Falkiewicz Artur. Education of IT students in the field of IT management practices and Sofware Asset Management in framework of IT studies at academic level. Journalof Education, Health and Sport. 2018;8(11): 718-736. eISSN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.2620628
http://ojs.ukw.edu.pl/index.php/johs/article/view/6773

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26.01.2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 26.11.2018. Revised: 26.11.2018. Accepted: 30.11.2018.

Education of IT students in the field of IT management practices and Sofware Asset Management in framework of IT studies at academic level

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Key words: Software Asset Management, ISO/IEC 19770, COBIT. ITIL, ITAM, IT, education, IT studies, best practices, academic education

Abstract

The aim of this article is to demonstrate the need to include good practises of Software Asset Management in the field of academic IT education of IT professionals. In the article based on the analysis of the Regulation of the Minister of Science and Higher Education of July 12, 2007 on educational standards for individual majors and levels of education, as well as the mode of creating and conditions for the university to conduct inter-departmental studies and macro-studies, research, literature and standards the necessity to familiarize IT students with good IT management practices (Software Asset Management (SAM), COBIT. ITIL, ITAM) was demonstrated and specific ranges of information that can be included as appropriate elements of education in the field was proposed.

1. Introduction

Enterprises, in particular large ones and multinationals, can not afford not to have the knowledge about IT solutions that they use to run their business. At the level of greater generality, two ranges of assets are to be recognized, e.g. servers as well as workstations and

software, which include, for example, software licenses granted to the enterprise. The most important thing is to implement and maintain proper software management. The management of this area is called Software Asset Management (SAM). The goal of this article is to indicate the solutions allowing to raise awarness among those responsible in companies for IT management, in particular for Software Asset Management.

The knowledge of software usage and the knowledge of expenditures incurred for the initial purchase and subsequent maintenance of the environment is the primary responsibility of the company's managers. Management's responsibilities result from provisions of law and best practices. Best practices referring to SAM area are described in such methodologies as ITAM (Information Technology Infrastructure Library), COBIT 5 (Control OBjectives for Information and related Technology), ISO / IEC 19770 describing Software Asset Management (SAM) and International Accounting Standard IAS 38 regarding intangible assets. Managing IT environments is not only common sense approach, but also the fulfillment of each employee's obligations to act in favor of the company. If there is no management of the whole IT environment, if there is no certaintity of the software use rights acquired on the basis of software licenses or resulting from proprietary copyrights and knowledge of servers and their current configuration, it should be recognized that the company lacks IT management.

When trying to implement and monitor all aspects of asset life cycle it should also be emphasized that the scope of the problem requires extensive knowledge and competence in IT, law, economics and finance, as well as activities based on best practices in each of these areas. At the same time quoting the research carried out by Deloitte, published article "New approach to software management" dated October 2018: "The study conducted at the last SAM Deloitte Academy among Software Asset Managers and people involved in this area showed that:

- 76% of respondents implemented only partially or did not implement the appropriate SAM strategy in their company and related processes and procedures,
- 45% of organizations do not monitor their licensing compliance in a continuous or cyclical manner,
- 96% of the respondents assessed that the level of organization awareness in the SAM area is low or medium.

The reluctance with which enterprises implement initiatives in the field of software management results mainly from the progressive advancement of technology, the increasing complexity of licensing agreements, as well as challenges related to the integration of systems and data. Interestingly, for exactly the same reasons SAM projects should be seen as a priority."

It is necessary to indicate the reasons for this situation and the proposed solutions for changes, especially at the level of awareness of people directly or indirectly affecting

processes supporting the implementation of maintaining and improving best practices supporting Software Asset Management. Since Software Asset Management refers to IT assets, that is, computer and software servers and their usage, IT specialists are naturally the persons involved in the management of this area. A special role should be assigned to raising the awareness of the manageability of the area at the academic level of education. Thematic scopes suggested as significant for the extension of knowledge at the academic level in the field of IT proper management shall be presented.

The article was drafted on the basis of the literature, analysis of legal acts, content of best practices and the results of the pilot empirical research of the author.

2. Challenges in implementing good practices

First of all it is worth to refer to the study of the Deloitte company mentioned in the introduction and the article by Dr. Małgorzata Sobińska "IT ALIGNMENT IS MODERN BUSINESS MODELS", which states: "IT area in the enterprise is very often improperly managed, which may result in its misunderstanding by managers, which in turn may cause that it is sometimes underestimated and sometimes overestimated. As a result, most IT investments do not bring the expected results, and the IT maintenance itself costs too much. However, enterprises can not afford to manage poorly such an important area, absorbing huge resources and often deciding whether the company will be able to develop further.

Creating a coherent process culture and developing methods for managing IT services that shall maximize the use of human resources and infrastructure seems to be one of the greatest challenges for IT departments." There is still a lot to be done to understand the correct IT management. At the same time, it is necessary to recall the multiplicity of best practices, properly and completely describing asset management principles, their life cycle, methods of managing software licenses and financial aspects of enterprise asset management. Therefore, if there is information showing that the level of management maturity and awareness is low, and at the same time good IT management practices were created in the end of the 1980s, it becomes important to investigate the reasons of this situation and the way of changing it for the benefit of enterprises and the national economy.

Already in 2011, Dr. Sebastian Wilczewski in his PhD dissertation "Model of Resource Management Software in Economic Organizations" Sopot, March 2011, identified the problem - the responsibility for SAM processes is an addition to the implementation of other core reponsibilities of the employee: "During the surveys and during the individual in-depth

interview, it was noted that the management of software resources is an additional responsibility of people who have other duties, which has been given a higher priority". This topic is very important because it reflects the low awareness of people deciding about the division of roles, tasks and responsibilities in the company. The most often persons entrusting in this kind of responsibility are managers with IT education. For several years from this publication, the level of awareness has increased, but until today many publications underline a need to support managers of SAM development in an enterprise (Gartner - Software Asset Management Is Now a C-Level Imperative). Recalling further examples, we can rely on further Deloitte research "As Deloitte data show only 29 percent of companies adhere to all terms of the software license. More than half (54%) audits displayed gaps in SAM processes. Only one third of companies after the audit decided to transform the management of software licenses." It should also be noted that the education should also keep up with new technologies, and students should have access to the latest technologies and understand their impact on the cost optimization opportunities through their application, but also have an understanding of threats related to potential claims connected with often unintentional exceedances of licensing terms while using the software. The role of computer science in this area is growing significantly. This is also emphasized by the leader in the market of IT research, Gartner in its publishing:

Through 2020, only 25% of enterprises will be satisfied that their SAM tool purchases align well with prepurchase expectations of value. This is an increase in satisfaction by only 2% compared to 2016.

“SAM is becoming more challenging every year,” says Roger Williams, research director at Gartner. “Increasingly complex license agreements in conjunction with the shift to the cloud require a mature SAM practice to deliver optimal value.”.

This statement means that the responsibility of well-educated IT specialists will increase. IT specialist will not only have to take care of proper usage of licensed software, but also support people and teams responsible for Software Asset Managemet in the company in obtaining reliable data on configuration IT environments. The question should also be asked if in the company only people closely related to IT, that is, IT specialists should be aware of the implemented best practices. IAITAM Bets Practice Library lists as important also following teams teams that should be aware of and possess knowledge about good IT management practices:

- legal department;
- finance;

- procurment;
- executive level / board of directors;
- help desk;
- end users;
- human resources;
- IT security.

In education and all the mentioned assemblies an educated IT specialist play a key role. In the education of the aforementioned teams a key role plays an educated IT specialist.

3. Rudiments of assets management

As the management of IT assets in general is well described in the framework of best practices, this article shall refer to the concepts and definitions enshrined in best practices.

First of all, we should refer to the definition in the IAITAM Best Practice Library (IBPL) described by the International Association of Information Technology Asset Managers, Inc. "Software Asset Management (SAM). - Software, IT, and technology. The goal of SAM is to overhead, and risk, inherent in owning and managing software assets."

In the second place, it is necessary to recall the definition enshrined in the ISO / IEC 19770-1: 2017 standard "software asset management SAM - coordinated activity0 of an organization to realize value from software assets."

Common approach and as well as perception and implementation of the objectives resulting from the definition is reduced to the correct settlement of the software license confirming that the amount of software licenses granted to the enterprise is consistent with the number of software instances on the servers. The license is settled on the basis of general licensing rules published by the licensors or on the basis of specific, contractually signed by the parties, licensing conditions.

Despite the simplicity of the common approach to the basic goal pursued by SAM, verification of the actual state of the enterprise is a big challenge and often an unachievable goal.

It should also be emphasized that this basic goal and its maintenance is only appropriate if the company is already on an advanced stage of good practice implementation, which means that it is not at the beginning of organizing the IT area and data about assets and their configuration. Most often, before implementation of best practices or during their implementation, the management of the company realizes that IT uses more software than

is required by the granted software licenses, which means becoming aware of the risks of claims submitted to the company by the licensors.

The board may also be informed that it possesses more rights to the software and often also pays, in principle, in annual cycles for the support of this software without using these licenses on the company's IT environments. In this situation, classical mismanagement occurs.

Due to the high costs of acquiring rights to software licenses and their subsequent maintenance, the level of financial significance of potential claims or expenditures that may be classified as wasteful is very high.

4. Risk associated with lack of proper asset management

The basic objective of implementing the good software Asset Management described above is an important but not the only reason why it is necessary to conduct a proper economy in this area.

Software Asset Management is the culmination of the correct management of many areas.

The following levels and types of strategies are enumerated:

(1) Corporate-level strategies:

a. adulteration of benchmark results;

b. misleading a shareholder on the Stock Exchange by publishing incorrect financial statements;

c. drawing the wrong conclusions by decisions-makers;

d. making inefficient use of the IT employees;

e. making decisions based on incomplete analytical data, while verifying the legitimacy of choosing newer technologies, because analyses do not cover all environments that could theoretically be subject to the technological optimization, also by choosing the optimal models for licensing computer programs;

(2) Business level strategies:

a. lack of knowledge about environments based on an older technology that often are more expensive to operate and maintain;

b. the risk of claims on software audits;

c. mismanagement risk consisting in the purchase or maintenance of the software license rights that are not used;

d. no use of the software licenses that may come from previously liquidated IT environments;

e. the risk of suboptimal use of environments, licensing models and technical capabilities available on the commercial market by producers and licensors.

5. Hypotheses

When defining a research approach, two hypotheses can be presented.

1. Hypothesis no. 1: Education standards for study IT does not provide education in the field of IT management based on best practices relevant to this area.
2. Hypothesis: The company's personnel responsible for Software Asset Management and directly or indirectly involved in IT management is dispersed, but IT and people with IT-related education are the owners of IT processes.

5.1. Verification of the accuracy of hypothesis No. 1

In order to verify the veracity of the hypothesis No. 1, it is necessary to study the Regulation of the Minister of Science and Higher Education of July 12, 2007 (Journal of Laws of September 13, 2007) amended by Journal of Laws 2009.180.1407 "on educational standards for individual directions and levels of education, as well as the procedure and conditions for the university to conduct inter-faculty studies and macro-fields" issued on the basis of the Act of 27 July 2005 Law on Higher Education (Journal of Laws No. 164, item 1365, with later changes).

The regulation in Annex No. 45 indicates education standards for the field of study: computer science. The description of standards is included in Part A. First-cycle studies and part B. Second-cycle studies.

For the scope of education described in the first-cycle studies (A. First-cycle studies):

- I General requirements;
- II Graduate's qualifications (Bachelor's studies, Engineering studies)
- III framework content of education;
- A Group General content
- B Group Targeted content
- IV Practices
- V Other requirements
- Recommendations;

Identically for the scope of education described in the first-cycle studies (B. Second Degree):

- I General requirements;

- II graduate qualifications
- III Framework content of education
- IV Other requirements
- Recommendations;

also, they do not contain indications directly to transfer knowledge and skills in relation to good IT management practices.

It should be added here that in section A. First-degree studies, III. Framework directions of education, B. A group of directional contents point 12 Education in the field of social and professional problems in computer science the following guideline is included: "Course content: Professional and ethical responsibility. Ethical codes and codes of conduct. Problems and legal issues regarding intellectual property. Patent system and legal basis for privacy protection.

Learning outcomes - skills and competences: perceiving and appreciating the social context of IT and related risk, as well as assessing the situation of IT professionals appearing in the professional life, both in legal and ethical terms."

The content of the guideline indicates the need to acquire knowledge of computer science in the scope relevant from the Software Asset Management perspective, i.e. "Problems and legal issues regarding intellectual property." However, this element as well as others regarding e.g." Risk and responsibility related to IT systems." do not explicitly mention best practices that IT should guide IT in managing this area, and do not ensure that an IT graduate shall work as a regular employee, understanding the importance of proper management of the area, its important role in management consistent with best practices and potential negative consequences that often go beyond the scope of IT and can work against the entire enterprise.

5.2. Verification of hypothesis No. 2 (elements of a pilot study)

In order to verify hypothesis No. 2, elements of a pilot study on the position of Software Asset Management in enterprises shall be used.

The research was carried out with the consent of the organizer, Deloitte company as part of regular meetings called "SAM Academy", the theme of which was "Software Asset Management (SAM) as part of the company's planning and development" on 10.10.2018.

As part of a special time slot, the respondents were asked the previously prepared questions.

The beginning of the study was preceded in the indicated order by instructions about the course of the study and its purpose, as well as a preliminary explanation of the concepts on the basis of the presentation.

Potential respondents were informed that the survey is: voluntary; anonymous and only for one person representing the company in case of a larger number of representatives of a given company participating in the "SAM Academy". The representative was to be an independent leader or team leader.

Participants were informed that the result of the questionnaire will be used in the academic work at the Nicolaus Copernicus University.

Respondents were asked to give true answers.

Given the level of organizational complexity of individual enterprises and various levels of knowledge and competence in the topics covered in the questionnaires, respondents were asked to provide answers only after completing explanations of the author of the questionnaire preceding each question and after asking the questions referring to meaning of the questions by the auditorium.

The strength of this study was the fact that participants of "SAM Academy" are representatives of the company that are in general well-oriented in the field of the software license management and understand the importance of this kind of management for the enterprise.

In order to calibrate the number of unique enterprises participating in the survey, the representatives of the enterprises participating in the "SAM Academy", but not willing to participate in the survey, were asked to answer the first question confirming whether they want to take part in the survey.

In the survey, apart from questions clearly formulated in such a way as to achieve the objectives of the research, there were also those aimed at deepening the subject and gaining feedback on expectations regarding the organizational structure based on the knowledge and experience of the respondents. Answers in this area have an obvious subjective hue, however, they allow to take into account the organizational complexities of the company.

5.3. Methods, techniques, research tools

Because, according to the information provided in this article, the lack of proper management based on good asset management practices, including proper management

as part of the implemented Software Asset Management generates a number of risks, including the particular risk of financial claims, researching this area is very difficult due to the fact that a number of aspects associated with this management is covered by the company's secret.

There is also a risk that the participating parties may manipulate information when using a test method that does not ensure the anonymity of the person and company. It is not in the company's interest to publicize information about a low level of maturity of software licenses management. Such risk is smaller if anonymity is ensured to the respondent.

Other risks related to the results of the study include diversification of organizational structures in individual enterprises as well as errors in the meaning of job titles and organizational units and the scope of their liability.

Methods: Survey

Techniques: Auditory questionnaire

Research tools: Questionnaire

The survey was prepared and carried out using the application available on the website http://directpoll.com/. Participants completed an online survey.

Immediately after the test, the results of the study were displayed and discussed with the participants of the "SAM Academy", and then the results were archived.

5.4. Results

Table 1. Indication to whom the SAM team leader reports in the organizational structure of the enterprise.

Question	Software Asset Manager currently reports to:	
Number of votes 20		
No.	Variants of answers	Selected answer
1.	(CEO) Chief Executive Officer / Owner	3
2.	(CIO) Chief Information Officer	5
3.	(CTO) Chief Technology Officer	4
4.	(COO) Chief Operating Officer	1
5.	(CFO) Chief Financial Officer	2
6.	Head of Supply Chain Management	0
7.	Head of Procurement	1
8.	Head of IT Service Sourcing	2
9.	Undefined organization/ not included in the responses	2

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 2. Software Asset Manager rating indicating in which organization would be the most effective

Question	The authority and scope of responsibility of the SAM team - confirmation of voting	
Number of votes 21		
No.	Variants of answers	Selected answer
1.	(CEO) Chief Executive Officer / Owner	4
2.	(CIO) Chief Information Officer	7
3.	Other services related to information technology	1
4.	(CTO) Chief Technology Officer	2
5.	(COO) Chief Operating Officer	1
6.	(CFO) Chief Financial Officer	1
7.	SAM solutions provider	1
8.	IT Asset Management	3
9.	Vice President	1
10.	Undefined role/ not included in the responses	0

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 3. The professional education of the SAM leader

Question	Software Asset Manager has competences in the field (education at every level of education)	
Number of votes 19		
No.	Variants of answers	Selected answer
1.	IT	4
2.	IT, Law, Economics (including the Accounting Act)	4
3.	IT, Law, Economics (including the Accounting Act), International Accounting Standards	2
4.	IT, Law, International Accounting Standards, International Accounting Standards,Taxes	4
5.	Law	1
6.	Economics (including the Accounting Act)	1
7.	Taxes	0
8.	International Accounting Standards	0
9.	Other technical education	3
10.	Other humanistic education	0

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 4. Knowledge about the configuration of the devices on which the software is installed

Question	I have full knowledge of the physical configuration of devices in the enterprise	
Number of votes 21		
No.	Variants of answers	Selected answer
1.	YES	5
2.	NO	3
3.	From 0 to 30%	4
4.	From 31% to 70%	4
5.	From 71% to 90%	5

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 5. The influence of the leader on company organizational units

Question	Software Asset Manager has a full impact on all organizational units in the enterprise	
Number of votes 21		
No.	Variants of answers	Selected answer
1.	YES	3
2.	NO	6
3.	Has influence up to 50%	8
4.	Has influence from 51% to 90%	4

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 6. The scope of software management

Question	Implemented and functioning management in the areas for which SAM is responsible	
Number of votes 21		
No.	Variants of answers	Selected answer
1.	License records	1
2.	License records + information on the existence of software installations	9
3.	License records + information on the existence of software installations + automatic settlement of licenses	3
4.	Purchases + License records + information on the existence of software installations + automatic settlement of licenses	3
5.	Purchases + Book of Inventory + License records + information on the existence of software installations + automatic settlement of licenses	2
6.	Purchases + Book of Inventory + License records + information on the existence of software installations + automatic settlement of licenses + reporting of expenditures divided into cost centers	2
7.	No management implemented	1

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

Table 7. Cooperation of SAM leader with other teams in software management processes.

Question	Other teams than SAM used in SAM management activities	
Number of votes 21		
No.	Variants of answers	Selected answer
1.	YES	19
2.	NO	2

Source: The results of the research conducted by Artur Falkiewicz using the survey method on 10.10.2018

6. Summary and recommendations

When considering the conclusions and recommendations, it should be underlined that Software Asset Management is the main element to be examined in this article in the context of the proper management based on ISO 19770-1 2017. The content of the standard refers to a number of standards or best practices supporting the ISO standard 19770 in aspects of e.g. the availability of asset data:

- ISO 55001:2014, Asset management — Management systems — Requirements;
- ISO 9000, Quality management systems — Fundamentals and vocabulary;
- ISO 9001, Quality management systems — Requirements;
- ISO 9004, Managing for the sustained success of an organization — A quality management approach;
- ISO 14001, Environmental management systems — Requirements with guidance for use;
- ISO 19011, Guidelines for auditing management systems;
- ISO/IEC 19770-5, Information technology – IT asset management – Part 5: Overview and terminology;
- ISO/IEC 20000-1, Information technology – Service management – Part 1: Service managementsystem requirements;
- ISO/IEC 20000-2, Information technology – Service management – Part 2: Guidance on the application of service management systems;
- ISO/IEC 27001, Information technology – Security techniques – Information security management systems – Requirements;
- ISO/IEC 27002, Information technology – Security techniques – Code of practice for information security controls;
- ISO/IEC 27005, Information technology – Security techniques – Information security risk management;

- ISO 22301, Societal security — Business continuity management systems — Requirements;
- ISO 31000:2009, Risk management — Principles and guidelines;
- ISO 37500, Guidance on outsourcing;
- ISO 55000:2014, Asset management — Overview, principles and terminology;
- ISO 55002:2014, Asset management — Management systems — Guidelines on the application of ISO 55001;
- ISO Guide 73:2009, Risk management — Vocabulary;
- IEC 31010, Risk management — Risk assessment techniques;
- ASTM E2132, Standard Practice for Inventory Verification: Electronic and Physical Inventory of Assets.

It should be added here that the explicit content of the ISO 19770 standard refers to the best practices of COBIT (Control OBjectives for Information and Related Technology), and in fact the elements of ITIL (Information Technology Infrastructure Library) are often invoked: Configuration Management (CM) and Change Management (CM) as important practices affecting the level of software management maturity.

Hypothesis No. 1 has been confirmed and it can be stated that best practices regarding IT management on the basis of the Ordinance of the Minister of Science and Higher Education of July 12, 2007 on educational standards for individual courses and levels of education, as well as the mode of courses creation and conditions to be met by the university to conduct intercultural studies and macro-fields in the field of education are not explicitly included as a teaching scope. It is necessary to specify that the purpose of this article is not to indicate any of the best practices as the leading one. It would be difficult to list all the relevant standards and best practices used in IT management and relate to them in the regulation. However, it would be worth pointing out best practices and standards as important in the education process at the general level.

All best practices evolve along with market changes, technology and the environment. However, the ideas they reflect are unchangeable.

Therefore, they can be referred as examples. The release of the first edition of COBIT is dated to 1996 (current version to the fifth edition dated April 2012), ITIL in the form of the first "HelpDesk" book appeared in 1989 (current version to ITIL4 dated February 2019). The most important norm from the perspective of this article ISO / IEC 19770-1: 2017 was first published in 2006 (subsequent editions in 2012 and 2017).

Hypothesis No. 2 has also been confirmed.

Table No. 1 indicates that persons responsible for Software Asset Management report to managers from C-Level: (CIO) Chief Information Officer; (CTO) Chief Technology Officer (9 votes out of 20). This result is not surprising because both managers are most often identified with the IT area.

Depending on the organization of the company and the organizational structure of the company, 3 out of 20 voters indicated (CEO) Chief Executive Officer / Owner as the person to whom directly reports. If the CEO has an impact on other C-Level managers, then it can be considered as a beneficial for the implementation of Software Asset Management in the company.

The purpose of obtaining information for the question described in Table No. 2 was to verify the subjective perception of the effectiveness of the person responsible for the implementation and maintenance of Software Asset Management in the enterprise in the event of the possibility of changing the manager, to which the person reports.

Two facts should be noted: the first is the increase in the number of people voting for (CIO) Chief Information Officer (increase to 7 people) with a simultaneous decrease by two people, voting for (CTO) Chief Technology Officer. The second is the increase by 1 person voting for (CEO) Chief Executive Officer.

While discussing the results with voters and in-depth interviews, managers responsible for Software Asset Management see their chance to implement and maintain proper management in close cooperation with IT units, in which they can cooperate with IT specialists. At the same time, due to many problems in the implementation and enforcement of processes for proper management, especially in the IT ordering phase, (CEO) Chief Executive Officer or owner is perceived as a manager who exerts more influence on entire enterprises, i.e. senior and middle managers who hinder implementation of management in line with best practices.

The answers in Table No. 3 confirm that 14 out of 19 participating in the voting pursued IT studies.

Important information is provided by data from Table No. 4, in which 19 out of 21 respondents confirm that in framework of Software Asset Management, they cooperate with other teams. In an in-depth interview, it was confirmed that these are IT teams, with particular emphasis on IT specialists.

The information from Table No. 4 should be compared with the information from Table No 5. The summary of this information is important because in 19 cases, the SAM manager declares cooperation with other areas, and at the same time only in 5 cases confirms the knowledge about the configuration of devices.

Knowledge about the configuration of IT environments is important in connection with the need to settle software licenses. Cooperation with organizational units, consisting mainly from IT specialists cause difficulties in access to information on the configuration of environments. It is due to the low awareness of IT specialists, but also middle managers avoid for various reasons providing the information and confirming the cyclical correctness of data on these environments.

Currently, IT elements are often dispersed in other organizations than IT itself. In the literature on the subject, a special name "shadow IT" has been coined. Shadow IT is a phenomenon that consists of the fact that some IT environments in enterprises are exempt from proper IT management. Most often this is the result of a deliberate action of organizational units trying to become independent from IT organizational structures subject to the level of C-level CIO and CTO managers. The scale of this phenomenon can be observed in the results of Table No. 6, in which only 3 out of 21 voters confirm their management encompassess the whole enterprise. This phenomenon entails large auditing and financial risks.

Education in the area of the need to properly manage the IT area on the basis of all the best practices mentioned in this article is a must.

Summarizing the subject matter that IT management should be addressed in the education at the university level.

Each of these ranges can be a profound topic for the development of an article in this area.

Suggested important aspects of IT education in the implementation and maintenance of best practices in IT management:

1. Best practices and standards in IT management (range proposals)
    a) ITAM (Information Technology Asset Management)
    b) ITIL (Information Technology Infrastructure Library)
    c) COBIT (Control OBjectives for Information and related Technology)
    d) ISO / IEC 19770
    e) ISO / IEC 20000
2. Auditing

a) Legality of software use audits

b) Audits carried out by the police

c) Financial audits

d) Internal audits in the company and internal audits at the level of the capital group

e) Audits as part of the transmission of data during optimization projects

f) Claims management

3. Organizational aspects

a) The need to cooperate with various organizational units during the implementation and maintenance of Software Asset Management processes

b) Organizational culture promoting correct data on IT environments

c) The idea of one organizational unit responsible for information on software licenses granted to the enterprise

d) Effective use of IT specialists to provide IT services

4. Financial risks

a) Risks of claims

b) Risks of misleading a shareholder

c) Incorrect results of the company's benchmarks or IT structures

5. Business results of incorrect IT management

a) Lack of knowledge about the costs incurred to purchase and maintain the software license and the IT environment

b) No possibility of comparison of technological solutions that appear on the market

c) Decisions on technological changes based on irrational assumptioms

d) Selection of non-optimal license models

e) Potntially multiplication of payments for the same IT environment

f) Weakened negotiating position in relation to software suppliers, IT environments and companies proposing outsourcing of IT solutions

6. Negative consequences for the state in the absence of improper management of the IT area with particular emphasis on Software Asset Management in all enterprises in the country and in the world.

The high level of significance of proper IT management with particular emphasis on software management should be reflected in the field of education. The benefits of proper management of these areas are measurable, and the risks should be eliminated before companies receive information about claims due to the detection of licensing breaches in the enterprise as part of ongoing software legality audits. Awareness of risks and tools for the

optimal use of IT resources should be acquired already during education, and not treated as knowledge acquired outside the university.

Currently, considering the lack of education in the field of best practices at academic level, IT should be recommended to the readers to familiarize themselves with the content of the standards listed in the article. Improving understanding can support the position of the IAITAM organization. Worth recommending are following positions: IAITAM Best Practice BluePrint items Volume 1 "IAITAM Best Practice BluePrint (BP2) is a process-oriented structure and initial volume of the IAITAM Best Practices Library based on collective knowledge and practices that turned out to be the greatest IT success. Asset management profession (ITAM). BP2 provides an information guide for an organization that wants to implement a program to manage IT resources and "Asset Identification Volume 11" Computer science uniquely identifies and verifies the physical presence of IT resources. This is a key element, including many activities related to software management, hardware lifecycles, obtaining IT and managing documentation processes. Unique physical identifications on the equipment associate it with the equipment which can be of no importance outside the organization." Both items will allow you to manage the quality and management of data that are mandatory as part of process management.

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