Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 238 (2018) 597 – 606

Procedia
Social and Behavioral Sciences

SIM 2017 / 14th International Symposium in Management

EMS Exploratory Analysis in order to Improve its Integration Quality through Fractal Design

Ionuţ Viorel Herghiligiu*

"Gheorghe Asachi" Technical University of Iasi, Department of Engineering and Management, 29 D. Mangeron Blvd.,700050 Iasi, Romania

Abstract

The organizations' need to satisfy consumers' demand often generates various environmental negative impacts caused by delayed responses to different environmental issues. Therefore it is necessary that this relation between organizations and environment be effectively managed. This can be done only by implementing and integrating an Environmental management system (EMS). Likewise analyzing this issue through another perspective, the EMS can be considered as a hierarchical management system – that is "limited", having in view the explosive modifications that define the current social reality. This paper presents the research results conducted at the level of NE Romania largest organizations that are predominantly developing industrial activities. The study sample is 171 organizational managers. The paper aims to improve EMS integration quality process by transforming and adapting its architecture relying on the principles of Fractal philosophy. Therefore, the general objective of this work is the development of a theoretical framework as a model based on Fractal design that should improve the EMS integration quality. It must be noted that this research also results in a practical component, since it provides the organizational manager with new working instruments in order to improve the EMS organizational integration.

Peer-review under responsibility of SIM 2017 / 14th International Symposium in Management.

Keywords: EMS integration quality; Environmental management; Fractal design

1. Introduction

Organizations nowadays interact among them in an unstable environment and thus they must have extensive knowledge about clients, market tendencies, new different technologies that might be utilized for the settlement of

* Corresponding author. Tel.: +40-232-230491; fax: +40-232-230491.
E-mail address: iherghelegiu@tuiasi.ro

Peer-review under responsibility of SIM 2017 / 14th International Symposium in Management.
doi:10.1016/j.sbspro.2018.04.040

various issues. Organizations must also have different management systems (for example compliance with ISO 14001 – International standard for Environmental Management System (EMS), ISO 9001 – International standard for Quality Management Systems (QMS), OHSAS 18001 – International standard for Occupational Health and Safety Management System (OHS), ISO 27000 – International standard for Information Security Management System (ISMS)), designed and implemented so that should be flexible, intelligent, easily configurable, and so on (Herghiligiu et al., 2013a; Herghiligiu, 2013). The consumers' demand in this modern environment became diverse, dynamic and sometimes unpredictable, whereas the organization's need to maintain and to increase a market share has become harder and harder to reach (Ryu and Jung, 2003a). Also organizations need to satisfy the consumers' demand generates often various negative impacts on the environment. Therefore this relation between organizations and environment it's absolutely necessary to be effectively manage through a management system – EMS. However the EMS can be considered nowadays as a hierarchical management system, used by those organizations that have a well-defined organizational system – hierarchical managed, and that "produce goods" in stable environmental conditions (Herghiligiu et al., 2012).

Taking into account the environment complexity and the features that defines the traditional hierarchical patterns - that are usually noticeable at the level of these patterns, it's noticed the fact that these pattern types are limited, having in view the explosive modifications that define the current social reality (Espinosa et al., 2007).

The traditional production systems managed through hierarchical management are no longer able to meet the actual needs, having in view the complexity of the environment (Dooleby, 2002; Shoham & Hasgall, 2005). Even if the hierarchical control is easy to understand and has a low redundancy level, it has a major disadvantage: the reduced capacity to register all modifications produced at all the hierarchical levels (Ryu & Jung, 2003a/b; Herghiligiu et al., 2012.; Herghiligiu et al., 2013a); also it can be noticed the same phenomenon in case of the decisional process that sometimes generates inadequate environmental decisions (Herghiligiu et al., 2013b).

It is also necessary to mention that, according to the Laws and Axioms of the Needed Variety of Ashby - 1964, a structure that is referred to as being hierarchically managed (a hierarchical authority) does not have the necessary variety in order to provide the adaptation of their own systems in their niche (Espinosa et al., 2007).

Having in view the ideas previously mentioned, it can state that this research is important; therefore EMS should have attributes as: flexibility, "intelligence", configurability, fast adaptability to the environment, it should also include entities characterized by the attributes previously mentioned, and autonomy, in order to really become an "advantage lever" in this strong competitive environment.

The paper aims to improve EMS integration quality process by transforming and adapting its architecture relying on the principles of Fractal philosophy. Therefore the general main objective of this work is the development of a theoretical framework as a model based on Fractal design that should improve the EMS integration quality.

In order to achieve the main objective, previously mentioned, the research will pursue the following main sub-objectives:

- identification and description synthetically of the main characteristics of the fractal philosophy (O_1);
- identification and investigation of the main aspects that characterized the EMS implementation process (O_2);
- transformation and adaptation of the EMS architecture relying on principles of the Fractal philosophy; concretely – development of a EMS integration model based on Fractal design principles (O_3).

2. Materials and methods

In order to materialize the main objective with the proposed sub-objectives, the realization phase aimed the following stages (Table 1):

Table 1. Research stages to materialize the main objective and sub-objectives.

Research stages	Research sub-stages
I. collecting information [the exploratory research techniques consisted in the identification of	1.for O_1 – secondary information sources: the literature; the exploratory research techniques consisted in the identification of the information type and source that need to be studied as follows: secondary information sources – the literature;

the information type and source that need to be studied] as follows sub-stage 1, 2 and 3:	2.for O_2 – secondary information sources: the ISO 14001 standard, the literature, environmental documentations from some of the largest organizations in the N-E development area of Romania, and so on; 3.for O_3: (i) secondary information sources: the ISO 14001 standard, the literature, environmental documentations from on some of the largest organizations in the NE development area of Romania, and so on; and (ii) primary information sources: the investigation of different aspects [A. EMS implementation and functionality (a1. establishing the environmental responsibilities; a2. environmental training; a3. environmental communication; a4. EMS control); B. the organization's flexibility to assimilate the transformation and the adaptation of the EMS architecture (b1.the flexibility of the organizational structure/ and the orientation of the organizations' managers towards the decentralization of the environmental objectives and targets; b2.decentralisation of the environmental decisional process)], considered as being important for this research, using the survey method and so designed and applying an questionnaire, with a scale of an ordinal type in seven (Liker scale), to **171 (validated final number) managers** from the largest N-E organizations area of Romania;
II. processing/codifying information:	1.the questions in the questionnaire were introduced and codified in the statistical analysis programme SPSS 16, with the purpose of obtaining statistical and graphical representations which shall allow the formulation of exact interpretations regarding the proposed "aspects" for the transformation and adaptation of the EMS integration architecture; 2.the information from literature were processed and adapted so that should serve in a direct manner to the proposed objective and sub-objectives;
III. analyzing and interpreting of the collected information:	In order to analyze the possibility of improving the EMS integration quality having in view the transformation and the adaptation of this system's architecture that relies on principles of Fractal philosophy, 1.the exploratory research techniques consisted in the identification of the information type and source that need to be studied, having in view: (1.1) the secondary information sources: the literature, and so on/ organizations environmental documentations; (1.2) the primary information sources: the information resulted after the application of a questionnaire/ processing/ and the critical analysis of the collected data; 2.the analysis process: (2.1) qualitative and quantitative analysis and the processing of data collected from the applied questionnaire were performed by using the SPSS statistical software (testing of the internal consistency corresponding to the aimed variables/ utilized within the research instrument – the Cronbach Alpha index, descriptive statistics (average/ standard average infringement), the analysis of the frequency); (2.2) the qualitative analysis of the information and knowledge from the literature either aimed at processing and adapting the respective information and knowledge, either aimed only at understanding their essential aspects (points t_0 in subsequent constructs); and 3.the result of the research consisted in: the transformation and the adaptation of the EMS architecture relying on principles of Fractal philosophy that should allow the improvement of EMS integration.

The paper originality result also from the construction of investigation model (Fig. 1) presented in the following:

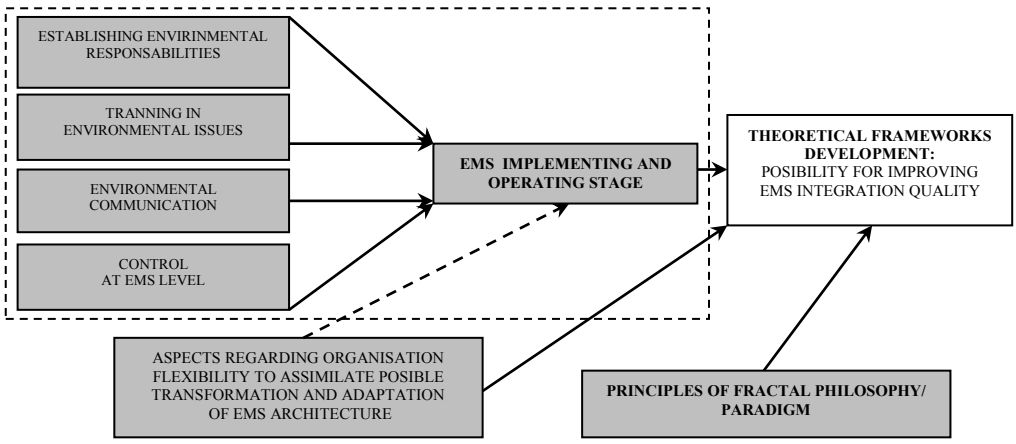

Fig.1. General research model regarding the possibility of improving EMS integration quality
Source: Herghiligiu, 2013

2.1. Main characteristics of the Fractal philosophy

One of the scientists' major preoccupations consists in understanding systems. This understanding approach relies on the following idea: if there are enough data, information, and knowledge (if it is the case) about a system, then the system's behavior can be forecasted. Having in view that any kind of systems could to be analyzed, the introduction of the Fractal geometry and philosophy represents a very important event in the contemporary science (Herghiligiu, 2013).

In order to understand the Fractal paradigm correctly, it is necessary to describe and explain the main characteristics/ or basic properties of the fractals, as follows (Sandkuhl & Kirikova, 2011; Kirikova, 2009a/b; Herghiligiu et al., 2012; Herghiligiu et al., 2013a/b; Ryu & Jung, 2003a/b; Ryu et al., 2003; Ryu & Jung, 2004; Shin & Jung, 2004, Herghiligiu, 2013):

I. SELF-SIMILARITY – the repetition of the structural organization on a different scale, starting with a basis to the infinity from a theoretical point of view (notice the development of Sierpinski's triangle/ Cantor's set/ Koch's curve). This characteristic property may be deduced logically; it eliminates the informational monopoly on the level of an organization/ system/ process, which in most of the cases describes the classical hierarchical processes. Self-similarity does not refer only to the design characteristics, but also to the service operating manner, and equally to the level of formulating and following objectives. In order to reach the proposed objectives, there may be several solutions to the particular issues; thus there may be several system components with different structure, but with the same entrances and the same exits (Ryu & Jung, 2003b; Sandkuhl & Kirikova, 2011).

II. SELF-ORGANISATION – the fractals' capacity to self-organise: (a) from a theoretical point of view (strategic re-organisation/ self-optimisation) and (b) from an operational point of view. The self-organisation concept means in essence (i) the re-organisation of the fractals, (ii) the development of new fractals, (iii) the elimination of fractals according to the proposed purposes and developed connections. The fractals' capacity to self-organise theoretically/ to self-optimise represents concretely the application of suitable methods in order to control the system and to optimise the fractals' component on the system's level. For example if a fractal's "work" load (the work concept is utilized with the meaning of information load/ level of operational activities, and so on) is not balanced with the others', the entire performance of the system falls down (Ryu & Jung, 2003b).

III. THE ORIENTATION TO THE OBJECTIVE (S) – the system's objectives result from the sum of each fractal's individual objectives; each fractal has different objectives from the other fractals in the system's structure, but in order to maintain their coherence, it is necessary to develop a relative concordance among all its objectives that should eventually lead to the achievement of the organisation's objectives. The internal process of making the fractals' objectives must be supported by a mechanism that should ensure their concordance, consistency and coherence. The individual objectives must be autonomously developed, continually coordinated and negotiated on the fractals' level in order to solve the possible conflicts – Figure 2 (Cha et al., 2007).

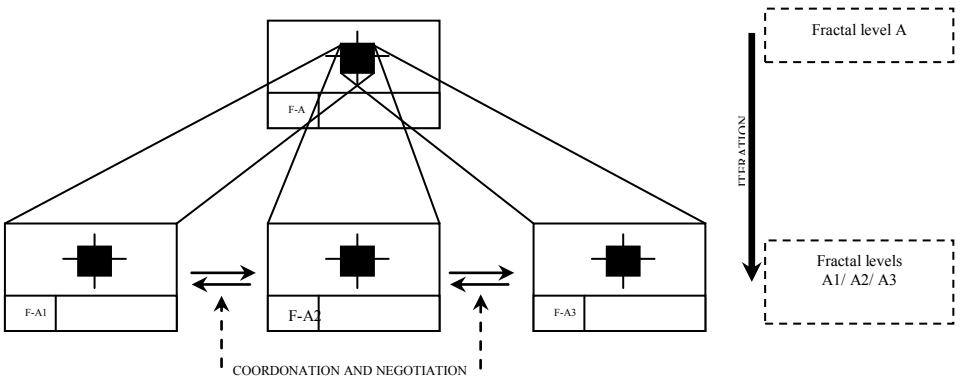

Fig.2. Forming fractals objectives process
Source: Herghiligiu, 2013

IV. DYNAMICITY AND VITALITY – due to the necessity to adapt to the environment that change in short periods of time, the cooperation and coordination among the fractals must be characterized by dynamicity; the fractals must develop among themselves a system to communicate efficiently the information and to determine the nature and the quantity of the transferred data. Having in view that the fractals must be characterized by dynamicity, they must be at the same time the subject of the analysis and continual evaluation of the achieved performances (Sandkuhl & Kirikova, 2011; Ryu & Jung, 2003b). The fractal can be considered as being the basic unit/ the basic entity of the considered system and having the following functional modules: an observer, an analyzer, a resolver, an organizer and a reporter (Ryu & Jung, 2003b).

2.2. Main aspects that characterized the EMS implementation

EMS can be described as a methodology by which the organizations function in a structured way with the purpose of ensuring the environmental protection. It identifies and defines the impact of the organization's activities, and then proposes actions of reducing the level of this impact. As a consequence, the objective of an EMS is to control and to reduce continually the induced negative effects upon the environment (Rowland-Jones & Cresser, 2005). EMS is at the same time an instrument that identifies issues, but also an instrument that solves them relying on the continual improvement concept – this principle could be implemented at the level of an organization by taking into account the way it is perceived by the management and having in view the activity sector of the companies (Perotto et al., 2008; Herghiligiu, 2013).

According to the International Standardization Organization ISO 14001, the environmental management system is characterized as being "a component of the general management system that includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources in order to elaborate, implement, achieve, analyze and maintain the environmental policy" (ASRO, 2005; Lozano & Valles, 2007; Herghiligiu, 2013).

Most of the EMS's are developed according to the pattern "Plan, Do, Check, Act" (Deming's principle) and that is why they can be presented as being a continual cycle of planning, implementation, re-evaluation and improvement of the organization's processes and activities in order to allow the continual improvement of the environmental performance; similarly to a continuous complex process – Table 2 (Stapleton et al., 2001; Perotto et al., 2008; Herghiligiu, 2013).

Table 2. EMS as a process – in accordance with ISO 14001: 2005.
Source: adapted after Perotto et al., 2008/ ASRO, 2005.

Continual improvement	Environmental policy	The global intentions and direction of an organisation in relation with the environmental performance
	Planning	The development of the environmental objectives and processes necessary for the compliance with the organisation's environmental policy
	Implementation and operation	The implementation of the designed processes
	Verification	The monitoring and measuring of the organisation's processes with the purpose of reporting the results that are to be operated – if it is the case, the necessary corrections at their level, in order to be compliant with the environmental policy, objectives and targets, with the legal regulations or to which the organisation subscribed.
	Management analysis	The start-up of different actions with the purpose of continually improving the EMS performance.

The EMS's have their "origins" in the need of integrating environmental management in the organization's general management (Teodosiu, 2005).

3. Experimental

In order to test the statistical reliability regarding the constructs of the research instrument was analyzed Cronbach Alpha index, mean, and standard deviation, as can be observed in Table 3. Therefore was found that

Cronbach Alpha index for all variables is situated at an acceptable level of confidence: greater than 0.5 (Jaba and Grama, 2004; Hodge and Shankar, 2014; Ionesi et al., 2014).

Table 3. Testing the trust of the internal consistency related to the selected constructs.
Source: Herghiligiu, 2013

No.	Considered constructs	Descriptiv statistic			
		N	Average	Average standard deviation	Cronbach's Alpha Index
EMS IMPLEMENTATION AND OPERATION (EMS implementation according to ISO 14001)					
A.	**SETTING ENVIRONMENTAL RESPONSABILITIES AT EMS LEVEL**				
I.	**Organizational structure through implementation of EMS environmental policies and programs**				
1.	Formalizing environmental activities	171	4.5380	.75873	.630
2.	Specialization of environmental activities	171	5.1178	.64883	.610
3.	Centralization of environmental activities	171	4.4503	1.73261	.656
4.	Decentralization of environmental activities	171	4.9450	.68291	.560
5.	Functional cooperation (departmental/ interdepartmental)	171	4.6374	1.04058	.599
II.	**Qualified staff in environmental management issues**				
1.	Environmental indoctrination	171	4.0390	.99201	.70
III.	**Establishing environmental responsibilities (at EMS level)**				
1.	Establishing environmental responsibilities	171	4.2807	1.56530	-
IV.	**Existence of another management system implemented at the organisational level**				
1.	Existence of quality management system	171	6.4386	.98848	.926
V.	**Operation of EMS internal audits**				
1.	EMS internal audits	171	6.0936	.96863	.895
B.	**ENVIRONMENTAL TRAINING**				
1.	Environmental training	171	4.6117	1.49205	.853
2.	Registration of environmental trainings results	171	5.3158	1.44089	-
3.	Registration of environmental trainings effects through performed environmental activities	171	6.0877	1.13678	-
C.	**ENVIRONMENTAL COMMUNICATION**				
1.	External environmental communication	171	4.2632	1.92378	-
2.	Internal environmental communication				
	*at environmental information level (a)	171	5.3494	.98760	.778
	*at environmental knowledge level (b)	171	5.0526	1.2932	.610
D.	**CONTROL AT EMS LEVEL**				
1	Control of environmental documents	171	5.8246	1.23607	.812
2.	Operational control	171	4.9873	1.14504	.886
3.	Operational control externalization	171	5.5614	1.45138	-
ORGANISATION FLEXIBILITY TO ASSIMILATE EMS ARCHITECTURE TRANSFORMATION AND ADAPTATION					
A.	**Flexibility of organisational structure**				
1.	"Flexibility" of organisational structure	171	3.2495	1.49862	.877
B.	**Orientation of organization managers – environmental decentralization objectives and targets/decentralization of decisional process**				
1.	Establishing, modifying and updating environmental objectives and targets at department level/ divisions of organisations guided by a set of environmental objectives and targets as general-directive (strategic orientation)	171	6.6959	.96863	-
2.	Decentralization of environmental decision-making process (each employee has to decide for themselves in performed environmental current activities (guided by a code of good environmental practices)	171	3.4620	.98848	-

4. Results and discussion

4.1. Research results critical analysis

It is currently asserted that the EMS can be seen as a system managed hierarchically, utilized by the organizations that have well-defined organizational systems (Herghiligiu et al., 2012). Taking into consideration this logical idea (a), the literature (b) and the research results (c), it could be made the following main remarks (in particular for the N-E area of Romania organizations): (1) lack of flexibility in the structural reorganization after the EMS

implementation; (2) unawareness regarding the importance of managing the aspects and the associated impact upon the environment - on the level of all the organizational managers; (3) organizations hierarchical structure determines the architecture of EMS integration; (4) environmental responsibilities is an ambiguous aspect as a result of ignoring the requirements of ISO 14001, or associated to lack of interest in the environmental issues; (5) it could be observe a high level of unawareness on the importance of correctly establishing the environmental responsibilities; (6) continual improvement principle is incorrectly applied; (7) exists different disfunctionalities at the level of environmental informational system; (8) human resource overall limited competence in terms of the environmental decisional process, and so on.

Regarding to the direct effects of EMS integration it could be mentioned also the following: (1) low level of EMS operational flexibility as an effect of the absent environmental responsibilities associated to all the organizational managers; (2) lack of configurability regarding EMS integration process; (3) lack of (relative) EMS autonomy or of the agents/ entities of this system on the integration process; (4) decentralization possibility of the agents/ entities associated to EMS having in view the flexibility of the job descriptions that allow the managers' to involve in the establishing process of the environmental objectives and targets; plus due to the high level of functional cooperation among departments regarding the pollution prevention; (5) the possibility and also the necessity to decentralize the establishing/ modifying/ and updating process of the organizational environmental objectives and targets; (6) the possibility to decentralize the environmental decision-making process with condition that the employees' competence level increases (by training sessions/ environmental specializations) and so on.

4.2. Theoretical framework regarding EMS architecture relying on Fractal principles

The classical hierarchical management systems are easy to understand and have a low degree of redundancy, but: (1) these do not have the capacity of being flexible to the inputs from the exterior, (2) these have a major difficulty in observing the negative aspects and the inefficiency ones on all the hierarchical levels, and not lastly, (3) these cannot change their pattern with which they were designed (the designed structure) (Herghiligiu et al., 2012; Herghiligiu, 2013). That is why in this dynamic environment it is necessary that EMS to have the following essential/specific features (Herghiligiu et al., 2012): [1] autonomy, [2] flexibility, [3] intelligence, [4] being made up of iterated functional modules (or entities), [5] configurability, [6]adaptability to the environment.

Thus EMS shall be considered as being an organizational system analyzed through the prism of the approach to which it has been subscribed.

The basic fractal entity (unit) – BFE – the initiator shall be considered as the main component of EMS and as having the following functional units which sum up the entity's functionality (the mechanism by which it functions – Figure 3), starting and adapting from the definition itself given to EMS by the ISO 14001: 2004 Standard: (1) monitoriser (the analyser that observes); (2) analyzer; (3) resolver; (4) implementer; and (5) reporter (that verifies) (Herghiligiu et al., 2012; Herghiligiu, 2013).

Starting from the elaboration requirements of the environmental policy (ISO 14001 – chapter 4.2), it is necessary to mention that the governing code of the Fractal basic entity must present a series of principles that should be observed on the level of the functioning mechanism of the BFE; there must be a concrete compliance with the correspondence between the specific activities developed on the level of the logical modules and: 1. the nature, the dimensions, respectively the environmental impact of the activities, products or services of the organization; 2. the principle of the continual improvement; 3. the continual prevention of pollution; 4. the compliance with the applicable environmental regulations, as well as with other requirements which the organization adopted; 5. the general objectives of the organization/ the proposed environmental general objectives/ the proposed environmental objectives on the level of the fractal entity; 6. the necessary framework for the establishment and analysis of the proposed environmental objectives and targets on the level of each fractal; 7. the possibility of documentation, implementation and consistency for each proposed specific activity; 8. the compliance with the transparency principle.

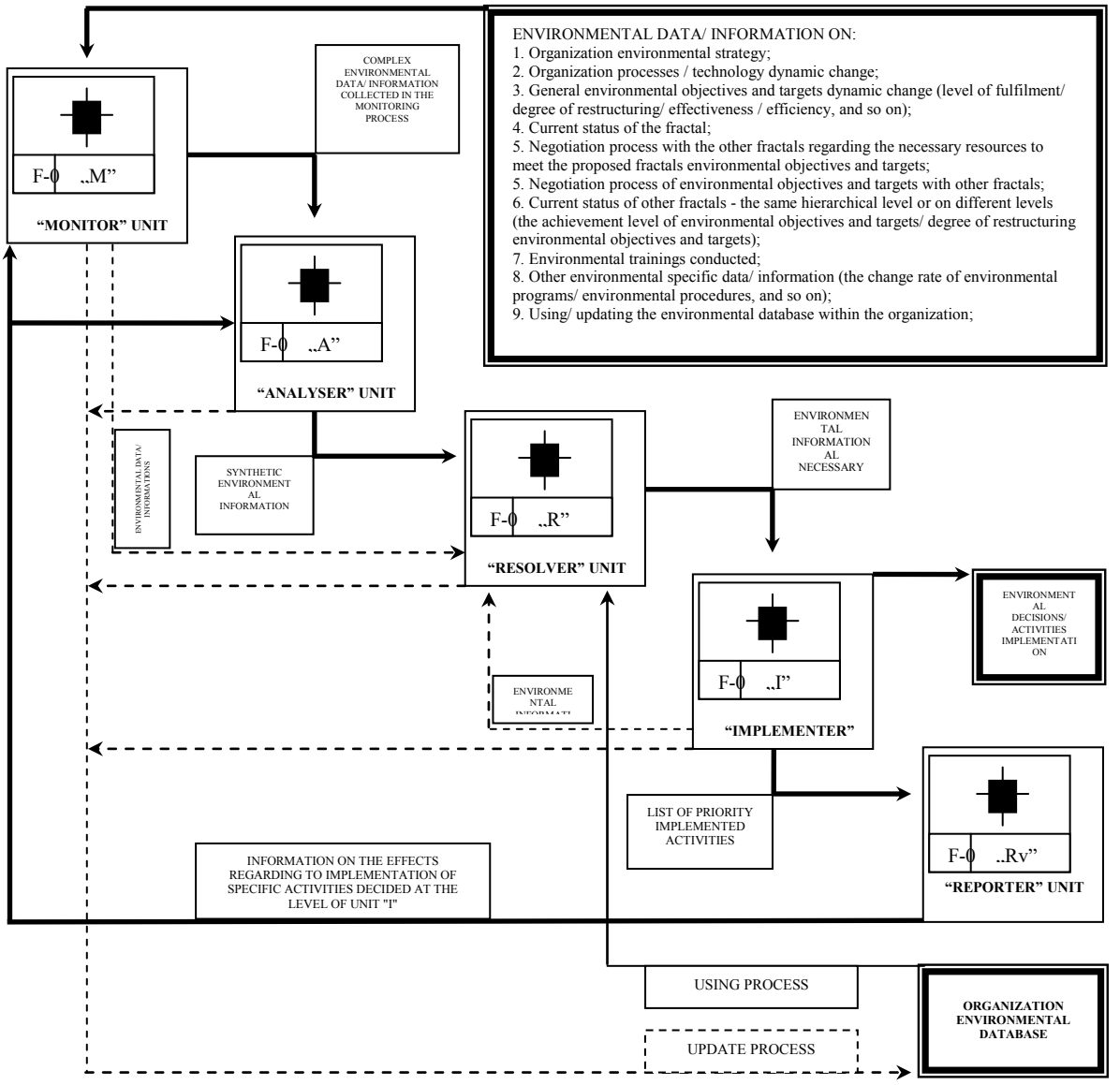

Fig.3. Global architecture developed for the BFE mechanism

Each fractal component entity is dynamic, independent, inter-operable, taking action in order to reach the main purpose (just as the basic fractal system – EMS as a whole). So it can be considered as being fractal entities of the EMS: a person, a department, a section, a production line, a part of a person's effective working time, or any combination of the aforementioned previously (Herghiligiu et al., 2012; Herghiligiu et al., 2013a/b).

EMS fractal approach relies on the following idea: this complex but simple system (EMS) iterates (it is multiplied with the same shape and the same defining specific features) from the macro level to the micro level. It gets thus to a simplification of each process carried out on the level of the entire EMS by each component entity.

Having in view that fractals must be characterized by dynamicity, they must also be the subject of the analysis and continual evaluation of the achieved environmental performances.

Likewise it's considered that it is necessary to have an identical process of negotiation and coordination – related to the environmental objectives – between BFE and the other entities (departments, sectors, persons , and so on) that

are to be found on the organization's level. It is only in this way that the proposed environmental objectives can be achieved under efficacy conditions.

Having in view the architecture proposed in Figure 3 by resuming synthetically, it can be said that on the level of the Basic Fractal Entity different functions are exercised on each module of each unit considered apart:

(1) main function of monitoriser (the analyzer that observes) module – consists first of all in monitoring the own current state of the fractal, and then in collecting/ receiving specific information from the organizational environment and from the other fractals/ respectively in transmitting to the Analyser Unit ("A"), or as it is the case to the other fractals, different complex environmental informational answers.

(2) analyzer module – analyses the current state of the fractal – the current analysis of the environmental activities carried out on the fractal's level. Concretely: on the level of the analysis unit there is an analysis of the efficiency and efficacy of the elaboration and hierarchisation process of the environmental activities carried out on the fractal's level – taking into account: (a) the proposed environmental performance (ISO 14031), (b) the environmental objectives and targets on the fractal's level and (c) the simulations performed in order to quantify the possible effects of the environmental activities deployed.

(3) resolver module – represents the most important module on a fractal's level; this module in essence (a) elaborates the environmental activities (on the level of the environmental program) (R1), (b) designs and reorganizes the environmental responsibilities necessary for the deployment of the planned environmental activities (R2) (if it is the case), (c) elaborates the environmental objectives and targets of the fractal (R3), (d) leads the environmental decisional process on the fractal's level (R4), , and so on

(4) main function of the implementer module – consists in implementing the environmental decisions elaborated on the resolution level; and secondly it has the organizing function of the fractal's current situation to stabilize dynamically the reorganization process that intervenes (a) once the proposed environmental objectives/targets are accomplished on the fractals' level, and (b) as an effect of the lack of equilibrium produced on the level of the negotiation process of the necessary resources.

(5) reporter (that verifies) module – reports to the monitor unit "M" / respectively to the analyzer unit – "A" the results attained after the implementation of all the "specific activities" developed on the level of the implementer module "I"; it fulfils indirectly the function of verifying the attained results and of the resulted effects (the reporting function satisfies/ meets the principle of the continual improvement).

5. Conclusions

Every organization is a complex entity and all of them are very different, fact that characterize the difficulty of EMS implementation and integration, and justify the complexity of this type of system. Therefore an organization can be seen as a complex entity that has on its base, a process of continuous interconnected systems (designed, implemented, integrated, monitored, audited and adapted to the different levels) that use the organization's resources to achieve the proposed objectives and targets.

The main purpose of EMS is to identify, to evaluate, to analyze and to solve the environmental problems and thus to improve the organization environmental performance. On the same judgment, the managers and other organizational stakeholders perceive this system as a complex process which practically demonstrates the existence of many very complex issues that occur at the level of implementation and integration. Therefore is needed a new approach – Fractal design.

In the light of previous ideas mentioned in the paper it could be appropriate that organizations in the EMS integration process to consider the following recommendations: (1) environmental policy transformation into a governance code of the entire management system and hence of each fractal entities ("element" of EMS); (2) general environmental objectives must have only an directive role and set the direction on environmental policy; (3) specific environmental objectives must be clearly established at each fractal entity ("element" of EMS) level and also must have a key role in the EMS ("decentralization of environmental objectives"); (4) creating the real premises to modify the management system government code, considering the dynamic change of the organization environment; (5) creating the premise (possibility in terms of system functionality) that BFE's could negotiate

between them environmental objectives; (6) constant audit of all specific BFE objectives coherency and unity (towards direction of the governance code).

Concluding this research is original and presents a new approach in the case of EMS subject. The originality of the research results also from the methodology design, from the proposed conceptual associations, and from the proposed practical component – since it provides to the organizational managers, new working instruments in order to improve the EMS integration quality.

References

Cha, Y., Shin, K., Ryu, K., Jung, M. (2007). Goal-balacing process for goal formation in the fractal manufacturing system, *International Journal of Production Research, 45* (20), 4771-4791.

Dooleby, K., (2002). Organizational complexity, *International Encyclopedia of Business and Management*, Editor Warner M., Thompson Learning, London, 5013-5022.

Espinosa, A., Harnden, R., Walker, J. (2007). Beyond hierarchy: a complexity management perspective, *Kybernetes*, *36* (3), 333-347.

Herghiligiu, I.V. (2013). Researches regarding environmental management system as a complex process at the organizations level, PhD Thesis, "Gheorghe Asachi" Technical University of Iasi, Romania/ University of Angers, France.

Herghiligiu, I.V., Lupu, M.L., Robledo, C. (2012). Necessity of change environmental management system architecture – introduction, 2nd International Conference on Quality and Innovation in Engineering and Management, Cluj-Napoca, Romania, 175-178.

Herghiligiu, I.V., Lupu, M.L., Robledo, C., Kobi A. (2013b). A new conceptual framework for environmental decision based on fractal philosophy, *Environmental Engineering and Management Journal, 12*, 1095-1102.

Herghiligiu, I.V., Lupu, M.L., Robledo, C., Kobi, A. (2013a). Organizational employee seen as environmental knowledge fractal agents as a consequence of the certification with ISO 14001, 10th International Conference on Intellectual Capital, Knowledge Management & Organisational Learning – ICICKM 2013, 24-25 October, Washington, DC, USA, Book II, pp. 524-532.

Hodge, A, Shankar, S. (2014). Partial Effects in Ordered Response Models with Factor Variables, *Econometrics Review, 33* (8), 854.

Ionesi, D., Fangueiro, R., Ciobanu, L., Dumitraş, C., Ursache, M., Dulgheriu, I. (2014). Evaluation of impact behaviour of composite materials using Taguchi method, *Industria Textila, 65* (3), 152-157.

Jaba, E., Grama A. (2004). *Statistical analysis with SPSS under Windows (in Romanian)*, Polirom Publishing House, Iaşi, Romania.

Kirikova, M. (2009a). Towards Flexible Information Architecture for Fractal Information Systems, Proceedings of International Conference on Information, Process, and Knowledge Management, 135-140.

Kirikova, M. (2009b). Towards multifractal approach in IS development, Information Systems development: Challenges in Practice, Theory and Education, Vol. 1. Barry Ch., Conboy K., Lang M., Wojtkowski G., si Wojtkowski W. (Eds.), Springer, 295-306.

Lozano, M., Valles, J. (2007). An analysis of the implementation of an environmental management system in a local public administration, *Journal of Environmental Management, 82*, 495-511.

Perotto, E., Canziani, R., Marchesi, R., Butelli P. (2008). Environmental performance, indicators and measurement uncertainty in EMS context: a case study, *Journal of Cleaner Production, 16*, 517-530.

Rowland-Jones, R., Cresser, M. (2005). An evaluation of current environmental management systems as indicators of environmental performance, *Management of Environmental Quality: An International Journal, 16* (3), 211-219.

Ryu, K., Jung, M. (2003a). Fractal approach to managing intelligent enterprises: Creating Knowledge Based Organizations, in Gupta, J.N.D., Sharma, S.K. (editor), Idea Group, 312-348.

Ryu, K., Jung, M. (2003b). Agent-based fractal architecture and modeling for developing distributed manufacturing systems, *International Journal of Production Research, 41* (17), 4233-4255.

Ryu, K., Jung, M. (2004). Goal-orientation mechanism in the fractal manufacturing system, *International Journal of Production Research, 42* (11), 2207-2225.

Ryu, K., Son, Y., Jung, M. (2003). Framework for fractal-based supply chain management of e-Biz companies, *Production Planning and Control, 14* (8), 720-733.

Sandkuhl, K., Kirikova, M. (2011). Analysing Enterprise Models from a Fractal Organisation Perspective - Potentials and Limitations, The Practice of Enterprise Modeling, Proceedings of 4th IFIP WG 8.1 Working Conference, PoEM 2011 Oslo, Norway, November 2-3, 193-207.

Shin, M., Jung, M. (2004). MANPro: mobile agent-based negotiation process for distributed intelligent manufacturing, *International Journal of Production Research, 42* (2), 303–320.

Shoham, S., Hasgall, A. (2005). Knowledge Workers as Fractals in a Complex Adaptive Organization, *Knowledge and Process Management, 12* (3), 225-236.

Standards Association of Romania – ASRO, (2005), "Sisteme de management de mediu. Cerinţe cu ghid de utilizare", SR EN ISO 14001: 2005.

Stapleton, P.J., Glover, M.A., Davis, S.P. (2001). Environmental management systems: an implementation guide for small and medium-sized organizations, in: NSF International, Editura Glover-Stapleton Associates, Inc.; available online at http://www.nsf.org/NSF-ISR/.

Teodosiu, C. (2005). *Management integrat al mediului*, Second edition, Publishing House: Ecozone, Iaşi, Romania.