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How Can We Use the Memoirs of Famous Managers in Digital Environment?

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Abstract: In today's rapidly changing business environment, organizations and supply chains face increasing socio-economic challenges. To address these challenges, they need new sources of growth and development. One of these sources is lost profits or profits that could be recouped by maximizing the benefits provided by the external environment. To reduce lost profits, organizations and supply chain need intellectual support based on the knowledge and experience of famous managers from past and current generations. Memoirs of these managers presented in the form of software products can be used to share their insights and best practices with current and future managers. The purpose of this article is to develop recommendations for creating digital memoirs of famous managers to design a digital twin for managing organizations and supply chains allowing them to minimize lost profits. To achieve this purpose, terminological analysis, descriptive and faceted methods of qualitative research of non-physical management objects were used. These methods have made it possible to identify, formalize, structure, combine, and digitize objects of this type. This article develops a classification and substantiates the structure of digital systems formed in organizations and supply chains. It also creates a template and form of digital memories of famous managers for use in the digital twin of management of these organizations and supply chains. The results obtained allow us to create an artificial intelligence that operates with non-physical management objects and epy digital twin to manage the organization and supply chain. This ensures the development of management decisions with minimal loss of profit.

Keywords: Memoirs; Management Decision; Template; Form; Artificial Intelligence; Digital Twin

1. Introduction

It is difficult to overstate the importance of information in today's society. Among all the information flows, there are some that are particularly significant, such as those that help manage organizations and supply chains. In order to create the desired value for the end consumer, numerous, linearly ordered organizations need to constantly transfer and process significant amounts of information not only horizontally, for example, between adjacent links in supply chains, but also vertically, that is, between levels of scalar chains or chains of command. Any inaccurate or delayed information can negatively affect the performance of organizations and result in lost profits [1]. Therefore, organizations need to not only develop effective management solutions, but also implement them successfully. To solve these problems, it is crucial to draw on the experience of successful managers from previous generations. This experience improves the knowledge, skills, and competencies of new-generation managers using information, including digital technologies. Despite the abundance of digitized (but not digital) memoirs of famous managers, they all have a significant drawback. When people study memoirs in their traditional format, this drawback is hardly

noticeable. However, when using digital technologies (using a computer), this disadvantage is difficult to eliminate. Unlike other types of activities, organization management involves the interaction of a manager (the subject of management) and an operator (both the object of management and a subject of management at the same time), who can use a machine as an object of management. Machines or physical management objects, such as machine tools, transport, warehouses, stocks, etc., are relatively easy to digitize. In turn, non-physical management objects such as values, ideas, projects, strategies, plans, relationships, powers, responsibilities, management decisions, etc. are extremely difficult to digitize [2].

Therefore, understanding the experiences of managers from previous and current generations and their transformation into digital technologies is a crucial objective. On the one hand, this allows us to create a library of proven management decisions. On the other hand, it ensures that these decisions can be adapted to the unique management situations that managers encounter today. Solving these challenges will allow us to move forward with the development and implementation of digital tools for managing organizations and supply chains.

The hypothesis of this study is based on the assumption that it is possible to digitize non-physical objects in organizations and supply chains, and create the necessary conditions for the development of artificial intelligence that can use digital memories of famous managers. This artificial intelligence would then be able to adapt these memories to specific management situations by using the digital twin for organizational and supply chain management. In other words, if a machine, as a physical object, can work according to a program that is embedded in it and make typical or atypical decisions, why can't humans, as managers or operators, use the machine to recognize and manage non-physical objects?

The objectives of the study are to create a classification and justify a structure of digital systems that are formed in organizations and supply chains. We will also develop a template and a form for the digital memoirs of the manager, which will become the basis for the digital twin that contributes to the management of these organizations and supply chains.

To solve these objectives, we propose to perform the following sequence of actions: identification of main problems and selection of research methods; clarification of the priorities of memoir readers in the field of management; substantiation of methods that allow the digitalization of memoirs of this type; identification of main sections of template and form for previously created, current, and future memoirs of famous managers; development of recommendations for the use of these template and form.

2. Preface

Memoirs of famous managers of any rank can be viewed from the point of view of the goals of their readers: firstly, as information about famous person and results of his activity (erudition); secondly, as a means of professional development in the field of management (education); thirdly, as a set of competencies and techniques to achieve the desired result in competitive environment (methodology); and, fourthly, as a basis for making future management decisions in the face of real threats and opportunities (skill or leadership). This article will focus on the third and fourth use cases of the memoirs of famous managers at any level, primarily businessmen who are characterized by:

Firstly, there are various factors in the external and internal environment that create unique management situations in which managers make decisions. As a result, managers may duplicate well-known decisions or they may lack information about innovative decisions implemented in specific management situations.

Secondly, the division of environmental factors, as well as management objects, into physical and non-physical factors and objects, the former of which are well measurable and quantifiable, while the latter pose significant difficulties in solving these objectives. Moreover, a management decision is itself a non-physical object that needs to be transformed into some kind of physical object or result of activity, such as money or profit. This process involves possible and sometimes inevitable adjustments to earlier decisions, which can be represented as a sequence of iterations. This in itself has been little studied.

Thirdly, non-physical objects, in contrast to physical management objects, constantly change their shape and content. For example, hostile relations turn into friendly ones; absurd ideas become constructive ones; bankrupt enterprises become successful ones. Resources move from the state of flow to the state of inventory and vice versa. This aspect of managing non-physical objects requires their identification, systematization, structuring, combination, formalization, standardization, modeling, and so on.

Fourthly, each management decision described in the memoirs is characterized not only by the benefits received, but also by the lost benefits, which are often given less importance in the memoirs. However, in the future, these lost benefits could significantly affect the current benefits received by the organization. Additionally, each decision should be structured both vertically (scalar chain or chain of command) and horizontally (levels of organizational management structure). This not only leads to achievements, but can also cause losses for the organization.

It should be noted that the topic of this article goes beyond the concept of "Industry 5.0", which is widely discussed at the moment. This concept focuses on effective human-machine interaction [3]. In this case, humans are not only operators of machines, but also managers of organizations or their divisions. They may directly or indirectly influence the work of operators, creating value for end consumers. At the same time, the manager may interact with various types of machines that use artificial intelligence to operate non-physical objects. This technology is still in its early stages of development. The result of this interaction is a management decision, which is a non-physical object. Naturally, the memories of the manager and the operator differ significantly in terms of form and content.

3. Literature Review

Due to digitalization, some management challenges have not been fully explored or even identified. One of these problems is the digitalization of management decisions previously made and implemented by previous and current generations of managers.

To search, select and analyze literature on the research topic, we used online information and keywords such as "digital," "memoirs," "management" and "business". To address these challenges, we examined a list of the most popular publishers who distribute scientific literature. After reviewing the content of online libraries and the specific features of these publishers, we selected 14 publishers as a basis for our research, including Springer, Taylor & Francis, Elsevier, Wiley, Sage, Inderscience, Emerald, IEEE, and MDPI, among others. The search for literature was not restricted by time periods.

Attempts to use online keywords related to this issue were unfortunately unsuccessful. Therefore, to justify the scientific novelty of the article, a sequence of typical management objects was used. These objects are proposed to be discussed in future managerial memoirs. These objects include: consumer behavior (value); management system; supply chain; management decision; organizational management structure; and lost profits. Moreover, the main emphasis of the article should be on digitizing them to create standards and then virtual copies of non-physical objects for subsequent computer modeling of real management situations.

3.1. Consumer Behavior and Its Value

The effectiveness of digital management decisions is primarily determined by a good understanding of consumer behavior [4]. This understanding largely depends on the ability to compare desired and perceived values of products and services offered to consumers [5]. If it is possible to digitize consumer behavior and its value, then in the future favorable prospects will be created for digitizing other typical management objects, which were mentioned earlier. In this case, by analogy, the "bullwhip effect" [6] should be taken into account, when the error amplitude in identifying and evaluating the initial non-physical management objects begins to increase as they approach the final non-physical object, that is, the management decision. In addition, it should be remembered that, firstly, "consumer behaviour is difficult to predict, even for experts in the field" [7], and secondly, "value is always intangible, heterogeneously experienced, co-created and potentially perishable" [8].

Despite the obvious difficulties of digitalizing consumer behavior and its values, recommendations on their structuring have been developed. So, for example, Buzzotta et al. proposed a two-dimensional approach to understanding buyer psychology [9]. They suggest that every-one tends to be warm or hostile, dominant or submissive. It would not be difficult for a researcher to convert these states into binary codes using the symbols "0" and "1". However, the resulting binary codes do not allow for transition from one consumer state to another, as it is unclear what factors determine such transition. This poses significant challenge to the development of artificial intelligence that can operate on non-physical objects and make effective management decisions based on this information.

Taking into account the state of the consumer, it is possible to establish the reasons why he acquires particular product or service. For example, an individual actually needs it, or perhaps he/she just wants to try it out, or

he/she buys it just to honor someone who recommended that product or service [5]. These reasons can be identified through marketing research. They can also be assigned appropriate binary codes. When a consumer has certain reasons for purchasing a product or service, they are guided by their skills, knowledge, and positive or negative feelings [10]. The computer can identify these characteristics thanks to the codes "00", "01", and "10". In the process of making the purchase decision, consumers go through several stages, including: need recognition, search for information both internally and externally, appraisal of alternatives, purchase decision and post-purchase [11]. Since there are five stages, a three-digit binary code will be required to designate each one. For example, the fourth stage could be designated by the code "100". Various types of consumer values can be digitized in similar way. For example, "desired value", "creation of value", "value appropriation", and "perceived value" [12], or other variations of these.

Thus, using the sequence of non-physical management objects: "consumer state → type of value → reason for purchase → characteristic of consumer → stage of purchase", it is possible to identify specific management situation and designate it with the appropriate binary code type "01.10.00.10.100". This code allows the computer to recognize following management situation: "consumer in the state of dominance focused on the value carrier (product), which he/she needs, uses knowledge to make the decision about the purchase of this product". However, it should be borne in mind that "often, consumers make choices irrationally (i.e., they act in ways that seem contrary to their best interests)" [13].

3.2. Organization's Management System

The digitized management situation suggests that the supplier or organization capable of providing the necessary value to consumers should be involved in solving this problem. In other words, could Russian car manufacturer solve consumer problem, or should consumers contact European or Japanese manufacturer instead? How do these manufacturers differ and are there enough quantitative parameters to characterize a particular manufacturer for this purpose? The answer to these questions is provided by the management system based on customer-centricity, as proposed by Kumar and Reinartz [14].

There are many variants of the organization's management system, which can be referred to as the "human resource system" [15] or "human resource management (HRM) practices" [16]. The opinions of authors [17–21] concerning the structure of systems of this type are significant differ. To bring their diversity into a standardized digital version and establish logical relationships between their components, appropriate arguments are needed, which should form the basis for creating artificial intelligence that operates on non-physical management objects.

3.3. Supply Chains

When the organization's management system meets the demands of consumer of products and services, next stage should be to form a supply chain in statics, including enterprises [22] and relationships [23] between them. This chain is further transformed into a supply chain that performs processes [24] and transforms resource flows into flows of finished products and services [25]. The solving of the problem of their identification, classification, structuring, and digitization were proposed by Tyapukhin [2]. When creating value for the concrete consumer, each of the management objects listed above exist in virtual form as assumptions or projects, which are then transformed into real objects. As they are used, operators or managers create virtual versions of these objects that are adapted to changing management situations. Changing the shape of one virtual or real management object also involves changing adjacent virtual or real management objects. The answer to the question: "What is the optimal combination of enterprises, their relationships, processes, and flows that form different types of supply chains, depending on the specific management situation?" has not been clearly defined in the theory and methodology of management. Even if such combination were to be found theoretically, the problem of structuring management objects into components and elements would inevitably arise. The rational combination of these at various levels of structuring would significantly reduce lost profits. Unfortunately, this is often overlooked in published memoirs by famous managers and not just them.

3.4. Management Decision

The management decision is a virtual product of the manager's activity, which should not only meet the needs of stakeholders, but also provide value to them in the forms described in Section 3.1. When developing the manage-

ment decision, the following methods can be used:

Firstly, mathematical methods focus on anonymous management objects and search for the optimal structure and/or outcome of their activity. These relatively easy-to-digitize methods are used at the stage of decision-making.

Secondly, statistical methods are adapted to specific research objects or groups of similar objects and involve several decisions based on, as a rule, quantitative information. Methods of this type are used at the stage of justification and selection of management decisions, including on the basis of decisions obtained using mathematical methods.

Thirdly, logical and structural methods related to the study of mostly unique non-physical management objects and the search for their rational combination depending on specific management situation. These methods are relevant during the implementation of management decisions due to the specific and dynamic nature of environmental factors in organizations, particularly in the supply chain.

This means that in order to reduce losses in complex socio-economic systems, it is advisable to use both quantitative and qualitative methods together to develop, justify, select, and implement management decisions [26]. However, this has not received enough attention in the literature. At the same time:

Firstly, there is a steady increase in the role of the human factor in decision-making [27] up the scalar chain: from performers to managers [28]. However, despite the growing opportunities for developing effective decisions, decision makers are unable to comprehend and process the information necessary to manage organizational change [29].

Secondly, the first results of using artificial intelligence to develop management decisions for supply chains, including based on empirical data, have been achieved [30].

Thirdly, decision support systems are widely used both in theory and practice [31].

Fourthly, efforts are being made to shift from developing management decisions at the link (organization) level to developing management decisions at supply chain level [32].

Fifthly, physical objects can be transformed into digital twins [33]. However, there is currently no single concept of digital twins for non-physical supply chain management objects [34].

3.5. Organizational Structure of Management

Organizational structure is the framework of the relations on jobs, systems, operating process, people and groups making efforts to achieve the goals [35]. It follows from this definition that organizational structure refers to non-physical management objects, the digitization of which can be problematic. According to Mintzberg, there are five types of organizational structures: simple structure, machine bureaucracy, professional bureaucracy, divisionalized form, and adhocracy. Organizations can move from one structure to another for various reasons. This raises several questions:

How to choose the organizational management structure that is appropriate for the management decisions made?

How to evaluate the inefficiency of current organizational management structure and demonstrate the need for transformation into more suitable organizational structure?

How to structure the management decision based on the chain of command and divisions within organizational structure?

How to coordinate the activities of organization's staff in terms of resources and timing in order to minimize losses and maximize value for customers?

The answers to these questions can be found through logical and structured methods, as discussed earlier.

3.6. Lost Profits

The analysis of the literature shows that currently "there is currently no theoretical framework that enables a systematic investigation of macroeconomic consequences" of disruptions and losses in supply chains [36]. This conclusion prevents an objective assessment of the effectiveness of the management decision, as it can lead to various outcomes, as shown in **Figure 1**.

Figure 1 shows the matrix formed on the basis of two classification attributes and their corresponding dichotomies: "result of a current management decision": positive, symbol "0", and negative, symbol "1", as well as "result of a strategic management decision": positive, symbol "0", and negative, symbol "1". Paired combinations of these attributes and dichotomies make it possible to identify 4 results of management decision: progress, code

"00", therapy, code "01", trap, code "10", and crisis, code "11" and the corresponding loss of lost profits: minimal, inevitable, deferred and increasing. Since losses of this type cannot be completely avoided, it is necessary to evaluate their impact in accordance with the results of managerial decisions made vertically (through the chain of command) and horizontally (within divisions) in organizational structure. Unfortunately, this aspect does not receive enough attention at the moment. As a result, there is a lack of research into the development and implementation of decisions at the supply chain level. This is surprising, given that lost profits are a major source of future competitiveness for all types of organizations.

		Result of a current management decision	
		Positive (0)	Negative (1)
Positive (0) **Result of a strategic management decision** Negative (1)		**Progress** (00) (minimal losses)	**Therapy** (01) (inevitable losses)
		Trap (10) (deferred losses)	**Crisis** (11) (increasing losses)

Figure 1. Classification of the results of current and strategic management decisions.

Thus, the analysis of the literature has allowed us to identify a list of research questions, which has predetermined the structure of our study (see **Figure 2**).

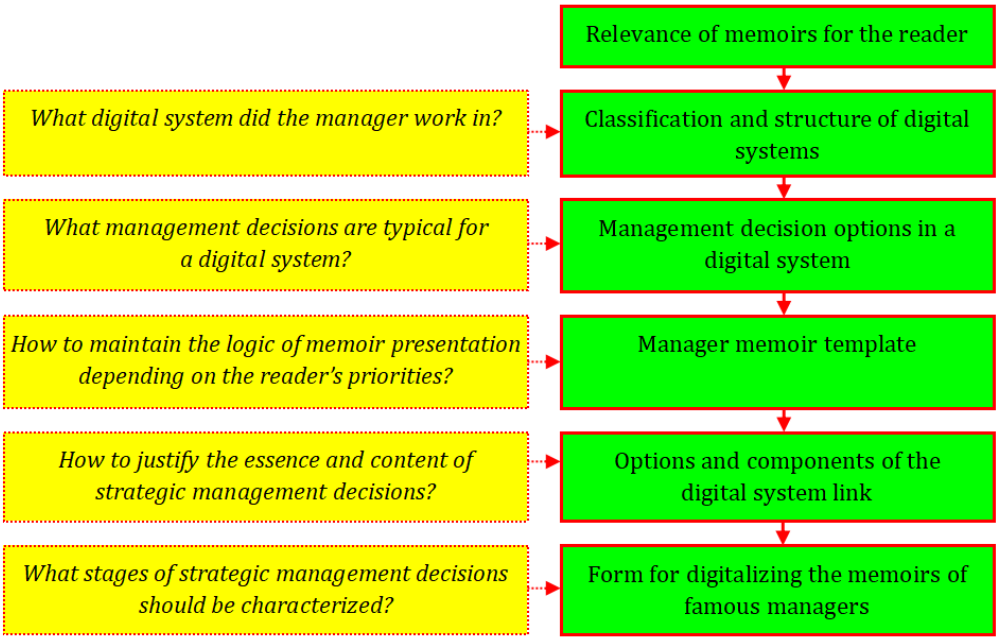

Figure 2. Research questions and its structure.

4. Methodology

The answers to the questions posed can be found on the basis of the integration of two basic components of digitalization of the management of organizations and supply chains: firstly, the methodology for the development and implementation of digital management decisions, focused on the systemic optimization of not only physical, but also non-physical management objects [2], and, secondly, emerging technologies such as terrestrial non-terrestrial network integration, mm Wave-THz band utilization, massive MIMO, D2D communication, network slicing and so on [37]. These two components could lead to the development of artificial intelligence that primarily operates on non-physical objects. It should be emphasized that this type of intelligence is fundamentally different

from the intelligence currently being developed, which is based on the concepts of AI for networks (AI4Net) and Network for AI (Net4AI) [38]. While the first concept emphasizes the importance of using AI technologies to optimize network performance, the second concept focuses on improving network capabilities to support various AI applications such as autonomous driving, AI-driven industrial Internet of Things (IoT), and smart cities [39,40]. To achieve the purpose of this study, the second concept of artificial intelligence is preferable. However, its current version operates "an equation/inequality consisting of letters, numbers and other mathematical symbols, or a mathematical structural expression (typically a chart, image, and diagram) that describes the features and internal relationships of an object," as defined in 6G Networks AL Concept and Terminology, released by 6GANA on December 27, 2025 (https://www.6g-ana.com/upload/file/20230313/6381433864369996165807627.pdf). Unfortunately, this concept is inapplicable to management activities based on organizational management structures or the mental activity of decision makers. Values, ideas, projects, strategies, plans, relationships, authority, responsibility, management decisions, etc., cannot be represented as mathematical or statistical models, much less used in scalar chains or chains of command. Therefore, when creating artificial intelligence that operates on non-physical management objects, one should rely on logical-structural methods, which are rejected by many well-known management journals [41,42].

Logical and structural methods for studying non-physical management objects are related to qualitative research methods. In order to achieve the goal of this article, we need to use methods such as identification, formalization, structuring, combination, digitization, modeling, and optimization of these types of objects.

The basis of methods listed above is formed by:

Firstly, terminological analysis, which allows us to determine classification attributes of the research object. There can be significant number of these characteristics, and accordingly, there can be many terms to identify the research object. For instance, Stock and Boyer examined 176 definitions of the term "supply chain management" [43]. This aspect involves a significant revision of the terminological dictionaries, the content of which, although understandable to humans, appears absurd from the perspective of artificial intelligence. Artificial intelligence, created based on terminological dictionaries of modern management, is unable to understand the logic of moving from one term to another, whether horizontally (for basic terms) or vertically (when structuring and combining terms).

Secondly, it is the descriptor method. It is advisable to divide classification attributes of the research object identified during terminological analysis into relevant and irrelevant attributes. The solution to this problem depends on specific management situation, in which the priorities of particular research object may change. Based on the descriptor method, we recommend creating an identification series or set of quantitatively limited, linearly ordered classification features for one or more research objects that are logically related. These attributes can be used to measure objects both individually and collectively, allowing for the selection of appropriate standards, creation of virtual copies, computer modeling, and decision-making. Unlike a numerical series, which is based on a fixed set of numbers, an identification series can change significantly depending on the management situation.

Thirdly, it is the faceted method. The identification series created using the descriptor method allows us to identify possible variations in research objects. This is useful for their modeling and the development of management decisions, as well as their implementation. It takes into account the specific attributes of non-physical objects in a real organization or supply chain. The example of using faceted method is shown in **Figure 1**.

Thus, the combination of qualitative research methods described above makes it possible to create theoretical and methodological prerequisites for the creation of artificial intelligence operating with non-physical management objects. This type of intelligence, in turn, is the basis for designing the digital twin for organization and supply chain management, focused on reducing lost profits of their links in competition with other supply chains.

5. Results

5.1. Relevance of Memoirs for Their Reader

As shown earlier, memoirs in general, and memoirs of famous managers in particular, are intended for different groups of readers. At the same time, it is important to understand the priorities of readers, as they determine the value of a memoir. To solve this problem, it is advisable to use following classification attributes and dichotomies: "purpose of a memoir reader": learning from experience or expanding ideas about management, symbol "0", and

capacity development or deepening the understanding of management, symbol "1", as well as "options for using memoirs in practice": creation of a database of typical management decisions, code "0", and adaptation to a specific management situation, symbol "1". The combined use of these attributes and dichotomies allows us to form the binary matrix, shown in **Figure 3**.

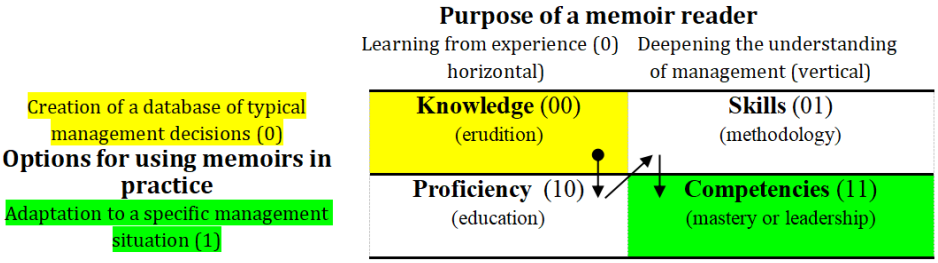

Figure 3. Classification of memoir readers' priorities.

From the contents of **Figure 3**, it can be seen that the reader of memoirs can update previously acquired knowledge or prioritize erudition, code "00", improve managerial skills, focusing on the methodology of developing and implementing management decisions, code "01", develop proficiency by improving the quality of education, code "10", and gain additional competencies by betting for mastery or leadership, code "11".

The preferred option is to use the priorities listed above to develop and implement innovative management decisions, while minimizing lost profits.

5.2. Variants of Management Objects and Organization of Their Interaction

Despite the fact, that supply chain management identifies at least four management objects: enterprise, relationship, process and resource flow, in total they form socio-economic systems of various types. Therefore, when writing a memoir, the author should describe the system that they, having been given appropriate authority, can or could influence. At the same time, it should be noted that systems of this type are constantly evolving, changing their form and content depending on various factors in the external environment of the organization or supply chain. This aspect of the study is shown in **Figure 4**.

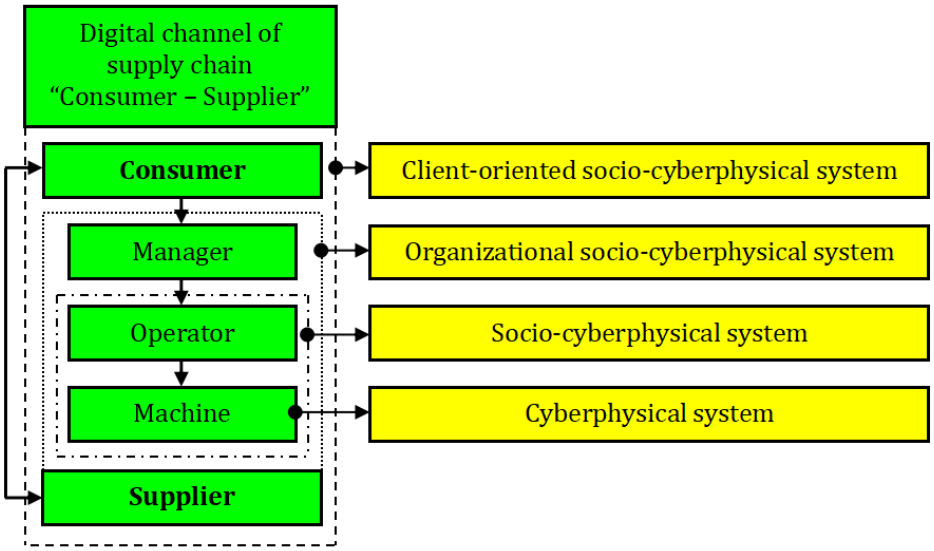

Figure 4. Classification and structure of digital systems formed in organizations and supply chains.

Note: The lines of strokes in **Figure 4** limit the field that includes two links of the digital channel: the supplier and the consumer. The lines of dots form a field that indicates the chain links within the supplier, including the manager, operator, and machine. Inside this field, the lines of strokes and dots represent a value creation channel for the end user, which includes an operator and machine.

The features of this figure are:

Firstly, there is the refined structure of digital chain formed within the traditional "consumer–supplier" supply channel.

Secondly, the consumer of products and services makes a demand to the manager as a link in the formed supply chain.

Thirdly, the creation of three–link supply chain in the supplier's internal environment: "manager–operator–machine".

This classification allows us to identify four main types of socio-economic systems: cyberphysical system [44], socio-cyberphysical system [45], organizational socio-cyberphysical system, and customer-oriented socio-cyberphysical system.

It is important to note that the first two types of socio-economic systems correspond to the concepts of "Industry 4.0" and "Industry 5.0" [3], while the latter two are likely to be the objects of research of later concepts.

After determining the type of socio-economic system, the manager, when creating the memoirs, should pay attention to the management decisions that were developed and implemented within internal supply chain of "manager–operator–machine". The solution to this problem is presented in **Table 1**.

Table 1. Options for management decisions of the digital chain link "manager–operator–machine".

Links of a Digital Chain			Options for an Interaction of Digital Chain Links
Manager (Object—0; Entity—1)	**Operator (Object—0; Entity—1)**	**Machine (Object—0; Entity—1)**	
0	0	0	Inaction
0	0	1	*Machine* → (manager, operator)
0	1	0	*Operator* → (manager, machine)
0	1	1	(*Operator, machine*) → manager
1	0	0	*Manager* → (operator, machine)
1	0	1	(*Manager, machine*) → operator
1	1	0	(*Manager, operator*) → machine
1	1	1	*Manager* ↔ *Operator* ↔ *Machine*

Table 1 shows:

Firstly, each link in the research chain can be either active, that is, a subject of management influencing other links, or passive, that is, an object of management.

Secondly, each option of management decisions is digitized with three-digit binary code, starting from "000" and ending with the code "111".

Thirdly, there are various options for interaction between the manager, operator, and machine to develop the system decision. For example, the manager may give instructions to fulfill a customer order, an operator may suggest options for doing so, and a machine may need the appropriate equipment in order to fulfill that order.

5.3. Structure of Memoirs

From the perspective of creating digital memories of famous managers, it is crucial to consider the interests and demands of supply chain partners: a consumer and supplier. The consumer focuses on the value of products and services, while the supplier focuses on creating this value through the process and, consequently, profit. This approach should be used as a basis for creating the template for manager's memoirs.

If we take as a criterion of effectiveness not the profit of organization, but the consumer value, then using classification attributes "phase (stage) of value creation" and "type of link in supply chain related to value creation"; 4 types of values can be justified: desired value, value prototype, value carrier, and perceived value [46].

This information allows us to understand the logic of value creation by the supplier, which is then evaluated by the consumer in the form of some type of value. Each step in this process focuses on the effectiveness of management decisions made by the supplier. To prove the objectivity of these criteria, we can use binary matrix with 2 rows and 4 columns (**Figure 5**).

The rows in this table are based on classification attribute "levels of management decision": supply chain level, symbol "0", and level of supply chain link (organization), symbol "1". In turn, the columns of **Figure 5** are formed using dichotomies: threats, code "00", facts, code "01", reaction, code "10", and losses, code "11" of classification

attribute "factors of effectiveness of a management decision". These dichotomies represent logical sequence: organizations experience threats that require them to collect information (facts) about their readiness to overcome these threats. After this, the organization's response to potential threats becomes necessary, often resulting in some losses.

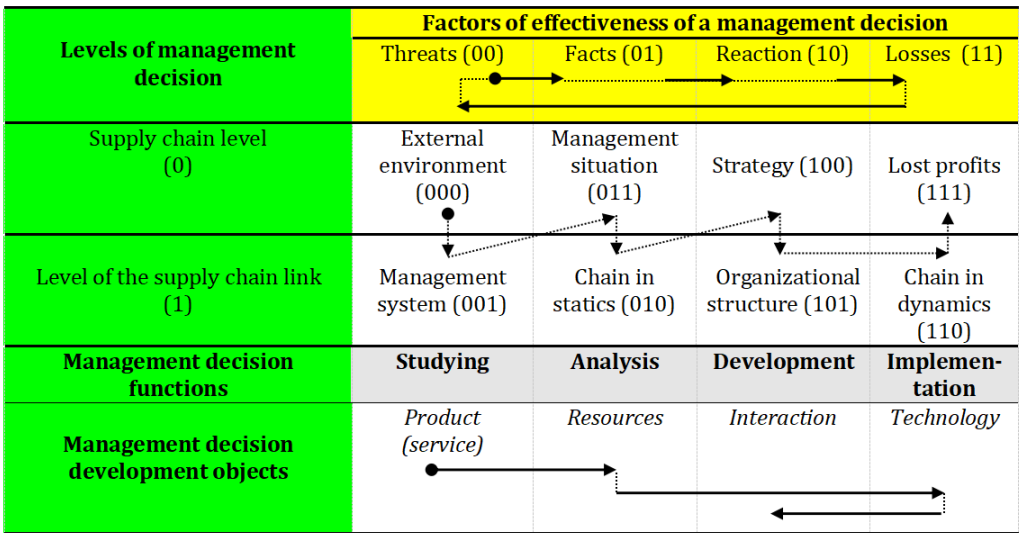

Figure 5. Classification of the components of the value creation process for the end consumer of products and services.

Note: Lines of dots represent the sequence of use of the eight components of the value creation process for the end consumer, considering two levels of the supply chain. Solid lines show the sequence of using four objects of management solution development, considering factors of management decision effectiveness.

To determine each of these factors, the organization uses following management functions: study, analysis, development, and implementation of management decision. Threats are usually associated with organization's inability to reach break-even point or critical volume of products and services to cover costs. The collection of information should allow the organization to determine the material, information, financial, and human resources necessary to neutralize threats. The organization's response to these threats involves selecting partners with the necessary resources, which requires interacting with them. However, losses can occur when an organization uses inefficient technologies or ignores the most appropriate technologies for the current management situation. These management decisions have logical relations, as shown in **Figure 5**.

The content of binary matrix (**Figure 5**) allows us to justify the chain of criteria for the effectiveness of management decisions as the basis for future digital memoirs of famous managers in following form: "external environment, code "000" → management system, code "001" → management situation, code "011" → chain in statics, code "010" → strategy, code "100" → organizational management structure, code "101" → chain in dynamics, code "110" → lost profits, code "111".

The combined use of values forms of end consumer of products and services and criteria for the effectiveness of management decision (**Figure 5**) make it possible to develop the template for manager's memoirs as the basis of digital twin for organization and supply chain management (**Figure 6**).

The features of this figure include:

Firstly, it is divided into 3 parts: "A. Questions", which allows we to create memories in the "Publicism" version; "B. Objects", focusing on the option of "Educational and cognitive literature"; and "C. Inputs and Outputs", which is the basis for creating the "Scientific literature" version.

Secondly, all three sections of **Figure 6** are connected horizontally, and the elements within these sections are logically arranged vertically.

Thirdly, if the "Publicism" option allows we to create memoirs in both paper and electronic media, then the "Educational and cognitive literature" and "Scientific literature" options are intended for the development of software products, including the digital twin for organization and supply chain management.

Fourthly, the components of variants "Educational and cognitive literature" and "Scientific literature" are digitized in binary codes, and the transition from one component to another component "downstream and upstream" is carried out by replacing one classification attribute or dichotomy with another attribute or dichotomy.

Fifthly, part "B" allows us to use pipeline effect, ensuring seamless value chain for the end consumer of products and services, as well as criteria for the effectiveness of management decisions that link them. For example, when switching from criterion "Management situation", code "011", to criterion "Strategy", code "100", component "Mechanism", code "011100" is used. When switching from criterion "Organizational structure", code "101" to criterion "Chain in dynamics", code "110", component "Stimulus", code "101110" is used, etc.

Figure 6. Template of the manager's memoirs as a basis for the digital twin of supply chain management.

5.4. Classification and Structuring of Digital Chain Link Strategies

The particular interest in preparation of memoirs of famous managers is the development of strategy for the organization and further supply chain, which can be created on the basis of some combination of vertically and horizontally related typical and innovative management decisions. This aspect of the study requires substantiation of the classification of organization's strategies as the link in digital supply chain, which is formed on the basis of their following attributes and dichotomies: "type of strategy": typical (T), symbol "0", and innovative (I), symbol "1", as well as "priority or strategy level": global (G), symbol "0", and local (L), symbol "1". As follows from the contents

of **Figure 7**, 4 types of organization strategies are possible: typical global (T–G), code "00", innovative global (I–G), code "01", typical local (T–L), code "10", and typical innovative (T–I), code "11".

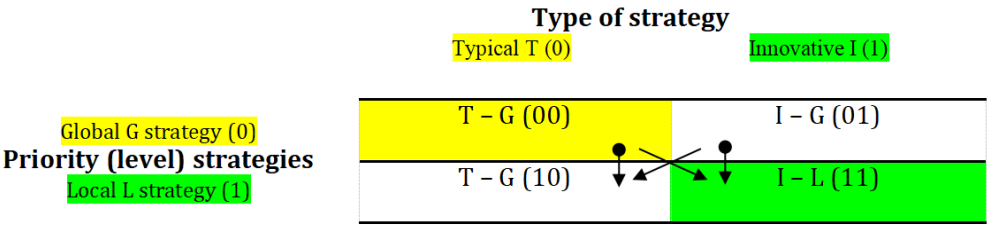

Figure 7. Classification of digital chain link strategies.

Based on this classification, it is possible to model not only the strategies of organization as the part of supply chain but also the entire supply chain. To solve this problem, we need to create digitalized standard strategies that can be used without modifications or adjustments depending on specific management situation. In this case, the standards should be transformed into virtual copies of non-physical management objects, which, after computer modeling, will replenish the database of digital twins for organization and supply chain management.

The basis for computer modeling of the strategies of organization and further supply chain and, accordingly, the processes of developing and implementing management decisions is the process of structuring these strategies, shown in **Figure 8.**

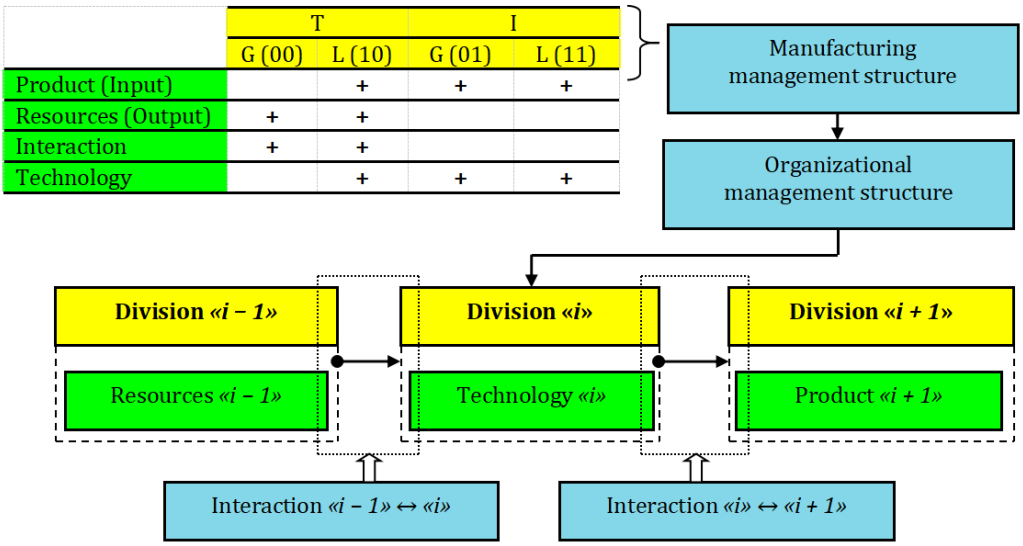

Figure 8. Scheme of structuring the digital chain link strategy.

The features of **Figure 8** include:

Firstly, at the beginning, in accordance with the information in lower part of **Figure 5** and **Figure 7**, the structure of management decision development process is specified. For example, the product created based on demand of end consumer is innovative at global level. However, at local levels, it contains both innovative and typical assembly units and parts. Despite the novelty of developed product, the resources required for its production are typical and do not necessitate the review of organization's relationships with counterparties. Simultaneously, creating desired value for end consumer of this product necessitates the introduction of innovative technologies.

Secondly, after filling in the table in upper left corner of **Figure 8**, it is necessary to investigate and refine the organization's manufacturing structure. This involves identifying those divisions that are involved in creating the product required by the customer, and establishing relationships between them.

Thirdly, after solving this problem, it is necessary to review organizational structure, that is, to form the set of internal supply chains by analogy with the information in **Figure 4**.

Fourthly, in order to develop local strategy for division *«i»* using technology *«i»*, it is necessary to organize its interaction with the supplier *«i – 1»* and consumer *«i + 1»*, thereby ensuring the transformation of incoming resources into outgoing products.

Fifthly, to perform above processes, we may need both typical, standard-based, and innovative management decisions obtained through computer modeling.

5.5. Recommended Form for Creating Memoirs of Famous Managers

Part "B. Objects" (**Figure 6**) includes the sequence of non-physical objects that are extremely difficult to identify, formalize, structure, combine, digitize, model, and optimize for managing the organization or supply chain. To perform these functions effectively, it is advisable to divide these management objects into components and elements from which various variations and combinations can be created. The solution to this problem can be based on qualitative research methods such as terminological analysis, descriptor and facet methods (Section 4). **Figure 9** shows the example of form for digitizing the memories of famous managers.

Objects	00	01	10	11
	Desired value (00)			
External environment (000)	Natural environmental	Object's environment	Consumer's environment	Environment of management entity
Management system (001)	Factors	*Goals*	*Approaches*	*Objectives*
	Tools	*Principles*	*Методы*	*Functions*
	Value prototype (01)			
Chain in statics (010)	Enterprises	-	Relationships	-
Management situation (011)	Disturbances	Challenges	Threats	Destruction
Strategy (100)	T – G	I – G	T – L	I – L
Management structure (101)	Stable regime	Adaptation to the external environment	Diversification of activities	Organizational flexibility
Chain in dynamics (110)	-	Processes	-	Flows
	Value carrier (10)			
	Perceived value (11)			
Lost profits (111)	Economic losses	Social losses	Ecological losses	Intellectual losses

Figure 9. Form for digitization of memoirs of famous managers.

The features of this form include:

Firstly, the structuring of each non-physical management object into four parts using two classification attributes and dichotomies. This allows us to digitize each part using two-digit binary code.

Secondly, external environment of the organization splits into two unequal parts: (a) natural environment, environment of the management object and environment of the consumer, each of which is characterized by a set of factors, as well as (b) environment of the management entity, which includes such components as goals, approaches, objectives, tools, principles, methods and functions.

Thirdly, the management situation that the organization or supply chain may face can lead to disturbances, challenges, threats, and destruction. This requires the organization or supply chain to take appropriate measures. These measures include: operating in stable regime, adaptation to external environment, diversification of activities, and organizational flexibility.

Fourthly, it is advisable to divide the losses of organization or supply chain into different categories based on their sustainability: economic, ecological, social, and intellectual losses. These losses, when added together, form the lost profit, which can be used as the criterion to evaluate the effectiveness of management decisions.

Fifthly, each component and, if necessary, each element of non-physical management object can be digitized using binary code. This allows us to design identification series that create necessary conditions for the development of algorithms where the dichotomies in classification attributes act as bifurcation points. Based on these algorithms, we can develop artificial intelligence that operates on non-physical management objects. If it is possible to integrate this type of artificial intelligence with that operating on physical management objects, then we can raise the question of creating the digital twin for organization and supply chain management.

Thus, this article presents the basics of translating non-physical objects: knowledge, skills, proficiency, and competencies of famous managers into new-generation software product: the digital twin for organization and supply chain management, which goes beyond the scope of industrial revolution "Industry 5.0" discussed by experts. The organization or supply chain that manages to develop and implement this software product will be provided with a sharp leap in competitiveness due to currently underutilized reserve: lost profits.

6. Discussion

It is difficult to find more widespread type of human activity than management. It arises and is used in cases where two or more people work together to achieve common goal. It is all the more surprising that specialists still do not pay enough attention to it, preferring to improve other types of human activity, such as industry, agriculture, transport, etc. In other words, a paradigm has not yet been substantiated that confirms the importance of the process of creating and implementing these achievements based on effective management decisions.

In the context of increasing socio-economic challenges facing humanity, the need to find and utilize neglected or implicit sources of development is becoming increasingly urgent. One such source is the experience of past and current generations of managers, which, when combined with the advances of scientific and technological progress, can provide adequate decisions to these challenges.

It is difficult to solve this problem, because management, like no other type of human activity, operates with non-physical objects that are difficult to identify, formalize, structure, combine, digitalize, model, and optimize. Many aspects of solving this problem are debatable. These include:

Firstly, the improvement of form and content of terminological dictionaries in the field of management is necessary. In dictionaries of the new generation, we need to create conditions for computers to be able to work with various, currently isolated terms and design management systems and processes that are adequate to current management situation.

Secondly, the introduction of concept of "identification series", which allows us to measure specific non-physical object in order to establish standards for objects of this type and their subsequent use in computer simulations.

Thirdly, the development of algorithms based on identification series in order to establish vertical and horizontal relations between various elements, components, and objects of management, assessed by classification attributes and dichotomies.

Fourthly, the justification of structure of artificial intelligence operating with non-physical management objects. The main challenge here is the choice between one or another point of bifurcation or dichotomy. Unlike with artificial intelligence that operates on physical objects, this choice must still be made by a human (manager or operator).

Fifthly, the creation of digital twin for organization and supply chain management, including its basic components such as a prototype, instance, aggregate, and digital environment.

Sixthly, the development of methodology to justify digital management decision that aims to reduce the lost profits of organization or supply chain.

7. Conclusions

In this paper, the following results were obtained, which are characterized by scientific novelty. The classification and structure for digital systems formed in organizations and supply chains, has been developed. The template and form for digital memoirs by famous managers has been created, which can serve as the basis for future digital twin for organization and supply chain management.

The contribution to the theory is based on the creation of theoretical and methodological foundations for digitalization of non-physical objects such as knowledge, skills, proficiency, and competencies that characterize the

manager. This is followed by their use in creating artificial intelligence and the digital twin for organization and supply chain management.

The contribution to practice is confirmed by the development of form and template for digital memoirs of famous managers, which allows them to be used as software product for the development and implementation of management decisions with minimal lost profits.

Further research is expected to develop methodological recommendations:

Firstly, for improving the content of management terminology dictionaries;

Secondly, for designing identification series that allow for the measurement of non-physical objects of organizational and supply chain management;

Thirdly, the creation of algorithms that substantiate logical relationships and provide for bifurcation points. These algorithms should reflect the logic of studying a system of interconnected physical and non-physical control objects, ensuring a combination that maximizes the organization's and supply chain's adequate response to changing environmental factors.

Fourthly, on the justification of the artificial intelligence structure operating objects of this type, particularly the design of so-called "sensors" and "actuators" activated when the organization and supply chain achieve certain management performance criteria.

Fifthly, on the design of a digital twin for managing the organization and supply chain's data, specifically, a prototype, instances, and an aggregate of the digital twin, as well as the technology for developing and implementing digital management decisions aimed at minimizing lost profits.

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