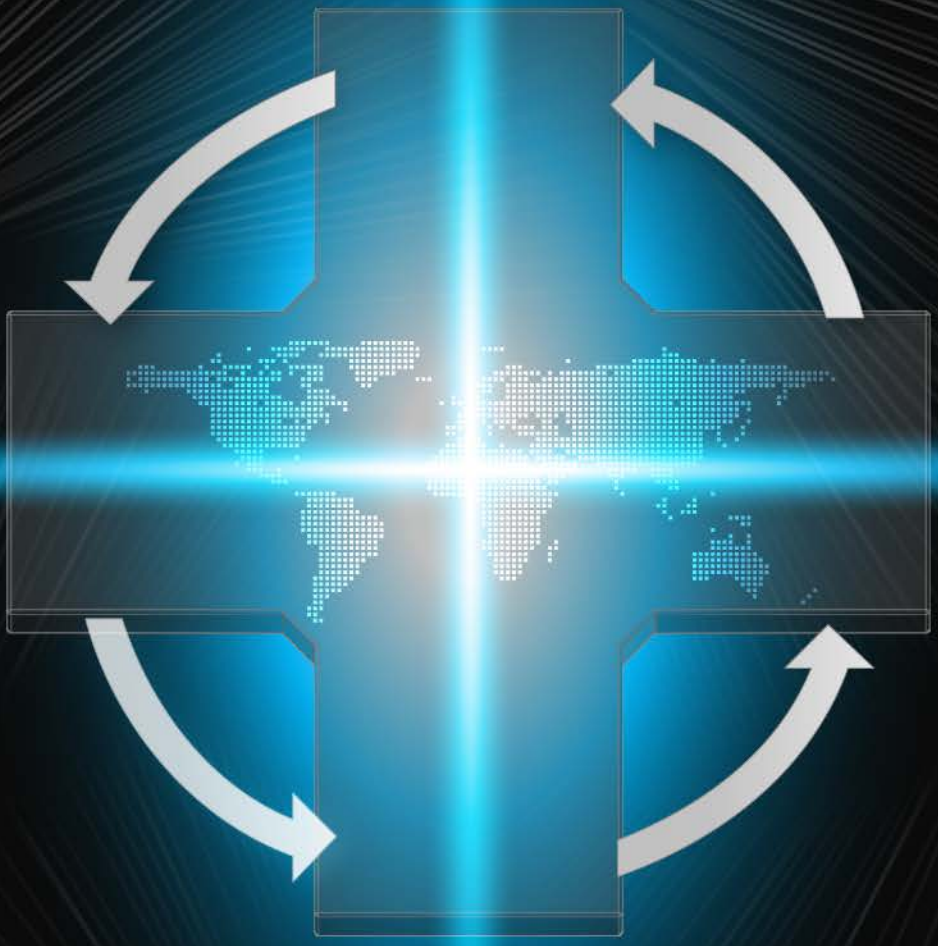
Business Model Ontology



The Basis for Digital Reform of Economic Science

part 1

Trifon Stefanov
Peter Bachvarov

Business Model Ontology

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Part 1

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"This is one of the best MBA reports, if not the best, I have ever supervised, although it is not easy to read and understand. The author spent a lot of time and put a lot of efforts in writing this report, which contains highly innovative ideas of new Business Model Ontology.

The key idea of the report is the following:

First, the existing business model ontology has two major flaws: (1) it does not provide a comprehensive and clear view of the principal of operation of the enterprise for machines as a systemic object, and (2) it does not provide any understanding of the principal of operation of the enterprise for machines as a systemic subject.

Second, the two major flaws block the development of the global scientific and educational system (mostly that of the European nations) in its role of a leading mean for the cultivation of highly effective human capital in the industry for machines.

Third, this research proves that the two major flaws in the scientific knowledge for creation of a managerial model of the economy of the enterprise for machines can be eliminated through a "new business model ontology" – a model created as a result of research based on a laboratory approach.

I like this research and offer my strongest support."

– Professor GAO Xudong
Department of Innovation, Entrepreneurship and Strategy
SEM, Tsinghua University, Beijing, China

NEW BUSINESS MODEL ONTOLOGY, EXAMINED AS A BEARER OF COGNITIVE POTENTIAL FOR A HISTORICAL CHANGE IN THE DEVELOPMENT OF THE GLOBAL HUMAN CAPITAL

Thesis Submitted to

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by

Trifon Stefanov

Thesis Supervisor: Professor GAO Xudong

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ABSTRACT

In the time of Industry 4.0, also called the Second Machine Age, the scientific knowledge about creation of a managerial model of the economy of the enterprise for machines should be considered the most important part of the knowledge developed and disseminated by modern economic science.

The latest such knowledge is defined as Business Model Ontology.

However, the current Business Model Ontology, like all its predecessors created as a result of research based on a philological approach, has two significant flaws.

First major flaw:

The current Business Model Ontology does not provide a comprehensive and clear understanding of the principle of operation of the enterprise for machines as a systemic object. Just as medieval medicine could not provide a systemic explanation of the human anatomy and physiology, so is modern economic science incapable of providing a systemic explanation of the "anatomy" and "physiology" of the enterprise for machines.

Second major flaw:

The current Business Model Ontology does not provide any understanding of the principle of operation of the enterprise for machines as a systemic subject. In other words, economic science does not provide any systemic knowledge of the nature and meaning of collective, and therefore, of individual professional responsibility for sustaining the operation of an enterprise for machines.

These two major flaws block the development of the global scientific and educational system (mostly that of the Western nations) in its role as a leading means for the cultivation of highly effective human capital in the industry for machines.

This current research proves that the two major flaws in the scientific knowledge for creation of a managerial model of the economy of the enterprise for machines can be eliminated through a **new (holistic) Business Model Ontology** – a Model Ontology created as a result of research based on a laboratory approach.

Keywords: New business model ontology; Systemic economic engineer; Holistic industrial economist; Holistic ERP system; Principle of operation of the enterprise.

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I am also grateful to the founder of the foundation Information Technologies and the Future of Economic Science in the face of Georgi Velev, as well as to the management of this foundation in the face of Stefan Stefanov, Martina Dimitrova, and Daniela Vasileva for the materials provided by them from their research related to the book "Digital Reform of the Economic Science: Vision for a new road in the history of the future." Thank you!

I owe deep gratitude and acknowledgment to Peter Bachvarov, one of the two authors of the books "Conceptual pillars of the Engineering Dominated Managerial Model of the Business Entity" and "Some terms from the terminological system of Engineering Dominated Managerial Model of the Business Entity" – his ideas are at the basis of many of the concepts presented in the current MBA thesis, and without which its development would have been impossible. Thank you for the opportunity to learn and develop these ideas. Thank you!

I would also like to express my deepest gratitude and appreciation to my supervisor, Prof. Dr. Gao Xudong of Tsinghua University, Beijing, for the methodological assistance, advice, and recommendations without which the development of this MBA thesis would not have taken place. Thank you!

Lastly, on this list, I am extremely grateful to my family for the tolerance, understanding, patience, and love I have received during all this time when I have not given them the attention they deserve. Thank you!

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CHAPTER 1
INTRODUCTION

1.1 Research context

According to the Oxford Dictionary, the definition of "context is " *The circumstances that form the setting for an event, statement, or idea and in terms of which the event, statement or idea can be fully understood and assessed.*" (Hobson, 2004)

The idea for the current research, titled "***New Business Model Ontology, examined as a bearer of cognitive potential for a historical change in the development of the global human capital***" stems from two types of factual circumstances – one I define as family circumstances and the other as social circumstances. I will start with the family circumstances.

I was born and raised in Bulgaria, surrounded by *machine engineers*. The first *machine engineer* in my family is my grandfather. The next *machine engineers* are my parents - they graduated in Moscow. *Machine engineers* are also my uncle and aunt - she is a former rector of the Bulgaria's second largest technical university. My brother and my sister are also *machine engineers* - he graduated in Paris and she in Vienna. The last *machine engineer* in my family is me - I graduated in Tokyo.

Our family's professional interests in the field of *machine engineering* are focused primarily on the formation of practically effective scientific knowledge for management of the economy of enterprises purposed for the production of machines and machine-related goods and services of all kinds. This marked the beginning (in the face of my father and uncle) of a family tradition – after *machine engineering,* to continue with a systemic study of the scientific knowledge for management of the industrial economy, which includes acquiring higher education in this field.

Continuing towards the social circumstances, I will introduce a series of *disregarded evident facts* formed by Forum ITFES (Forum Information technologies and the future of economic science - where my brother and I are members), from which directly stems the idea of this very extensive in scope and unusual in nature MBA thesis. Presented in the corresponding order, these *disregarded evident facts* are as follows: (Forum-ITFES, 2019; Stefanov & Velev, 2022)

1st Disregarded Evident Fact:

The industry for machines is a leading industry of paramount importance for the development of all other industries.

The global industry for machines comprises numerous enterprises for machines which provide machines and spare parts to all industries as well as household machinery. In addition, this industry provides various services, such as repair and maintenance services of machines, and in some cases even modernization of various machines among many others.

It is perfectly clear that today the industry for machines represents the basis for the operation and development of all other industries.

It is enough to imagine our modern global world with no machinery – no household appliances such as cookers, fridges, washing machines, air-conditioners, etc.; no transport vehicles such as cars, trains, airplanes, and so on; no agricultural machinery; no textile industry or food industry machinery; no medical machinery; no smartphones or computers; no machines whatsoever.

If some unknown force suddenly wiped out all machines in our contemporary world, this would lead to a devastating calamity comparable to a nuclear war.

Furthermore, the industry for machines is a *meta-industry* – not only does it provide machinery for all other industries, but it does so for itself.

The above facts determine the top and leading position of the industry for machines among all other industries.

2nd Disregarded Evident Fact:

The scientific understanding of a universal model of the enterprise for machines is the most significant knowledge and task of economic science; this designates it as a "fundamental scientific knowledge of economy."

The entire global collection of enterprises for machines can be compared to the global population. Each individual person is unique, but the blueprint of the human body is the same and can be understood through the study of anatomy and physiology. The same holds true for all enterprises for machines – they are all unique; however, the makeup of each one can be grasped through the knowledge of a model, which describes its principle setup and way of functioning as a systemic object and subject.

In this sense, just as the understanding of the anatomical and physiological design of the human body is a fundamental scientific knowledge of medicine, so too the understanding of a universal model of an enterprise for machines provides the fundamental scientific knowledge of economy.

A universal economic model of an enterprise for machines does exist. It is commonly known as 'double-entry bookkeeping' and was conceived more than 500 years ago by an Italian

monk by the name of Luca Pacioli. This model has been invaluable to date, yet as early as the last decades of the 19th century, it was found to suffer from great shortcomings with respect to managing the effectiveness of the industrial economy (specifically, the effectiveness of industrial labour) in the context of the Industrial Revolution. Practical necessity gave rise to three engineering waves, which aim to remedy some of these shortcomings.

3rd Disregarded Evident Fact:

The history of the fundamental scientific knowledge of economy clearly shows three engineering waves in its development.

The first engineering wave in the development of the fundamental knowledge of economy dates back to the 1890s up to the 1920s. It involves the creation, development, and dissemination of knowledge of operational modelling of the processes in the enterprise. This wave is associated with the names of the engineers Henry Robinson Towne and Frederick Winslow Taylor.

The second engineering wave in the development of the fundamental knowledge of economy covers the 1930s, 40s, and 50s. It involves the creation, development, and dissemination of knowledge of production management focused on quality. It is associated with the names of the engineers Walter Andrew Shewhart, William Edwards Deming and Joseph Moses Juran.

The third engineering wave covers the 1970s, 80s, and 90s. It involves the creation, development, and dissemination of knowledge of computer-integrated modeling of the sales, production, and supply processes.

The key concepts for the knowledge of this computer-integrated modelling are MRP I (Material Requirements Planning) and MRP II (Manufacturing Resource Planning). MRP I refers to a knowledge of computer-integrated modeling of the *sales*, *production*, and *supply* processes without taking into account the production capacity of the enterprise. MRP II refers to the same type of knowledge, however, considering production capacity.

This third engineering wave of development of the fundamental scientific knowledge of economy stems from the work of two IBM engineers – Joseph Orlicky and Oliver Wight.

In the early 1990s, Gartner employees introduced the concept of ERP (Enterprise Resource Planning) as a vision for the upcoming development of the MRP systems. They claimed that the ERP systems were a new generation of MRP systems, which integrated a set of specialized enterprise software applications for digital modeling of the management of finance, human resources, distribution, manufacturing, supply chain, services, etc. ERP tools (both MRP systems and business applications) should share a common digital process and database.

The approach of integrating many and diverse business applications to the classic MRP

system has ensured the exceptional market success of the current ERP software (worth over 500 billion US dollars per year). However, this approach leads to the significant departure of the functional constructs of all modern ERP systems from the cognitive universalism, which is inherent in the functional construct of every pure, application-free MRP system. This departure from the cognitive universalism hinders the development of this type of system as an indispensable means of addressing the major flaws of the fundamental scientific knowledge of economy.

4th Disregarded Evident Fact:

Compared to the fundamental scientific knowledge of medicine, the fundamental scientific knowledge of economy is still at a "medieval" level, and it therefore, it still has major functional flaws.

A closer look at the current fundamental scientific knowledge of economy will show that it comprises numerous and conceptually different elements that are unrelated in terms of content. For instance:

(1) knowledge of accounting modeling, (2) knowledge of operational management, (3) knowledge of planning and control, (4) knowledge of human resources (HR) management, (5) knowledge of change management, (6) knowledge of project management, (7) knowledge of crisis management, (8) knowledge of business modeling, among many other.

It is clear that these elements do not form a robust and monolithic foundation for economic science in the form of a systemic universal model of the enterprise for machines, unlike the foundation laid in medicine at the very beginning of the Renaissance (in the form of a systemic anatomical and physiological model of the human body).

This means that, in the era of digital information technologies (also known as the Era of Globalization or The Second Machine Age), the fundamental scientific knowledge of economy has only evolved to the level of medieval scholasticism in comparison to the fundamental scientific knowledge of medicine.

The above is the result of two major flaws intrinsic to the way the fundamental scientific knowledge of economy is commonly taught today:

First major flaw:

The fundamental scientific knowledge of economy does not provide a comprehensive and clear understanding of the principle setup and way of functioning of the enterprise as a systemic object. Just as medieval medicine could not provide a systemic explanation of the human anatomy and physiology, so is modern economic science incapable of providing a systemic explanation of the "anatomy" and "physiology" of the enterprise for machines.

Second major flaw:

The fundamental scientific knowledge of economy does not provide any understanding

of the principle setup and way of functioning of the enterprise as a systemic subject. In other words, economic science does not provide any systemic knowledge of the nature and meaning of collective, and therefore, of individual professional responsibility for sustaining the operation of an enterprise for machines.

A closer look at the current fundamental scientific knowledge of economy will show not only that this knowledge is fragmented and, when examined as a whole, is a bearer of the above-stated two major flaws, but it will also show that the separate fragments of this scientific knowledge have different magnitudes of practical significance for managing the economy of the enterprise for machines. In this regard, the knowledge of accounting comes first as its practical significance is considerably higher than the practical significance of all other fragments put together. However, they have an objective reason to exist, which stems from the fact that the knowledge of accounting has limited capabilities as a means for managerial modeling of the economy of the enterprise.

An overview of the fundamental scientific knowledge of economy will also show that among the numerous fragments of that knowledge, there is only one such fragment that directly claims that it clearly explains how the enterprise for machines functions in order to make a profit. In other words, this fragment represents an official scientific claim that the major flaws of the fundamental scientific knowledge of economy have already been eliminated.

The popular name of this fragment, part of the fundamental scientific knowledge of economy, is Business model canvas, and its scientific name is Business Model Ontology, hereafter abbreviated as BMO.

1.2 What is Business Model Ontology?

I will present two answers to the question "What is a Business Model Ontology?": the first answer is according to the person who introduced the term Business Model Ontology in the scientific knowledge of economy, and the second answer is related to clarifying the objective meaning of this term in the context of the current research.

1.2.1 What is BMO, according to the person who introduced this term in the scientific knowledge of economy

The term Business Model Ontology originates from the dissertation of the Swiss economist Alexander Osterwalder, which was completed in late 2004 and published under the title "*The Business Model Ontology a proposition in a design science approach*" (Osterwalder, 2004). However, this term would have fallen into scientific oblivion if, at the end of 2010, a book titled "*Business Model Generation: A handbook for visionaries, game changers, and*

challengers", authored by A. Osterwalder and Yves Pigneur (the scientific supervisor of his Osterwalder's dissertation), had not been published (Osterwalder & Pigneur, 2010).

The author of the dissertation mentioned above tries numerous times to answer the question of the potential reader, "what is a Business Model Ontology and what is it for?"

The first three Chapters of the dissertation are dedicated (solely) to this purpose. The following are quotes from the mentioned Chapters, with a focus on Chapter 2 titled "Origin, definition, place and role of business models in the company."

1st quote:

"In this section I outline my understanding of the expression and concept of Business Models. This understanding is based on a careful literature review, but may not be shared in detail by all the authors in Business Model research.

As the term Business Model intuitively suggests it has something to do with business and it has something to do with models. A quick lookup in the online version of the Cambridge Learner's Dictionary returns no result for the full combined term but the following definitions for the two separate terms:

- *Business: the activity of buying and selling goods and services, or a particular company that does this, or work you do to earn money.*
- *Model: a representation of something, either as a physical object which is usually smaller than the real object, or as a simple description of the object which might be used in calculations.*

Related to the first definition it can be said that the term Business in the expression Business Model relates to "the activity of buying and selling goods and services" and "earning money." Related to the second definition it can be said that the term Model relates to "a representation of something as a simple description of the object which might be used in calculations." By combining the two we get a first simple understanding which is that a Business Model is a representation of how a company buys and sells goods and services and earns money.

In general the purpose of creating a Model is to help understand, describe, or predict how things work in the real world by exploring a simplified representation of a particular entity or phenomenon. Thus, in the case of a Business Model the Model (i.e., representation) shall help understand, describe and predict the "activity of buying and selling goods and services" and "earning money" of a particular company. But as the notion buying and selling seems too narrow, I try to extend it. So differently put, the Business Model is an abstract representation of the business logic of a company. And under business logic I understand an abstract comprehension of the way a company makes money, in other words, what it offers, to whom it offers this and how it can accomplish this. [...]

In a nutshell I describe a Business Model:

- *as an abstract conceptual Model that represents the business and money earning logic of a company.*
- *as a business layer (acting as a sort of glue) between business strategy and processes."*

.....

2nd quote:

"A last thing that must be considered when talking about Business Models is ***their type****. Similar to Linder and Cantrell* ***I distinguish between three different types****. First, there is the* ***abstract Business Model*** *concept, which is a generic model of elements, components and relationships. Second there are the* ***operating Business Models*** *that are the implemented and existing Business Models of different companies. In other words, they represent an instance of the generic Business Model. Finally, there are the* ***scenario Business Models*** *that are only virtual, not existing as such in the real world. They can serve different ends like fostering innovation, simulating opportunities or acting as a guideline in change management. They represent a* ***virtual instance of the generic Business Model****."*

.....

3rd quote:

"Business Model research is a rather young research domain and still has to prove its relevance. But as addressed above, yet relatively little concepts and tools exist to help managers capture, understand, communicate, design, analyze and change the business logic of their firm. In my opinion and the opinion of many other researchers in this domain the Business Model concept can fill some of this gap and can eventually gain an important position in managing under uncertainty.

In the following sections I will outline some of the roles the Business Model concept (i.e., the use of a specification of a conceptualization of Business Models) can play in business management, and, particularly in regard to e-business issues. I have identified five categories of functions, which are understanding & sharing, analyzing, managing, prospects and patenting of Business Models. ***Furthermore, an ontological approach to Business Models is indispensable for building software-based tools that help fulfill these five functions****.*

I describe these categories to give an outlook on what could be done with the help of the Business Model concept, particularly on the base of the Business Model Ontology. The scope of this dissertation, however, is the design of a Business Model Ontology."

.....

4th quote:

"The first area in which Business Models can contribute is in understanding and sharing the business logic of a firm. Concretely, Business Models help to capture, visualize, understand,

communicate and share the business logic. [...]

The second area in which the Business Model concept can contribute is in analyzing the business logic of a company. Concretely, they can improve measuring, observing and comparing the business logic of a company. [...]

The third area of contribution of Business Models is in improving the management of the business logic of the firm. The Business Model concept helps ameliorating the design, planning, changing and implementation of Business Models. Additionally, with a Business Model approach companies can react faster to changes in the business environment. Finally, the Business Model concept improves the alignment of strategy, business organization and technology. [...]

A fourth area of contribution of Business Models refers to the possible futures of a company. I believe that the Business Model concept can help foster innovation and increase readiness for the future through Business Model portfolios and simulation. [...]

A last but fundamental area of contribution of Business Models is in building the foundation for a set of new computer-assisted management tools. Management literature is famous for producing concepts and models. Yet, little of these concepts have been translated into software-based tools, although, in my opinion this could bring enormous value to management."

.....

5th quote:

"To tackle this question I design and propose a rigorous conceptual model of Business Models, which I subsequently call an ontology. Gruber (1993) defines an ontology as an explicit specification of a conceptualization. It can be understood as a description (like a formal specification of a program) of the concepts and relationships in a specific domain. [...] Current application areas of ontologies are also disparate, including enterprise integration, natural language translation, medicine, mechanical engineering, standardization of product knowledge, electronic commerce, geographic information systems, legal information systems, biological information systems (Guarino 1998). [...] This seems to suit the Business Model Ontology quite well, as it aims at defining the concepts and their relationships in the Business Model domain.":

1.2.2 Proposal for clarification of the term BMO from the point of view of a machine engineer and author of the current MBA thesis

In order to define the objective meaning of the term Business Model Ontology, the main parts of which are quoted above, the author needs more than 50 pages. For this purpose are fully dedicated the first three Chapters of his dissertation (Osterwalder, 2004). However, after

careful examination of these pages, I came to the conclusion that this term was far from being clearly defined and the reason for this lies in the adopted way of doing it. The author approached the task of deriving an objective definition for the term Business Model Ontology by breaking it down into two stages:

The first stage answers the question "What is a *Business Model*?" and the second stage answers the question "what is a Business Model *Ontology*?"

Based on thorough research, I propose another possible approach, which also breaks down the task into two stages:

The first stage answers the question "What is a *Model Ontology*?" and the second stage answers the question "what is a *Business* Model Ontology?"

Here, the first stage of this approach should be implemented in three steps. The first step should give an answer to the question "what is an *Ontology*?", The second step should give an answer to the question "what is a *Model*?", And the third step should give an answer to the question "what is a *Model Ontology*?."

The answers to the questions "what is a *Model*" and "what is an *Ontology*" have been given above in the form of quotations and as my research shows, those answers are in full synchrony with the definitions of these terms that can be found on the Internet.

What remains is the answer to the question, "what is a *Model Ontology*?"

To begin with, I will use two examples to answer this question: one example is a schematic and formulated description of the principle of operation of a Class 1 Lever, and the other is the simplest possible schematic and formulated description of the principle of operation of a Hydraulic Jack.

The terms Class 1 Lever and Hydraulic Jack form notions of classes of systemic engineering objects from the human environment, through which the power of the individual, which is limited, can be multiplied in accordance with the dependencies shown in the formulas below.

Class 1 lever

The lever is a simple mechanism consisting of a beam pivoted at a fulcrum. The sections from the end of the beam to the fulcrum are called lever arms.

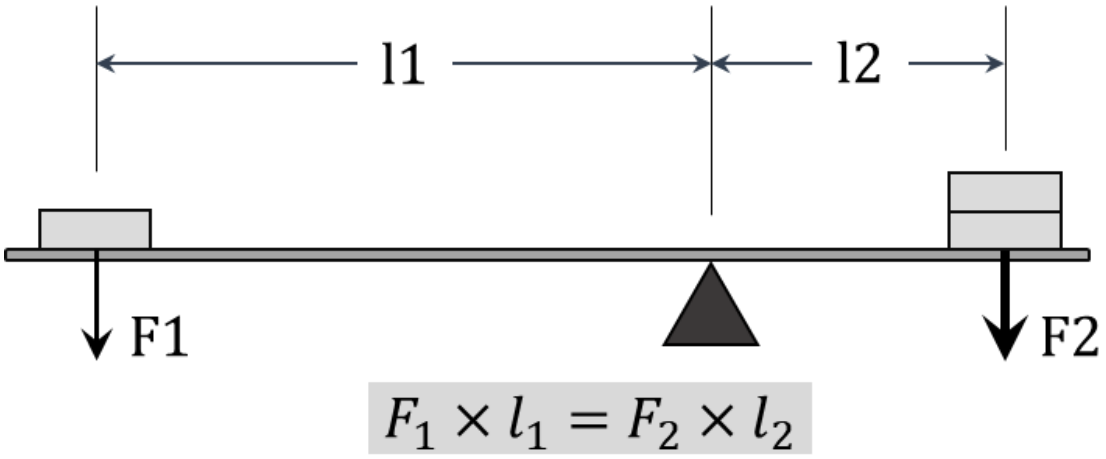


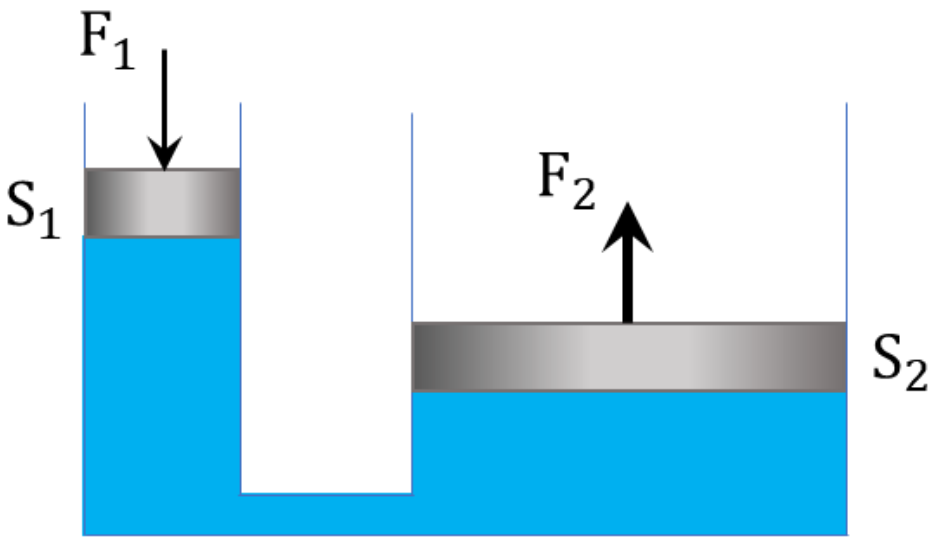
Figure 1.1 Schematic and formulated description of the principle of operation of a Class 1 Lever

The lever is in equilibrium when the following equation is fulfilled:
$F_1 * l_1 = F_2 * l_2$, where:
F_1 is the force applied to one arm (in this case, the left arm),
l_1 is the length of the left arm,
F_2 is the force applied to the other arm (in this case, the right arm),
l_2 is the length of the right arm.

As can be seen from the equation, the product of the force applied to one arm multiplied by its length is equal to the product of the force applied to the other arm multiplied by the that arm's length.

Hydraulic jack:

The hydraulic jack is a system consisting of two connected cylindrical vessels of different diameters, filled with suitable fluids and enclosed by movable lids on which different forces are applied.



$$F_1 \times S_2 = F_2 \times S_1$$

Figure 1.2 Schematic and formulated description of the principle of operation of a Hydraulic Jack

The system is in equilibrium when the following equation is fulfilled:

$F_1 * S_2 = F_2 * S_1$ where:

F_1 is the force applied to the first (in this case, the left) movable lid,

S_2 is the surface area of the second (in this case, the right) movable lid,

F_2 is the force applied to the first (in this case, the right) movable lid,

S_1 is the surface area of the first (in this case, the left) movable lid.

As can be seen from the equation, the product of the force applied to the first movable lid multiplied by the surface area of the second is equal to the product of the force applied to the second movable lid multiplied by the surface area of the first.

The two examples above are the schematic and formulated descriptions of the principle of operation of a Class 1 Lever and a Hydraulic Jack.

Having this in mind, I believe these descriptions can also be defined as a model ontology of a Class 1 Lever and a model ontology of a Hydraulic Jack. Therefore, *Model Ontology* means a ***schematic and formulated description of the principle of operation of a class of systemic objects***.

In the dissertation of A. Osterwalder, it is stated that the Model Ontologies represent the foundation of all scientific disciplines. However, he purposefully avoids providing examples as this would set strict requirements for the depth and quality his work should possess as a Model Ontology of the industrial enterprise.

In order to first establish the fundamental scientific significance of Business Model

Ontology for economic science and second set strict requirements for the depth and quality of any such development, I will describe the most representative example of a Model Ontology that has redefined our world.

The model ontology I will provide represents the fundamental scientific knowledge of medicine. It establishes the very beginning of the transition of medical science from a scholastic (medieval) level of development to a modern (systemic) level of development – this is the universal anatomical and physiological model of the human body founded by Andreas Vesalius (1514-1564).

In 1543, Andreas Vesalius published his fundamental work in seven books titled "*On the fabric of the human body*." In this work – based on his research – A. Vesalius not only summarizes the achievements in the field of anatomy in the past centuries but also corrects more than 200 mistakes of Galen. The latter, at that time, is an indisputable authority in this field. Most importantly, however, A. Vesalius organizes the understanding of the structure of the human body into a system, thereby redirecting the development of the field of anatomy onto a new path. (Stefanov & Velev, 2022)

From the standpoint of the current research, the universal model of the anatomy and physiology of the human body of a young, healthy, and capable person, which is the foundation of the modern scientific discipline called "medicine", can be viewed as a Model Ontology. Despite the visual differences between each individual person, the principle setup and way of functioning of the human body are the same and can be recognizable through the derived knowledge of an anatomical and physiological model of the human body. This knowledge is accepted as fundamental scientific knowledge of medicine and is studied by all medical students, regardless of their specialty.

As I already clarified, the term Model Ontology means a schematic and formulated description of the principle of operation of a class of systemic objects. In order to define the meaning of **Business** Model Ontology, it is required first to define the specific class of systemic objects, "economic units", which schematic and formulated description of their principle of operation will serve as a basis for this definition.

Which is this object, whether part of the geopolitical or industrial economy, that should be observed as a "young, healthy and capable person"? In my opinion, given the fact that every geopolitical economy is based on the industrial economy, and in the industrial economy the importance of the industry for machines for the development of all other industries is indisputable, the logical choice for the object of study should be precisely the enterprise for machines. Thus, the term Business Model Ontology should be understood as the Model Ontology of the enterprise for machines. If such a Business Model Ontology exists, it can be defined as fundamental scientific knowledge of economy in the same way the Model Ontology

of the human body is the fundamental scientific knowledge of medicine.

The entire global collection of enterprises for machines can be compared to the global population. Each individual person is unique, but the blueprint of the human body is the same and can be understood through the study of anatomy and physiology. The same holds true for all enterprises for machines – they are all unique; however, the makeup of each can be grasped through the knowledge of an "anatomical and physiological model" of the enterprise for machines.

In this sense, just as the understanding of the anatomical and physiological model of the human body is a fundamental scientific knowledge of medicine, so too the understanding of a universal model of an enterprise for machines provides the fundamental scientific knowledge of economy.

After establishing the enterprise for machines as the main object of study of economic science (the focus of its fundamental scientific knowledge Business Model Ontology) it is imperative to form an idea of the depth and quality in which the enterprise for machines should be studied, so that the fundamental scientific knowledge of economy can finally overcome its two major flaws.

Once again, I will make a parallel with medical science.

The development of medical science is associated with the establishment of its object of study and the imposition of an absolute requirement to master the knowledge of the "anatomical and physiological model of the human body." What is more – after millennia of applying the so-called "*philological* approach", deciding to start applying the *laboratory* approach was a crucial moment in the history of the development of medical science. That is because it is precisely the *laboratory* approach that helps the fundamental scientific knowledge of medicine to transition from medieval to modern level of development through the formation and mass dissemination of knowledge about the human body as an object. The formation of this knowledge as a basis of medical science has enabled many brilliant scientists to build on and improve it. This solid foundation – in the form of knowledge about the human body as an object – has allowed scientists to begin to analyze the Human as a thinking entity – a natural systemic object characterized by subjecthood. That is how the science of psychology came to be.

"Subjecthood" is a characteristic of objects by which these objects are defined as "capable" of **knowing and transforming both the world around them and themselves**. All objects bearing the characteristic subjecthood are "*systemic* Objects", which, based on their origin, are two types: "natural" and "artificial."

The only *systemic* objects of natural origin that bear the property of subjecthood are people.

However, the characteristic of "subjecthood" is also inherent to artificial *systemic* objects, which inevitably contain a multitude of human subjects that work together in a system.

An example of an artificial *systemic* object bearing the property of subjecthood is industrial enterprises, including enterprises for machines, which, like humans, are capable of knowing and transforming both the world around them and themselves.

The Model Ontology of the Human Body is the anatomical and physiological model of a young and healthy person, but the Model Ontology of the Human is the study of a person as an object bearing the characteristic subjecthood.

Following the above-given parallel, I conclude that the (*holistic)* Business Model Ontology is a ***schematic and formulated description of the principle of operation of the enterprise for machines examined as a systemic object bearer of the characteristic subjecthood***.

1.3 Methodology

The proposed methodology includes several methods for scientific research and development, among which the "comparative method" takes a central place.

According to the Collins dictionary of sociology, the *comparative method* is "*the oldest method of research, which consists in discovering and describing similarities and differences in objects, phenomena, and processes. The studied and compared objects may be adjacent or very distant from each other, may be comparable in function or completely different, may be located in the same space-time or in different historical epochs. It is also possible to use the comparative method to compare the states of the same object in different time (stages) of the trajectory of its development. The comparative method is used for both applied research and fundamental research*" (Jary & Jary, 1999).

In general, this MBA thesis methodology consists of analyzing and then comparing the functional capabilities of two business models ontology, created through two fundamentally different approaches for development of scientific knowledge in the field of managerial modeling of the economy of enterprises for machines. One of them - the widely studied Business Model Ontology – is defined as the ***current*** *Business Model Ontology*, and the other is defined as the ***new*** *Business Model Ontology*.

The current Business Model Ontology is one of the many fragments that today form the fundamental scientific knowledge of economy and, like all its predecessors created as a result of scientific research based on a philological approach, is a bearer of the two major flaws (Section 1.1).

In this MBA thesis, the ***current fragmented*** Business Model Ontology is being evaluated in its capacity of a schematic and formulated description of the principle of operation of the

enterprise for machines and hence a cognitive foundation for developing a new generation ERP system and is examined as a scientific knowledge created by application of the ***philological approach*** for scientific research and developments.

The current Business Model Ontology is a holistic scientific knowledge for creation of a managerial model of the economy of the enterprise for machines which has overcome the two major flows.

In this MBA thesis, the ***new holistic*** Business Model Ontology is examined in its capacity of a schematic and formulated description of the principle of operation of the industrial enterprise and hence a cognitive foundation for developing a new generation ERP system and is examined as a scientific knowledge created by application of the ***laboratory*** *approach* for scientific research and developments.

Here it would be appropriate to provide brief information on both the *philological* and *laboratory* approaches for scientific research and developments.

1.3.1 Philological approach

The philological approach (considered as a package of philological methods) arises as a natural consequence of the birth and then the realization of the idea of a new scientific discipline called philology (McNeely & Wolverton, 2008).

The idea for the scientific discipline of philology was born in 1776 when a student applicant named Friedrich August Wolf insisted on being enrolled at the University of Göttingen (Germany), but not in the arts or theology, but as a student of philology. The idea of philology was not accepted, but seven years later (1783) Friedrich Wolf was offered a position as a professor at the University of Halle (also Germany) with the task of realizing his previously rejected idea of a new scientific discipline. Friedrich Wolf accepted the offer, moved to Halle, and laid the foundations of the scientific discipline of philology and the *philological* approach to scientific research.

It is said that the *philological approach* is a secular version of the theological approach with one very significant difference: it is distanced from theological texts and instead is based upon texts recognized by academic elites as classic examples of European literature and culture.

A substantial contribution to the validation and dissemination of the *philological approach* has Wilhelm von Humboldt, a professor at the University of Göttingen and one of the first and most loyal followers of Friedrich Wolf.

In 1808, Wilhelm von Humboldt was commissioned by Baron von Stein of Prussia to carry out a radical reform of the education system in order to transform it into the source of the German national spirit. At the heart of this reform is the "humanitarian high school." The curriculum of the "humanitarian high school" placed emphasis on classical languages, ancient

history and philosophy, and mathematics, while natural sciences and religion played a peripheral role as the goal was the idealistic upbringing of the younger generation.

Humboldt's educational reform turned the high school into an incubator for socially adaptive young people with ambitions for a career in the public and private administrative hierarchy. Since at the time the basic requirement for admission to universities was mastery of the classical disciplines, the humanities education that students received opened the doors to higher education institutions for them. Students who had a solid philological foundation were allowed to specialize in the various fields of philosophy, which was seen as a natural continuation of their *philological* qualifications. At the beginning of the 19th century, the privileged status of philosophy found expression in the new scientific title introduced in German universities - "Doctor of Philosophy", which is considered to date a prestigious professional certification. Through its universities, Germany became a European center of "scientific philosophy", and the University of Berlin became a model for higher education in Western Europe. Its first rector, the philosopher Johann Gottlieb Fichte, became the main force behind the process of linking German mass education with the awakening of German national aspirations for a united Germany.

From today's point of view, Wilhelm von Humboldt, Johann Fichte and their colleagues, classic academics, were the first representatives of the scientific humanitarian elite, who assembled and successfully cooperated with the political elite in order to implement a major investment program with the aim to enhance the development of the national human capital by reforming the mass education.

An interesting coincidence: in 1776 (when the idea of philology as a scientific discipline was born) Adam Smith's book "*The Wealth of Nations*" was first published – a sacred book of the modern professional economists and a fertile ground for the *philological approach* (McNeely & Wolverton, 2008; Smith, 1773).

An example of the practical application of the *philological approach* for scientific research and development is the methodology for creating the *current fragmented* Business Model Ontology, which will be presented in Chapter 2.

1.3.2 Laboratory approach

Today's scientifically and technologically oriented *laboratory approach* emerged as a socially engaged version of the "academically elitist *laboratory approach*" for the creation, development, and dissemination of knowledge in the field of natural sciences. This approach marked its first manifestation in France between 1765-1794 and was the work of Antoine Laurent Lavoisier, considered the "father of modern chemistry." In 1765, then 22-year-old Lavoisier presented his research to the Paris Academy of Sciences on "A Better Way to Light

the Streets of the Big City." In this first research of his, the young scientist demonstrated his extraordinary dedication and thoroughness in achieving practical, socially useful goals through experimental research - virtues that are manifested in all of his subsequent works.

In 1793, Lavoisier was accused of "conspiring with the enemies of France", but according to some historians, this was a fabricated accusation, and it represented the reaction of his influential ideological opponents, who viewed his laboratory approach as an act of "diminishing" of academic science to a practical level.

Throughout his whole career, Lavoisier believed and hoped that the academic science, and chemistry in particular, could and should serve the common good rather than the private interests. Based upon this conviction, he defined three requirements for the development of chemistry as a socially useful science: (1) theory, (2) terminology, and (3) technology.

Especially important to Lavoisier was the terminology apparatus of chemical science, about which he writes: "*Precisely formulated scientific language is not an arbitrary set of names and signs. Clear language and clear signs stimulate the development of analytical skills that obscure language would only demean. Just as Roman numerals gave way to Arabic ones because they were too "vague", so too subjectively varying terms must be replaced by precise and unambiguous scientific terminology.*" In regard to that, Lavoisier proposed the first scientific-terminology system based on the terms oxygen, hydrogen, nitrogen, oxidation, and the classification of chemical compounds within three main groups: bases, acids, and salts.

Lavoisier was not fortunate enough to experience the triumph of his ideas among the scientific community. Instead, his ideas were met with hostility, going so far as to conduct a "solemn burning" of his portrait. This happened in Germany, where 30 years after the death of Lavoisier, Justus von Liebig established the first university chemistry laboratory, which became the nucleus of some of the world's largest chemical corporations. The scientific-technological nature of Liebig's laboratory scandalized the humanities professorship and led to the ultimate demand that "*the university must offer basic theoretical knowledge in chemistry, including to students from other faculties, but without any practical orientation.*" Pressed by the academic leadership, Liebig was forced to seek the support of the government authorities, convincing them that the exact sciences were just as worthy of respect as classical philology, philosophy, and history.

In one "apolitical" letter to the Prussian government, a letter that has caused a wide response, he sharply criticized the humanists' reverence for texts and directly accused "traditional academics" of denying the *laboratory approach*, even though it met the highest philosophical criteria.

Louis Pasteur is especially credited for the recognition of the high social significance of scientific knowledge obtained through a *laboratory approach*.

He is more radical than Liebig and announces the definitive discrepancy between knowledge created and developed through critical-discursive analysis of texts and knowledge created and developed through laboratory research. According to Louis Pasteur, the latter knowledge brings greater social benefit as it can be used as a reference point toward the realization of various economic activities (McNeely & Wolverton, 2008).

An example of the practical application of the laboratory approach for scientific research and development is the methodology for creating the *new holistic* Business Model Ontology, which will be presented in Chapter 3.

1.3.3 Methods for developing this MBA thesis

As it was already mentioned at the beginning of Chapter 1.3, the methodology includes a number of scientific research and development methods, among which the comparative method takes a leading place. Compared to the comparative method, the other methods can be considered necessary tools for its realization. Those methods are: (1) the SWOT analysis method, (2) the PEST analysis method, (3) the interview method, which is applied in two cases - multiple interviews with the authors of the new Business Model Ontology to clarify its nature, as well as numerous interviews to compare the cognitive potential of the current Business Model Ontology and the new Business Model Ontology and (4) the method of literature research and analysis – this method has a dominant work role in the current research and therefore this research can be considered as a result of the practical application of the philological approach for scientific research.

1.4 Contribution of this MBA thesis

The goal of this study is to further develop the research on Business Model Ontology. This will be achieved through the following three scientific contributions:

(1) Renewal of the knowledge in the research area of Business Model Ontology given by Alexander Osterwalder and Yves Pigneur in the period 2004-2010 (Osterwalder, 2004; Osterwalder & Pigneur, 2010), here defined as *current* Business Model Ontology, through comparison with new knowledge of a higher quality given by Peter Bachvarov and Anna Videva in the period 2011-2012 (Bachvarov & Videva, 2011; Bachvarov & Videva, 2012), here defined as a *new* Business Model Ontology. It is based on an in-depth content analysis of made publications and will compare the two approaches for the development of scientific knowledge in the field of managerial modeling of the economy of the enterprise for machines: the *philological approach* in the direction of ***current*** Business Model Ontology and *laboratory approach* in the direction of ***new*** Business Model Ontology

(2) Giving a new and much greater scientific significance to the knowledge of Business Model Ontology. The process of forming and disseminating knowledge about the *current* Business Model Ontology is seen as an unsuccessful attempt to give the world fundamental scientific knowledge for managerial modeling of the economy of the industrial enterprise in a clear and easy to understand schematic and formulated description of its principle of operation as a systemic object, bearer of the characteristic subjecthood. On the other hand, the process of formation (still without dissemination) of knowledge about the *new* Business Model Ontology is seen as a successful attempt to give the world such knowledge and, in this sense, is a key prerequisite for a historical transition in the quality of the fundamental scientific knowledge of economy.

(3) Vision for a historical change in the development of the global human capital as a result of the emergence of a new professional class of *systemic economic engineers*, engineers who has not only specialized knowledge in a given field of modern machine engineering but also have serious theoretical and practical knowledge of the functional capabilities of digital systems (created on the basis of the *new* Business Model Ontology) for holistic managerial modeling of the economy of the enterprise for machines.

1.5 Structure of this MBA thesis

The MBA thesis is divided into six parts:

Chapter 1 presents the personal and historical context of this research by focusing on the object of research known as Business Model Ontology, an object that exists in our space and time in two qualitative dimensions: one called ***current*** *fragmented* Business Model Ontology and the other ***new*** *holistic* Business Model Ontology. This Chapter also presents the methodology for the development process of this research, as well as the research goals.

Chapter 2 presents the ***current*** *fragmented* Business Model Ontology, firstly, examining the methodology of its creation as an example of the application of a *philological approach* for scientific research and developments; secondly, presenting the essence of the ***fragmented*** Business Model Ontology; and thirdly, presents a SWOT analysis of the work of A. Osterwalder and Y. Pigneur. The last part also concludes that the ***fragmented*** Business Model Ontology is functionally inadequate for describing the principle of operation of the enterprise for machines and for becoming a basis for the creation of digital technology for holistic managerial modeling of the economy of the enterprise due to which the world needs another (***new***) Business Model Ontology which to be functionally adequate.

Chapter 3 presents the ***new*** *holistic* Business Model Ontology, firstly, examining the methodology of its creation as an example of the application of a *laboratory approach* for

scientific research and developments, secondly, presenting the essence of the ***holistic*** Business Model Ontology, and thirdly, presenting a brief description of the functional construction of a new generation of ERP systems created on the basis of the theory and terminology of the ***holistic*** Business Model Ontology.

Chapter 4 presents a comparison of the ***holistic*** Business Model Ontology and the ***fragmented*** Business Model Ontology, which is made in four aspects: comparison of the ***holistic*** and the ***fragmented*** BMO as a result of research activities, comparison of the ***holistic*** and the ***fragmented*** BMO as a result of experimental activities, comparison of the ***holistic*** and the ***fragmented*** BMO as functional capabilities, and comparison of the ***holistic*** and the ***fragmented*** BMO as invested man-hours for their creation. This Chapter concludes that the process of creation and dissemination of the ***fragmented*** Business Model Ontology should be observed as a manifestation of ***scientific individualism***, while the process of creation and dissemination of the ***holistic*** Business Model Ontology should be observed as a manifestation of ***scientific collectivism.***

Chapter 5 presents a vision of the global technological, social, economic, and political effects that will be realized, provided that the knowledge of the ***holistic*** Business Model Ontology is widely disseminated through the entire scientific and educational system.

CHAPTER 2
CURRENT FRAGMENTED BUSINESS MODEL ONTOLOGY

At the beginning of this Chapter, I would like to recall two main points that were presented in the Introduction: (1) in the context of the whole MBA thesis, Business Model Ontology means a schematic and formulated description of the principle of operation of the phenomenon enterprise for machines – a systemic object, bearer of the property subjecthood and (2) in the available information spaces there are publications for two Business Model Ontologies, which are different both in terms of scientific approaches for their creation and in terms of their quality – one of these Model Ontologies, called *current fragmented* BMO, is the result of a *philological approach* for scientific research, and the other, called *new holistic* BMO, is the result of a *laboratory approach* for scientific research.

Here, in this Chapter, I present the *current fragmented* Business Model Ontology in 3 parts. The first part examines the methodology for the creation of the *fragmented* Business Model Ontology as an example of an application of the *philological approach* for scientific research, the second part presents a brief description of this Model Ontology, and the third part provides an answer to the question *"why the world needs a new holistic Business Model Ontology?"*

2.1 Methodology for creation of the *fragmented* BMO, an example of an application of the *philological approach*

The methodology for the creation of the *fragmented* Business Model Ontology is given as a list of seven methods defined as follows: (1) Speculation/commentary; (2) Frameworks and Conceptual Models; (3) Library Research; (4) Literature Analysis; (5) Case Study; (6) Interview; (7) Secondary Data.

Each of these methods is described as follows (Osterwalder, 2004):

Speculation/commentary – This is research that derives from thinly supported arguments or opinions with little or no empirical evidence.

Frameworks and Conceptual Models – This is research that intends to develop a framework or a conceptual model.

Library Research – This is the research that is based on the review of existing literature.

Literature Analysis – This is the research that critiques, analyzes, and extends existing literature and attempts to build new groundwork, e.g., it includes meta-analysis.

Case Study – This is the study of a single phenomenon (e.g., an application, a technology,

a decision) in an organization over a logical time frame

Interview – This is research in which information is obtained by asking respondents questions directly. The questions may be loosely defined, and the responses may be open-ended.

Secondary Data - This is study that utilizes existing organizational and business data, e.g., financial and accounting reports, archival data, published statistics, etc.

Of these seven methods, two methods, the literature research and analysis, totally dominate in the work of A. Osterwalder for creating the *fragmented* Business Model Ontology. That can be seen clearly in the defined practical application of the presented methodology.

Examining this Chapter, it becomes clear that the author has invested a lot of time and effort in getting familiar with and analyzing the content of the most recognized publications on Business Models. He has done this to create the composition of his Business Model Ontology. He claims that each of the nine blocks of the created composition is derived from the publications of at least two recognized researchers working in the field of Business Models.

Analyzing A. Osterwalder's dissertation, I came to the conclusion that his methodology is a classic example of an application of a *philological approach* to scientific research.

2.2 Brief description of the current BMO

In 2004, within the dissertation of Alexander Osterwalder, not only the term Business Model Ontology was born, but also a scientifically recognized version of the first business Model Ontology. Six years later, with the publication of the book *"Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers"*, the commercial version of this Model Ontology was born, which is widely known today as *Business Model Canvas* (Osterwalder & Pigneur, 2010).

My comparative research of the *fragmented* Business Model Ontology's scientific and commercial version showed some differences between them, but they are too insignificant. Therefore, I will examine only the commercial version as a more up-to-date one.

The composition of the *fragmented* Business Model Ontology, or Business Model Canvas, I examine as a bearer of scientific knowledge of the definition given in Chapter 1.2.2, which was as follows: *"Business Model Ontology means a schematic and formulated description of the principle of operation of the enterprise for machines examined as a systemic object bearer of the characteristic systemic subjecthood."*

The *fragmented* BMO consists of nine building blocks as follows: (Osterwalder & Pigneur, 2010)

<table>
<tr><td rowspan="2">Key
Partners</td><td>Key
Activities</td><td rowspan="2">Value
Propositions</td><td>Customer
Relationships</td><td rowspan="2">Customer
Segments</td></tr>
<tr><td>Key
Resources</td><td>Channels</td></tr>
<tr><td colspan="2">Cost Structure</td><td colspan="3">Revenue Streams</td></tr>
</table>

Figure 2.1 Fragmented business model ontology

1st Building block:

It is called **Customer segments** and defines the different groups of people or organizations an enterprise for machines aims to reach and serve: (1) mass market; (2) niche market; (3) segmented; (4) diversified; (5) multi-sided platforms (or multi-sided markets).

2nd Building block:

It is called **Value propositions** and defines the bundle of products (goods and services) that create value for a specific Customer Segment. This block gives answers to the questions "What are the main reasons for which the customers are ready to pay for one or another supplied product?" In this regard, eleven main reasons are presented: (1) newness; (2) performance; (3) customization; (4) "Getting the job done"; (5) design; (6) brand/status; (7) price; (8) cost reduction; (9) risk reduction; (10) accessibility; (11) convenience/usability.

3rd Building block:

It is called **Channels** and describes how an enterprise for machines communicates with and reaches its customer segments to deliver the products produced by it. Several types of channels are presented: (1) direct channels; (2) indirect channels; (3) owned channels; (4) partner channels. For securing sales by the respective channels, five types of activities are defined in the following order: (1) awareness; (2) evaluation; (3) purchase; (4) delivery; (5) after sales.

4th Building block:

It is called **Customer relationships** and describes the types of relationships an enterprise for machines establishes with respective customer segments. In this sense, six types of relationships are presented: (1) personal assistance; (2) dedicated personal assistance; (3) self-service; (4) automated services; (5) communities; (6) co-creation.

5th Building block:

It is called **Revenue streams** and represents the various kind of sources of revenue which the enterprises for machines generate from each customer segment. Presented are seven sources for generation of revenue streams: (1) asset sale; (2) usage fee; (3) subscription fees; (4) lending/renting/leasing; (5) licensing; (6) brokerage fees; (7) advertising.

6th Building block:

It is called **Key resources** and describes the most important assets required for the enterprise for machines in order to make a business model work. Those resources can be categorized as follows: (1) physical resources; (2) intellectual resources; (3) human resources; (4) financial resources.

7th Building block:

It is called **Key activities** and describes the most important activities an enterprise for machines must do to make its business model work. Those activities are categorized as follows: (1) production; (2) problem solving; (3) creation and maintenance of platform/network.

8th Building block:

It is called **Key partnerships** and describes the network of suppliers and partners that make the business model work. Four types of partner relationships are presented: (1) strategic alliances between non-competitors; (2) strategic partnerships between competitors; (3) joint ventures to develop new business projects; (4) buyer-supplier relationships to assure reliable supplies. Following is a distinction between three motivations for creating partnerships: (1) optimization and economy of scale; (2) reduction of risk and uncertainty; (3) acquisition of particular resources and activities.

9th Building block:

It is called **Cost structure** and describes all costs incurred to operate a business model. It is proposed to examine the costs of the enterprise for machines in the following four categories: (1) fixed costs; (2) variable costs; (3) economies of scale; (4) economies of scope.

The shown in Figure 2.1 schematic description of the principle of operation of the enterprise for machines, as a systemic object examined as a bearer of the characteristic systemic subjecthood, is an emanation of A. Osterwalder and Y. Pigneur's work, for which they are recognized as the world's fourth most important thinkers in the field of management of the economy of the enterprise (Thinkers 50, 2021), and as it will be mentioned below, the study of this schematic description is embedded in almost all curricula in the world. In this situation, anyone who has accepted the above-shown knowledge as scientific and has carefully read the title of the current MBA thesis would want to ask the question: *" Why does the world need a new holistic Business Model Ontology?"*

2.3 *Why does the world need a new holistic business model ontology?*

In an attempt to answer this question, I will make a brief SWOT analysis of the work and the activity of A. Osterwalder and Y. Pigneur.

The work of A. Osterwalder and Y. Pigneur (consisting of a dissertation and a book), I will examine as a tool for influencing the development (in a positive or negative direction) of the global human capital, and the activity aimed at commercial dissemination of the *fragmented* Business Model Ontology, I examine as the realization of such influence.

Strengths of the work and the activity of A. Osterwalder and Y. Pigneur:

After repeated and careful analysis of both the dissertation and the book by A. Osterwalder and Y. Pigneur, as well as after many meetings and discussions with academic supporters and business followers of the *fragmented* Business Model Ontology, I came to the conclusion that their work and activity, seen as means of influencing the development of the global human capital, has only two undeniable strengths.

1st strength:

Through the doctoral dissertation and from the standpoint of professional economic science, A. Osterwalder and Y. Pigneur focus attention on one huge problem in the development of global human capital. This problem finds the following description:

"Every manager and entrepreneur does have an intuitive understanding of how his business works and how value is created. In other words he does have an intuitive understanding of the company's Business Model, but even though this Business Model influences all important decisions, in many cases she or he is rarely able to communicate it in a clear and simple way (Linder and Cantrell 2000). And how can one decide on a particular business issue or change it, if it is not clearly understood by the parties involved?" (Osterwalder, 2004)

This text represents less than one percent of the texts explaining the nature and meaning of the term Business Model as well as the term Business Model Ontology. However, it reveals the truth that there is no entrepreneur or a manager in the world who is a bearer of a clear and conscious understanding of the principle setup and way of functioning of the enterprise. The understanding is on an intuitive level and is strictly personal, making it very difficult to form a collective unanimity and hence unity of action for management of the actual economy of the enterprise.

In the context of the mentioned problem, another descriptive text deserves attention, which reads:

"... because people have different mental models they will not automatically understand the same thing under a Business Model. Thus, a generic framework (i.e., an Ontology) for describing Business Models becomes necessary. Such a framework can be understood as a

common language between stakeholders to get the ideas out of their heads in order to formulate them in a way that everybody understands." (Osterwalder, 2004)

This text not only confirms the author's idea that there is a global shortage of scientific knowledge, which explains the principle of operation of the phenomenon of industrial enterprise. This text is also a transition to the second strength of the work and activity of A. Osterwalder and Y. Pigneur.

2nd strength:

The second strength of the work and activity of A. Osterwalder and Y. Pigneur is that they defined the means (in the form of a scientific task) for overcoming the discovered problem. They gave this means the name *Business Model Ontology* and assigned it one fundamental function, which should cover the most important operational functions for the management practice. Here I should note that according to the context, the fundamental function of the Business Model Ontology, considered as a schematic and formulated description of the principle of operation of the enterprise, comes down to its role as a theoretical basis for the creation of a new generation management software.

Weaknesses of the work and the activity of A. Osterwalder and Y. Pigneur:

My extensive research of the work of A. Osterwalder and Y. Pigneur has clearly shown that it has only one weakness which remains out of the public attention and almost no one seems to be concerned about it. Thus, it can be said that it is a disregarded evident fact.

The current BMO is fragmented – it does not form a robust and monolithic foundation for Economic science capable of explaining the principle setup and way of functioning of the enterprise for machines in its entirety, unlike the foundation that was developed by medical science in the form of a systemic anatomical and physiological model of the human body.

Moreover, the *fragmentary* BMO not only does not provide a comprehensive such explanation, it does not provide any explanation of the principle setup and way of functioning of the enterprise for machines. Proof of this is that to this day – 10 years after the presentation of the *fragmented* BMO – there is no new generation of digital technology for managerial modeling of the economy of the enterprise built based on this knowledge, although A. Osterwalder foresees such a technology.

A second piece of evidence is a survey I conducted among master's and Ph.D. students attending some of the world's most elite universities—Stanford University, New York University, University of California, Peking University, and Tsinghua University. The topic of study was the analysis of the *fragmented* BMO and examining to what extent, based on the schematic description (Canvas), students will be able to determine the principle setup and way of functioning of a random enterprise for machines.

The responses were unanimous and can be summed up in the following remark from a

Ph.D. student at Stanford University who commented as follows: *" The Business Model Canvas (the current fragmented BMO) does not provide any sort of knowledge not only of the principle of operation of the enterprise, it does not provide any useful knowledge about the enterprise at all. The idea of a knowledge is to serve as a management tool. Even the professors couldn't explain to us what the point of this Business Model Canvas was in the real world, other than drawing useless pictures."*

A survey among my colleagues at Tsinghua University showed that none of the master's and Ph.D. students could understand how a knowledge that is so useless is so widespread!

The results of the conducted research categorically and unequivocally confirm that the *fragmented* Business Model Ontology does not meet the original purpose of its creation – to give to the world scientific knowledge explaining what the enterprise for machines consists of and how it functions as a whole, and for this knowledge to be the basis of a new generation management software.

A. Osterwalder and Y. Pigneur's *fragmented* Business Model Ontology could quite reasonably be argued to fall short of their own criteria for "What is a Business Model Ontology?", yet they chose to ignore this evident fact and proceed to mass disseminate the knowledge they have created.

Precisely because of this mass dissemination, this weak side in the work of A. Osterwalder and Y. Pigneur represents a source of severe threats to the future development of global human capital.

Threats arising from the work and the activity of A. Osterwalder:

Today, at the very beginning of the third decade of the 21st century and ten years after its first introduction, the *fragmented* Business Model Ontology is globally recognized as a benchmark in its scientific field. What is more, it has already found a place in the curricula of the faculties of economics of all universities around the world. For example, I can mention my MBA program at the School of Economics and Management of Tsinghua University, where this Model Ontology was studied in four scientific disciplines.

In Bulgaria, this Model Ontology is not only studied in universities but also in elementary, middle, and high schools (Ministry of Education and Science, 2021). Given that Bulgaria is a member of the European Union, and the educational programs are regulated considering one another, I am sure that the *fragmented* Business Model Ontology has found a similar place in the educational system of most European countries.

It is indisputable fact that the world has an acute need (as A. Osterwalder and Y. Pigneur also point out) of knowledge about the principle setup and way of functioning of the enterprise. It is exactly in this lacking (in terms of knowledge) area that A. Osterwalder and Y. Pigneur positioned their development and founded enormous success in the form of mass

dissemination. But given its weak side, namely that the knowledge developed by them does not at all correspond to the initially set purpose, this mass dissemination raises serious questions: "*How is this knowledge mass disseminated when it does not at all fulfill its original purpose – to provide a schematic and functional knowledge of the principle setup and way of functioning of the enterprise?*" and "***How can the world's academic elites totally ignore this knowledge's weak side and uncritically accept this fragmented BMO?***"

Whatever the answers to these questions are, the uncritical acceptance of the knowledge of the fragmented BMO and its subsequent mass dissemination carries enormous threats to the development of the global human capital, which A. Osterwalder himself is extremely concerned about.

Suppose the curricula courses presented the work and the activity of A. Osterwalder and Y. Pigneur in its entirety (both in its strengths and weaknesses after a critical analysis). In that case, this could have been somewhat useful for the development of global human capital. However, all my research showed that in these courses, the strengths are totally ignored, while its extremely weak side is shown as an extremely strong one. In this way, people who study the *fragmented* Business Model Ontology get the misconception that this Model Ontology of A. Osterwalder and Y. Pigneur is scientific knowledge of the highest quality for the principle of operation of the enterprise, which is not true at all.

In my opinion, it would be much better for the education system not to provide scientific knowledge for the principle of operation of an enterprise at all than to provide such knowledge that is of questionable quality. This is because the quality of scientific knowledge for Business Model Ontology is as important for the development of the quality of human capital in the field of economy as the quality of scientific knowledge about the anatomy and physiology of the human body (Model Ontology of the human body) is important for the development of the quality of human capital in the field of medicine.

Moreover, just as the Model Ontology of the human body in the field of medicine serves as the fundamental scientific knowledge of medicine, the Business Model Ontology in the field of economics should be the fundamental scientific knowledge for economy – a knowledge in the form of unified theory and terminology describing the principle structure and way of functioning of the phenomenon enterprise for machines, and on their basis enabling the development of the next generation digital technology for managerial modeling of the economy of the enterprise. Unfortunately, the *fragmented* Business Model Ontology is of poor quality and cannot serve as a foundation for creating a holistic Model of the economy of the enterprise. Teaching it can be compared to the texts taught to medieval doctors only because they were considered authoritative even though they lacked any objective proof for practical value. And we all know the medical and treatment practices that were provided at that time–

letting blood out, drilling holes in the skull, using leeches and so on.

If we draw a parallel between medieval doctors and modern managers relying on the *fragmented* Business Model Ontology, the threats to the enterprises they manage are enormous.

The wasted potential of human capital and directing it to the use of knowledge of dubious quality is the greatest threat resulting from the work and the activity of A. Osterwalder and Y. Pigneur.

Opportunities arising from the work and the activity of A. Osterwalder:

The opportunities arising from the work and the activity of A. Osterwalder and Y. Pigneur are primarily contained in the realization and acceptance, after critical analysis, of the weaknesses of the *fragmented* BMO by the world academic elites, and then in making the collective decision to transition and create an entirely *new holistic* BMO – BMO, which actually overcomes the two major flaws of the modern fundamental scientific knowledge of economy.

This holistic BMO will be a new quality fundamental scientific knowledge of economy that will drastically develop the global educational and scientific research system. On its basis, it will be possible to develop a holistic digital technology that will become a carrier of the new quality of knowledge. Its mass dissemination in the educational systems and also its use as a digital tool for managing the economy of enterprises for machines will lead to a drastic increase in the quality of the human capital in the field of managerial modeling of the industrial economy, and from there, overcome the weaknesses and prevent the threats from the work and the activity of A. Osterwalder and Y. Pigneur.

SWAT ANALYSIS CONCLUSION:

1st conclusion: The realization of the strengths of the *current fragmented* BMO, but more importantly, the realization of its weaknesses, is a task of paramount importance for the modern academic and scientific elites.

2nd conclusion: The realization of the strengths and weaknesses of the *current fragmented* BMO is expected to lead to a collective decision to invest the necessary resources, in the form of invested human capital, time, effort, and financial resources towards the development of a new quality, *holistic* BMO, and on its basis development of the next generation digital technology for managerial modeling of the economy of the industrial enterprise, which will inevitably replace the currently existing solutions. The created digital technology will carry the new quality knowledge and thus should serve as an educational platform for the creation of a new and higher quality human capital in the field of managerial modeling of the industrial economy.

In this regard, I will continue with the introduction of another BMO, developed in complete public anonymity during the last 20 years in Bulgaria and now, for the first time,

being officially presented in this MBA thesis. BMO, which after detailed analysis, I define precisely as *holistic* BMO.

CHAPTER 3
NEW BUSINESS MODEL ONTOLOGY

In this Chapter, I present the *new holistic* Business Model Ontology in 3 parts. The first part examines the methodology for the creation of the *new* Business Model Ontology as an example of the application of the *laboratory approach* for scientific research; the second part presents a brief description of this Model Ontology; and the third part presents (based on the new BMO) the functional construct of a new generation of digital technology for managerial modeling of the economy of the enterprise for machines.

In the previous Chapters, I paid special attention to the motivation of A. Osterwalder and Y. Pigneur, who are the individuals behind the *fragmented* BMO, although given the mass dissemination of the *fragmented* BMO, such a presentation might have been unnecessary as its creators are globally influential personalities (4th place in the "Thinkers50" ranking).

For this reason, before proceeding to the introduction of the methodology for the creation of a holistic Business Model Ontology – the result of a *laboratory approach* – I will make a brief historical overview of the formation of the *holistic* Business Model Ontology with which to present its creators, their motivation, and also the reason for choosing the *laboratory approach*.

The emergence of the idea for the formation of a *holistic* BMO in the form of a new quality of knowledge for managerial modeling of the industrial economy began in the 1980s. It all started when Eng. Peter Bachvarov, a Bulgarian machine engineer and CEO of an enterprise for machines, noticed that the widespread knowledge about the formation of job descriptions was inadequate. The standard practices for creating job descriptions were not based on a universal knowledge of the principle setup and way of functioning of the enterprises (knowledge that is even considered impossible to develop) and therefore did not in any way reflect the actual job responsibility of employees. That ignited interest in Peter Bachvarov to research and analyze the global multitude of specialized literature in the field of knowledge for managerial modeling of the industrial economy.

After the changes in Bulgaria in 1989 (the fall of the communist system), P. Bachvarov passed through the CEO positions of 2 more large Bulgarian enterprises for machines. There, his view was confirmed that despite the different production of the enterprises, their principle setup and way of functioning were much more similar than different. A view that is almost identical to that of William Deming. However, despite this view, the read literature and the conducted consultations with professional economists indicated that at the given moment (the mid-90s of the 20th century), there was a lack of unified knowledge that would give a clear

understanding of the principle setup and way of functioning of the enterprise for machines. The path of Peter Bachvarov brought him together with Anna Videva – a mathematician – with whom they have similar views on the level of development of economic science. Together they define the two major flows inherent in the fundamental scientific knowledge of economy. Namely:

"First major flaw:

The fundamental scientific knowledge of economy does not provide a comprehensive and clear understanding of the principle setup and way of functioning of the enterprise as a systemic object. Just as medieval medicine could not provide a systemic explanation of the human anatomy and physiology, so is modern economic science incapable of providing a systemic explanation of the "anatomy" and "physiology" of the enterprise for machines.

Second major flaw:

The fundamental scientific knowledge of economy does not provide any understanding of the principle setup and way of functioning of the enterprise as a systemic subject. In other words, economic science does not provide any systemic knowledge of the nature and meaning of collective, and therefore, of individual professional responsibility for sustaining the operation of an enterprise for machines."

The formulation of these two flaws happened to coincide with the beginning of the mass privatization within Bulgaria. In essence, this process represents the privatization of most of the enterprises forming the industrial economy of Bulgaria. Until recently, state-owned (after the fall of communism), these enterprises, by decision of the Bulgarian government, had to change their form of ownership from state-owned to privately-owned.

For P. Bachvarov and A. Videva, it was clear that the realization of the mass privatization bringing a positive change (economic growth for Bulgaria) was directly related to the successful overcoming of the two major flaws. Failure to act on these flaws would guarantee a highly negative end result in the form of bankruptcies and closed businesses.

That is so because these enterprises, which until recently worked within COMECON (Council for Mutual Economic Assistance), with guaranteed markets for specific production volumes, were now facing a huge problem. Thus entering the free market of the Western world, their production turns out to be uncompetitive. That presented a huge problem, as these enterprises needed serious reengineering to become once again competitive participants in the global supply chains. However, in the absence of the know-how to make this happen and the personnel capable of implementing such large-scale projects, a process of privatization could prove destructive for the Bulgarian industrial economy. This was because many private owners would rather choose to discontinue the business and sell off the enterprise's assets than put the will and effort, despite absolute cognitive impotence, into reengineering the processes of the

enterprise.

In an attempt to prevent this problem, P. Bachvarov and A. Videva address the individuals responsible for the privatization process with two worldview ideas:

First worldview idea: The Bulgarian economy is crippled because the scientific knowledge about its management has two major flaws. The first major flaw is that the fundamental scientific knowledge of economy fails to provide a comprehensive and clear understanding of the principle setup and way of functioning of any modern enterprise as a *systemic object* that must generate added value. The second major flaw is that the scientific knowledge about the economy fails to provide any understanding of the principle structure and way of functioning of any modern enterprise as a *systemic subject* that must generate added value. That means that the existing knowledge is largely devoid of meaning when it comes to the essence of collective responsibility and hence unable to assist in the development of job descriptions in the industry, which are clear from a practical point of view.

Second worldview idea: The well-being of the Bulgarian economy can be strengthened through constructive reengineering of its enterprises. This constructive reengineering can be accomplished using an IT product consisting of universal knowledge about the principle setup and way of functioning of every enterprise as a systemic object and subject that can and must generate added value. Thus, this IT product must be the bearer of a new quality of fundamental scientific knowledge of economy; knowledge that would explain, replace, and complete all modern scientific knowledge about the management of enterprises for machines as the building blocks of a well-developed national economy.

Unfortunately, at that time, they did not find support among the Bulgarian political elites, while the privatization condemned many Bulgarian enterprises for machines to be closed in the following years.

Despite the lack of support, P. Bachvarov and A. Videva take it upon themselves to dedicate their lives to creating qualitative new knowledge for managerial modeling of the economy of the enterprise for machines. Knowledge that is comprehensive (holistic) and that gives a clear understanding of the principle setup and way of functioning of every enterprise for machines as a systemic object and subject.

As a practicing machine engineer (with several patents for inventions), aware of the importance of the industry for machines as a leading industry of paramount importance, Eng. Peter Bachvarov logically chooses the *laboratory approach* for developing this new quality of knowledge, and the object of research is precisely the enterprise for machines.

The formation of a new quality of knowledge required the formation of a laboratory without an alternative in our world. This unique laboratory system, which was built over time (1998-2005), consisted of three main functional parts: (1) organizing and subsidizing core – this

is a private foundation established under the name "Engineering Culture in Management of the Future"; (2) base for applied research – these are several enterprises in the field of the industry for machines and (3) research core – this is a joint-stock company, which exists today under the name Institute for System Economic Engineering ISEE. In this system, the central organization is ISEE as an organization engaged with the development of the new quality knowledge for managerial modeling of the economy of the enterprise, in the form of numerous written materials (research, textbooks, etc.), as well as a carrier of this knowledge in the form of an IT product (holistic ERP system).

After getting to know in detail the work and research of ISEE over the years, I can confidently state that the knowledge developed by them is precisely a new quality Business Model Ontology. BMO, which should be defined as holistic.

After introducing the laboratory necessary for the creation of the *new holistic* BMO, I will proceed with the Methodology for its creation.

3.1 Methodology for creation of the new BMO, an example of an application of the laboratory approach

The methodology for creating a holistic Business Model Ontology is based on a set of methods, which also include the methods for creating the fragmentary BMO, namely: (1) Speculation/commentary; (2) Frameworks and Conceptual Models; (3) Library Research; (4) Literature Analysis; (5) Case Study; (6) Interview; (7) Secondary Data. However, the primary method here is the Trial-and-Error method – the basis of the *laboratory approach*. Within this approach, ISEE systematically develops knowledge to overcome the two major flaws inherent to the fundamental scientific knowledge of economy. Subsequently, the developed knowledge was tested in practice in the multitude of enterprises for machines, part of the laboratory system. The knowledge and research went through several stages of cognitive development.

The first stage of cognition-based development

The initial stage lasted 4 years, from 1998 until the end of 2001. During this period, ISEE developed a cognitive platform for a universalist understanding of the enterprise as a *systemic object*. On this basis, it then designed and rolled out the first version of the IT solution for enterprise modeling as a *systemic object.* This first cognitive platform was called the ***Industrial Cross***.

The second stage of cognition-based development

The second stage also lasted 4 years, from 2002 until the end of 2005. During this period, ISEE developed a second cognitive platform for the enterprise relevant to its very essence and to the *meaning and hierarchy of knowledge* that enables the very existence of an enterprise as a

systemic subject. On this basis, it then designed and rolled out the second version of the IT solution for enterprise modeling as a *systemic object and subject.* The second cognitive platform was called the ***Industrial Cognition Tree***.

The third stage of cognition-based development

This stage lasted 6 years, from the beginning of 2006 until the end of 2011. During this period, ISEE made a crucial step in the development of the second cognitive platform, which supplemented and substantially deepened its understanding of an enterprise as a *systemic subject*. On this basis, it then designed and rolled out for scientific research activities the third version of the IT solution for enterprise modeling as a *systemic object and systemic subject (systemic object, carrying the property of subjecthood)*.

In order to eliminate the two major flaws, during all three stages of its cognition-based development, ISEE conducted large-scale research of the development of fundamental scientific knowledge of the economy all around the world. These spanned the following areas:

1. Academic circles and recommended scholarly publications;
2. Management consulting;
3. Business software.

The first major wave of research was conducted in 2006 and 2007. The result was confirmation that the global community of professional economists had not yet overcome the two major flaws. In contrast, the second version of the IT product created by ISEE successfully overcame the first major flaw.

The second major wave of research was conducted during the period 2011-2015. It covered three main work areas:

1. Overview and curation of working materials relevant to the theory and terminology underlying ISEE's IT solution;
2. A large-scale campaign dedicated to studying the development of fundamental scientific knowledge about the economy in the elapsed few years;
3. And, most importantly, an IT solution experimentation as a bearer of knowledge for the creation and development of an effective technological elite capable of nurturing and developing innovative technology industrial systems with conscious dedication and in-depth understanding.

The overview and curation of the theory and terminology-related working materials for the IT solution developed by ISEE commenced at the end of 2011 and was finalized at the beginning of 2014. During this period, in order to secure ISEE's copyright in the scientific work carried out, three books exclusively intended for in-house use were published in limited print runs (Bachvarov & Videva, 2011; Bachvarov & Videva, 2012; Spasov, Simeonov, Kacharov, & others, 2014).

The largest-scale campaign studying the development of all fundamental knowledge for economic management was launched in late 2011 and completed in mid-2012. It was undertaken within the framework of two distinct research projects.

The results of the two research projects fully corroborate the results of previous studies, which have shown the absence of dedicated research to create flawless fundamental knowledge about the economy.

The culmination of ISEE's experimental work was a large-scale experiment proving the superiority of the IT solution developed as a bearer of knowledge for the creation and development of an innovative technological elite. An elite capable of designing and developing high-tech industrial systems using its in-depth understanding and expertise. This experimental study was launched at the beginning of 2014 and finalized in the autumn of 2015.

The generated results could be considered astonishing.

These results, along with the results of all previous studies and experimental research, unequivocally show that ISEE has fulfilled its mission to achieve a new quality, holistic knowledge for managerial modeling of the economy of the enterprise for machines, which I define as a *new holistic* Business Model Ontology.

3.2 Brief description of the *holistic* BMO

The *holistic* Business Model Ontology recreates the economy of the enterprise for machines within two projections called cognitive platforms.

The first cognitive platform provides knowledge for understanding the enterprise for machines as a systemic object, which exists through its economic result, which extends over time and can be positive (profit) or negative (loss).

The second cognitive platform provides knowledge of the nature, meaning, and hierarchy of knowledge that enables the existence of the enterprise for machines in its capacity as a systemic subject (systemic object bearer of the characteristic subjecthood).

3.2.1 The enterprise for machines as a systemic object

The *holistic* BMO recreates the enterprise for machines as a systemic object as it explains schematically as well as in a formulated manner the principle of operation of the enterprise for machines.

3.2.1.1 Schematic description of the principle of operation of the enterprise for machines as a systemic object

The schematic description of the *holistic* BMO explaining the principle of operation of

every enterprise for machines as a systemic object is called ***Industrial Cross***. (Figure 3.1)

According to this description, every enterprise for machines – in its capacity as systemic objects – exists as a result of the synergy of five functional systems: (1) system for Sales, (2) system for Production, (3) system for Supplies, (4) system for Financing and (5) system for Implementation of the Technological Environment.

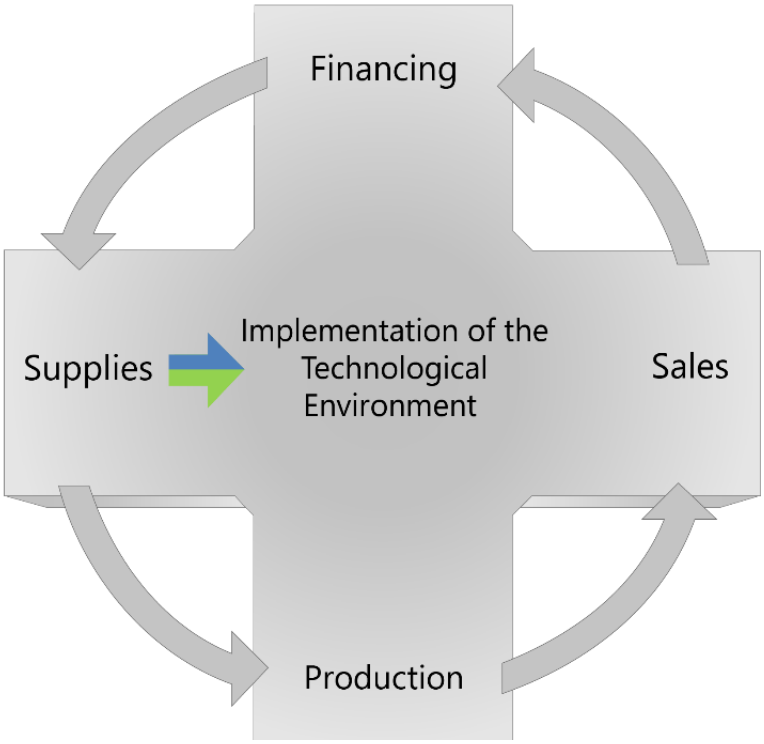


Figure 3.1 The Industrial cross

The five functional systems of the enterprise manage the assets which are under its control: both its own, as well as the ones attracted from the outside. Examined through a time interval manner and from a technologically systemic point of view, this management is described as two object flows.

The first flow is circular four-tier flow. It is formed and driven by the synergy of the four functional systems for Sales, Production, Supplies, and Financing. It is commonly referred to as the *Working capital flow*. (Figure 3.2)

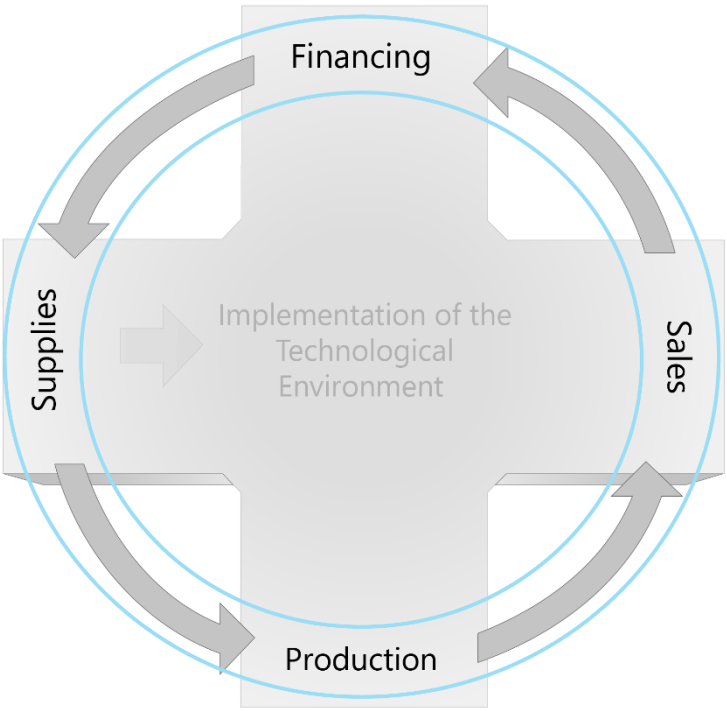


Figure 3.2 Working capital flow

The second flow is centripetal two-tier flow. Its purpose is to provide for the functioning of the technological environment of the enterprise. This flow is driven by the functional systems for *Supply* and *Implementation of the Technological Environment*. (Figure 3.3)

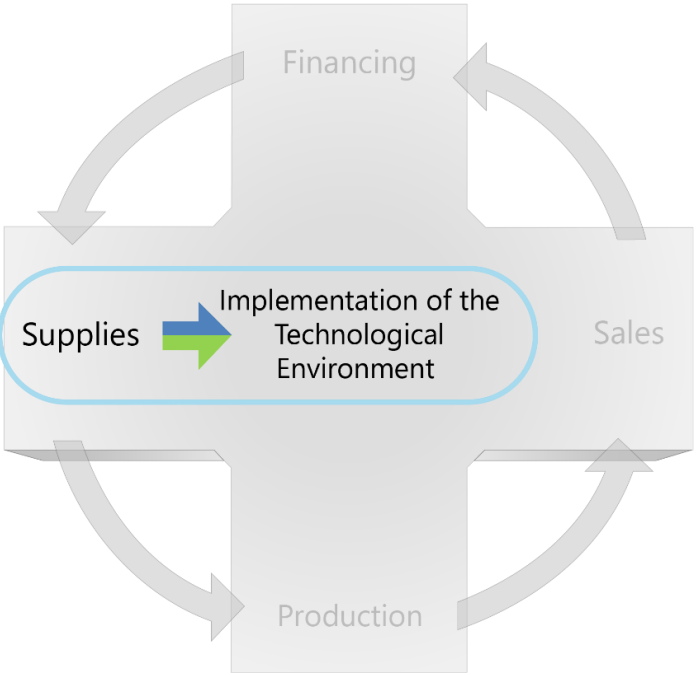


Figure 3.3 Centripetal two-tier flow

The centripetal two-tier flow has two parts: (1) Expenses flow and (2) Investment flow.

Expenses flow: this comprises all objects provided by the systems for Supply and Implementation of the Technological Environment and used (spent) by the enterprise for machines to maintain the ongoing functional aptness of its technological environment.

Investment flow: this comprises all objects provided by the systems for Supply and Implementation of the Technological Environment and used (invested) by the enterprise for machines to introduce qualitative changes to its technological environment.

The investment flow bifurcates into two tiers: (1) Recovery tier and (2) Development tier.

Unlike the other systems (i.e., Sales, Production, Supplies, and Financing), the system for Implementation of the Technological Environment is, in fact, a meta-process. On the one hand, it ensures the formation, maintenance, and strategical development of the technological environment of the other four fundamental functional systems, on the other, it ensures the same for its own operation.

The establishment of every enterprise starts from the formation and development of its system for Implementation of the Technological Environment. The technological environment of the enterprise consists of two building components (1) technical environment and (2) organizational environment.

The main foundation and operational element of the technical environment of each enterprise can be appropriately defined by the concept of *operational place* (OpP). Any deeper elaboration on the contents and meaning of the term operational place, as part of an objectively more precise and correct terminology for describing the modern enterprise for machines, would complicate this research. Because of this, we could state that the term operational place appears partially synonymous with the colloquial expression workplace. (Figure 3.4)

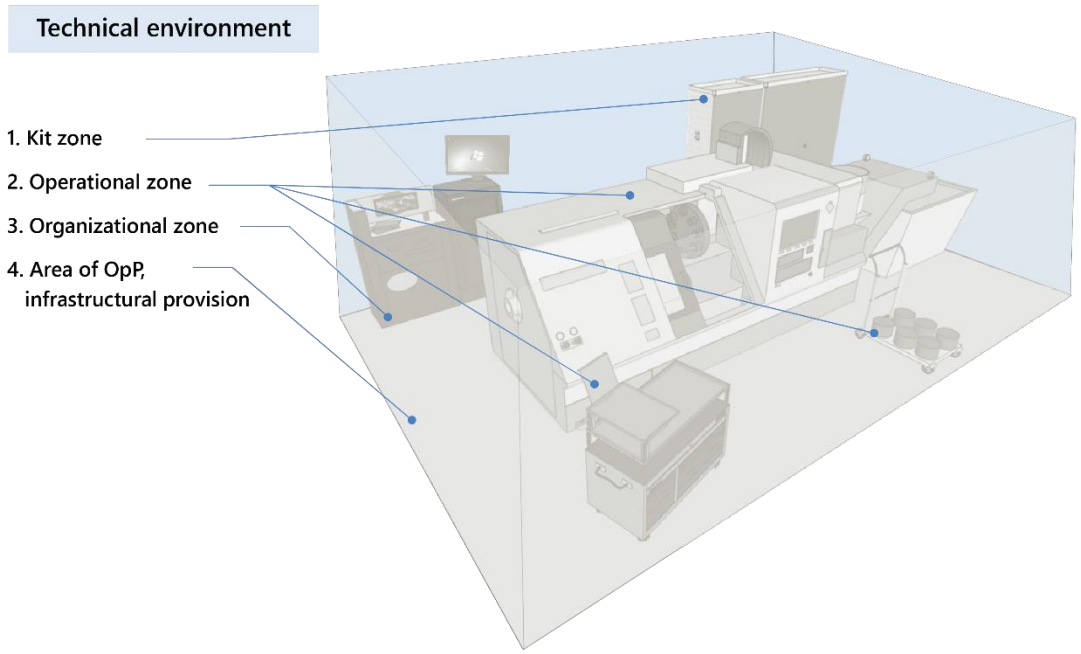


Figure 3.4 Technical side of an operational place

There are four main types of operational places in the enterprises: (1) Administrative, (2) Production, (3) Warehouse, and (4) Public.

The first three types of operational places are essential for each enterprise for machines.

The main structural part of the operational place is its physical space, measurable as area and height – it can be conditionally defined as *operational area*.

The operational area is where the other physical objects that make up the structure of the operational place are positioned: equipment, furniture, devices, tools, etc.

The multitude of operational places of the enterprise for machines forms the physical basis for shaping its multitude of *operational technological fields*. The operational technological field is a descriptive term for the main building component of each of the five functional systems of the enterprise.

Besides the operational place (in its role of physical constituent), the operational technological field has two more inherent aspects that could be described as *organizational*. These include:

(1) an array of documented knowledge (in different types and forms) about the operational technological field lifecycle management in accordance with its intended systemic purpose;

(2) a multitude of appointed workers from specific parts of the human resources of the enterprise, which are assigned with responsibilities concerning the existence of the respective operational field. (Figure 3.5)

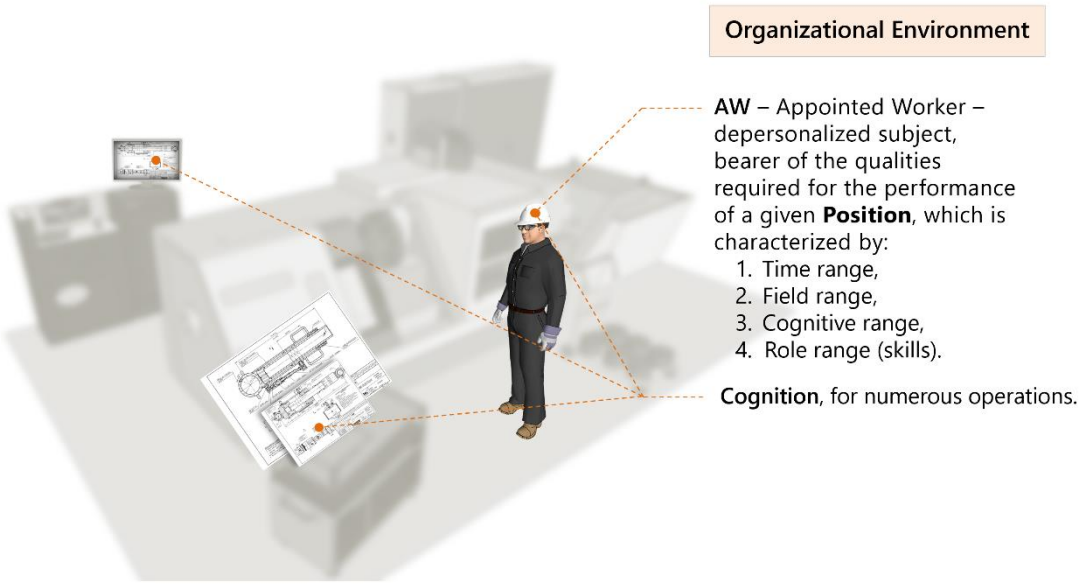


Figure 3.5 Organizational side of an operational place

On the basis of one actual operational place, different operational technological fields may be created, required for establishing the functional systems of the enterprise. These include the systems for Sales, Production, Supplies, Financing, and Implementation of the Technological Environment.

The multitude of organizational components, which are structurally typical for the multitude of operational technological fields, form (and represent) the organizational environment of the enterprise, which is an indispensable part of its technological environment.

3.2.1.2 Formulated description of the principle of operation of the enterprise for machines as a systemic object

The existence of an enterprise is dictated by the law for positive development of the total Value of the Elements of its Proprietary Assets (VEPA) and is expressed by the formula:

$$\sum VEPA(t_1) < \sum VEPA(t_2)$$

Where:

$t_1 < t_2$ – the moment in time t_2 is greater than the moment in time t_1.

$\sum VEPA(t_1)$ – the total Value of all Elements of the Proprietary Assets of the enterprise at time t_1.

$\sum VEPA(t_2)$ – the total Value of all Elements of the Proprietary Assets of the enterprise at time t_2.

The difference between the total Value of the Elements of the Proprietary Assets of the enterprise at time moments t_1 and t_2 is the **Economic result** of the activity of the enterprise at

the time interval $[t_1, t_2]$, denoted by $ER[t_1, t_2]$ and is determined by the formula:

$$ER[t_2, t_1] = \sum VEPA(t_2) - \sum VEPA(t_1)$$

In terms of management, the value of the Economic Result in the time interval $[t_1, t_2]$, can also be calculated by the following 3 values:

$\sum MOC[t_1, t_2]$ – Monetary Obligations of Clients,

$\sum InV_1\{MOC[t_1, t_2]\}$ – Tier 1 Invested Value,

$\sum ExFl[t_1, t_2]$ – Expenses flow.

$\sum MOC[t_1, t_2]$ – is the total acquired value of the Elements of the Proprietary Assets in the form of *Monetary Obligations of Clients* (MOC) generated in the time interval $[t_1, t_2]$ in return for products provided to the Clients, during the same time interval, in the form of goods and services.

$\sum InV_1\{MOC[t_1, t_2]\}$ – is *Tier 1 Invested Value* for the production of the products provided in ownership of the clients in the time interval $[t_1, t_2]$ in the form of goods and services, as a result of which the enterprise acquires value in the form of Monetary Obligations of the Clients.

InV_1 of a completed product is equal to the total purchase value of the elements of the proprietary assets of the enterprise, which are directly invested in the final structure of this product.

$\sum ExFl[t_1, t_2]$ – is the value of the multitude of elements of the proprietary assets of the enterprise invested in its technological environment to ensure its operation in a regular (non-investment) mode, over the time interval $[t_1, t_2]$.

According to the logic of the *Industrial Cross*, in the time interval $[t_1, t_2]$, the economic result $ER[t_1, t_2]$ of the economic activity of the enterprise, is calculated by the formula:

$$ER[t_1, t_2] = \sum MOC[t_1, t_2] - \sum InV_1\{MOC[t_1, t_2]\} - \sum ExFl[t_1, t_2]$$

Example: July 2019

Economic Result during the month of July = *Sales of products during the month of July* − *Invested value via supply of elements of the assets making up the composition of the sold products during the month of July* − *Expenses Flow necessary for the functioning of the technological environment during the month of July*

The Industrial Cross, as a schematic description, and the introduced formulas above, as a formulated description of the principle of operation of each enterprise for machines in its capacity as a systemic object, represents a solid cognitive foundation for the creation of new generations of ERP systems.

The only thing that remains open is the question about the principle of operation of the enterprise for machines as a systemic subject (systemic object bearer of the characteristic

subjecthood).

3.2.2 The enterprise for machines as a systemic subject

The *holistic* BMO explains the principle of operation of the enterprise for machines as a systemic subject through its second cognitive platform called ***Industrial Cognition Tree***.

Similar to any tree, the *Industrial Cognition Tree* – in its capacity of a schematic and emblematic representation of every enterprise for machines as a systemic subject – has five composite elements (1) fruits, (2) leaves, (3) branches, (4) trunk, and (5) roots.

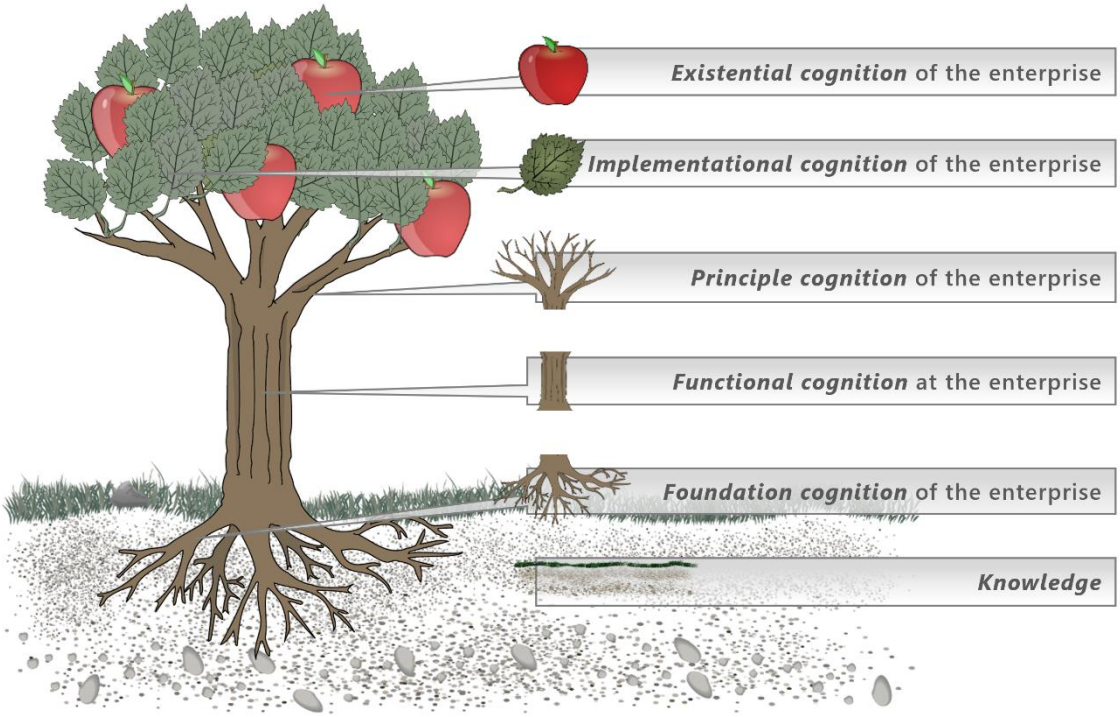


Figure 3.6 The Industrial Cognition Tree

The understanding and comprehension of an enterprise for machines as a systemic subject requires understanding and comprehension of the objective meaning of the individual parts of the *Industrial Cognition Tree* in the assigned order:

The fruits of the Industrial Cognition Tree are a symbolic representation of the *existential cognition* of the enterprise in its capacity as a systemic subject. This is the knowledge about the past, but more importantly about the future changes over time of the value of its capital assets (= economic result), changes that in everyday language are defined as *profit* or *loss*. The condition and development of the fruits of this tree depends entirely on the condition and development of its leaves, branches, stem, and roots.

The leaves of the Industrial Cognition Tree are a symbolic representation of the

implementational cognition of the enterprise in its capacity as a systemic subject. This is the knowledge for implementation of the necessary trajectories of the multitude of objects in space and time, which jointly form the current capital assets of the enterprise. This is the knowledge of what to do *here and now* in accordance with the logic of the Industrial Cross.

The implementational cognition (referred to a specific object, that is part of the capital assets of the enterprise) can be most accurately defined by the concept of *Implementational* MOTEIs (an abbreviation for *implementational time interval models of the **M**ultiple responsibilities **O**ver the **T**rajectory of an **El**ement*). (Figure 3.7)

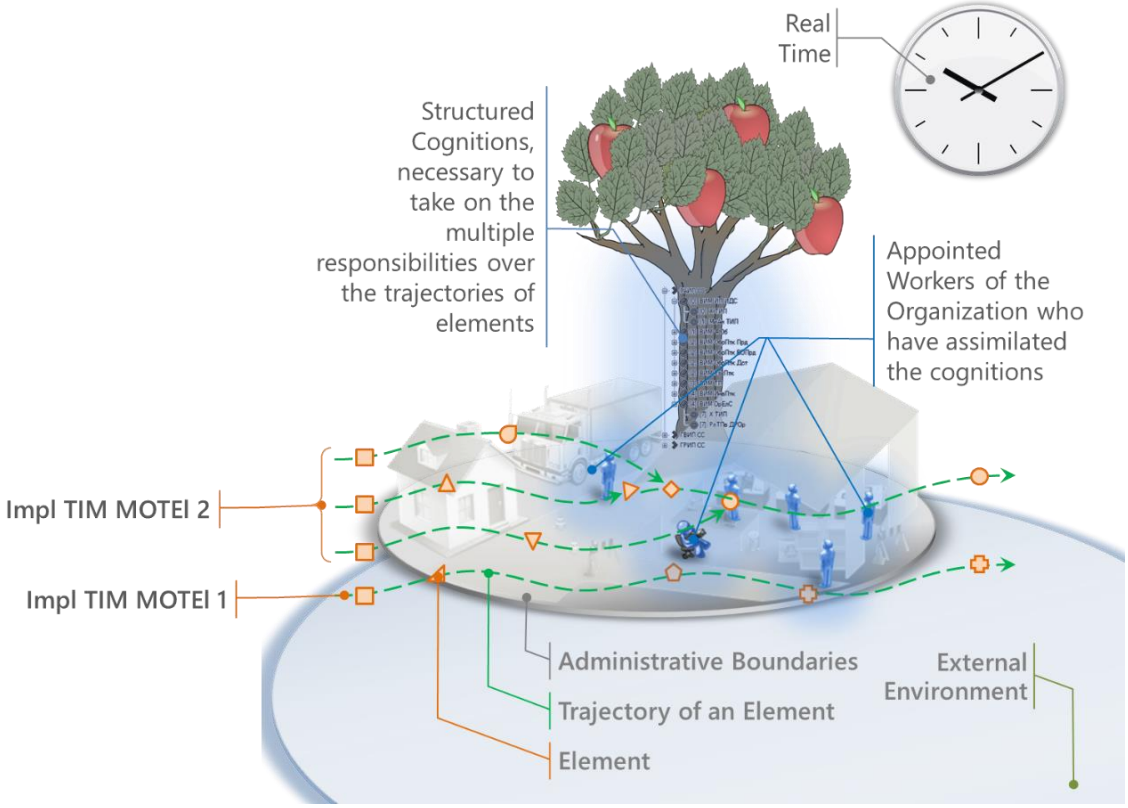


Figure 3.7 *Implementational* MOTEIs

Those responsibilities should be taken on by the operational technological fields of the enterprise and more specifically, by the appointed workers in charge of their functioning as they are an indispensable part of them.

The condition and growth of the leaves of the Industrial Cognition Tree, symbolizing implementational cognitions (in the shape of *Implementational* MOTEIs) for attaining an economic result by the enterprise, are directly dependent on the condition and growth of the branches.

The branches of the Industrial Cognition Tree are a symbolic representation of the *principle cognition* of the enterprise in its capacity as a systemic subject. This is the knowledge

of the principle possible space-time trajectories of its capital assets and answers the question of what these trajectories could be. The principle cognitions are the basis for creating, in variants, *implementational cognitions* (implementational MOTEls).

The principle cognition, referred to a specific object, part of the capital assets of the enterprise, can be most accurately defined by the concept of *Principle* MOTEls (an abbreviation for *principle time interval models of the **m**ultiple responsibilities over the **t**rajectory of an **el**ement*). (Figure 3.8)

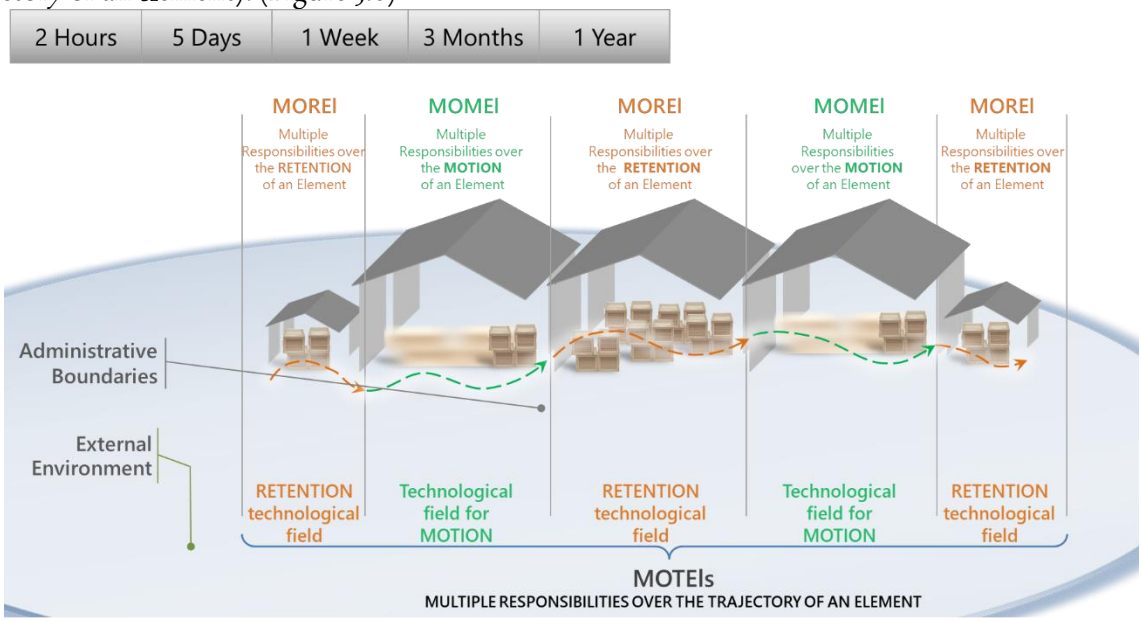


Figure 3.8 *Principle* MOTEls

The principle cognition is the basis for the creation of implementational cognition. However, unlike implementational cognition, where managerial responsibilities are assigned along the real-time axis, principle cognition assigns responsibilities according to a principle time axis, i.e., by principle time steps and intervals. Consequently, on the basis of one principle cognition, infinite number of implementational cognitions can be generated.

The condition and growth of the branches of the Industrial Cognition Tree, symbolizing principle cognitions (in the form of Principle MOTEls) that forms the basis for creating implementational cognitions (in the form of Implementational MOTEls), are directly dependent on the condition and growth of the tree trunk.

The trunk of the Industrial Cognition Tree is a symbolic representation of the *functional cognition* at the enterprise in its capacity as a systemic subject. This is the knowledge that indicates the essence of the ways for creating principle cognitions and their respective outcomes, as well as the ways for creating implementational cognitions by applying principle cognitions with the purpose of attaining economic results.

The essence of the functional cognitions of the enterprise for machines can be understood by comprehending the objective meaning of two abbreviations, interrelated in their denotations: (1) SIS (Subjecthood Implementation System) of the industrial enterprise, and (2) VCSS (Volitional and Conceptual Space of Subjecthood) of the industrial enterprise. (Figure 3.9)

SIS and VCSS of the enterprise are described in detail on hundreds of pages by the authors of the *holistic* Business Model Ontology. For this reason, I will only briefly summarize their main role.

VCSS is the universal structure for each enterprise and represents the building core of each SIS system. SIS is a build-on system comprising of a multitude of specific to the enterprise cognitions (for specific technological processes, specific operations, etc.) based on the universal system VCSS.

Thus, SIS is a "*DNA program*" for the implementation of the technological environment of the enterprise and, in particular, for the working behavior of its human capital, considered as a whole and as an integral part of this environment.

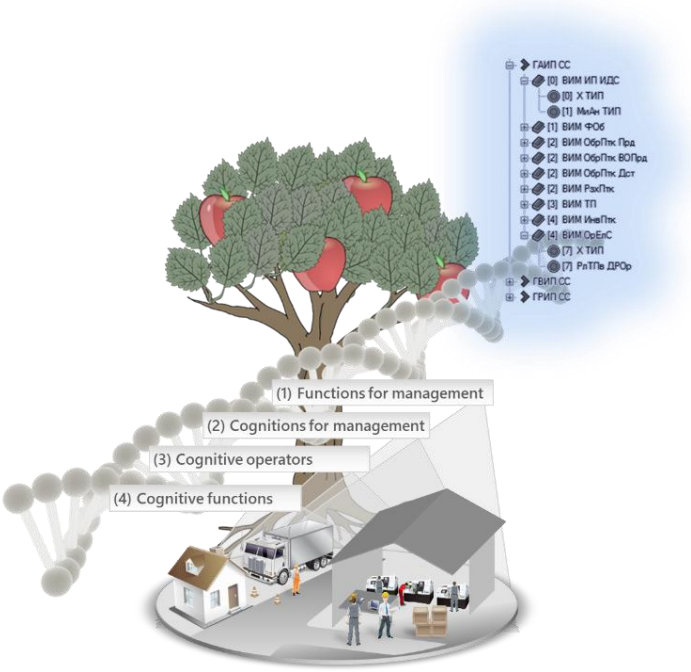


Figure 3.9 SIS (Subjecthood Implementation System),
the *DNA program* of an enterprise

The condition and growth of the trunk of the Industrial Cognition Tree, symbolizing the functional cognition base for creating principle cognition and then implementational cognition for attaining economic results by the enterprise, are directly dependent on the condition and growth of the tree roots.

The roots of the Industrial Cognition Tree are a symbolic representation of the *foundational cognition* of the enterprise in its capacity as a systemic subject. Examples of foundational cognitions of the industrial enterprise can be found in the applied knowledge of the natural sciences in fields such as Physics, Biology, Chemistry, Mathematics, Engineering, etc. The knowledge for a universal systemic model of the enterprise for machines, symbolically represented by the *Industrial Cross* and the *Industrial Cognition Tree*, are also examples of foundational cognitions.

The *Industrial Cross* and the *Industrial Cognition Tree* have cognitive applicability to each fragment of the global industrial capital, which is defined by the concept of enterprise for machines. Thereby, they represent the cognitive foundation for creating a new generation of ERP systems, which by their nature, are hierarchically at the top of all digital technologies for managerial modeling of the economy of the enterprise for machines.

3.3 The construct of a new generation ERP system based on the *holistic* BMO

Both in the present as well as in the future, digital technologies will play an increasingly vital role in our daily lives.

Every day we talk about the digitalization of specific sectors of the economy, *Digital Twins*, *3D Printing*, *Internet of Things*, new digital solutions to all sorts of problems, etc. The list is long.

However, at the level of actual enterprise management, very few people know (1) what the main types of digital technologies for managerial modeling of the economy of the enterprise for machines are, (2) what the practical role of each of these types is, and (3) what the systemic managerial relationship (more precisely the hierarchy) between them is. For this reason, I will present brief introductory information.

At the lowest level in the hierarchy of digital systems, on which the potential for development of any modern enterprise for machines depends, are DNC (Direct Numerical Control) systems; at the next level are CAD / CAM / CAE systems; and at the highest are the so-called ERP systems.

DNC (Direct Numerical Control) are computer systems (software and hardware) for direct control of the operating behavior of many different CNC (Computer Numerical Control) machines.

CAD / CAM / CAE (Computer-Aided Design / Manufacturing / Engineering) are computer software systems for two- and three-dimensional graphical representation of various objects for creating programs for CNC machines and for engineering calculations based on a three-dimensional graphic model designed using CAD systems.

ERP systems (Enterprise Resource Planning) are two types: (1) fragmentary and (2) holistic. Fragmentary as well as holistic ERP systems not only implement the MRP II algorithm, but they are both created in similar steps: first – theory and terminology are developed; second – functional interface (functional construct) is developed; third –program architecture is designed; fourth - the whole digital system is programmed; fifth – it is tested.

The fragmentary ERP systems are based on the widespread scientific knowledge of managerial modeling of the economy of an enterprise, which, as already mentioned in Chapter 1, is fragmentary – consists of individual fragments, such as knowledge of accounting modeling, knowledge of productivity and quality management, knowledge of planning and control, knowledge of human resources management, knowledge of project management, knowledge of crisis management, knowledge of business modeling, and many more.

As already mentioned, all these fragments created over the years are not part of the same unifying theory and do not share a common terminology. Therefore, they do not represent parts of a holistic model that explains, in a clear and accessible way, the principle of operation of the enterprise for machines.

It is no coincidence that in the dissertation of A. Osterwalder he repeatedly points out that there is a scientific deficit of knowledge about the principle of operation of the enterprise and that such knowledge, which he calls Business Model Ontology, will become the basis for creating a new generation of digital technologies. In other words, Osterwalder unintentionally brought out the idea of the creation of *holistic* ERP systems.

Unlike the fragmentary ones, the *holistic* ERP systems are built on the basis of a universally applicable knowledge of the principle of operation of the enterprise for machines, in the form of theory and terminology derived from the industrial practice. Knowledge characterized in this MBA thesis as ***new holistic*** Business Model Ontology.

The *holistic* ERP system represents an end-to-end information environment in which all employees of the enterprise work, thus ensuring the unity of action of the 5 Functional Systems of the enterprise: (1) system for Sales, (2) system for Production, (3) system for Supplies, (4) system for Financing, and (5) system for Implementation of the Technological Environment (ITE). According to the theory of the *holistic* Business Model Ontology, these five functional systems of the enterprise are formed by objects and subjects while simultaneously managing the flows of subjects and objects. That means that the functional design of a *holistic* ERP system ought to have the following 7 necessary and sufficient functional information systems (FIS): (1) FIS for Subjects, (2) FIS for Objects, (3) FIS for ITE, (4) FIS for Sales, (5) FIS for Production, (6) FIS for Supplies, and (7) FIS for Financing. (Figure 3.10)

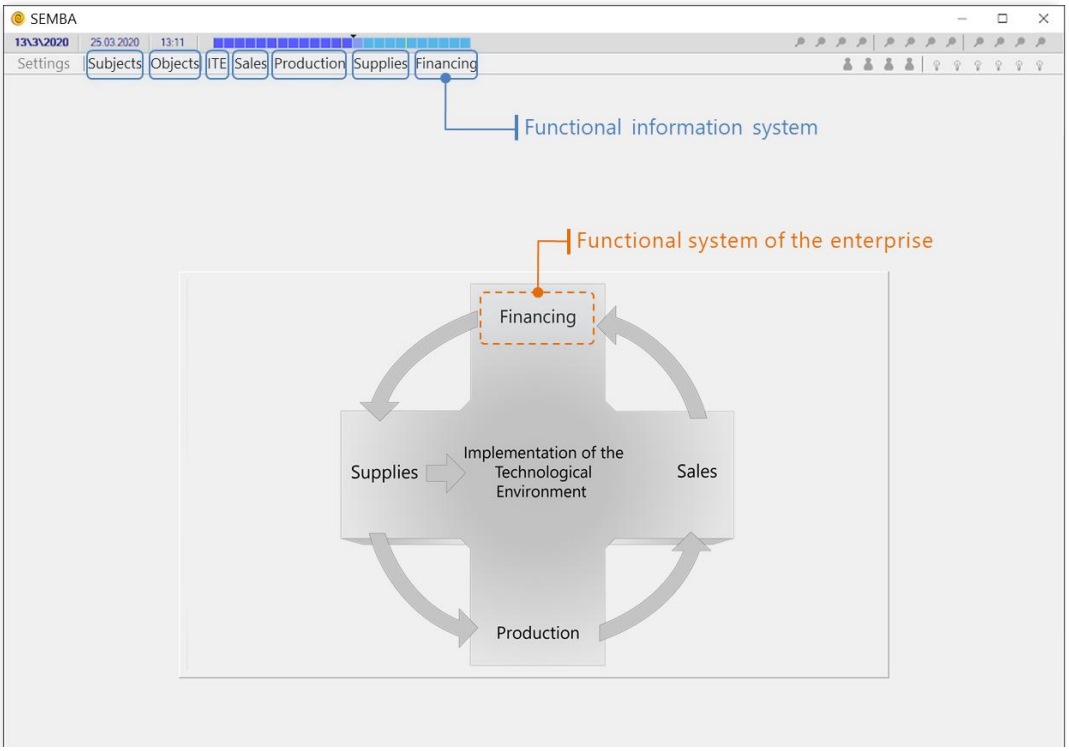


Figure 3.10 Prototype of a holistic ERP system

One *holistic* ERP system developed according to the logic of the Industrial Cross and the Industrial Cognition Tree has a number of advantages over every conventional ERP system (including the most popular ones, such as SAP, Oracle, and Microsoft Dynamics). The most important of these advantages are the following:

3.3.1 Initial integration

Initial integration of the functional systems, which form the construct of the *holistic* ERP system, means that they should be interconnected by the logic of the Industrial Cross and the Industrial Cognition Tree and thus cover the entire economy of the enterprise for machines, so that there would be no need for expensive and endless processes of implementing a variety of informational environments (numerous modules, serving different fragments of the current knowledge of economy, and their databases).

The initial integration is a consequence of the end-to-end scope, from which follow the properties of *intersystemicity* and *unified approach*.

3.3.1.1 Intersystemicity

Intersystemicity means that the *process units* and related data must be shared for the whole system. That is, provided that they have already been created in one functional system to be

available for use by all other functional systems.

For example, once an object has been designed after an order for principle engineering development, to be able to launch orders for Production or Sale for the exact same object and not for "*some other*" objects.

Intersystemicity is a fundamental characteristic of the *holistic* ERP system, which applies to all other characteristics and functionalities of the system.

3.3.1.2 Unified approach

The unified approach includes the use of uniform classifiers, graphical and tabular time interval models (TIMs), registers, etc.

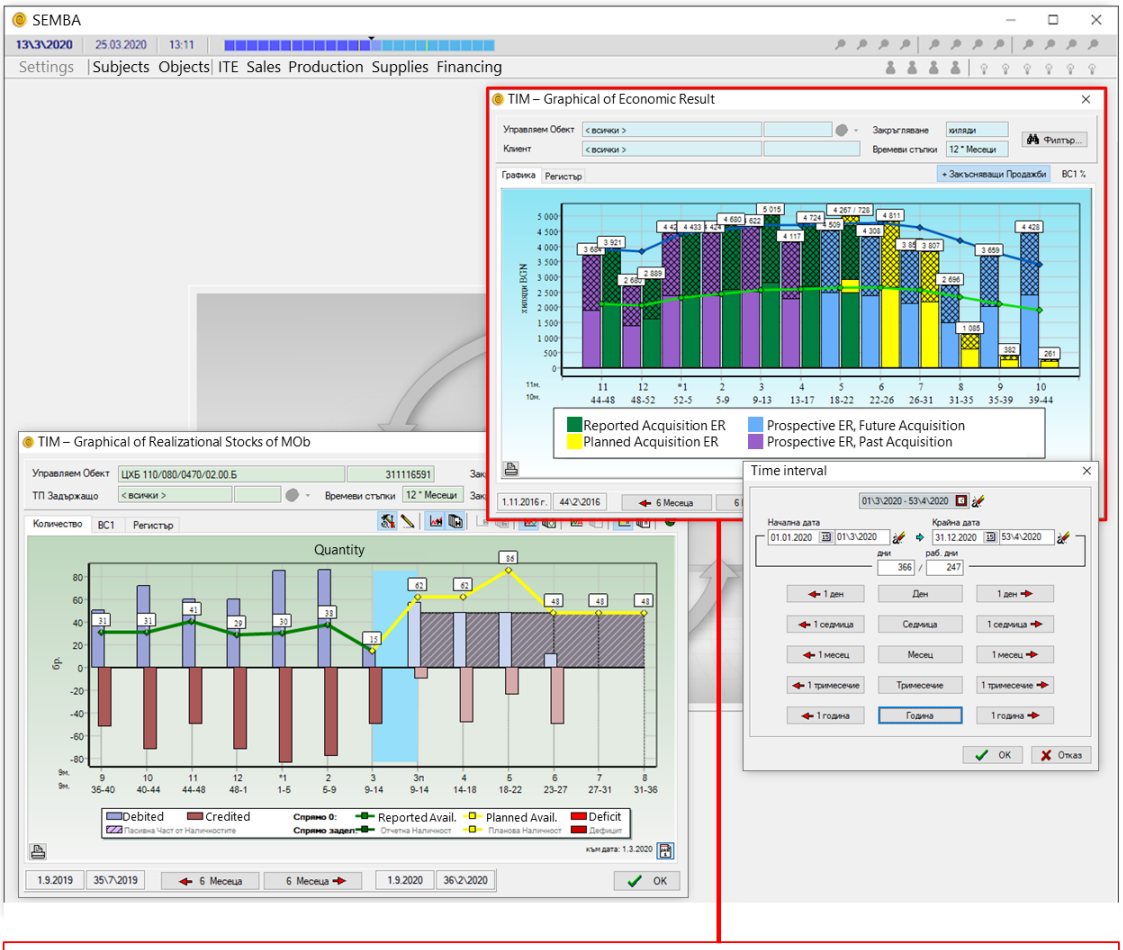
The unified approach determines the achievement of high work efficiency and mobility of human resources. It reduces the time for training and implementation of the digital system and, at the same time, increases the level of overall understanding of employees about the principle of operation of each enterprise for machines.

3.3.2 Operation in real-time

Operation in real-time means that all changes made to a process unit are reflected immediately in all affected Registers and time interval models (TIMs).

For example, the creation of a Sales Order for an object instantly causes a change in the prospective stocks of the object in the respective warehouse.

Or the reporting of the same Order as completed instantly changes (from planned to reported) the picture of the economic result of the enterprise, as well as the picture of the stock availability of the object in the respective warehouse. (Figure 3.11)



The digital form *TIM of Economic Result* is for the top management. It is a beginning for monitoring and analysis, in the deepest detail, of the development of the economic result in the three dimensions of its management: strategic, tactical and operational

Figure 3.11 Time interval model of the Economic Result and Stock Availability

3.3.3 Modeling in variants and time intervals

All essential managerial parameters are modeled in time intervals in the *holistic* ERP system.

Simultaneously, for the same time interval, different variants of MOTELs (technological routes) are possible for the creation of the structure of a given product.

This allows for multifaceted expansion of the system's capabilities in strategic, tactical, and operational dimension. In this way, the system becomes an effective means of reengineering.

3.3.4 Single and set management

Single management concerns the analysis and change of parameters of a specific process

unit. For example, dialogue with a customer, sales order, financial movement, etc. (Figure 3.12)

Set management concerns the screening of target sets of process units, their analysis, and taking action depending on the results. For example, in the register of customer dialogues, screening of all dialogues conducted with a specific customer for the current month. Or in the register of sales orders, screening the orders related to a specific customer group.

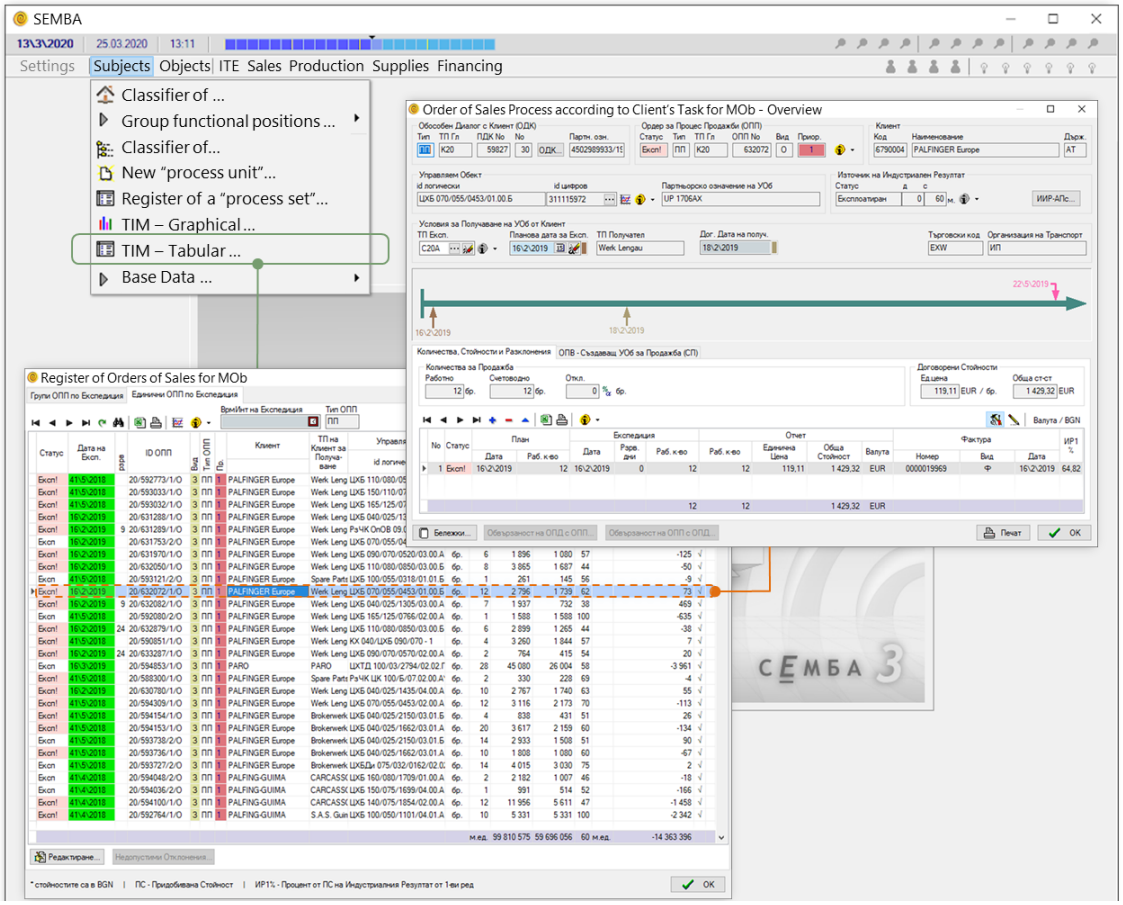


Figure 3.12 Single Unit Management

3.3.5 Feedback

The state of an object in which the value of the deviation of a given parameter of the object exceeds the corresponding allowable limit is called Inadmissible Deviation.

The occurrence of Inadmissible deviations is inevitable for any enterprise. A feedback entry point for identifying inadmissible deviations is every process in the 5 functional systems that make up the enterprise.

Inadmissible deviations are subject to single and set management in order to be overcome on an ongoing basis (through specific measures) and to prevent their future occurrence (through the implementation of projects).

In addition to the above-mentioned 5 proven advantages, there is another advantage of the *holistic* ERP system over any conventional ERP system that deserves to be mentioned.

This advantage is expressed in that the *holistic* ERP system carries the theoretical and technological potential to be an instrument for revolutionary change in the educational and scientific research system and, more precisely, the part responsible for the development of human capital as a bearer of knowledge for management of the industrial economy.

This fundamental idea is at the center of the book "Digital Reform of the Economic Science: Vision for a New Road in the History of the Future." written by the engineers S. Stefanov and G. Velev.

According to the authors, Digital Reform of the Economic Science refers to "The process of creating, developing and widespread study – both theoretical and applied – of the functional programming constructs of a new generation of digital technologies for managerial modeling of the economy of the industrial enterprise. A six-month course of study, both theoretical and applied, of the functional programming constructs of this new type of software would help acquire a new kind of knowledge and understanding of the economic management of the mechanical engineering enterprise. An understanding that would compare much more favourably to that acquired after a full course in economics at any leading university both in terms of validity as well as in terms of practicability for the real industrial world." (Stefanov & Velev, 2022).

In Chapter 4 I will present a comparison between the *holistic* and the *fragmented* Business Model Ontology, starting with the research activities during their creation.

CHAPTER 4
COMPARISON BETWEEN THE NEW HOLISTIC AND THE CURRENT FRAGMENTED BUSINESS MODEL ONTOLOGY

As already mentioned in Chapter 1, the main contribution of this study is to further develop the knowledge in the field of Business Models Ontology given by Alexander Osterwalder and Yves Pigneur, defined here as the ***current fragmented*** *BMO*, through comparison with a new quality of knowledge given by Peter Bachvarov and Anna Videva defined here as ***new holistic*** *BMO*. In this Chapter, I will compare the *holistic* and *fragmented* Business Model Ontology in four dimensions: (1) as a research activity, (2) as experimental activity, (3) as functional capabilities, and (4) as invested time and motives for their creation.

In determining the order and manner of comparison between the *holistic* and the *fragmented* BMO, I take into account the fact that the work process for creating both BMOs, in addition to the mandatory development activity, invariably contains two other types of activities: (1) research activity and (2) experimental activity.

I also take into account the fact that the work process for the creation of the *fragmented* BMO was carried out only by two people in less than 4 years, and the work process for the creation of the *holistic* BMO lasted nearly 20 years and involved dozens of appointed workers, and for some periods even hundreds of appointed workers. These appointed workers were organized within an informal laboratory system that includes several enterprises for machines. At the center of this system is a research organization called *Institute for Systemic Economic Engineering* (*ISEE*). In Chapter 3, ISEE was examined as the organization which carried out the whole development activity, the result of which was the creation of the *holistic* BMO, and here, in this Chapter, ISEE is examined in the same role, but this time in regard to the research and experimental activity.

4.1 Comparison of the *holistic* and the *fragmented* BMO as a result of research activity

The comparison of the *holistic* and the *fragmented* BMO as a result of research activity necessarily contains three working steps: first "the *holistic* BMO as a result of research activity" is presented, then "the *fragmented* BMO as a result of research activity" is presented and finally "comparison of the nature and the scale of the research for the creation of the *holistic* and the *fragmented* BMO" is made.

4.1.1 The *holistic* BMO as a result of research activity

The research carried out by ISEE to identify and better understand the application potential of available scientific fundamental knowledge about economic management and to compare this potential to the capabilities offered by the IT solution developed, which offers knowledge of a brand-new order, was a serious cognitive process. A process that was inextricably linked to the creative and experimental work of ISEE, which was implemented on an ongoing basis in background mode and via projects and dedicated campaigns. The knowledge process focused on the following as the principal sources of available 'scientific' fundamental knowledge about economic management:

1. Academic circles and recommended scholarly publications;
2. Global audit and management consultancy companies;
3. ERP business software developed by global companies.

In line with the view that each high-quality IT solution for the managerial modeling of an enterprise should be based on holistic fundamental knowledge about management of the economy, the research efforts of ISEE focused on the third area — ERP business software developed and sold by some of the most renowned global companies.

In order to obtain a general idea of the research work of ISEE, short descriptions of several research projects (one project in the first two areas and two projects in the area of ERP business software) are set out below.

Research of academic circles and scientific publications

To date, during the course of ISEE's twenty-year history, in addition to current research, three major projects for evaluation of 'academic circles and scientific publications' were conducted to appraise existing fundamental knowledge about management of the economy in the form of a managerial model of the economy of the enterprise for machines.

All three research projects were implemented through thematic meetings with representatives of academic circles and representatives of professional economic thought, who then recommended research publications to be reviewed. The latest research project is of particular interest. It was not only the largest scale one but also the most relevant one. The project was implemented in the first half of 2012. Eighty-nine calls were sent to prominent representatives of the professional academic community. Over a period of 5 months, more than 50 working meetings with the invited representatives took place and dozens of research publications were reviewed and analyzed between meetings.

Similar to the first two projects, the meetings under this project warranted the conclusion that the academic circles have failed in their mission to generate systemic scientific knowledge for the creation of a managerial model of the economy of the enterprise for machines. Another

conclusion was that the people in these circles firmly believed in the eventual enormous societal benefit of such knowledge while also assuming that efforts aimed at obtaining such knowledge would be futile and an unachievable task.

In conclusion, the widespread opinion of a significant number of economic scientists and other members of the academic community was that the global economic science did not possess fundamental knowledge on the management of the economy in the form of a managerial model of the economy of the enterprise for machines. A model which, for the purposes of economic practice, contributes clear and verifiable knowledge about the principle of operation of the enterprise as the systemic anatomic and physiological model does for medical practice.

Research of audit and consultancy companies

Research projects were the main tool used by ISEE to evaluate audit and management consultancy companies as sources of fundamental knowledge about management of the economy in the form of a managerial model of the economy of the enterprise for machines. The research projects focused on global companies such as Deloitte, KPMG, PricewaterhouseCoopers, etc.

ISEE has implemented several such projects throughout the years, with the earliest one from the summer of 2001.Here I will present the project implemented in the autumn of 2007.

In the early autumn of 2007, the media became increasingly willing to publish materials dedicated to human competencies, corporate competencies, and job competency models. At the center of media publications were the audit and management consultancy companies studied back in 2001 as potential sources of knowledge about a managerial model of the economy of the enterprise. The results of the study were unsatisfactory overall, but six years had elapsed between the first and the second research project, which is a lot of time. The insistence and conviction with which the terms 'competencies' and 'competency models' are used had given the impression that between 2001 and 2007, global audit and management consultancy companies had arrived at a breakthrough in fundamental knowledge about management of the economy, more specifically by creating a universal model of the enterprise for machines as a systemic object and subject simultaneously.

With this idea in mind, in the autumn of 2007, ISEE launched a project to research the companies Deloitte, KPMG, PricewaterhouseCoopers, and IDS Scheer as potential creators of fundamental knowledge of a brand-new order about the management of the economy of the industrial enterprise.

However, these hopes were short-lived.

During the project implementation, it was established that the use of the terms

'competencies' and 'competency models', in their capacity as a cognitive basis for the management of enterprises as comprehensive subjects, was not the result of serious work to generate systemic knowledge about a universal holistic model of the economy of the enterprise for machines. These were rather the product of essayistic speculation and were not grounded in sound logic in terms of practical implementation.

That warrants the conclusion that global audit and management consultancy companies have not yet achieved a radical breakthrough in the area of fundamental knowledge of management of the economy. Their level, as a source of such knowledge in the autumn of 2007, did not differ significantly from the one they possessed at the beginning of 2001. The results of the subsequent research projects show that this trend continues to this day.

Research of ERP software solutions for global companies

ERP-type business software means a piece of computer information technology for enterprise resource planning. This type of software is considered the most comprehensive solution for the managerial modeling of industrial enterprises and corporations. ERP is usually accompanied by a number of modules with three-letter abbreviations that require additional integration as part of an expensive and time-consuming process in order to achieve optimal functionality. The global companies developing such software include SAP, Microsoft, Oracle, BAAN, Infor, 1C, etc.

The study of various types of ERP software as sources of fundamental knowledge of managing the economy of the enterprise had two aspects: (1) a review of companies that had implemented such software solutions and (2) research projects, including a series of paid working meetings with firms specializing in assisting enterprises with the implementation of ERP software.

More specifically, ISEE implemented four projects studying various types of ERP software as sources of fundamental knowledge of management of the economy. Two of them are presented below:

1. The project implemented in the autumn of 2003 was peculiar;
2. The project implemented in the spring of 2012 is the most recent.

The project implemented in the autumn of 2003

This project differs from all other implemented projects about studying the cognitive potential of the most highly regarded brands of ERP software available on the market. Each of the other projects had the task of studying several brands of ERP-type business software developed by various global companies. The research of a given brand of ERP software invariably includes demonstrations of its capacity to serve as a tool for managerial modeling of

the enterprise. Such demonstrations were conducted by specialists tasked with implementing the software. Based on the knowledge gained during the demonstrations, the ERP-type business software examined was evaluated as a source of effective knowledge for the managerial modeling of economy of the enterprise for machines.

Unlike the other projects, the project implemented in 2003 studied solely the ERP known as BAAN 5.0 business software. The study of the modeling potential of this software was conducted through its experimental implementation in one of the enterprises, part of the base for practical research of ISEE. For this purpose, a license was purchased and consultants who had completed specialist training were hired.

The comparative experimental installation of BAAN 5.0 took place in parallel to the development, implementation, and practical study of the second version of the IT solution developed by ISEE. This version of the IT solution was being used at the same time and at the same enterprise to manage a large-scale campaign for industrial reengineering. In addition, the sales, supply, production, and engineering of new solutions, together with the entire documentation necessary to enable each of the above processes, were also being managed in an interrelated mode. Via this version, engineering models for product costs and quality management were also being developed and implemented. The production capacity was also being modeled.

The parallel comparison did not work in favor of BAAN 5.0. The comparison conclusively demonstrated that BAAN 5.0 was unfit as a tool for industrial reengineering. It was also unfit as an instrument for developing engineering models for product cost and quality management. To a certain extent, BAAN 5.0 was compatible with the IT solution developed by ISEE as an instrument for interlinked management of the processes of sales, supplies, and production and also for production capacity appraisal but with a significantly lower quality of practical capabilities.

The only functional advantage of BAAN 5.0 compared to the proprietary IT solution developed by ISEE was in the area of corporate accounting. This advantage may be described as absolute as the ISEE IT solution does not regard accounting as a management process.

The experimental study of BAAN 5.0 lasted approximately three months. It ended with a major disappointment in its capacity as a tool for managerial modeling of the economy of the enterprise for machines.

The assurances received from consultants that BAAN 5.0 was one of the best instruments for managerial modeling of industrial enterprises were thus cast into doubt. Furthermore, the assertions to the effect that the corporation BAAN had won an exclusive contract against SAP and ORACLE and was the sole supplier of ERP software to BOEING and that BAAN 5.0 was the main IT instrument for corporate management used by BOEING also failed to be

substantiated.

At the time, i.e., at the end of 2003, the ISEE team, more specifically the engineers involved in the experimental rollout, expressed considerable doubts that renowned global IT solutions for the managerial modeling of enterprises for machines could perform so poorly as an instrument for achieving consensus and hence taking concerted action geared towards the management of the future of the enterprise. These doubts were dispersed over time mainly due to the findings from the following two research projects, specifically the last one launched in the spring of 2012.

The project implemented in the spring of 2012

At the beginning of 2012, ISEE celebrated the completion of the third version of the IT solution it had developed. This version was to be used to substantiate the principal premise of ISEE that it is possible to develop IT solutions serving as bearers of fundamental knowledge about management of the economy of a brand-new order. The third version of the IT solution developed by ISEE was to demonstrate the possibility of achieving this.

In order to do so conclusively, the IT solution to be used as an instrument relevant to innovative management of the enterprise as an object and subject simultaneously, the solution had to demonstrate major cognitive advantages and be free from cognitive flaws in comparison to all IT solutions for managerial modeling of the economy of the enterprise available on the market at the time.

The definition of the cognitive advantages and flaws of the IT solution developed by ISEE compared to counterpart IT solutions for enterprise managerial modeling requires, by necessity, a study of these products as sources of knowledge about the enterprises as a systemic object and subject.

In order to fulfill this requirement, at the end of 2011, ISEE launched a market study project to examine the commercially available IT solutions for enterprise managerial modeling as bearers of knowledge about the nature of the enterprise as a systemic object and subject, implementing the said project in the spring of 2012. This is the most relevant and largest-scale project implemented by ISEE, which entailed a market survey conducted in order to review of the commercially available business software.

In preparation for the actual research work to be conducted, a system comprising ten indicators enabling comparison between the IT solution developed by ISEE and other commercially available solutions for enterprise managerial modeling was developed. This system of indicators enabled a comparison and appraisal of the quality of the solutions as a tool for collective consensus and concerted action in corporate management in the spirit of innovation while striving to nurture and develop highly effective human resources.

Three independent working groups conducted the research and analysis, along with the comparative studies and appraisals, of commercially available software and the IT solution developed by ISEE. The first working group comprised representatives of an economic science institute, the second comprised representatives of a technical university, and the third consisted of practicing machine engineers.

Within the framework of the project, 64 companies implementing a wide variety of business software solutions were contacted. A total of 21 working meetings have taken place. As the focus of the study, ISEE has placed the most popular enterprise management modeling IT solutions in 2012 developed by renowned global companies such as SAP, ORACLE, and Microsoft through their IT solutions SAP R/3, SAP HANA, Oracle Business Solutions, Microsoft Dynamics NAV/AX.

The meetings of the working groups tasked with the comparative evaluations organized by ISEE and representatives of the parties responsible for the implementation of the IT projects lasted several days and involved demonstrations of the product capabilities as an instrument for enterprise future management focused on the processes of building technologically innovative human resources.

The results of the comparative evaluations conducted by the three working groups conclusively demonstrated the following:

The third version of the ISEE proprietary IT solution was superior to all other solutions studied under the project and used for managerial modeling of the enterprise, including those most renowned, when assessed against the entire range of indicators.

These evaluations suggested that there is a reason to claim that in mid-2012, ISEE was at the threshold of demonstrating the viability of its thesis, i.e., that it is possible to create IT solutions that can serve as bearers of fundamental knowledge of a brand-new order about economic management.

4.1.2 The *fragmented* BMO as a result of research activity

The research carried out to identify and better understand the available scientific knowledge for the principle of operation of the enterprise for machines is presented in detail in the dissertation of Osterwalder and consists of two types of activities: (1) review of existing scientific publications that talk about Business Models as a knowledge for management describing how the company makes a profit and (2) conducting a total of 11 interviews with 8 managers and 3 business consultants.

In Osterwalder's review of existing scientific publications that talk about business models, he first examines materials ranging from "*Business Model definitions, components, taxonomies, design tools, change methodologies to evaluation measures*" (Osterwalder, 2004).

In his search, Osterwalder found that at the beginning of 2003, the term "Business Model" appeared in the titles of approximately 60 publications, one of which he considered distinctive because it contained a summary table of the contributions of the most influential authors who by the end of 2002 have written publications in the field of Business Models. Based on this table, Osterwalder prepared his own, which includes a list of 20 authors whose works he later used extensively in the creation of the *fragmented* BMO about which he writes: *"The nine building blocks (of the fragmented BMO) are based on a synthesis of the existing business model literature. In other words, I have identified what business model building blocks have been proposed by the other authors in the field and constructed a new model taking their contributions into account. [...] Basically, the nine elements of the Ontology cover all the Business Model building blocks mentioned by at least two authors."* (Osterwalder, 2004)

In conducting interviews, Osterwalder aims first to identify the tools that companies use when planning their company goals and second to check whether the *fragmented* BMO is able to describe the business logic of a company, about which he writes: *"Interrogating business people on the (fragmented) Business Model Ontology is insofar problematic as it is a theoretical construct that cannot directly be evaluated by practitioners as such"* (Osterwalder, 2004)

4.1.3 Comparison of the nature and the scale of the research for the creation of the *holistic* and the *fragmented* BMO

The nature of research activity is determined by its purpose, and a clear answer to the following questions must be sought: "What is the purpose of the research?", "What is attempted to be discovered or proven?" and "What is aspired to be learned?"

The nature of a research activity for the creation of the *holistic* BMO is aimed at researching the existing scientific knowledge for managerial modeling of the economy of the enterprise for machines on a global scale. The process is tied to the attempt to find scientific knowledge, which is capable of being a solid theoretical basis for the creation of a new generation of software that will serve to: (1) form and objectify holistic and unified knowledge about the economy of the enterprise; (2) analyze the enterprise economy and (3) manage the enterprise economy in strategic, tactical, and operational dimensions.

The scale of the research activity for the creation of the *holistic* BMO covers: (1) a large amount of scientific literature in the field of business, management, and economics, (2) discussions with numerous individuals with scientific degrees from various schools of economics and business management on a global scale, (3) discussions with numerous teams of globally recognized consulting firms such as PricewaterhouseCoopers, Deloitte, KPMG and others, and (4) a detailed study of IT products in the field of business software owned by the companies SAP, Microsoft, Oracle, Infor, etc. It is also important to acknowledge the time

invested in research activity. Here we are talking about over 15 years of effort by at least 20 people. Aside from the amount of literature read, an appropriate example is the research from 2011-2012, when 21 meetings were held with leading consulting companies, 51 meetings with representatives of the academic community, and organized in-depth presentations of the leading ERP suppliers.

The nature of the research activity for the creation of the *fragmented* BMO is aimed at researching the content of most serious publications on the topic of Business Models in order to create the structure of the *fragmented* Business Model Ontology. The process is tied to searching for "building blocks" concepts related to Business Models and seeking feedback from managers and consultants during interviews.

The scale of the research activity for the creation of the *fragmented* BMO covers scientific literature in the field of Business Models, which at the time of its creation was extremely scarce, as well as interviews that were carried out with 8 managers and 3 business consultants. This research was done rather to validate the development of the *fragmented* BMO than to research and critically analyze the existing scientific knowledge for managerial modeling of the economy of the enterprise for machines. It is also important to acknowledge the time invested in research activity. Aside from the read literature, we are looking at only about 5 months of research activity (between June and October 2003), expressed in a dozen meetings held by 2 people with a duration of 90 minutes each. That is, the research activity of the *fragmented* BMO in the direction of meetings with representatives of the business and academic elites sums up to just 17 hours.

The comparative analysis of the nature and scale of the research activity for the creation of the two BMOs leads to a clear disparity in the invested time, work, scientific approaches, and conscious responsibility towards creating scientific knowledge for public benefit.

Everything clearly points to the intense and in-depth research activity during the creation of the *holistic* BMO in contrast to the research activity of the *fragmented* BMO, which can be defined as superficial and frivolous.

The analysis of the time spent on research activity during the creation of the two BMOs, concludes that the research activity for the creation of the *holistic* BMO exceeds the scope and scale of the research activity for the creation of the *fragmented* BMO, at least by a hundred times.

4.2 Comparison of the *holistic* and the *fragmented* BMO as a result of experimental activity

The comparison of the *holistic* and the *fragmented* BMO as a result of experimental activity (similarly to the comparison of the research activity) necessarily contains three working steps: first is presented the *holistic* BMO as a result of experimental activity, then is presented the *fragmented* BMO as a result of experimental activity and finally is made a comparison of the nature and scale of the experiments for the creation of the two Business Model Ontologies.

4.2.1 The *holistic* BMO as a result of experimental activity

The Experimental activity for research of the cognitive potential of the *holistic* BMO – as a theory and terminology for creating *holistic* ERP systems – consists of experimental scientific research of a prototype of such an ERP system as a bearer of applied knowledge for effective management of the economy of the enterprise for machines. This activity represents a multiyear cognitive process that runs continuously and inseparably from the necessary development and research activities. Here I will present 5 of the most illustrative examples in this regard. I want to focus on the fact that all of the experiments are carried out in real-world conditions, and 3 of them were conducted in the main laboratory-enterprise of the Applied Research Base of ISEE. These experiments have different research focuses defined as follows:

1. Scientific research of the *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for large-scale industrial reengineering;

2. Scientific research of the *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for SMED and lean manufacturing;

3. Scientific research of the *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for system quality management;

4. Scientific research of the *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for engineering and nurturing a technological elite;

5. Scientific research of the *holistic* BMO as a bearer of knowledge for educating highly effective leaders.

The *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for large-scale industrial reengineering

Implementation site: Hydraulic Elements and Systems PLC, Yambol, Bulgaria

ISEE has conducted a number of industrial reengineering campaigns. Two of these had a major scale, reaching more than 500 workplaces.

1st campaign for large-scale industrial reengineering

The first campaign was conducted between 2002 and 2003. Over a period of approximately 15 months, more than 80% of all workplaces were restructured and relocated. The campaign was notable for the fact that the development and then the management of reengineering implementation was handled by several engineers in parallel, each highly proficient in the modeling of the technological environment and industrial processes through the IT solution designed and developed by ISEE, despite being young and having less than 3 years of professional experience.

2nd campaign for large-scale industrial reengineering

The second campaign occurred immediately after the global economic crisis set in during 2009. During the campaign, which ran from the spring of 2010 until the summer of 2011, more than 70 % of all workplaces were restructured and relocated.

Both campaigns were conducted in a highly expeditious manner, without any delay or suspension of industrial processes. On the contrary, manufacture accelerated in terms of both volume and nomenclature over the course of the reengineering process. During the second campaign, this increase was more than twofold. The studies of ISEE failed to find a precedent where industrial reengineering had ever been conducted by any party that was comparable in terms of investment indicators to the performance achieved in the two campaigns, which would not have been possible without the IT solution designed and developed based on the *holistic* BMO.

The *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for SMED and lean manufacturing

Implementation site: Hydraulic Elements and Systems PLC, Yambol, Bulgaria

In the period between 2009 and 2010, in the short span of 18 months, two engineers without any prior experience in plant design or knowledge of the so-called Lean Manufacturing theory but highly proficient in the ISEE IT solution and its cognitive platforms developed and rolled out a system for SMED and lean manufacturing in two sections comprising a total of approximately 40 digital programming workplaces.

Following SMED, the productivity of the workplaces in question increased between 5 and 10 times. Minimal costs were incurred. A personnel training program was also developed.

By way of comparison, the development and rollout of such a system on a global scale, within a plant owned by a large Western company, would take approximately 6 years, meaning that significantly greater human and financial resources will be needed.

The *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for system quality management

Implementation site: Hydraulic Elements and Systems PLC, Yambol, Bulgaria

In October 2005, the Applied Research Centre conducted a project for the implementation of a system quality management and ISO 9001:2000 certification.

For this purpose, two of the most highly renowned global companies – Lloyd's Register and TÜV Rheinland – were invited as partners. The ISEE team comprised two company employees – an engineer versed in the IT solution developed and a technical assistant. The consultants from Lloyd's and TÜV arrived with the idea that the implementation of the document quality management procedures would take months, and the actual certification audit – many more months of efforts. However, after becoming familiar with the computer technology, they established that all necessary forms and information were already available. All that remained to be done was to ensure they were in a format familiar to the certification bodies.

In mid-December 2005, less than two months later, Lloyd's Register and TÜV Rheinland issued the respective certificates. In the next few years, ISEE was frequently used by TÜV Rheinland as a demonstration base for 'good practices' for other companies wishing to obtain certification under ISO 9001:2000.

The *holistic* ERP system (the *holistic* BMO) as a bearer of knowledge for engineering and nurturing a technological elite

Implementation site: M+S Hydraulic PLC, Kazanlak, Bulgaria

This experiment was conducted between the beginning of 2014 and mid-2015 and is the culmination of the applied research efforts of ISEE. As a result of the privatization and sale of parts of a large manufacturing enterprise in Bulgaria, ISEE was able to purchase remaining fragments and documentation at an excellent price from a high-tech manufacturing solution purchased many years ago from a Western country. The technology in question was applied across five plants, and back in the day, socialist Bulgaria had paid more than EUR 40 million to obtain it. Although the implementation process was well underway, the old regime fell, and the democratic period commenced.

As of the date of their acquisition, both the equipment and the related documentation were obsolete. Despite this, for ISEE, saving fragments of this cutting-edge technology was a blessing because this enabled ISEE to use it in its experiments to test the IT solution developed as a bearer of knowledge for engineering and nurturing an innovative technological elite. For the experiment, a project was initiated. It aimed at technologically expanding and

organizational aligning the joint production at two Bulgarian factories and the sale of the high-tech solutions in question.

A partner factory ready for such an expansion was founded in 2013. The project was launched in early 2014 under the name *Association for Highly Innovative Products - AHIP*.

The ideas underlying the *AHIP* project are the following: (1) to create a team of young engineers with no experience in designing factories but who know theoretically and practically the holistic ERP system and (2) to entrust this team with the planning and management of the work on the expansion of the two factories, with a limit value of € 1.6 million.

The experiment AHIP is carried out in two stages:

1st stage: achieving technological capabilities – especially human resource related – for developing and production of high-tech products that are totally new and unknown to the team.

2nd stage: proving engineering capabilities by achieving high-quality functional parameters of the developed and manufactured products at a highly competitive cost.

The results of this experiment are spectacular: Five young machine engineers without any prior experience in plant design but thoroughly versed in the ISEE IT solution designed, built, and backed up the operation of the expanded technological environment at both plants. They did so for the same amount of time and money that foreign consulting companies required to simply update the product documentation. Under their leadership, four workers without any specialist experience took 9 months to learn a range of high-tech processes, which usually require 25 to 30 highly skilled specialists trained at global companies.

In June 2015, the products manufactured from AHIP were sent to a renowned specialist laboratory in Germany. Experts there found it hard to believe that products of such type and quality could have been designed and manufactured in Bulgaria. Thus, it was announced that the experiment was completed successfully.

The *holistic* BMO as a bearer of knowledge for educating highly effective leaders

Implementation site: Battery plant Tungstone, Ryazan, Russia

Unlike other experiments, this one was conducted outside of Bulgaria and without direct use of computer technology, relying solely on knowledge and understanding of its theoretical foundations – the new BMO.

The experiment was initiated by a young Associate Professor at the Russian Academy for the Economy. Within the remit of his professional competence, for years on end, he has been making efforts – in his capacity as a member of the Board of Directors of a hydraulic product manufacturing plant – to implement the Japanese Lean Manufacturing philosophy. He ultimately reached the conclusion that the results did not justify the effort invested.

In 2007, the associate professor and colleagues from the plant, visited the Applied Research Centre of ISEE. There, he saw the second version of the IT solution in action and felt drawn to its theoretical foundations. The intellectual attraction was so great that he convinced the authors of the theoretical foundations to familiarize him in detail with their work and grant him the right to use it in his work as a researcher.

In order to gain a thorough understanding of the theoretical premises and foundations of the IT solutions developed by ISEE, the Associate Professor visited Bulgaria twice, each time for one month, in the summers of 2008 and 2009. At the end of the second visit, he shared his intention to conduct practical experiments in order to test the theoretical knowledge gained by concluding a trust management agreement with a mid-sized Russian plant for the production of car batteries. True to his word, he took full responsibility for the plant from 2010 to 2012.

At the end of 2009, the plant had a headcount of 176 employees, who manufactured between 6 000 and 7 000 car batteries a month worth between EUR 170 000 and 190 000, or approximately EUR 2.1 to 2.3 million per year.

At the end of 2012, the plant had a headcount of 196 employees, who manufactured between 32 000 and 34 000 car batteries a month worth between EUR 900 000 and 1 000 000 or approximately EUR 11 to 12 million per year. This means that labor productivity increased more than four times and sales increased almost five and a half times. It is important to note that all investments made over the three years amounted to less than EUR 1 (one) million.

In this regard, the Associate Professor has said: *'I let all economists go. I also changed three accountants and finally found one who was a mathematician. I changed the entire management approach, shifting it away from accountancy and towards engineering. The construct of your ERP system I recreated in Excel – in a car battery factory this can be achieved, but in a factory for more complex products such as those in the field of hydraulics this would be an impossible task'*

Overview of the results from the implementation of the *holistic* ERP system (the *holistic* BMO) *Hydraulic Elements and Systems PLC*

Hydraulic Elements and Systems PLC (HES) is the main laboratory-enterprise in the Applied Research Base of ISEE.

On the eve of "democratic changes" that began at the end of 1989, HES had 4 territorially separate manufacturing sites with over 2,500 employees. Over 70% of the total production consisted of two types of hydraulic cylinders for electric and motor forklifts, and within each of these types, there were modifications that differed between each other in diameter and length, but in technological terms these differences were insignificant. It can be said that in the last 5 years before the democratic changes, HES, cooperating through COMECON, held over

20% of the world's production of hydraulic cylinders for electric and motor forklifts and was an example of a large batch size enterprise in the industry.

At the beginning of March 1997, when Peter Bachvarov (one of the two authors of the *holistic* BMO) was elected a member of the Board of Directors of HES, the company was almost bankrupt – it employed a little over 1000 people. However, the average salary was less than 10 dollars a month, and the technical environment was in a deplorable state.

A vague idea of the state of the technical environment of HES at the beginning of 1997 can be obtained from the following three photos. (Figure 4.1)

Figure 4.1 Condition of the enterprise before the experimental activity (1997)

The following three photos (Figure 4.2) should create a notion of the state of the technical environment of HES at the end of 2011, when the three experiments had already been completed and all business processes in the company, including production, were being managed based on knowledge of the *holistic* BMO and through a holistic ERP system.

At that time, the whole activity was focused on only the largest territorial site, where about 600 people worked with an average salary of $630 per month, which was 1.5 times higher than the national average, and over 90% of the production was exported to Western Europe and the United States.

Figure 4.2 Condition of the enterprise after the experimental activity (2011)

Realizing that the above photos are not sufficient to illustrate well enough the 20 years of economic development of HES, development possible because of the knowledge about the *holistic* BMO and the implementation of a *holistic* ERP system, I will present the following 4

graphs:

The first graph (Figure 4.3) shows the attained sales of HES over a twenty-year period, as well as the investments made during that time.

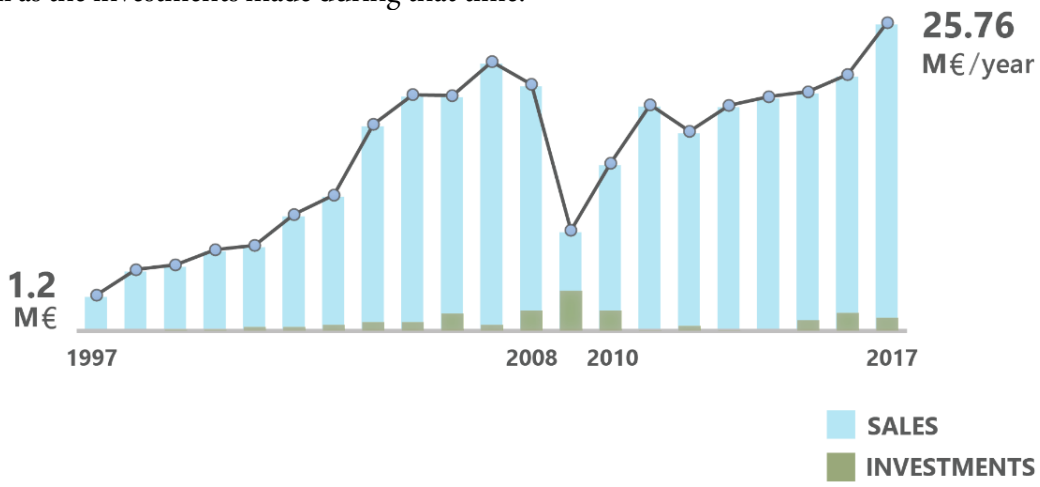


Figure 4.3 Attained increase of sales via holistic ERP management as per investment made

The above graph clearly shows the global economic crisis of 2008/2009, which is defined by professional economists only as a financial crisis. However, the truth is that during that time, the decline of HES was nearly 3 times, while in the enterprises along its sales chains and deliveries were from 1.8 to 2.2 times. The western clients of HES reduced their stocks by transferring more weight from the crisis onto HES as a Bulgarian (non-western) enterprise.

The second graph (called demassification, Figure 4.4) shows the developed ability of HES to engineer and manufacture products in small batches via a holistic ERP system over a twenty-year period.

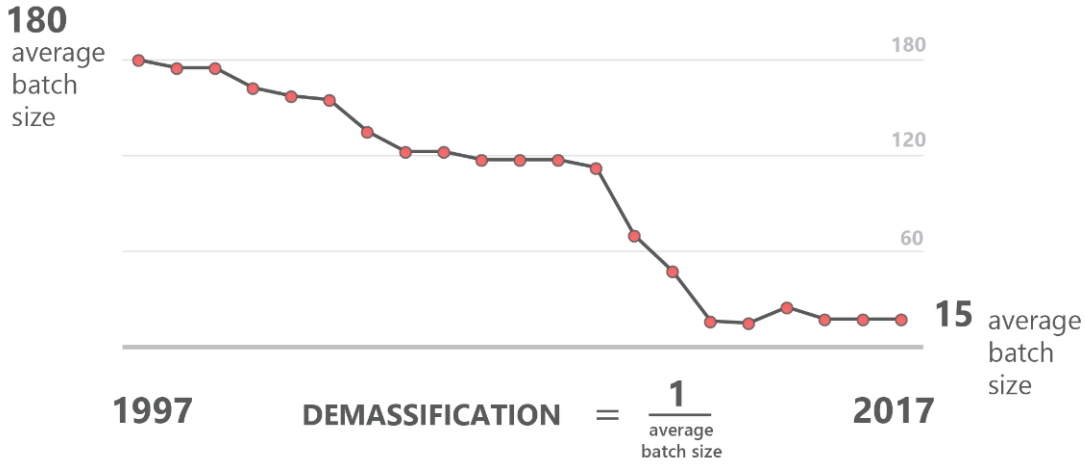


Figure 4.4 Developed ability to engineer and manufacture products in small batches via holistic ERP system

It should be borne in mind that the number 180 as an average batch size in 1997 is very misleading, because it was obtained during an extremely low staff workload who in the years before the "democratic changes" used to work with batch sizes of several thousand units and with a very considerable design and technological similarities between the objects of the different batches.

The third graph (Figure 4.5) shows the developed ability of HES for new product implementation via a holistic ERP system over a twenty-year period.

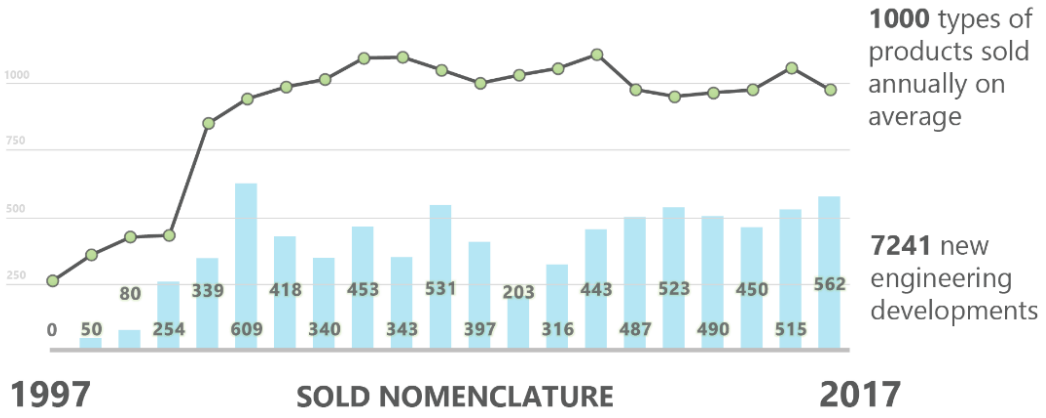


Figure 4.5 Developed ability for new product implementation via holistic ERP system

The above graph clearly shows that in 1997 there was not a single engineering development for new product implementation. There were only eight engineers in the enterprise who dealt with all the various information received from potential customers about the products they required, and on this basis, they make their own sketches (in rare cases and engineering drawings) and then "help" as much as possible the so-called "workshop technologists", as well as the more prominent workers defined as "craftsmen" to implement the relevant products in production. The product cost calculation was handled by a department called "Norms and Limits", in which the eight engineers were also helping.

Thus described organization of the enterprise's process of new product implementation shows clearly that from the standpoint of 1997, HES has no future. Its days are numbered, and a radical change is needed. The necessary change was made in the next 3 years based on the knowledge of the *holistic* BMO. At that time, this knowledge was still in its infancy stage. However, it's development was entirely focused on the idea of digitalization of engineering developments so that they become a direct means of unified management of the functional systems for sales, production, and supply.

In the second half of 1997, HES attracted and hired 12 machine engineers, each with less than a year of professional experience in this field. In the first half of 1998, the new hires were introduced to the initial form of the *holistic* BMO. At the beginning of the second half of the

same year, ISEE provided these engineers with an "*embryonic variant*" of the 1st version of its IT solution, which led to the practical possibility for the engineering developments to become a direct means for unified management of the functional systems for sales, production, and supplies.

By the end of 2001, the 1st version of this IT product was completed, and in 2002-2003, many young engineers developed and led the above-described first production reengineering campaign. This campaign is also the reason why the graph of engineering developments shows the most in 2002.

1999, 2000, and 2001 were years of development of both the engineering capital of HES and the IT solution of ISEE. By the end of 2001, the 1st version of the IT solution was completed, and in 2002-2003, it was delegated to the young and inexperienced engineers to develop and lead the above-described "*1st campaign for large-scale industrial reengineering*." This campaign is also the reason why the graph for engineering developments shows the most in 2002.

It should be added that the engineering developments required for the '1st campaign for large-scale industrial reengineering' not only determined the labor norms and material limits but also included "engineering organizational cost analyses" of the products. All this occurs during the planning stage and is even done in technological variants.

Following the successful completion of the *1st campaign for large-scale industrial reengineering*, the role of the engineers providing design and technological documentation was transformed from 'servicing' in 1997 to 'central management' in 2003.

After this relatively comprehensive presentation of the *holistic* BMO as a result of experimental activity, I will present the *fragmented* BMO as a result of experimental activity.

4.2.2 The *fragmented* BMO as a result of experimental activity

The experimental activity for research of the applied potential of the current BMO finds no representation in the context of the definition given for BMO. It does not even cover any industrial enterprise. The whole experimental activity is focused on a past event – the already held Jazz Festival in Montreux, Switzerland – periodically organized by a specially created for this purpose Foundation. Ignoring the overall activity of the Foundation, Osterwalder tried to apply his BMO in order to create a model of the economy of the last at that time Montreux Jazz Festival, about which he wrote:

" The case study of the Montreux Jazz Festival MJF serves as an illustration of the business model ontology. Furthermore, it examines the ontology's applicability to a real-world case and shall help eliminate incoherencies. The case study was accomplished through information research on the Internet, a series of open interviews with executives and employees of the MJF

and a study on the MJF and its impact on the region. [...] Below I present an overview of the MJF's business model as well as a bird's eye view"

<table>
<tr>
<td rowspan="2">Key Partners

Artists, sponsors, shops, F&B, volunteers, media, infrastructure, general festival partners, "Friends of the Festival", musical partners, Montreux municipality</td>
<td>Key Activities

Contract musicians, contract sponsors, ticketing, advertising / concerts, F&B...</td>
<td rowspan="2">Value Proposition

MJF Concerts,
MJF off,
Frequentation,
MJF Sponsorship,
Festival recordings,
MJF Brand & Franchise</td>
<td>Customer Relationships

None are presented</td>
<td rowspan="2">Customer

Festival visitors
Shops
Sponsors
Record, TV, artists
Franchisees</td>
</tr>
<tr>
<td>Key Resources

Attractive MJF venue
Contract stars
Attract people
Mobilize volunteers
Atmosphere...</td>
<td>Channels

Montreuxjazz.com
MJF event
Ticket Corner
MJF program
Media...</td>
</tr>
<tr>
<td colspan="3">Cost

Infrastructure {20%}
Artists {29%}
F&B {10%}
Merchandising {2%}
Production {16%}
Fixed costs {15%}
Marketing {4%}
Divers {4%}</td>
<td colspan="2">Revenue

Ticket sales {41%}
Sponsoring {20%}
F&B {28%}
Merchandising {5%}
Recordings {4%}
Diverse {2%}</td>
</tr>
</table>

Figure 4.6 The current BMO applied to the Montreux Jazz Festival (*bird's eye view*)

The dissertation continues with explanations in four sections: product, customer interface, infrastructure management, and financial aspects.

In the **product** section, Osterwalder describes the main activities of the Montreux Jazz Festival, which bring in revenue.

In the **customer interface** section, Osterwalder outlines the target customers to whom the festival is addressed, through which channels it does this, and what relationships it maintains with the customers of the festival.

In the **infrastructure management** section, Osterwalder describes the main activities needed to organize the festival. He outlines the main quality characteristics of the festival and shows the various partnerships within the festival.

In the **financial aspects** section, Osterwalder presents the accounting structure of the festival's revenues and expenditures.

4.2.3 Comparison of the nature and the scale of the research for the creation of the *holistic* and the *fragmented* BMO

Upon careful review of the described experimental activities for the creation of the *holistic* and *fragmented* BMO, inevitably comes the conclusion that the nature and scale of the experiments performed are incomparable. Not only that but also considering the scope of the experiments, it can be argued that the experimental activity of applying the *fragmented* BMO

lacks seriousness.

4.3 Comparison of the *holistic* and the *fragmented* BMO as functional capabilities

By definition, Business Model Ontology means a schematic and formulated description of the principle of operation of an enterprise for machines as a systemic object bearer of the characteristic subjecthood. The social importance of such knowledge is presented in Chapter 2, and it comes down to three operational functions, which together form one fundamental function. The business model ontology should be a theoretical and terminological basis for the creation of a new generation of software, which should be a key tool for the execution of the described operational functions as it serves to: (1) form and objectify holistic and unified knowledge about the economy of the enterprise; (2) analyze the enterprise economy and (3) manage the enterprise economy in strategic, tactical, and operational dimensions.

The comparison between the *holistic* and the *fragmented* BMO as a result of experimental activity unequivocally shows that the *fragmented* BMO does not have any of the functionalities shown above. At the same time, all these capabilities are inherent in the *holistic* BMO. In this sense, it can be stated again that the *holistic* and the *fragmented* BMO are in fact incomparable.

And thus, naturally, the question arises: *" Why is there such a gap in the functionality of the new and current BMO?"* The answer to this question is contained in the following part of this Chapter.

4.4 Comparison of the *holistic* and the *fragmented* BMO as invested time and motives for their creation

The methodology for the creation of the *fragmented* BMO (as an example of an application of the philological approach for scientific research), which was presented in Chapter 2, is realized through the process of writing a doctoral dissertation.

In this process, a maximum of 2 people (Osterwalder and his supervisor) took part for a period of 4 years. Given that in one year, there are 250 working days, and one working day has 8 working hours, it turns out that the man-hours invested are utmost 16,000.

The methodology for the creation of the *holistic* BMO (as an example of the application of a laboratory approach), which was introduced in Chapter 3, was realized through the process of developing and experimenting a prototype of a new order of quality ERP system. The creation of the *holistic* BMO (as theory and terminology) was an absolutely necessary condition for carrying out this process.

In this process, more than 40 people from the Laboratory System described in Chapter 3 took part (15 in the development core, 5 in the organizing division, and well over 20 in the Applied Research Base), which has continued for 20 years. Given that in one year, there are 250 working days, and one working day has 8 working hours, this sums up to well over 1,600,000 man-hours, which means 100 times more man-hours were invested in the creation of the *holistic* BMO in comparison to the creation of the *fragmented* BMO

The massive difference in invested time, and hence in the functional capabilities of the current and the *holistic* BMO, finds a logical explanation in the personal motives of the people leading the processes for the creation of the current and the *holistic* BMO

The leaders of the process of creation of the *fragmented* BMO are Alexander Osterwalder and Yves Pigneur. At the beginning of the process of creation of the *fragmented* BMO, as well as during the whole process, they both worked at the University of Lausanne, Switzerland, Faculty of Business and Economics, Department of Information Systems. The former was a research fellow in this Department, and the latter was a professor of Management Information Systems.

As mentioned in Chapter 2, the idea of the *fragmented* BMO was born when defining the topic of A. Osterwalder's doctoral dissertation with supervisor Y. Pigneur. In this sense, the process of creation of the *fragmented* BMO is part of their official obligations for which they receive a salary.

Leaders in the process of creation of the *holistic* BMO are Peter Bachvarov and Anna Videva. At the beginning of this process, during the second half of 1996 and the first quarter of 1997, they worked in a private company for construction equipment and technology owned by P. Bachvarov. During the rest of the process, they led and managed the Laboratory System formed and partially financed by them.

By the middle of 1996, P. Bachvarov and A. Videva invested a lot of time and effort in mastering the then-existing fundamental scientific knowledge for economy in all its fragments. They had become admirers of Luca Pacioli, Frederick Taylor, and especially William Deming and his book *The New Economy* – central to this book is what Deming calls a *diagram of the production viewed as a system*, or *flow diagram* (Deming, 1993).

Here is what Deming wrote in his book about the *flow diagram*:

*"... **What ignited Japan?** The flow diagram shown was the spark that in 1950 and onward turned Japan around. It displayed to top management and to engineers a system of production. The Japanese had knowledge, great knowledge, but it was in bits and pieces, uncoordinated. This flow diagram directed their knowledge and efforts into a system of production, geared to the market – namely, prediction of needs of customers.*

The whole world knows about the results. This simple flow diagram was on the

blackboard at every conference with top management in 1950 and onward. It was on the blackboard in the teaching of engineers.

Action began to take place when top management and engineers saw how to use their knowledge..."

In Bulgaria, as well as in some other Western countries, Deming is defined as *the father of the Japanese economic miracle*. However, very few people know that Deming's miraculous tool is his *diagram of the production viewed as a system* (or *flow diagram*, Figure 4.7), which in the context of this MBA thesis can also be appropriately defined as the world's first Business Model Ontology.

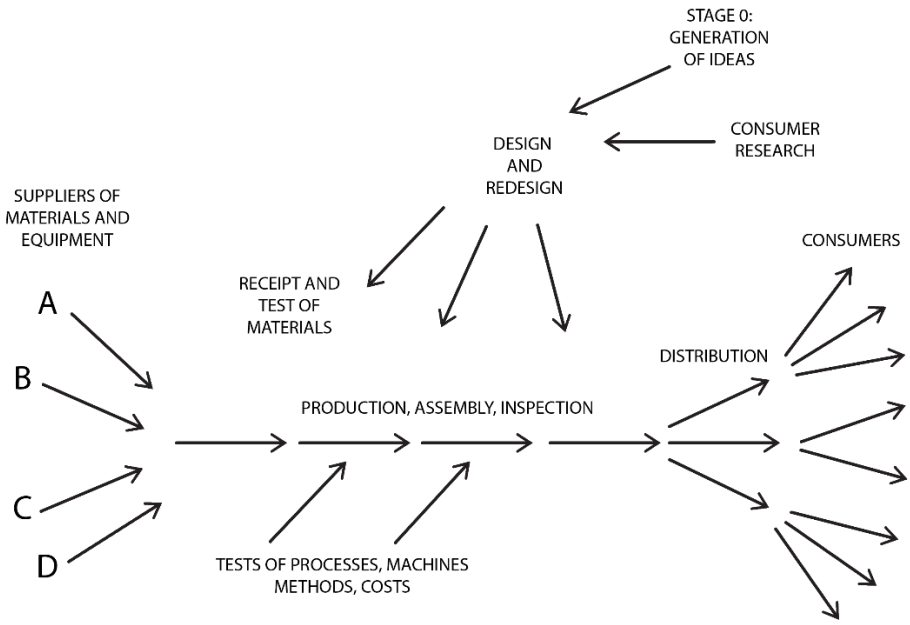


Figure 4.7 Deming's Flow Diagram

From the standpoint of today's digital world, and also from the standpoint of the *holistic* BMO, the model of William Deming looks archaic. However, history has shown that this has not prevented it from being miraculous.

P. Bachvarov and A. Videva were deeply impressed by Deming's book. This impression was further strengthened after reading Michael Hammer and James Champy's book "*Reengineering the Corporation: A Manifesto for Business Revolution*" (Hammer & Champy, 1993). All of this led to the birth of the idea of creating a schematic of the principle of operation of the enterprise as a single functional system. Schematic that bears a cognitive potential for developing an IT product capable of creating a managerial model of the economy of an enterprise.

After the birth of this idea (middle of 1996), P. Bachvarov and A. Videva began to believe that the destroyed Bulgarian industrial economy – as a result of the 7 years of democratic

change to that date – could be revived (just like the Japanese economy after World War II) via dissemination of an IT product that is a bearer of knowledge about the principle of operation of the enterprise as a single functional system. At that time, they also believed that there were such IT products to the West, but those products had not yet reached Bulgaria.

This belief of P. Bachvarov and A. Videva dictated their decision to try and enter the management of a large (for the conditions of Bulgaria) enterprise for machines and to implement some of the most renowned Western IT products, which were bearers of the above-mentioned knowledge, and after a successful implementation, to become consultants-implementers working for the mass dissemination of this product as a means of reviving the Bulgarian industry.

The first part of this strategy was successfully realized at the end of the first quarter of 1997. However, the second part of the strategy of P. Bachvarov and A. Videva couldn't be accomplished because a few months later, they realized that the West had not yet created an IT product like the one they were looking for. Thus, they were presented with two choices: either to forget about their ambition and return to their previous endeavors or to form a team and create the IT product they were looking for.

From all that has been said so far, it is clear that the process of creation of the *fragmented* BMO is governed from the standpoint of *scientific individualism*, while the *holistic* BMO is from the standpoint of *scientific collectivism*.

Scientific individualism means that the knowledge that is being created as a result of research aims to serve a limited range of personal or corporate interests, not the interests of human society as a whole – synonymous with this concept is the concept of *social egoism* (Nyberg, 2010). Social egoists receive more benefits from society than they give back to it. I believe that A. Osterwalder and Y. Pigneur are aware of the low (or rather harmful) quality of their *fragmented* BMO. However, after realizing the tremendous public deficit of this type of knowledge, they started to spread their BMO in order to extract maximum personal gain in the form of world scientific recognition and a lot of money. And this is understandable because they live in the conditions of liberalism.

Various academic dictionaries describe that the terms *individualism* and *social egoism* are often associated with the political idea popular as *liberalism* (Hudelson, 1999; Carlson, 1972).

An antonym of the term *scientific individualism* is the term *scientific collectivism* (Biddle, 2012). It means that the knowledge that is being created as a result of the research is aimed primarily at serving the interests of human society as a whole – synonymous with this term is the term of *social altruism* (Kelley, 2010). Social altruists receive less from society than they give to it. P. Bachvarov and A. Videva do not receive a salary (unlike A. Osterwalder and Y. Pigneur) for leading and managing the process of creation of the *holistic* BMO. On the contrary, they

have financed this process with substantial personal finances. They also did not seek public recognition without being convinced that their *holistic* BMO would be truly useful for the development of industrial human capital. They published their books in limited editions, given that at that time, their IT product was not yet experimentally proven as a bearer of applied knowledge for engineering and nurturing a technological elite. This behavior of P. Bachvarov and A. Videva (radically different from that of A. Osterwalder and Y. Pigneur) as leaders of the processes for the creation of their BMO finds a logical explanation in the fact that they were brought up and were educated in the conditions of socialism.

Academic dictionaries link the terms *collectivism* and *social altruism* with the political ideas of *socialism* and *communism* (Blonna, 1977).

The vast difference between the invested time and the personal motives for the creation of the *holistic* and *fragmented* BMO understandably leads to the beforementioned gap in the functionality of the *holistic* and *fragmented* BMO.

CHAPTER 5
EFFECTS OF THE MASS DISSEMINATION OF THE NEW HOLISTIC BUSINESS MODEL ONTOLOGY

The effects of the mass dissemination of the *new holistic* Business Model Ontology will be present in the form of a PEST analysis which is made under the condition that in the foreseeable future, the knowledge about the *holistic* Business Model Ontology is widely disseminated and comparable in scope with the dissemination of the knowledge about anatomy and physiology of the human body.

This PEST analysis is also made under the condition that not so much the development of the external environment affects the mass dissemination of the knowledge about the *holistic* Business Model Ontology. However, instead the mass dissemination of this knowledge would affect the development of the external environment. Therefore, it would be reasonable to do the PEST analysis in reverse.

5.1 Technological effects of the mass dissemination of the *holistic* BMO

The *holistic* Business Model Ontology is a laboratory-proven new fundamental scientific knowledge of economy that can replace, complete, and evaluate the practical significance of all the individual fragments of the currently existing knowledge. This new knowledge of economy is in the form of theory and terminology, which is a basis for developing *digital information technologies* for the creation of a *comprehensive and continuous managerial digital model of the economy of an enterprise for machines* – here, these technologies are called ***holistic ERP systems***.

5.1.1 The objective meaning of the term *holistic* ERP system

A clear and precise understanding of the objective meaning of the term holistic ERP system inevitably requires a clear and precise understanding of the term *comprehensive and continuous managerial digital model of the economy of an enterprise for machines*. Nowadays, everyone knows what digital information technology is, so from the standpoint of the current research, the expression *comprehensive and continuous managerial digital model of the economy of an enterprise for machines* remains a problematic area.

The explanation of the objective meaning of the expression *comprehensive and continuous managerial digital model of the economy of an enterprise for machines* will be done in two stages.

In the first stage, I will answer the question "what is *economy of an enterprise for machines?*", and in the second stage, I define the objective meaning of the whole expression.

What is *economy of an enterprise for machines*?

The objective meaning of the term *enterprise for machines* is related to what accountants would call *capital of the enterprise for machines* – this is a purposefully organized (for profit) set of various objects (including debit and credit relationships) that are owned by the enterprise – a subject that is part of the industry for machines.

It is relatively easy to explain the objective meaning of the term *enterprise for machines*. However, it is incomparably more difficult to achieve a clear understanding of the objective meaning of the term *economy*.

Any highly educated modern person who freely and regularly uses the Internet, but has never set a purposeful goal to achieve a conscious understanding of the term *economy*, will accept the above statement as ridiculous because: (1) such a person believes that he himself has a clear understanding of the objective meaning of the term *economy* and this understanding is very similar to that of all people like him and (2) such a person also believes that the enormous investments of the Western world for the development and dissemination of scientific knowledge of the phenomenon called *economy* – investments of billions of man-hours and tens of billions of euros a year – are reflected on the Internet in the form of thousands of publications that have substantially similar definitions of the objective meaning of *economy* and these definitions provide a clear and unambiguous understanding of this term (Stefanov & Velev, 2022).

But suppose this person carefully researches the various publications on the Internet, he will understand that such a belief is unfounded because not only will he not find definitions that give a clear and unambiguous understanding of the term *economy*, but he will also come across texts that read:

"***Economy*** *– a voluminous and multifaceted term, different people fill it with different content. Opening any dictionary, both encyclopedic and economic, you can find many interpretations of it."* (Bardovskiy, Rudakova, & Samorodova, 2011)

Or "*Each textbook or dictionary of economics gives its own definition of the phenomenon of economy."* (IME, 2021)

If the above two statements are accepted as true, then two hypotheses must be considered:

1st Hypothesis – the term *economy* is not directly related to the existence of classes of objects inherent in real life and this makes it pointless to make efforts for creation, development, and dissemination of scientific knowledge that leads to a clear understanding of the objective meaning of this term;

2nd Hypothesis – the term *economy* is directly related to the existence of classes of objects

inherent in real life. However, for one reason or another, the professional society of economists has no interest and hence work aspirations to make purposefully organized efforts for the creation, development, and dissemination of scientific knowledge that leads to a clear understanding of the objective meaning of this term.

The first hypothesis should be rejected. Any working group of several project engineers – with proven potential in their field – could develop an educational knowledge that leads to a clear understanding of the objective meaning of the word *economy*. In its content, such a development will not be significantly different from the development made as a necessary part of the process of creation of the *holistic* BMO – a development which, to my knowledge, took nearly 300 hours, parts of which I present below:

" The term 'economy' forms an idea of the process of manageable existence of artificial systemic Objects, which are bearers of systemically realized Subjecthood, generally defined as 'economic units'.

In modern reality, the set of objects defined as 'economic units' contains three types of such units: (1) geopolitical, (2) industrial, and (3) household.

'Geopolitical economic units' are: (1) the countries and (2) the administrative and political regions of a country.

'Industrial economic units' are: (1) individual enterprises of different type and scale of their activities and (2) associations of enterprises in the form of corporations and holdings.

'Household economic units' are: (1) family households, different in scope of property and human resources, and (2) single-person households, considered as a special case of family households.

The three cognitive dimensions of the term 'economic unit' define three cognitive dimensions of the term 'economy': (1) Geopolitical economy; (2) Industrial economy; (3) Household economy.

The term 'geopolitical economy' has specific manifestations in three geopolitical dimensions: (1) domestic, (2) supranational and (3) national, as the national dimension of geopolitical economy is commonly referred to as national economy.

The term 'national economy' represents the process of existence of the country as a systemic object, driven by its functional systems.

The term 'enterprise economy' represents the process of existence of the enterprise as a systemic object, driven by its functional systems."

Having said all that, I define ***economy of an enterprise for machines*** as the process of existence of the **capital of the enterprise for machines**, driven by its functional systems, in the space and time of the global world.

Using the above definition, the following two analogies can be made: (1) an analogy

between the term economy of an enterprise for machines and the term human life; and (2) an analogy between the term capital of the machinery enterprise and the term human body.

If we think about it, human life is the process of existence of the human body, driven by its functional systems, in the space and time of the global world. As long as the functional systems of the human body are interconnected, the person lives, but if the interconnectivity of the functional systems is permanently disrupted, the person dies.

In the same way, as long as the functional systems of the enterprise are interconnected, the enterprise lives. However, if the interconnectivity of the functional systems is permanently disturbed, the enterprise dies.

What is a *comprehensive and continuous managerial digital model of the economy of an enterprise for machines*?

After defining the objective meaning of the term economy of an enterprise for machines – as the process of existence of the capital of the enterprise for machines, driven by its functional systems, in space and time of the global world – it is time to define the objective meaning of the expression comprehensive and continuous managerial digital model of the economy of an enterprise for machines. I will be doing that in three steps.

In the first step I will define the concept of a **digital** model of the economy of an enterprise for machines, in the second step I will define the concept of a **managerial** digital model of the economy of an enterprise for machines, and in the third step I will define the whole expression.

Digital *model of the economy of an enterprise for machines* – this is a computer representation that recreates the process of existence of the capital of the enterprise for machines, driven by its functional systems, in the space and time of the global world.

Managerial *digital model of the economy of an enterprise for machines* – this is a digital model of the economy of an enterprise for machines, which sets the collective and individual responsibility for the management of the capital of the enterprise for machines, in the space and time of the global world.

Comprehensive and continuous *managerial digital model of the economy of an enterprise for machines* – this is a managerial digital model of the economy of an enterprise for machines, which covers the entire capital of the enterprise managed by its functional systems, recreating the movement of capital continuously over time in the 3 managerial dimensions: (1) strategic, (2) tactical, and (3) operational – this kind of model of the enterprise for machines can only be created through a *holistic ERP system*.

Information technology for the creation of a *digital model of the economy of the enterprise for machines* does exist and there are two types: (1) computer programs for the creation of an accounting model of the enterprise for machines and (2) fragmentary ERP systems (described in Chapter 3) which are based on the currently fragmentary scientific

knowledge for modeling the economy of the enterprise, and in which the central place is occupied by the knowledge about creation of an accounting model of the enterprise. It should be mentioned that the developers of fragmentary ERP systems claim that the model of the economy of the enterprise, which is created through these systems, is *managerial*. However, given that this model is not *comprehensive and continuous*, its definition as truly *managerial* is subject to doubt.

Chapter 3 presented in detail the functional advantages of the holistic ERP system over the most renowned fragmentary ERP systems. However, one significant advantage was omitted – the advantage that the holistic ERP system is a *digital meta-technology*.

5.1.2 The holistic ERP system as a digital meta-technology

In almost every specialized dictionary, the term **technology** is defined as the sum of any methods, processes, materials, and equipment used to achieve the desired result – the way to transform the given into the necessary. The technology includes the sequence of operations and procedures, as well as the organizational documentation related to the used machines, equipment, tools, and materials. The word technology comes from Greek: τέχνη - art, skill, cunning of hand and λόγος – reason, logic.

Meta-technology is a fundamental instrument for the creation of a multitude of technologies for a given area. Meta-technology includes management of cognition, organizational and technical requirements, modeling of principle and implementation methods, etc. used for the creation of new technologies, while digital meta-technology means that a meta-technology is embedded in a digital product.

In the context of these definitions, the theory and terminology of the *holistic* BMO is meta-technology, and the prototype of the holistic ERP system created by ISEE is digital meta-technology. This statement is practically verified by the experimental activity for the creation of the *holistic* BMO (presented in Chapter 4).

It must be noted that all the described experiments were carried out by young machine engineers who do not have a conventional scientific education and any practical experience in the relevant areas but are familiar with the theoretical foundations and practical possibilities of the holistic ERP system created by ISEE.

Naturally follows the conclusion that a person who has acquired the knowledge and skills to work with a holistic ERP system, in terms of theory, terminology, and digital technology, achieves a cognitive superiority in the field of managerial modeling of the industrial economy over any other person who has not acquired such knowledge and skill. This fact underlies the social effects that would result from the mass dissemination of the *holistic* Business Model Ontology.

5.2 Social effects of the mass dissemination of the *holistic* BMO

The social effects of the mass dissemination of knowledge about the *holistic* Business Model Ontology will be many, however, in my opinion, the most significant are two, which consist in forming two new professional classes. The first is defined by the term *systemic economic engineers* and the second by the term *holistic industrial economists* (Stefanov & Velev, 2022).

1st social effect:

Systemic economic engineer is any professional machine engineer who, as a result of purposeful education, has acquired fundamental and specialized engineering knowledge in a certain field of the industry for machines, but unlike the current machine engineers has also acquired theoretical and practical knowledge of the *holistic ERP systems*. The idea of *systemic economic engineer* is a continuation of the idea of the *Engineer as an economist* (Towne, 1886) – an idea born in the late 19th century that led to the three engineering waves in the development of fundamental scientific knowledge of economy. Engineering waves that during the 20th century made The United States of America the world economic leader.

For a few months, a future (still not graduated) or current (already graduated) machine engineer can learn theoretically, terminologically, and to some extent practically the functional construct of a holistic ERP system and, in this way, become a systemic economic engineer – an engineer who has knowledge about managerial modeling of the economy of enterprises for machines, knowledge which is superior in this field, counting the knowledge of the consultants from the Big Four for business audits and management consulting: Deloitte, KPMG, Ernst & Young, and PricewaterhouseCoopers.

From the research done and partially shown in Chapter 4, the most significant such advantages are the following:

(1) The systemic economic engineer has the ability to thoroughly understand, and then clearly explain the principle of operation of the enterprise for machines as a ***systemic object*** as a result of the continuous interaction of its 5 functional systems and, on this basis, to provide clear and understandable answers to questions such as:

What is *economy* and *capital* of an enterprise for machines?

What is *economic result* in the form of a *profit* or *loss* of an enterprise for machines?

How does the term *goods* differ from the term *services* produced by an enterprise for machines?

(2) The systemic economic engineer has the ability to thoroughly understand, and then clearly explain the principle of operation of the enterprise for machines as a ***systemic subject*** that forms a hierarchical structure of knowledge for managing its economy (Subjecthood Implementation System – SIS) and on this basis provide clear and understandable answers to

the questions:

What is *existential cognition* of an enterprise for machines?

What is *implementational cognition* of the enterprise for machines?

What is *principle cognition* of the enterprise for machines?

What is *functional cognition* of the enterprise for machines?

What is *foundational cognition* of the enterprise for machines?

(3) The systemic economic engineer, on the basis of the knowledge for the principle of operation of the enterprise for machines as a systemic object and subject, forms practical knowledge for development of highly effective strategies for the future economic development of the enterprise for machines with a focus on anticipatory development of its innovation potential. This knowledge enables a systemic economic engineer, if not to develop personally, at least to participate in the development or to lead the development of such strategies.

(4) The systemic economic engineer possesses the ability to clearly explain the capabilities for managing product cost and quality of the goods and services created by an enterprise for machines. Based on this understanding and with the help of a *holistic* ERP system, he can make (in terms of product cost and quality) technological analysis of the process for the creation of those goods and services while offering technological trajectory variants.

(5) The systemic economic engineer possesses practical knowledge for development of highly effective programs for training, retraining, and motivation of the staff of an enterprise for machines. Programs aiming toward the realization of the strategies for future economic development of the enterprise for machines.

(6) The systemic economic engineer possesses practical knowledge for planning and management of the execution of **engineering** of enterprises for machines or large parts of them.

(7) The systemic economic engineer possesses practical knowledge for *planning and* management of the execution of **reengineering** of enterprise for machines or large parts of them.

(8) The systemic economic engineer possesses practical knowledge for planning and management of projects for implementation of a quality management system for the goods and services sold by the enterprise for machines.

(9) The systemic economic engineer possesses practical knowledge for planning and management of projects for implementation of systems for lean manufacturing (Single-Minute Exchange of Die – SMED) of goods and services sold by the enterprise for machines.

(10) The systemic economic engineer possesses practical knowledge for audit of enterprise for machines in order to assess the current and future development of their economy and to generate ideas for increase of the effectiveness of this development.

(11) The systemic economic engineer possesses practical knowledge for planning and management of projects for construction and further development of information systems for

managerial modeling of the economy of the enterprise for machines.

(12) The systemic economic engineer possesses conceptual knowledge for the creation and development of a truly effective accounting model of the economy of the enterprise for machines.

2nd social effect:

The second social effect manifests through the formation of one more new professional class defined as *holistic industrial economists*.

Holistic industrial economist is any current professional industrial economist who, as a result of purposeful education, has acquired theoretical and practical knowledge of *holistic ERP systems*.

The holistic industrial economist has no cognitive superiority, in the areas of managerial modeling of the industrial economy, over a systemic economic engineer. However, he achieves cognitive superiority in the areas of accounting, banking, and insurance.

The above-defined two new professional classes will be bearers of a new order of quality knowledge for managerial modeling of the economy of the enterprise and will become the basis of the economic effects that naturally result from the mass dissemination of the *holistic* Business Model Ontology.

5.3 Economic effects of the mass dissemination of the *holistic* BMO

The economic effects of the mass dissemination of knowledge about the *holistic* Business Model Ontology will be many, but in my opinion, the most significant is one.

This effect consists of a total redistribution of the global knowledge market for managerial modeling of the enterprise economy. A market that covers the areas of business software, business consulting, business auditing, industrial engineering, and reengineering. A market that by 2020 amounted to $2.3 trillion, and by 2030 is expected to reach $3.5 trillion.

Today, the global knowledge market for managerial modeling of the enterprise economy is entirely dominated by the current class of professional industrial economists, led by the World Economic Forum and the Big Four for business audits and consulting – it (The Big Four in the face of PricewaterhouseCoopers, Deloitte, KPMG and Ernst & Young) owns nearly 10% of this market.

In 2020, the World Economic Forum (WEF) and the Big Four initiated a major project, which, according to them, will take the knowledge of managerial modeling of the enterprise economy to a qualitatively new level.

After several weeks of getting acquainted with the content of the project entitled "Measuring Stakeholder Capitalism: Towards Common Metrics and Consistent Reporting of

Sustainable Value Creation", I learned contradictory and untenable statements (World Economic Forum, 2020). I learned that according to WEF and the Big Four, the high-quality knowledge of managerial modeling of the enterprise economy (the primary purpose of this project) should be organized into four pillars which are in line with the main elements of the United Nation's Sustainable Development Goals (SDGs). The four pillars are defined as: (1) principles of governance, (2) planet, (3) people, and (4) prosperity.

From the point of view of actual management of the enterprise economy, the texts of the project sound very abstract and obscure, with very few exceptions in the second pillar defined as Planet.

The following are two examples of the mentioned abstract and obscure texts:

About what is called **Principles of Governance**, writes that: *"Governance is foundational to achieving long-term value by aligning and driving both financial and societal performance, as well as by ensuring accountability and building legitimacy with stakeholders. Achieving this alignment requires governance to oversee the setting, monitoring and execution of a company's aspirations with respect to economic, environmental and social impact as part of its purpose and strategy, to navigate risks and embrace opportunities associated with these dimensions over time, and to see that the interests of stakeholders, including shareholders, are protected."*

About what is called **People**, writes that: *"People are crucial for every organization: they represent employees, workers, customers, suppliers, distributors, retailers and contractors. People are also the investors and ultimate beneficiaries of providers of capital (e.g. pensioners). Their growth – in knowledge, prosperity and well-being – is central to the success of all organizations and societies. The business case for firms to measure, manage and disclose information on how they ensure an engaged, skilled and healthy workforce across their value chains is compelling. Such a workforce creates both financial and non-financial value that is critical for a company's business performance and competitive advantage, while enabling it to mitigate risks, maintain a licence to operate and strengthen stakeholder relationships."*

After an analysis of the final report of this project in the parts defined as *Principle of Governance* and *People*, the inevitably reached conclusion is identical to the conclusions made as a result of the research projects of ISEE (presented in Chapter 4). The conclusion is that by 2020, in the Big Four, there are no *people* who are bearers of holistic knowledge of managerial modeling of the enterprise economy, knowledge that can be even somewhat comparable to that of a *systemic economic engineer*. All the knowledge is at a superficial level and extremely general to be useful for management of the actual economy.

In this situation, it would be fair for the current professional industrial economists to be pushed out of the knowledge market for managerial modeling of the enterprise economy and their place to be taken by *systemic economic engineers* and *holistic industrial economists*. This

change of positions is the basis of the political effects that naturally result from the mass dissemination of the *holistic* Business Model Ontology.

5.4 Political effects of the mass dissemination of the *holistic* BMO

The most significant political effect of the dissemination of knowledge about the *holistic* Business Model Ontology is that it leads to a clearer and deeper understanding of the objective meaning of the main political ideologies for social and economic development, and hence the transformation of their weaknesses into strengths.

5.4.1 Which are the main political ideologies for social and economic development

Political ideology means authoritative scientific knowledge for determining and evaluating (and hence objective-oriented management) of the historical development of national and supranational union economies – a development considered within criterion-specific historical stages.

According to these criteria, there are three main political ideologies for social and economic development today: the first is known as *Marxism*, the second is known as *Knowledge Economy*, and the third is known as *Industry 4.0*.

These *main political ideologies* do not correspond to the fairly popular view that the main ones are another three: *liberalism* with a focus on freedom from state interference in the economy, *socialism* with a focus on justice in the distribution of economic result and *conservatism* with a focus on adhering to the governing tradition.

In my opinion, the concepts in question are *political approaches* and not *main political ideologies* for understanding and managing the historical development of national economies. There are no criterion-specific historical stages for such a development for those concepts.

Based on this view and understanding of the objective meaning of the term main political ideologies for social and economic development, I will make a general overview of the currently existing ideologies, adhering to the chronology of their creation.

5.4.1.1 Political ideology for social and economic development – Marxism

This is a theory of strategic modeling of the political management of the social and economic development of society, according to which this development goes through 5 historical stages: (1) primitive-societal stage, (2) slavery-owning stage, (3) feudal stage called *feudalism*, (4) a capitalist stage called *capitalism*, and (5) a communist stage called *communism*, which is defined as the highest and last historical stage of the socio-economic development of

society.

According to this theory, capitalism and communism are only possible and can only exist thanks to *industrialization*. In both of these types of economies, there are two clearly distinguishable sectors: *sector A* and *sector B*. In *sector A* the means of production are created, of which the most important are machines, and in *sector B* consumer products are created. The development of *sector A* dominates the development of *sector B*. Capitalism means extensive and intensive industrialization based on private ownership of enterprises. Communism means the same industrialization, but with public ownership of enterprises and according to the theory, such ownership means a much fairer distribution of the economic results, and hence a much faster and more sustainable development of the economy based on innovation.

In the course of history, *Marxism* acquires two appliable forms:

The first form can be defined as *soft* – it is assumed that industrial enterprises can be managed effectively regardless of the form of ownership: private, state, or mixed. This form of Marxism today works as an instrument of political governance in China.

The second form of Marxism can be defined as *hard* because it is much closer to the original theory – it assumes that industrial enterprises can be managed effectively only in the conditions of state or cooperative ownership.

The hard form became an instrument of political governance firstly in Soviet Russia, and after the end of World War II also in the European East, led by the USSR. In the 1950s and 1960s, the economy of the European East was marked by world achievements in the field of nuclear energy and space research, but in the late 1980s – without serious attempts at mitigation – the hard form of Marxism has been withdrawn from practical use due to untenability. Its socio-economic development strategies – excluding some areas such as education, health, and a few others – have proved ineffective.

Until the end of the last decade of the 20th century, Marxism was the only ideology officially accepted as a scientific basis for political practice. But at the beginning of the 21st century marks a major change in this direction.

In 2000, the ideology of *post-industrial society* (also called the *knowledge economy*) was officially adopted as a scientific basis of the Lisbon Strategy, according to which, by the end of 2010, the European Union was to build a world-class *knowledge economy*.

5.4.1.2 Political ideology for social and economic development – Knowledge Economy

According to the political ideology of *post-industrial society* (also called the *knowledge economy*), the social and economic development of society goes through 3 historical stages: (1) pre-industrial stage, called *pre-industrial society*, (2) industrial stage, called *Industrial society*,

and (3) the post-industrial stage, called *post-industrial society*, which is defined as the highest and last historical stage of the socio-economic development of society.

According to this ideology, in any economy – no matter *pre-industrial*, "industrial" or *post-industrial* – there are three distinct sectors: *primary sector*, *secondary sector* and *tertiary sector*.

The *primary sector* is comprised of the extractive industries and agriculture, the *secondary sector* is comprised of the manufacturing industry and the *tertiary sector* is comprised of the service industry. The economy of *pre-industrial society* is dominated by the *primary sector*, the economy of *industrial society* is dominated by the *secondary sector* and the economy of *post-industrial society* is dominated by the *tertiary sector*.

The post-industrial society has several stages of development, the last and most evolved of which is *knowledge economy*.

The theory of *post-industrial society* gives relevance to the concept of *globalization* and introduces a positive connotation to the concept of *de-industrialization* as the main prerequisite of all stages of *postindustrial society*. According to this ideology, without *de-industrialization* reaching *knowledge economy* is impossible.

In the context of the ideology of *post-industrial society*, *deindustrialization* is a process by which the national economy gets rid of obsolete resource-intensive industries and also modernizes the remaining industrial enterprises through innovative transformations and development of knowledge and skills of the personnel. In this way, the old productions are either modernized or relocated to countries where the transition to a post-industrial economy has not yet taken place. All of this leads to new technologies, new types of activities, and development of the small and medium-sized businesses. It also leads to an increase in the share of services in the national economy, especially financial services, legal services, as well as consulting services in the field of knowledge for effective economic management.

5.4.1.3 Political ideology for social and economic development – Industry 4.0

The clearest and most accurate definition of the ideological foundations of the political ideology of economic and social development, widely known as Industry 4.0 can be found in the book *The Fourth Industrial Revolution* (Schwab, 2016).

"The word "revolution" denotes abrupt and radical change. Revolutions have occurred throughout history when new technologies and novel ways of perceiving the world trigger a profound change in economic systems and social structures. Given that history is used as a frame of reference, the abruptness of these changes may take years to unfold.

The first profound shift in our way of living – the transition from foraging to farming –

happened around 10,000 years ago and was made possible by the domestication of animals. The agrarian revolution combined the efforts of animals with those of humans for the purpose of production, transportation and communication. Little by little, food production improved, spurring population growth and enabling larger human settlements. This eventually led to urbanization and the rise of cities.

The agrarian revolution was followed by a series of industrial revolutions that began in the second half of the 18th century. These marked the transition from muscle power to mechanical power, evolving to where today, with the fourth industrial revolution, enhanced cognitive power is augmenting human production.

The first industrial revolution spanned from about 1760 to around 1840. Triggered by the construction of railroads and the invention of the steam engine, it ushered in mechanical production.

The second industrial revolution, which started in the late 19th century and into the early 20th century, made mass production possible, fostered by the advent of electricity and the assembly line.

The third industrial revolution began in the 1960s. It is usually called the computer or digital revolution because it was catalysed by the development of semiconductors, mainframe computing (1960s), personal computing (1970s and 80s) and the internet (1990s).

Mindful of the various definitions and academic arguments used to describe the first three industrial revolutions, I believe that today we are at the beginning of a fourth industrial revolution. It began at the turn of this century and builds on the digital revolution. It is characterized by a much more ubiquitous and mobile internet, by smaller and more powerful sensors that have become cheaper, and by artificial intelligence and machine learning.

Digital technologies that have computer hardware, software and networks at their core are not new, but in a break with the third industrial revolution, they are becoming more sophisticated and integrated and are, as a result, transforming societies and the global economy. This is the reason why Massachusetts Institute of Technology (MIT) Professors Erik Brynjolfsson and Andrew McAfee have famously referred to this period as "the second machine age."

In Germany, there are discussions about "Industry 4.0", a term coined at the Hannover Fair in 2011 to describe how this will revolutionize the organization of global value chains by enabling "smart factories."

By enabling "smart factories", the fourth industrial revolution creates a world in which virtual and physical systems of manufacturing globally cooperate with each other in a flexible way. This enables the absolute customization of products and the creation of new operating models."

5.4.2 Significant weakness of the political ideologies, which becomes a strength through the dissemination of the *holistic* BMO

In my opinion, each of the presented political ideologies has more than one weakness in terms of political governance of social and economic development. However, here I will consider, within a given ideology, its most significant weakness that can be completely altered (so that it becomes a strength) through the mass dissemination of the *holistic* BMO.

5.4.2.1 Significant weakness of Marxism, which becomes a strength through the dissemination of the *holistic* BMO

Until the beginning of the so-called Democratic and Economic Reform – which began in late 1989, continues to this day and its end cannot be seen in the foreseeable future – Bulgaria was part of the Eastern Bloc, where the dominant political ideology was Marxism in its hard form. The strategy for social and economic development was developed and implemented in accordance with the strategy of COMECON (Council for Mutual Economic Assistance). Within this strategy, Bulgaria specialized in several areas of the industry for machines, including the production of personal computers. In the mid-80s of the 20th century, among the member countries of COMECON, Bulgaria was the only country producing not only personal computers and printers as finished products but also all the required parts.

In the field of the industry for machines and especially in the field of digital information devices, Bulgaria was forming an impressive engineering human capital for the end of the second to last decade of the 20th century, but this alone was not enough to allow the Bulgarian enterprises for machines – built with enormous loans from the West – to be worthy competitors of the Western companies.

In my opinion, the leading reason for the disintegration of the Eastern Bloc was its inability – in the face of the ruling elites – to wisely make use of the loans provided by the West and create an efficient industry for machines, if not superior, then at least comparable to that of the West. This fact is the basis of the subsequent Democratic and economic reforms that took place, both in Bulgaria and in the other countries of the Eastern Bloc, under the motto *the country is a bad manager*.

But if we imagine that at the founding of COMECON (in the late 1940s), the Eastern bloc countries had adopted the soft form of Marxism, similarly to today's China, and also had the knowledge of the *holistic* BMO based on which in two to three decades to form an army of systemic economic engineers, then by the end of the 80's, the Eastern Bloc instead of disintegrating, would have the world's most efficient industry for machines, as well as an economy under the motto *the country is a good manager.*

5.4.2.2 Significant weakness of Knowledge Economy, which becomes a strength through the dissemination of the *holistic* BMO

After the political disintegration of the European East – it began in the mid-1980s and ended in 1989-1991 – the authority of Marxism among the nations of the European world reached a historic low, and the authority of the ideology of *post-industrial society* grew. In the year 2000, this political ideology for the economy was officially adopted as the scientific basis of the Lisbon Strategy, according to which by the end of 2010, the European Union must build an exemplary *knowledge economy.*

The belief in the idea of a *knowledge economy* provided ideological comfort to the West until almost the end of the first decade of this century. However, in the first years of the second decade, this belief was put to the test. The reason for this was the great financial and economic crisis in 2008 and 2009 and the eye opening to the economic success of China, which despite the "*teachings*" of the West, continued to adhere to the theory of Marxism, only by revising it and adapting it to the needs of its political practice.

The crisis and China's rapid economic development call into question the strength of one of the main ideological pillars of the *knowledge economy* – that of *deindustrialization*. It gradually became clear that the cost of maintaining one's own industry and transferring all "unattractive" (mentally and physically) industries to other countries is a "double-edged sword." Although Western companies were reaping huge profits from this decision in the short term, it was clear how in the long run – due to their drastically reduced innovation capabilities – they will be overtaken, and some of them will even go bust. The European Union was acknowledging this trend and starting to develop and discuss concepts for *reindustrialization*, but without seeing the most significant weakness of the idea of the *Knowledge Economy* – simply that this idea has no solid scientific foundation. It is based on the current fundamental scientific knowledge of economy, which has two major flaws that determine its level of historical development as "medieval" in relation to the level of historical development of the modern fundamental scientific knowledge of medicine.

However, if we imagine that when creating the Lisbon Strategy (in 2000) the EU countries also had the knowledge of the *holistic* BMO, this strategy would have had a rock-solid scientific foundation and would not have allowed the destructive development (which continues to this day) of the human capital of the European world.

5.4.2.3 Significant weakness of Industry 4.0, which becomes a strength through the dissemination of the *holistic* BMO

At the beginning of 2016, the book *The Fourth Industrial Revolution* was published for the first time. The author of the book is Klaus Schwab, founder and chairman of the World

Economic Forum. This book lays the foundations for the new political ideology of social and economic development currently known as "Industry 4.0" and also as "second machine age" – an age characterized by *intelligent factories for machines*.

It is more than obvious that the creation of *intelligent factories for machines* necessarily requires the professional scientific knowledge of economy to be able to ensure the process of formation of a new quality human capital – human capital, which is a bearer of scientific knowledge of the principle of operation of enterprises for machines, considered as a systemic objects and subjects of the global economy. However, modern professional scientific knowledge of economy does not have the cognitive potential to secure such a process. This is the weakest point of this political ideology, which makes it a *utopia*.

The mass dissemination of the *holistic* BMO will take the idea of Industry 4.0 out of the realm of political utopias and put it into the realm of expected future realities.

So far I examined and analyzed three political ideologies for social and economic development in terms of the influence of the *holistic* BMO on their weaknesses – here, I would like to recall that in my understanding, "*political ideology*" means authoritative scientific knowledge for determining and evaluation (and hence objective-oriented management) of the historical development of national and supranational union economies – a development considered within criterion-specific historical stages.

If the above definition of the phenomenon of *political ideology* is strictly applied to one of the last works of Klaus Schwab (founder and chairman of WEF), it will turn out that the main political ideologies are not three but four. In mid-2020, was born the latest political ideology for social and economic development.

5.4.3 The latest political ideology for social and economic development and the emerging new world order

In mid-2020, a book by Klaus Schwab and Thierry Malleret titled "*COVID-19: The Great Reset*" was published (Schwab & Malleret, Covid-19: The Great Reset, 2020). In the introduction of the book (similar to the book about the *Fourth Industrial Revolution*), new criterion-specific historical stages for the development of national and supranational (union) economies were defined.

Following are quotes from the introduction of the book *The Great Reset*.

"*At the time of writing (June 2020), the pandemic continues to worsen globally. Many of us are pondering when things will return to normal. The short response is: never. Nothing will ever return to the "broken" sense of normalcy that prevailed prior to the crisis because the coronavirus pandemic marks a fundamental inflection point in our global trajectory. Some analysts call it a major bifurcation, others refer to a deep crisis of "biblical" proportions, but the*

essence remains the same: the world as we knew it in the early months of 2020 is no more, dissolved in the context of the pandemic. Radical changes of such consequence are coming that ***some pundits*** *have referred to a* ***"before coronavirus" (BC) and "after coronavirus" (AC) era****."*

I would like to point out that it is not a coincidence that the abbreviations BC and AC – used in this way by Klaus Schwab – resemble the abbreviations of ***"before Christ"*** **(BC) and** ***"Anno Domini"*** **(AD) era** to emphasize the global significance of the proposed epoch-making division.

The political idea of *The Era Before Coronavirus (BC)* and *The Era After Coronavirus (AC)* was launched for the first time at an emergency virtual session of the World Economic Forum held on the 3rd of June 2020. Participants included a number of prominent political and business figures, including Antonio Guterres, Secretary-General of the United Nations (UN).

At the very beginning of his opening speech, Klaus Schwab said (World Economic Forum, The Great Reset, 2020):

"It is obvious we are amidst the most serious crisis the world has experienced since World War II. 75 years ago, countries and people came together to shape the post-war global order, which brought us decades of peace, increased global cooperation, and prosperity to hundreds of millions of people around the world.

The COVID-19 crisis has shown us that our old systems are not fit any more for the 21st century. It has laid bare the fundamental lack of social cohesion, fairness, inclusion, and equality.

Now is a historical moment in time, not only to fight the real virus but to shape the system for the ***post-corona era****. [...]*

In short, we need a ***Great Reset****. We have to mobilise all constituents of our global society to work together. We must not miss this unique window of opportunity. [...]*

Now we have the very special message from the UN Secretary General António Guterres."

Antonio Guterres fully supports Klaus Schwab in his initiative for The Great Reset of the global economy by declaring personal and professional readiness to assist in the process of providing financial conditions for the implementation of this initiative – for which he says (World Economic Forum, The Great Reset, 2020):

*"****Rebalancing investments****, harnessing science and technology, and enhancing the transition to net zero emissions – all elements of The Great Reset – are fundamental to building the future we need.*

We have already called for an economic stimulus package equivalent to a double-digit percentage, more than 10% of the global economy*."*

In one of Klaus Schwab's next appearances on the agenda of the video conference of the World Economic Forum (dedicated solely to the idea that the world is in dire need of a Great

Reset of the global economy) he explains The Great Reset as a process of creation, development, and universal implementation of a system of criteria of ecological, social, and governance nature, for which he says:

" The most important issue is to change our minds and instead of being so much focusing on short-term as we did in the past, we have to keep in mind the long-term perspectives, and the long-term prosperity.

This leads me, for example, to the need, and the WEF is very much engaged, to elaborate a comprehensive system of ESG – environmental, social, and good governance criteria for companies.

It should be a must for companies to report not only on financial success but how they contribute to our environmental, health, to social cohesion, and exercise good government."

I return to the introduction of the book by Klaus Schwab and Thierry Malleret, published under the title "COVID 19: The Great Reset" on July 9, 2020, exactly 36 days after the conference in question.

Given that the project *The Great Reset* – in the form of a system of environmental, social, and governance criteria – was initiated by the World Economic Forum in partnership with the Big Four and the Bank of America in mid-summer 2019, and in mid-January 2020 (at that time COVID-19 was only in China) the first version of the criteria in question was officially discussed, it seems more than strange to make a meaningful connection between The Great Reset and the COVID-19 pandemic. However, Klaus Schwab does not think so, and this can be seen most clearly in the introduction to his book, which begins as follows (Schwab & Malleret, Covid-19: The Great Reset, 2020):

" The worldwide crisis triggered by the coronavirus pandemic has no parallel in modern history. We cannot be accused of hyperbole when we say it is plunging our world in its entirety and each of us individually into the most challenging times we've faced in generations. It is our defining moment – we will be dealing with its fallout for years, and many things will change forever. It is bringing economic disruption of monumental proportions, creating a dangerous and volatile period on multiple fronts – politically, socially, geopolitically – raising deep concerns about the environment and also extending the reach (pernicious or otherwise) of technology into our lives. No industry or business will be spared from the impact of these changes. Millions of companies risk disappearing and many industries face an uncertain future; a few will thrive. On an individual basis, for many, life as they've always known it is unravelling at alarming speed. But deep, existential crises also favour introspection and can harbour the potential for transformation. The fault lines of the world – most notably social divides, lack of fairness, absence of cooperation, failure of global governance and leadership – now lie exposed as never before, and people feel the time for reinvention has come. A new world will emerge,

the contours of which are for us to both imagine and to draw."

Using the connection, artificially created by him, between the idea of The Great Reset and the COVID 19 pandemic, Klaus Schwab allows himself to give The Great Reset a historical significance comparable to the historical significance of the Age of Enlightenment and World War II.

"...the gradual retreat of the church and many other historical events that can be attributed in no small measure to pandemics. The changes were so diverse and widespread that it led to "the end of an age of submission", bringing feudalism and serfdom to an end and ushering in the era of Enlightenment. If such profound social, political and economic changes could be provoked by the plague (examined as a pandemic) in the medieval world, could the COVID-19 pandemic mark the onset of a similar turning point with long-lasting and dramatic consequences for our world today? [...]

In doing so, we look for precedents, with questions such as: Is the pandemic like the Spanish flu of 1918 (estimated to have killed more than 50 million people worldwide in three successive waves)? Could it look like the Great Depression that started in 1929? [...] Could it be like the great financial crisis of 2008, but much bigger? The correct, albeit unwelcome, answer to all of these is: no! None fits the reach and pattern of the human suffering and economic destruction caused by the current pandemic. [...] That said, World War II could even so be one of the most relevant mental anchors in the effort to assess what's coming next. World War II was the quintessential transformational war, triggering not only fundamental changes to the global order and the global economy, but also entailing radical shifts in social attitudes and beliefs that eventually paved the way for radically new policies and social contract provisions (like women joining the workforce before becoming voters). There are obviously fundamental dissimilarities between a pandemic and a war (that we will consider in some detail in the following pages), but the magnitude of their transformative power is comparable."

After portraying the COVID-19 pandemic as a devastating Apocalypse for the world economy, Klaus Schwab offered salvation led by the World Economic Forum, the Big Four, and the Bank of America. Salvation he calls The Great Reset and for which (according to Antonio Guterres, the UN Secretary-General) it is worth the world to pay at least 10% of its GDP.

"...the objective of this book is to offer some coherent and conceptually sound guidelines about what might lie ahead, and to do so in the most comprehensive manner possible. [...]

The possibilities for change and the resulting ***new order*** *(new world order as a result of The Great Reset) are now unlimited and only bound by our imagination, for better or for worse."*

If we go online and look for publications related to the name Klaus Schwab and his idea

of The Great Reset, we can see that a lot of these publications present Klaus Schwab and the founded and led by him World Economic Forum (WEF) as the visible part of a secret organization of the Western elite that aims to impose a *new world order*. I define such an ideological position as ridiculous.

My view is that The Great Reset is a political ideology through which WEF, the Big Four, and the Bank of America seek to preserve the now existing *Third New World Order* of the modern history of the world (which started after the Second World War) by re-actualizing themselves in it, while at the same time blocking, or at least delaying the emergence of the *Fourth New World Order*.

5.4.3.1 The first new world order

The beginning of the *first new world order* is set in the second half of the 1940s, and its end came at the beginning of the 1990s – it lasted nearly 50 years.

The first new world order is bipolar.

At one pole are the countries of the Western world, led by the United States, and their satellites. There is no officially accepted political ideology for social and economic development, but behind the scenes is the culturally related such ideology, which can be defined as Protestant industrialism.

At the other pole are the countries of the Eastern Bloc, led by the Soviet Union. There is an officially accepted political ideology for social and economic development, and that is Soviet Marxism – a rigid form of Marxism that denies the effectiveness of private ownership of enterprises.

5.4.3.2 The second new world order

The beginning of the *second new world order* is set in the first years of the 1990s, and its end came in the middle of the 2010s – it lasted nearly 25 years.

The second new world order is unipolar.

The world is dominated by the Western countries, led by the United States. The political ideology adopted for social and economic development (both officially for some countries and informally for others) is that of the *Knowledge Economy*.

5.4.3.3 The third new world order

The beginning of the *third new world order* is set in the middle of the 2010s, and its end is somewhere in the near future.

The third new world order (similar to the first one) is again bipolar.

At one pole are the countries of the Western world, led by the United States, and their

satellites. There are two accepted political ideologies for social and economic development, namely the *Knowledge Economy* and the *Fourth Industrial Revolution*, also known as Industry 4.0.

At the other pole are the countries of the Shanghai Cooperation Organization (SCO) and BRICS, led by China. Only China has an officially accepted political ideology for social and economic development. It can be defined as Chinese Marxism – a soft form of Marxism that recognizes that industrial enterprises can be managed effectively regardless of the form of ownership: private, state, or mixed.

5.4.3.4 The fourth new world order

The fourth new world order is unipolar.

The world is dominated by the member countries of the SCO and BRICS, led by China. There is no officially accepted political ideology for social and economic development by all countries within SCO and BRICS. However, in one way or another, the leading one is Chinese Marxism, because under the sign of this ideology, at that time China has created and developed an industry for machines, which by far surpasses both the industry for machines of the entire Western world as well as the industry for machines of all other SCO and BRICS countries combined. It should be noted that in the context of this MBA thesis, the industry for machines includes not only the enterprises for machines but also all parts of the scientific and educational system that creates the workforce for this industry, with the Technical Universities being the most important.

The end of the Fourth New World Order is somewhere in the inconceivable future, but its beginning is clear, and it is in the first years of the 2030s or the 2040s, depending on China's place in the process of dissemination of the *holistic* BMO.

5.4.3.5 The *holistic* BMO and the fourth new world order

My view on the relationship between the process of dissemination of the holistic BMO and the time of emergence of the fourth new world order, I will present using Figure 5.1, which shows the comparison in the development of the bases for creation of technological elites in the West and China.

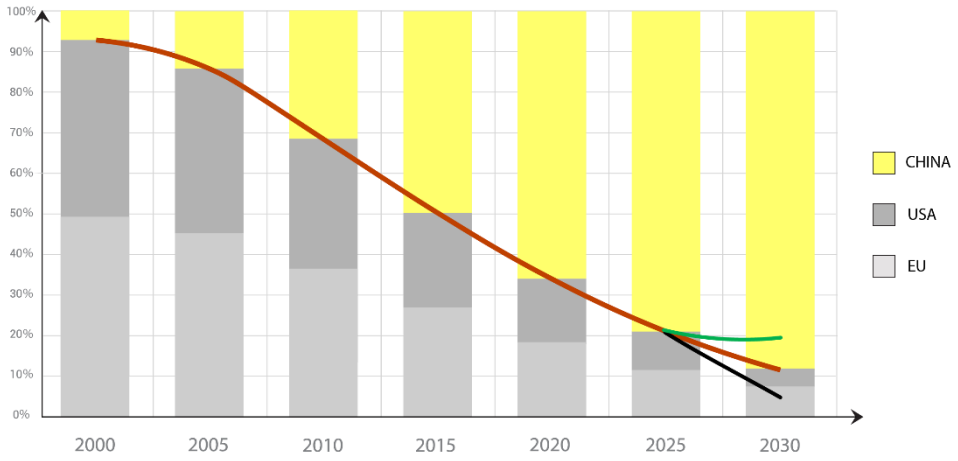


Figure 5.1 Comparison of the development of the bases for creation of technological elites in the West and China (Stefanov & Velev, 2022)

The red line of the figure shows the ratio in the development of the bases for the creation of technological elites in the West and China, provided that there is no knowledge of the *holistic* BMO.

The green line depicts the relationship between the development of the bases for the creation of technological elites in the West and China, provided that the West is the first to adopt and disseminate the knowledge about the *holistic* BMO and thus create its own army of *systemic economic engineers*. In this case, the beginning of the Fourth New World Order is going to take place in the first years of the 2040s.

The black line depicts the relationship between the development of the bases for the creation of technological elites in the West and China, provided that China is the first to adopt and disseminate the knowledge about the *holistic* BMO and thus create its own army of *systematic economic engineers*. In this case, the beginning of the fourth new world order is going to take place in the first years of the 2030s.

I rule out the possibility that the knowledge about the *holistic* BMO will not be disseminated, and thus economic science to remain at a medieval level of development. That is because it would mean the tensions between the West and China will continue increasing, inevitably leading to a devastating nuclear apocalypse, which the West will initiate. In order to avoid such a danger, the transition of the fundamental scientific knowledge of economy – from a medieval to a modern level of development through the mass dissemination of the *holistic* BMO – should begin as soon as possible and almost simultaneously from both China as well as the West.

IN CONCLUSION:

I will first observe the position of the Western world and the Shanghai Cooperation Organization and BRICS in the process of creation, development, and dissemination of fundamental scientific knowledge about economy, after which I will answer the question "Why the dissemination of the knowledge about the *holistic* BMO, first in the member countries of the SCO and BRICS, led by China and then in the Western world, led by the United States, will significantly reduce the risk of military conflict between them, which could be devastating for humanity?"

A general overview of the positions of the West and the SCO and BRICS in the process of creation, development, and dissemination of fundamental scientific knowledge about managerial modeling of the economy, clearly shows that the Western countries, led by the United States, have accepted the role of a TEACHER, while the countries of the SCO and BRICS, led by China, have accepted the role of their STUDENT.

Flagbearers of the idea that the Western world can and should be a TEACHER OF THE WORLD in the field of fundamental scientific knowledge about economic management are WEF and the companies of the Big Four. This idea finds an objective justification in the form of two factual circumstances: (1) all the existing fundamental scientific knowledge of economic management is the work of the West and (2) from the beginning of the Industrial Revolution to the end of the first decade of the 21st century, the Western human capital in the area of the industry for machines has surpassed (mainly in quality) the human capital of the rest of the world.

In the middle of 2010, an influential German media outlet published an article entitled "The West's Last Chance." The author of the article is Neil Ferguson, a renowned British scholar in the field of economic history and the history of international relations, where he writes:

"...The crisis has fundamentally called into question the legitimacy of "The American Way." [...] I have just returned from China, where I have most often heard the following: "You can no longer tell us that your system is the best. And this with democracy, forget it completely. You see how far it has taken you." In the course of the current crisis, we have lost an important component of power: the power to teach and to listen to us." (Ferguson, 2010; 2011)

The financial crisis of 2008-2009 – which began in the United States and then spread to all EU countries – is practical evidence that the West's knowledge about economic management has significant flaws. This crisis can be compared to a nearly two-year "knockdown" of the economies of the Western countries inflicted by its professional economists. However, it can be seen from Figure 5.1 – showing the comparative development of the bases for technological elites in the West and China –that by the end of 2010, the West

still dominates, and this is an objective prerequisite for maintaining the then-unipolar world order.

Figure 5.1 shows that the parity in the development of the bases for technological elites in the West and China will occur at the end of 2015. This is an objective prerequisite for the transition from a unipolar to bipolar world order. This circumstance is being largely "felt" instead of "realized" by the West and is reflected in the more emotional than constructive statements by representatives of the Western ruling elite.

In early 2016, an influential American media outlet – the Washington post – published an article by then-US President Barack Obama, in which he wrote:

"*...America should write the rules of the global economy. America should call the shots. The other countries should play by the rules that America and our partners set, and not the other way around. [...] The world has changed. The rules are changing with it. The United States, not countries like China, should write them.*" (Obama, 2016)

Such a statement, by the man under whose direct command is the world's most powerful army and who holds its nuclear briefcase, cannot be interpreted otherwise than as a threat that "he who refuses to voluntarily recognize the West as a TEACHER OF THE WORLD in the field of scientific knowledge about management of the economy will be made to do so by force."

Here I would like to remind that at the very beginning of 2016, the book *The Fourth Industrial Revolution* was published. Its conversion into the center of attention at the World Economic Forum Annual Meeting should be seen as an approach to impose the idea that "only the West can and should be a TEACHER OF THE WORLD in the field of economic management in all its dimensions."

However, this idea is subject to accelerated "erosion" in the next 5 years (2016-2020), which is best seen through the comparative development of the bases for technological elites in the West and China (Figure 5.1) – this development is not only an objective prerequisite for establishing the newly created bipolar world order but is also a hidden requisition to transition towards a unipolar world, dominated not by the West but by the East, led by China. In order to strengthen the public image that only the West can and should be a TEACHER OF THE WORLD (in the field of economic management in all its dimensions), the West, in the face of the World Economic Forum, creates and tries to impose (with the help of the UN) the political ideology for The Great Reset. The key positions of this ideology are two: (1) the system of criteria of **ecological**, **social** and **governance** nature and (2) the definition of two epochs in the social and economic development of the human world: the ***"before coronavirus" (BC) and "after coronavirus" (AC) era***.

The political ideology of The Great Reset can be defined as a "psychological weapon-like system" that is designed to work in favor of the West for imposing (through the companies that

have created the beforementioned criteria) its control. on the economic development of the rest of the world and, above all, China. The West, in one way or another, affirms the notion that China is guilty in humanity's eyes for COVID-19, and in this sense, it must, to the greatest extent possible, adhere to the newly established "scientific" criteria for managing its economy.

The implementation by the West of the described "psychological weapon-like system" – this will happen in the next 4 to 5 years – will lead to increasing political tensions between the West and the countries of the SCO and BRICS to such an extent that it would be a miracle if a war does not break out.

I believe this "psychological weapon-like system" of the West must be blocked. That can be achieved by establishing an International Economic Forum, which should incorporate in its work the individual parts (theory, terminology, and digital technology) of the *holistic* BMO in its role as a means for achieving a historical change in the development of the global human capital. At the same time, this forum should become an ideological opponent and well-meaning critic of the World Economic Forum. The focus of the criticism should be the behavior of the World Economic Forum regarding the fact that the fundamental scientific knowledge of economy, which is undoubtedly the work of the West, is still at a medieval level of development. Its most valuable parts were created a long time ago, not by professional American economists, but by a Christian church official (Luca Pacioli) in the 16th century and by American machine engineers in the first half of the last century.

In order to be effective as a means of reducing the risk of World War III, the abovementioned International Economic Forum must be organized with the leading active assistance from individuals and organizations from the member countries of the SCO and BRICS – first from China and second from Russia.

The purpose of this MBA thesis is to initiate an academic discussion, which will form a group of academics who support the idea of the creation of an International Economic Forum as a *Pillar of World Peace*.

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LIST OF FIGURES AND ACRONYMS

BMO	Business Model Ontology
CAD	Computer-Aided Design
CAE	Computer-Aided Engineering
CAM	Computer-Aided Manufacturing
CNC	Computer Numerical Control
DNC	Direct Numerical Control
ER	Economic Result
ERP	Enterprise Resource Planning
ExFl	Expenses Flow
InV	Invested Value
ISEE	Institute for Systemic Economic Engineering
ITFES	Information Technologies and the Future of Economic Science
MOC	Monetary Obligations of Clients
MOTEl	**M**ultiple resp**o**nsibilities over the **t**rajectory of an **el**ement
MRP I	Material Requirements Planning
MRP II	Manufacturing Requirements Planning
SCO	Shanghai Cooperation Organization
SIS	Subjecthood Implementation System
VEPA	Value of Elements of Proprietary Assets

“This is one of the best MBA thesis, if not the best, I have ever supervised, although it is not easy to read and understand. The author spent a lot of time and put a lot of efforts in writing this thesis, which contains highly innovative ideas of new Business Model Ontology.

The key idea of the report is the following:

First, the existing business model ontology has two major flaws: (1) it does not provide a comprehensive and clear view of the principal of operation of the enterprise for machines as a systemic object, and (2) it does not provide any understanding of the principal of operation of the enterprise for machines as a systemic subject.

Second, the two major flaws block the development of the global scientific and educational system (mostly that of the European nations) in its role of a leading mean for the cultivation of highly effective human capital in the industry for machines.

Third, this research proves that the two major flaws in the scientific knowledge for creation of a managerial model of the economy of the enterprise for machines can be eliminated through a "new Business Model Ontology" –
a model created as a result of research based on a laboratory approach.

I like this research and offer my strongest support.”

- Professor GAO Xudong
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