UDC 004.9:911.5/.9:528.94

MICROSOFT SOLUTIONS FRAMEWORK (MSF) AS A GENERALIZED METHODOLOGY OF THE FRAMEWORK APPOACH TO SPATIAL INFORMATION SYSTEMS HANDLING

V. Chabaniuk,

E-mail: chab3@i.ua

Institute of Geography of the National Academy of Sciences of Ukraine,

O. Dyshlyk,

E-mail: dyshlyk@geomatica.kiev.ua

Geomatic Solutions LLC

Annotation

In the article "Framework approach as a strategy for research and design of complex spatial information systems (using the example of NGDI)" the names of its three possible interpretations are formulated. The first of them – as a specific constructive strategy for using geographic information systems and technologies (GIS&T) to manage the territory of Ukraine - considered there also. This paper explores the second interpretation of the Framework Approach – as a generalization of the methodology for SpIS handling.

The notion of "generalized methodology" is at the same "epistemological" level of the hierarchy of notions as the notion of "constructive strategy". To consider this correspondence, the notion of "meta X" is used, where X takes the values necessary for this work. From a theoretical viewpoint, the main attention paid to the notion of "meta-research" and its component - the notion of "meta-methodology". From a practical viewpoint, the main attention paid to the notions "methodology" and "meta-methodology", known since the end of the last century as the Microsoft Solutions Framework (MSF, versions 1.0 – 4.0). Moreover, such understandings of "generalized methodology" selected that correspond to the notion of "meta-methodology" in the context of the Framework Approach to SpIS handling.

Paying due respect to the origin of the term "Solutions Framework (SoFr)", the consideration of the generalized methodology (or generalization of methodologies) begins with a reminder of version 2.0 of the MSF methodology, to all versions of which the abbreviation M SoFr (Microsoft SoFr) is applied. Such a notation makes it logical to ask about the similarities between M SoFr and the previously considered X(Y) SoFr, such as GeoSF (GeoSolutions Framework) or AtlasSF (Atlas Solutions Framework). Some of these similarities discussed in the article.

At the turn of the century, the MSF 2.0 methodology consisted of six Microsoft models (solutions), some of which we used in practice: 1) enterprise architecture, 2) project team, 3) risk management, 4) application development process, 5) design process, 6) enterprise application. All of them described in the MCSD70-100 exam using the example of a hypothetical application that was relevant at that time. Then the MSF 2.0 methodology generalized, so that MSF version 4.0 included two methodologies: MSF for Agile Software Development (MSF4ASD) and MSF for CMMI Process Improvement (MSF4CMMI). There are sources in which the mentioned constructs called approaches. The following relations are valid: 1) MSF4ASD ↑ MSF 4.0, 2) MSF 4.0 ↓ MSF4CMMI. The relation ↑ is epistemological, and the relation ↓ is reductive. The ↑↓ relations are supplemented by inclusion relations: MSF 4.0 = MSF4ASD ∪ MSF4CMMI.

Updating MSF 4.0 and presenting it with a modern generalization of the methodology for SpIS handling is necessary for the possible reduction from it of currently practically useful methodologies. In particular, built using modern Microsoft products, open source products, including our "extension methodology", as well as others. Formally, the MSF notion is not currently being developed and the methodological constructs of MSF are hypothetical, however, the phenomenon of MSF itself actually exists, is developing and is used.

The actual now MSF version in this article is interpreted as a meta-methodology, from which, by reduction (specification or specialization), it is possible to obtain the methodology for SpIS handling, necessary for practice and including actual Microsoft information technologies. The renewal of our interest to Microsoft

solutions and technologies explained not only by their usefulness, but also by the more than ten-year strategy of their gradual openning by the parent (author) company. Due to this fact, by reduction (one or two) from the MSF meta-methodology, we expect to obtain our "extension methodology". The more traditional name of the latter is Pattern-Based Spatial Engineering (PBSE) due to the fact that it is now being created as Model-Based Software Engineering. The latter will be Model-Based Systems Engineering.

Keywords: *generalized methodology for SpIS handling, MSF methodology and meta-methodology, Pattern-Based Spatial Engineering (PBSE)*

Introduction and purpose

What is the generalized methodology of Framework Approach?

The term "generalized methodology" or "generalization of methodologies" used in the second of three interpretations of the "Framework Approach to Research and Design of Complex Spatial Information Systems (SpIS)", which is formulated "Framework Approach … as a generalization of the methodology for SpIS (such as NGDI and NSII) handling" [1]. In short – "The Framework Approach for SpIS handling as (its) generalized methodology". The cited article considered the first interpretation of the Framework Approach to the SpIS handling – as a constructive strategy. The strategy, like the Framework Approach itself, was called constructive because the notion was described using a hierarchical system of interconnected notions, among which is the notion of the methodology.

The cited article explained the differences between approach and methodology. In summary, approach defines the overall direction and provides a guiding philosophy, while methodology outlines the specific steps and methods that will be used to implement the approach and achieve the desired results. Approach is more about the "what" and "why" while methodology is more about the "how". Moreover, there is a ↑↓ relation between approach and methodology, as "neighboring" components of a hierarchical system. "Up" hierarchy is an epistemological relation ↑, "down" hierarchy is a reductive relation ↓.

The hierarchical system of notions mentioned here is shown in Figure [1; Fig. 4]. It was obtained by repeatedly applying the so-called “epistemological extension”, which was carried out from the bottom up, starting from the components of the lowest echelon. In the case of spatial information systems (SpIS), the most famous of its components are Electronic Atlases (EA), the practice of creating which is well known. Epistemological relations in this case were reduced to finding satisfactory values for the components of the hierarchy EA ↑ AtIS ↑ $AtIS^2$ ↑ GIP ↑ IGIF. The abbreviations used mean: AtIS – Atlas Information Systems, $AtIS^2$ – Dynamic Atlas Information Systems, GIP – GeoInformation Platforms, IGIF - Integrated Geospatial Information Framework.

All these ↑ relations are based on the researcher's special knowledge. For example, the entry AtIS ↑ $AtIS^2$ implies knowledge of: 1) the structure of the AtIS, 2) which components of the AtIS structure can be changed but remain "satisfactory" from the viewpoint of the "complete" AtIS. An example is a component called a "content tree" in the case of AtIS and a "decision tree" in the case of $AtIS^2$. From the $AtIS^2$ decision tree the developer or skilled user creates, possibly "dynamically", the content tree of the final AtIS. A useful example for us of the relation GIP ↑ IGIF is the relation NSDI ↑ IGIF, which can also be interpreted as NSDI □ IGIF. Without further clarification, the phrase used reflects two ways of forming a hierarchical system as: 1) a metasystem ↑, 2) a structured system □.

“Epistemologically similar” notions are combined into echelons that form a “spatial system” (SpaSys) that models reality. This fact is shown on the left in Figure [1; Fig. 4]. “Generalization of methodologies” refers to the two highest echelons, the Infrastructure echelon of the external and the Infrastructure echelon (NSDI). Let us clarify it with the help of **Fig. 1**, where **1Strategy/Approach** and **.1.2GeneralMethod**. (Generalized methodology) are added in gray. Echelons are also used to combine user groups. As an example, the Managers/Architects group will refer to the “Infrastructure echelon (NSDI)”.

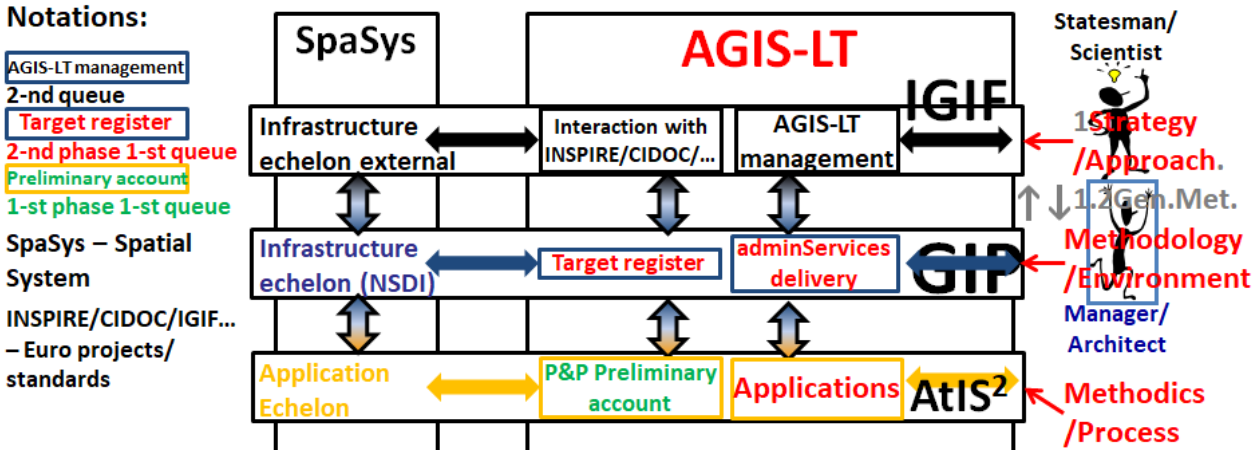

Fig. 1. The two highest echelons of the hierarchy of basic notions according to [1; Fig. 4]

The ↑↓ relation is shown in the right part of Fig. 1, although it exists in all relations shown by two-sided colored (changing from blue to black) volumetric arrows between the components of the Infrastructure echelon external and Infrastructure echelon (NSDI). In particular, it exists between the approach and the methodology and, importantly in this article, between the “Generalized methodology” and the “Methodology”. The “generalized methodology” notion or “generalization of methodologies” notion obtained by the “epistemological extension” of the “methodology” notion. There are quite a few of the latter in the practice of creating information systems. Several of them described in the article [2].

The "generalized methodology" notion compared to "methodology" notion requires a more detailed consideration. To do this, we will use the prefix *"meta"*, which has Greek origins and has three main meanings in the Greek language:

1. ‘meta X’ is the name of something that happened *after* X, that is, X is a prerequisite of meta X,

2. ‘meta X’ indicates that X is changing and is the name of this *change*,

3. ‘meta X’ is used as the name of something that is *higher* than X in the sense of higher organization, or of a higher logical type, or viewed from a more general perspective (transcending).

If we accept X as a methodology, then the “generalized methodology” is a “metamethodology”.

This article is part of a series of articles on the development of the X(Y) SoFr. This fact is reflected in the name Microsoft Solutions Framework (MSF). This name is abbreviated as M SoFr or MSF, where SoFr is short for Solutions Framework, and M is used here instead of X(Y). The latter entry was often found in works with different meanings for both X(Y) and X(Y) SoFr in general.

MSF has come a long way in development and now we can talk about the still actual MSF methodology and the generalized MSF methodology. Generalization of the MSF methodology is appropriate to consider as a meta-methodology. This is the main focus of this article.

Purpose of work

The **purpose of the work** is to renew interest to the MSF methodology and consider its meta-methodology (both – for SpIS research or design) from the view point of their use in the Pattern-Based Spatial Engineering (PBSE) we are creating.

The belonging of the MSF meta-methodology to the PBSE is not explicitly stated, but this fact follows from the context of the Framework Approach to the SpIS handling. In addition, both MSF constructs will be used in further work.

Generalization of methodologies – theory

The term “generalization” has several meanings, which are considered in many sources. This concept is considered in detail in the famous monograph [3] (Poya, 1975). We are satisfied with the definition of the third part of the article by O. Gvozdik from the dictionary [4; 653]: “3) Identification of regular principles of connection of certain phenomena or their characteristics, on the basis of which it would be possible to carry out explication and prediction of the dynamics of all individual phenomena that are in the field of action of these principles. Thus, generalization is always associated with the transition of knowledge (both individual thoughts and entire theories) to a higher level of abstraction. Although this weakens the so-called “empirical clarity” of knowledge, thanks to generalization the scope of their applicability is expanded. The limits of general concepts that reflect universal regular connections and relations that exist in objective reality are categories.

Generalized knowledge allows us to reflect reality more deeply and to penetrate its essence. The opposites of generalization are concretization and specification, which express the transition from the general to the particular and the individual (see General).

To provide a scientific basis for some of the concepts used, we first use the articles on meta-research, meta-methodology and meta-hermeneutics from the encyclopedia [5]. The article on meta-research uses the three-tier model of Tsoukas and Knudsen [6]. We show its correspondence to the van Gigch meta-model, which we used earlier to describe hierarchical systems.

The titles of the two sections below are those of the original articles in the second edition (Ed. 2) of the encyclopedia [5]. The author of all three articles mentioned is Mark G. Edwards, Business School, University of Western Australia, Crawley, WA, Australia. To reduce the volume, we have removed the references he used and also shortened the content where appropriate.

Meta-research (Meta-level research)

Definition of Meta-Research

Meta-research (alternatively called meta-level research) is a form of cross-border scientific inquiry that takes a reflective, big picture approach. It is “meta” in the sense that its subjects are other scientific studies. That is, it examines the theories, methods, findings, and interpretive frameworks of other research programs and seeks pluralistic integration within and/or between the fundamental elements of the scientific process. The “research” aspect refers to the pluralistic and multidimensional nature of this form of research.

Meta-research consists of at least four branches of research: meta-methodology, meta-data analysis, meta-hermeneutics, and meta-theory. They relate, respectively, to four aspects of knowledge creation and transformation: (i) externalization (adherence to a specific prescriptive method), (ii) internalization (observation, experimentation, and data collection), (iii) socialization (interpretation and search for meaning in these

data), and (iv) combination or validation (communication and validation of the theory, model, or findings that result from the knowledge creation process).

Meta-research differs from disciplinary integrative research in at least four ways: (i) it is not necessarily based on any disciplinary distinctions; (ii) it is defined by the meta-level and integrative nature of the research itself, rather than by the disciplinary expertise of the researchers; (iii) it produces meta-level research outputs, that is, meta-theories and meta-methods, that can then be tested, applied, and critiqued, rather than seeking solutions to specific problems; and (iv) it consciously employs meta-level research methods, assumptions, and forms of inquiry. Meta-research is not a specific meta-theory, meta-method, or form of meta-analysis, but rather an explication for all those varieties of scholarly inquiry that reflexively examine the constitutive products and processes of other scholarly inquiry and other sources of cultural knowledge.

Description of Meta-research

There are many terms used to describe integrative forms of research. Meta-research is a general descriptor of the research landscape, where each of the terms used can be located in a specific niche (**Fig. 2**).

Tsoukas and Knudsen's three-tier model [6] provides a useful framework for understanding how meta-research relates to other types of social science. The model consists of an "object level" of empirical phenomena, a "theoretical level" of middle-level scientific inquiry, and a "meta-theoretical level" of large-scale knowledge. While the "theoretical level" studies the "object level" of empirical and operational realities and subsequently develops its theories and models, the meta-theoretical level takes the products of middle-level research as its "data" and from this database builds and tests meta-theories, synthesizing frameworks and integrative models. Meta-research does this not only for the theoretical aspect of the study (metatheory), but also for the method (meta-method), the analysis of the results (meta-data analysis), and the interpretive frameworks (meta-hermeneutics).

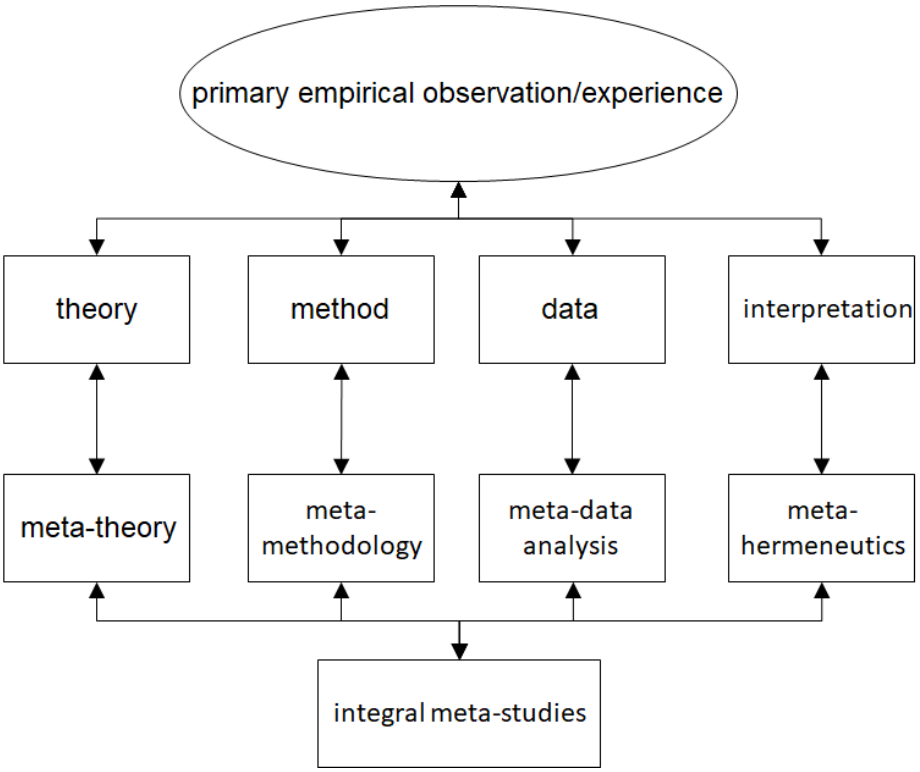

Fig. 2. Structure of integral meta-studies

The Tsoukas and Knudsen model [6] corresponds to the three-level inquiry model in van Gigch's metamodel [7], which reduces to a hierarchy of three levels of inquiry with obvious changes in the names of the levels.

Namely, the first *level is the intervention* or *implementation level*. In management terminology, the intervention level represents the *operational level* of the hierarchy of a traditional organization. This level always implements methods and procedures that originate from a higher level of research. The second level of research called the *modeling level*. Traditionally, this level called the tactical level of the enterprise. [7] calls it the *object level*.

Given the degree of abstraction required to solve the problems of the third level, the latter called the *metamodeling level* or *meta-research level*. In the traditional management hierarchy, this level called the *strategic level* of the enterprise.

We will not go into the differences between the names of the levels here. We will only note that the three levels of van Gigch in Relational Cartography [8] correspond to three strata, from bottom to top: 1) Operational, Application, Conceptual or 2) Application, Conceptual, General, depending on the subject of usage.

Modeling is the process of transforming our perceived vision of reality into a representation of it. Metamodeling is the process of defining the requirements that the modeling process must meet, or establishing specifications that the modeling process must meet.

Modeling or *to model* involves the modeler abstracting the properties of things to obtain a representation of the physical world (reality). It is easy to imagine that the (object) model is at a higher level of abstraction than the things from which these properties derived. This process of abstraction can be applied to the modeling itself to obtain a model of the modeling process, which we call a *metamodel*.

Multilayered interpretation in science

The scientific process can be viewed as a multi-layered activity that includes grounded, perceptual, or operational data; mid-level analyses of these data; and integration, comparison, and reviews of these analyses at the meta-level. In each of these activities, interpretation is a key element, and the interpretive systems that we use at each level in this sense-making process are very suitable topics for close study (see **Fig. 3**). The full range of research on interpretive dynamics includes (1) the collection of people's direct experiences and judgments (first-level perceptual interpretations), (2) the scientific analysis of these experiences and judgments (second-level, middle-level interpretations), and (3) the meta-scientific analysis of these middle-level interpretations (third-level, meta-hermeneutic interpretations).

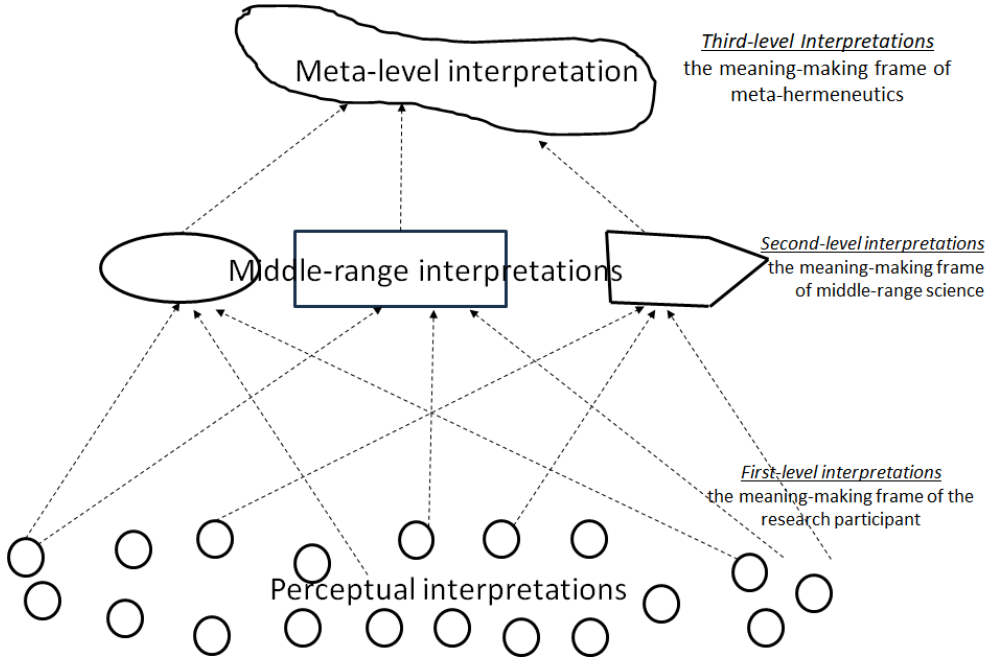

Fig. 3. Meta-hermeneutics and the multi-layeredness of interpretation [5; 4327]

The "interpretive turn" movement that emerged in the 1950s and 1960s focused on the power of assumptions and unacknowledged systems of meaning-making to influence theories, methods, and research findings. Social constructivism, feminist studies, critical theory, ecological ethics, and deep ecology are just a few of the many new interpretive disciplines that have grown out of this challenge to traditional positivist and objectivist forms of science. Meta-hermeneutics is a general term to describe these and many other kinds of approaches to knowledge that examine the interpretive framework of secondary or secondary analysis.

When research does not include this third level of meta-interpretation, it becomes vulnerable to uncritical acceptance of dominant social paradigms and values. As a result, quality of life can be associated with particular social and cultural perspectives revolving around, for example, materialism, consumerism, individualism, and neoliberalism.

Meta-methodology

Definition of Meta-methodology

Meta-methodology is the research of existing scientific methods. It is a rigorous form of meta-level research where the subject of the study is other research methods. Meta-methodological research is a branch of meta-research and is therefore closely related to other large-scale forms of scientific research, including meta-theory (the construction and testing of comprehensive theoretical frameworks from middle-level theories), meta-data analysis (the comprehensive analysis of primary results), and meta-hermeneutics (the comprehensive study of the systems of interpretation used in primary research).

Meta-methodological research is an important, though often unrecognized, topic for scientific research because it explores, consciously and reflexively, the models and procedures by which we acquire knowledge. In addition to examining the procedures used to study something, meta-methodology examines the underlying assumptions and perspectives (lenses) that we use to structure method-based research. The term "methodology" is sometimes used synonymously with meta-method.

However, methodology is also used variously to refer to all research methods in general, the philosophy of research methods, and meta-methods, and this ambiguity should be kept in mind when using the term.

Description of Meta-methodology

Meta-method is useful for (1) reflective examination of a method, (2) critical evaluation of other methods, (3) determining the direction of future research, (4) identifying methodological gaps and redundancies, and (5) identifying epistemological blind spots. Meta-method is particularly valuable in fields characterized by multiple and competing methods, epistemological paradigms, and schools of inquiry.

The notion of meta-method (and other similar concepts such as "methodology" and "multimethods") emerged in the 1970s and 1980s with the rapid growth of the health and social research fields and the proliferation of social science journals reporting on many new types of quantitative and qualitative methods. As with the emergence of meta-theory and meta-data analysis, researchers have recognized the need to combine and make sense of many different methodological procedures for constructing and testing theories, and for conducting quantitative and qualitative research.

MSF methodology and its generalization - Practice

Definition 1 MSF in [9]: MSF is a collection of models, principles, and methods that help an organization more effectively create and use IT to solve business problems. By providing measurable progress and clear and sufficiently flexible guidance, it helps to meet the changing needs of the organization. The basic building blocks of this guide to MSF-based solutions are six core models.

Definition 2 MSF from [10], trans. from English: "MSF is a set of principles, models, disciplines, concepts, and guidelines for delivering IT services from Microsoft. MSF is not limited to application development; it is also applicable to other IT projects, such as deployment, network, or infrastructure projects. MSF does

not force a developer to use a specific methodology (e.g., waterfall or agile software development models)."

Definition 2 MSF has clear features of a methodology, although the terminology is not used strictly. The instability of the terminology is explained by versioning and the variability associated with versions. Four versions of MSF are known: 1.0 - 1993, 2.0 - 1997, 3.0 - 2002, 4.0 - 2005. MSF 4.0 [11] is a combination of metamodels that can be used as a basis for prescriptive software engineering processes, and two configurable and scalable software engineering processes.

Definition 3 MSF from [10], translated from English: “MSF is a set of principles, models, disciplines, concepts, and guidelines for delivering IT services from Microsoft.” It also states that MSF includes:

- "Metamodel", the basis of software engineering processes - fundamental principles.
- Two software engineering process templates: MSF4ASD and MSF4CMMI. These software engineering processes can be modified and customized.

Definition 3 MSF is important because MSF includes a metamodel and defines two methodologies: MSF4ASD and MSF4CMMI. Around 2006, publicly available descriptions of the MSF concept ended. The MSF phenomenon itself continued to develop after 2006. This is evidenced, in particular, by the development of its six main models of version 2.0. Thus, with the help of the modern development of some of them, we can smoothly move to such information technologies (frameworks) of Microsoft as ASP.NET MVC Core and Entity Framework Core.

The term “Solution Frameworks (SoFr)” borrowed from MSF at the turn of the millennium was used in the names “Project Solutions Framework ProSF” and “GeoSolution Framework GeoSF”. The corresponding concepts and phenomena were invented by abduction. At the same time, our SoFr concepts and phenomena (ProSF, GeoSF, …) differed from the concepts and phenomena of MSF. The basis of our SoFr was project activities to create spatial information systems (SpIS). The basis of MSF was activities to create software using Microsoft software tools.

At the turn of the millennium, we did not use MSF as a methodology, only its individual models. Although the term “methodology” in the context of MSF was first seen then - in the Russian translation of the training course [9] in the title “Part I. Methodology”, which consisted of four chapters, which sequentially considered: 1) Production Architecture, 2) Enterprise-scale Applications, 3) Project Teams, 4) Development Process. In the original [9] this same part was called “Part I Developing the Framework”, and its Chapters were called: 1) Enterprise Architecture, 2) Enterprise Applications, 3) Project Teams, 4) Development Process.

MSF models needed today

The basic building blocks of MSF-based solution management are six basic models: 1) Production Architecture, 2) Development Team, 3) Development Process, 4) Risk Management, 5) Design Process, 6) Application. Given the relevance, we will describe them. In doing so, we recommend paying attention to the differences between the models and their meanings in a specific project. In essence, these are the differences between metamodels and models, which in [9] were the differences between models and their meanings. The meanings (hypothetical application) were supplied on a CD that supplemented the MCSD70-100 training course.

We have used all six MSF models explicitly or implicitly in the practice of creating SpIS. The following section briefly describes them and provides some published examples of their use. In addition, due to the relevance of the MSF phenomenon, we will refer to them more than once in future works.

MSF Enterprise Architecture (EA) Model

Since the turn of the millennium, this model has been used very often; sometimes implicitly. It offers a consistent set of instructions (principles) that ensure the rapid creation of enterprise architecture (EA) through the release of versions. At the same time, information technology is brought into line with business requirements from four perspectives: business, applications, information and technology. Using this model allows you to reduce the time spent on EA development.

In the monograph [8], we used this model to demonstrate the analogies between MSF and GeoSF shown in **Fig. 5**. The double-headed arrow in **Fig. 4a** means that there are relationships between the MSF perspectives. An example of such a relationship could be the impact that business has on applications, information, and technology, and vice versa.

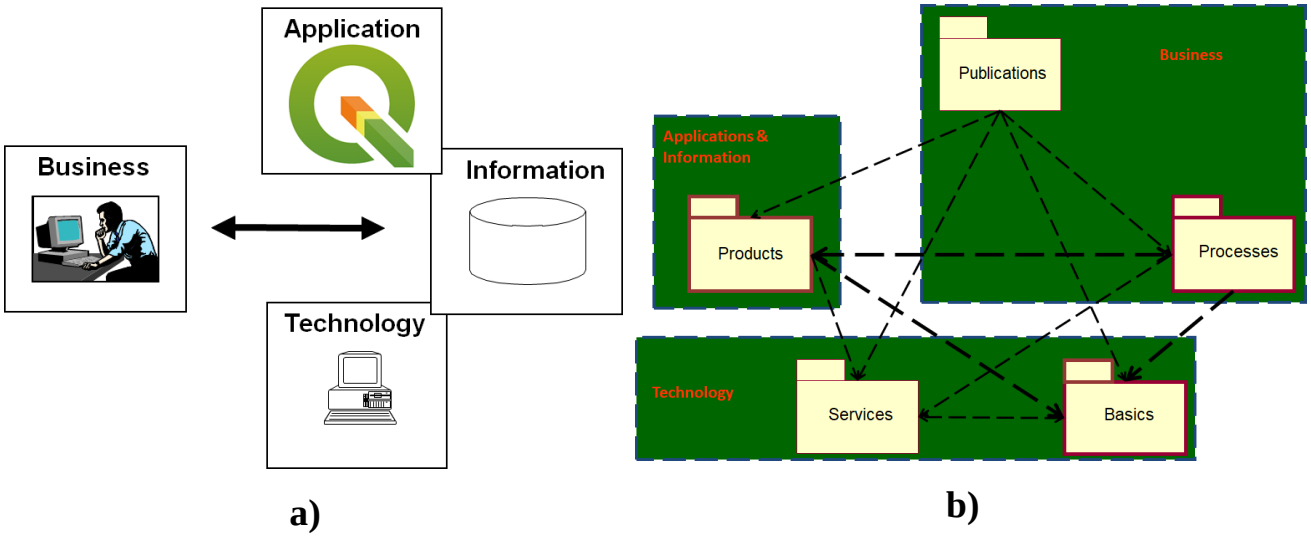

Fig. 4. a) MSF EA Model according to [9], b) Relationship between MSF EA Model and EA model used in GeoSF

At the beginning of the millennium, we proposed using the GeoSF method and tool for the development of the EA of geo-enterprises dependent on the National Spatial Data Infrastructure (**Fig. 6**). If this project had been implemented, Ukraine would have long ago had a NSDI built in a bottom-up manner - from the geo-enterprise to the country.

The EA model (**Fig. 4a**) is the main one in MSF. The MSF approach itself is sometimes called “Architecture-first”. The EA of an enterprise should be created iteratively and at each iteration it is necessary to perform the work of the stages (phases): Conceptualization (Envisioning), Planning, Development, Stabilization. In national practice, these stages (phases) are called as follows: Vision and/or Concept, Design, Development, Stabilization. At the same time, when describing the “Models of the Design Process” to denote groups of stage works, the term “stage” is used and the design stages were called Conceptual, Logical and Physical Design, respectively. In our works, phases consist of stages, stages - of stages, and phases form queues.

That is, to divide the design stage into smaller groups of works, it is more appropriate to use the term “stages”.

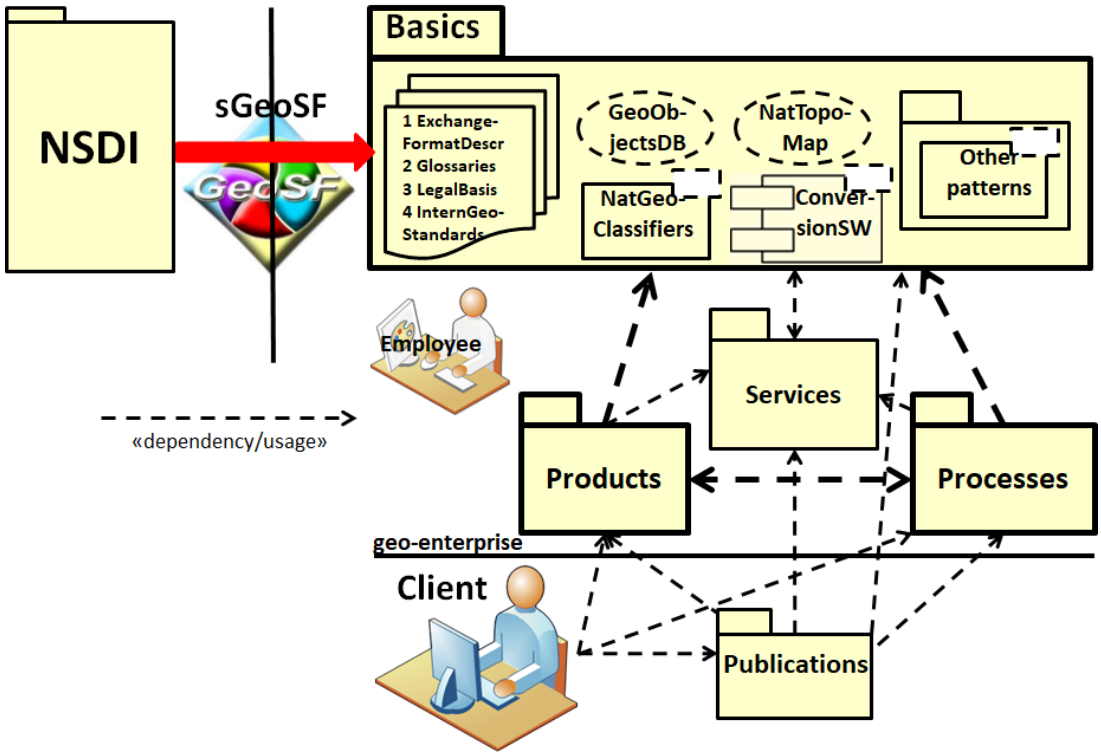

Fig. 5. Scheme of GeoSF usage in NSDI MSF Development Team Model

This model provides a flexible framework for organizing project teams: it describes the roles, responsibilities of each member, the distribution of responsibilities, and the order of work. It emphasizes both clear roles and responsibilities and clear goals for the team's success, and also increases the accountability of team members by approaching them as a collective of like-minded people. Flexibility allows you to adjust the model to the specifics of the project, the size of the team, and the qualifications of the members. Using this model and its fundamental principles and practices helps create more engaged, effective, resilient, and successful teams.

However, in practice, this model is of little use due to the high variability of projects. That is, the model most likely makes sense in a specific project, and one that is suitable for the application of the “classic” MSF methodology. In practice, we partially solved the problem of the required project team by changing the development process. In one of the practical projects, we changed the Waterfall

process model to the V-model. This allowed us to shorten, simplify, and break the implementation into manageable parts.

MSF Development Process Model

The MSF Development Process Model provides structure and guidance throughout the project lifecycle, which is based on milestones, is iterative and flexible. It describes the phases, milestones, activities and deliverables of an application development project, as well as their relationship to the roles of the MSF development team model. Using this model helps improve project control, minimize risk, increase quality and reduce delivery time.

MSF Risk Management Model

This model provides a structured and normative way to manage project risks. It establishes a discipline and environment of normative decisions and actions to continuously identify potential problems, identify the most significant risks and implement strategies to eliminate them. Using this model and its basic principles helps the team focus on what matters most, make the right decisions, and be better prepared for when the unknown future becomes known.

MSF Design Process Model

This model describes a three-phase, end-user-oriented, continuous development process characterized by parallel and iterative project execution, thus contributing to its efficiency and flexibility. Three distinct phases (more familiar to us as stages) – Conceptual Design, Logical Design and Physical Design – provide perspectives on the project from three audiences: end users, project team and developers. Progression from Conceptual Design to Physical Design transforms a set of use cases into a set of components and services that form an application that implements the requirements of the customer and users. Thus, the application is developed not for the sake of demonstrating technological capabilities, but to solve pressing business and user problems. **Fig. 6** shows an example of applying the MSF Design Process Model to the so-called GeoSolution Framework GeoSF [8]. The Research (Conceptual Design), Development (Logical and Physical Design), and Release and Operation

(Stabilization) phases correspond to the areas of operation of the GeoSF Method – βSoFr, GeoSF Tools – αSoFr, and the "Working" Computer System X – ωSoFr.

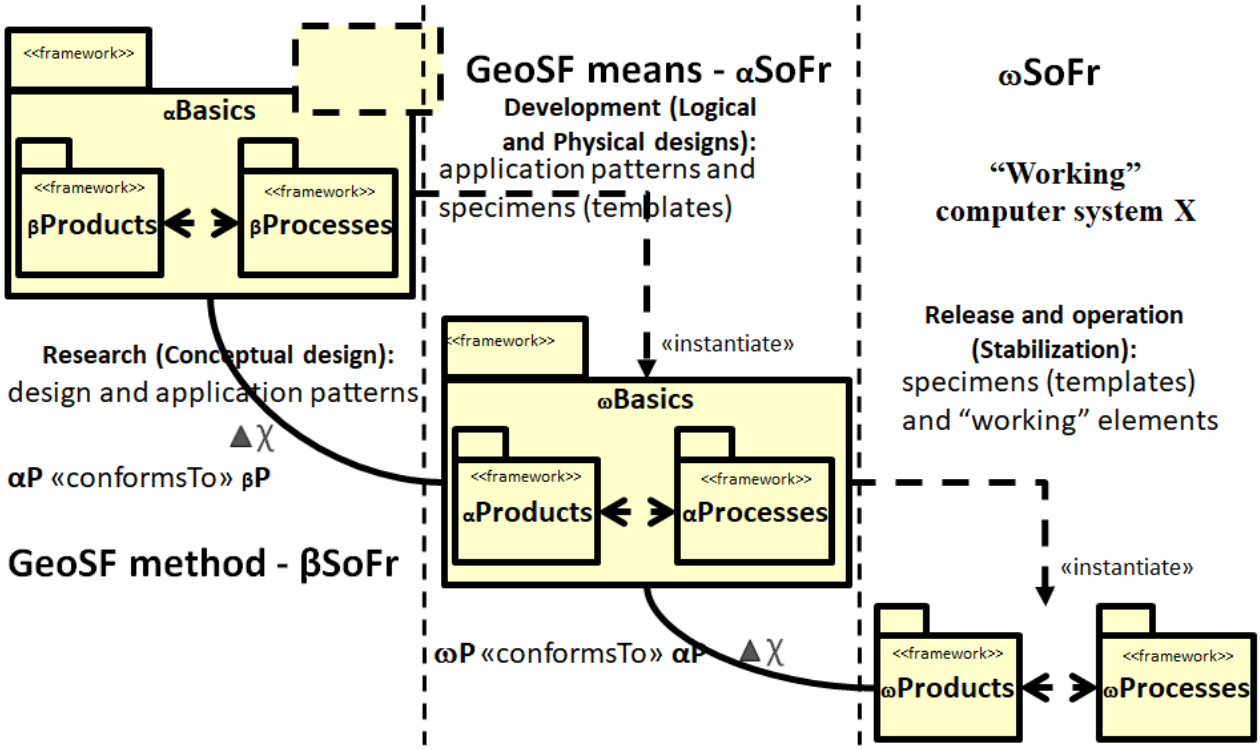

Fig. 6. MSF Design Process Model in action MSF Application Model

This model describes a logical, three-tier, service-oriented architecture for an application that is designed and developed. The use of user services, business services, and data services allows for parallel development, better use of technology, easier maintenance and support, and maximum deployment flexibility, as the services that make up an application can reside on a single personal computer or on different servers and clients in different countries.

MSF as a generalized methodology (meta-methodology)

Up to this point in the article, terms such as "methodology", "generalized methodology", "meta-methodology", "approach" have been used in connection with MSF. It seems that the meaning of this term could be finally clarified by the material of the monograph [11], which includes, in particular, **Fig. 7**, which offers an alternative vision of the MSF "family" with **Fig. 8**.

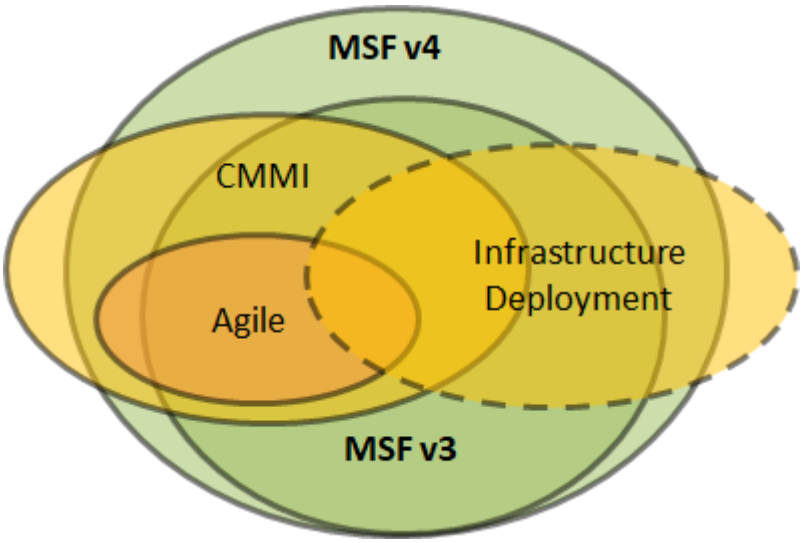

Fig. 7. MSF content ratio [10; Figure 1-3]

The "core" of MSF v4 encompasses and extends MSF v3. Each domain (e.g., application development and infrastructure deployment) includes the parts of MSF applicable to that domain. Each instance of MSF may also include domain-specific corporate governance that exists outside of MSF.

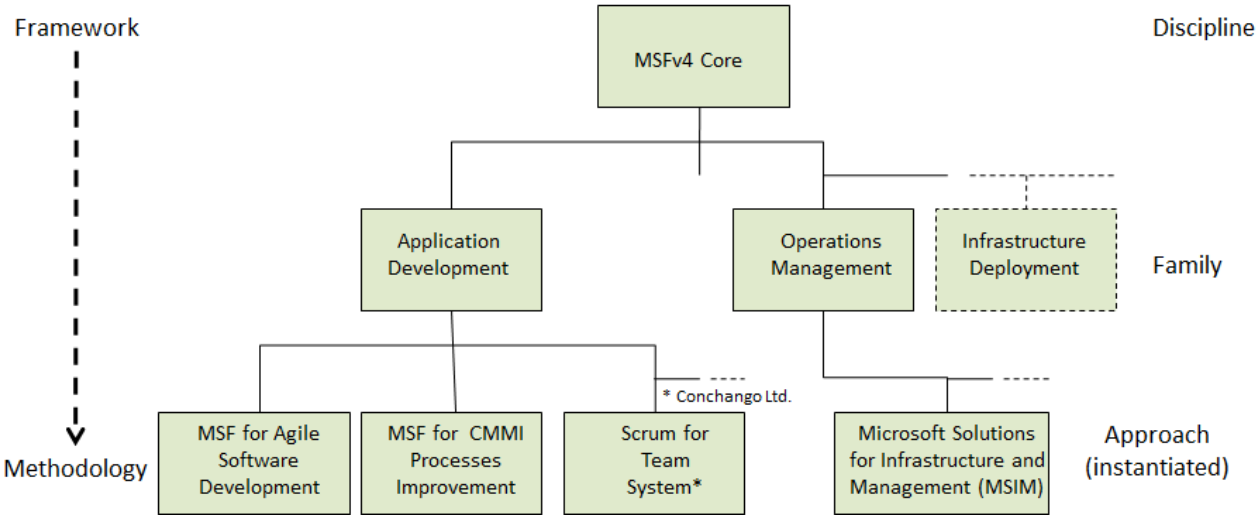

Fig. 8. MSF "family" tree [10; Figure 1-2]

As of 2006, Microsoft offered two approaches to Application Development: MSF4ASD and "MSF4CMMI[1]" (**Fig. 8**). In addition to Application Development,

[1] **Capability Maturity Model Integration** (CMMI) is a process improvement approach that provides organizations with the essential elements of effective processes. It can be used to improve processes at the project or department level, as well as at the level of the entire organization. CMMI allows for the integration of traditionally separate organizational functions, sets goals and priorities for process improvement, provides guidance for creating quality processes, and provides a benchmark for evaluating current processes (https://uk.wikipedia.org/wiki/CMMI, accessed 2025-May-30).

this family planned to include components such as Operations Management and Infrastructure Deployment. It should be noted that an organization could also define its own MSF-based components.

Unfortunately, the author does not provide sufficient reasoned explanations of **Fig. 7** and **Fig. 8**. At the same time, it is stated that the MSF metamodel consists of fundamental principles, a team model and cycles and iterations. MSF 4.0 provides a high-level framework of guidance and principles that can be mapped (transformed) into a set of normative process templates. It is divided into descriptive and normative methodologies. The descriptive component is called the MSF 4.0 metamodel, which is a theoretical description of best practices for creating Software Development Life Cycle (SDLC) methodologies. Microsoft believes that organizations have different dynamics and conflicting priorities during software development; some organizations need a responsive and adaptive software development environment, while others need a standardized, repeatable and more controlled environment. To address these needs, Microsoft is introducing the MSF 4.0 metamodel in two normative methodological templates that provide specific process guidance, MSF4ASD and MSF4CMMI. These software engineering processes can be modified and customized to meet the needs of the organization, customer, and project team.

Conclusions

The paper describes the notion of "Generalized methodology of the Framework Approach for building arbitrary spatial information systems (SpIS)". Arbitrary SpIS include classical and non-classical Electronic Atlases and Atlas Information Systems, together - Atlas Systems (AtS). Non-classical AtS include Atlas GeoInformation Systems (AGIS), which are used as an example in specifying important provisions of the article. In particular, when presenting the Hierarchy of basic notions, among which are "strategy", "generalized methodology" and "methodology" of creating arbitrary SpIS.

“Generalized methodology” interpreted using the notion “meta” as “meta-methodology”. An example of the latter is the Microsoft Solutions Framework (MSF), which: 1) is described in the article taking into account its evolution, 2) is

both a methodology and a meta-methodology of software development, 3) is important in that it can be used when creating our own Pattern-Based Spatial Engineering (PBSE) methodology.

The results of the article are important both for creating a PBSE methodology and for performing practical work on creating a SpIS using modern Microsoft information technologies.

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В. Чабанюк, О. Дишлик

КАРКАС РІШЕНЬ MICROSOFT (КАРІ М) ЯК УЗАГАЛЬНЕНА МЕТОДОЛОГІЯ КАРКАСНОГО ПІДХОДУ ПОВОДЖЕННЯ З ПРОСТОРОВИМИ ІНФОРМАЦІЙНИМИ СИСТЕМАМИ

Анотація

У статті «Каркасний підхід як стратегія дослідження і проектування складних просторових інформаційних систем (на прикладі НІГД)» сформулювано назви трьох його можливих інтерпретацій. Там же розглянута перша з них – як конкретна конструктивна стратегія використання геоінформаційних систем і технологій (ГІСіТ) для управління територією України. У цій роботі досліджується друга інтерпретація Каркасного підходу - як узагальнення методології поводження з просторовими інформаційними системами.

Поняття «узагальнена методологія» знаходиться на тому ж «епістемологічному» рівні ієрархії понять, що і поняття «конструктивна стратегія». Для розгляду цієї відповідності використовується поняття «мета Х»,

де X приймає потрібні для цієї роботи значення. З теоретичної точки зору основна увага приділяється поняттю «мета-дослідження» і його складовій - поняттю «мета-методологія». З практичної точки зору основна увага приділяється поняттям «методологія» і «мета-методологія», відомим з кінця минулого століття як Microsoft Solutions Framework (MSF, версії 1.0 – 4.0). Більше того, вибрано такі розуміння «узагальненої методології», що відповідають поняттю «мета-методологія» у контексті Каркасного підходу поводження з ПрІС.

Віддаючи належне походженню терміну «Каркас Рішень (КаРі)», розгляд узагальненої методології (або узагальнення методологій) розпочинається з нагадування про версію 2.0 методології MSF, до усіх версій якої застосовується скорочення КаРі М (КаРі Microsoft). Такий запис робить логічним питання подібності між КаРі М і розглянутими раніше КаРі X(Y), такими як GeoSF (GeoSolutions Framework) або AtlasSF (Atlas Solutions Framework). Деякі з цих подібностей розглядаються у статті.

На межі сторіч методологія MSF 2.0 складалася з шести моделей (рішень) Microsoft, деякі з яких ми використовували на практиці: 1) виробничої архітектури, 2) команди проекту, 3) управління ризиками, 4) процесу розробки аплікацій, 5) процесу проектування, 6) аплікації підприємста. Усі вони описані у екзамені MCSD70-100 на прикладі гіпотетичної аплікації, актуальної на той час. Потім методологія MSF 2.0 була узагальнена, так що до MSF версії 4.0 ввійшли дві методології: MSF for Agile Software Development (MSF4ASD) і MSF for CMMI Process Improvement (MSF4CMMI). Існують джерела, в яких згадані конструкції називаються підходами. Справедливі такі відношення: 1) MSF4ASD ↑ MSF 4.0, 2) MSF 4.0 ↓ MSF4CMMI. Відношення ↑ є епістемологічним, а відношення ↓ - редукційним. Відношення ↑↓ доповнюються відношеннями включення: MSF 4.0 = MSF4ASD ∪ MSF4CMMI.

Оновлення MSF 4.0 і представлення його сучасним узагальненням методології поводження з ПрІС потрібне для можливої редукції з неї практично корисних зараз методологій. Зокрема, побудованої з використанням сучасної

продукції Microsoft, продукції з відкритим кодом, включаючи нашу «методологію розширення», а також інших. Формально поняття MSF тепер не розвивається і методологічні конструкції MSF є гіпотетичними, однак саме явище MSF реально існує, розвивається і використовується.

Актуальна зараз версія MSF у цій статті інтерпретується як мета-методологія, з якої редукцією (конкретизацією або спеціалізацією) можливо отримати потрібну для практики методологію застосування сучасних інформаційних технологій до поводження з ПрІС, включаючи актуальні інформаційні технології Microsoft. Відновлення нашого інтересу до рішень і технологій Microsoft пояснюється не тільки їх корисністю, але й більш ніж десятирічною стратегією їх поступового відкриття материнською (авторською) компанією. Завдяки цьому факту редукцією (однією або двома) з мета-методології MSF розраховуємо отримати і нашу «методологію розширення». Більш традиційною назвою останньої є Базована на Патернах Просторова Інженерія (БППІ) завдяки тому, що вона створюється зараз як Базована на Моделях Програмна Інженерія. Остання буде Базованою на Моделях Системною Інженерією.

Ключові слова: узагальнена методологія поводження з ПрІС, методологія і мета-методологія MSF, Базована на Патернах Просторова Інженерія.