Principles, Domains and Processes of HIT Governance Frameworks: A Systematic Review

SBT Yönetişim Çerçevelerinin İlkeleri, Etki Alanları ve Süreçleri: Sistematik Bir Derleme

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ABSTRACT

Introduction: IT governance points out how to manage IT and align the decisions related to IT with processes, resources, and responsibilities within the organization. This study was conducted aimed at a review of studies on the principles, domains, and processes of IT governance framework.

Method: This is an applied study that was carried out in the qualitative method of systematic review. The study population consisted of all English articles indexed in scientific databases and electronic journals available. 36 eligible articles from among the articles reviewed entered the study and the data desired were collected through data extraction form and search strategy and analyzed using content analysis.

Results: Results showed that among 36 articles, four of the articles dealt with principles, 33 articles with domains, and 24 articles with processes of IT governance frameworks. These principles are related to IT frameworks of ISO 38500, ITIL V3, TOGAF, Prince 2, COBIT, Val IT. The domains included frameworks of CMMI, ITIL, PMBOK, COBIT, ISO 27001, COSO, Val IT, P2CMM. The processes also referred to the frameworks of Val IT, P2CMM, COBIT, ISO 27001 and 27000, ITIL, PMBOK and CMMI.

Conclusion: Based on this information and an overview of the principles, domains, and processes of the frameworks obtained in this study, the managers and officials of hospitals IT units can specify an appropriate governance framework for IT Service Management, method improvement of processes, probable risks management and project management.

Key Words: Health information technology, governance, decision making

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ÖZET

Amaç: BT yönetişi, BT’nin nasıl yönetileceğini ve BT ile ilgili kararların organizasyon içindeki süreçleri, kaynaklar ve sorumluluklarla nasıl hizalayacağını belirtir. Bu çalışma, BT yönetim çerçevesinin ilkeleri, alanları ve süreçleri üzerine yapılan çalışmaların gözden geçirilmesi amacıyla yapılmıştır.

 Yöntem: Bu, kalitativ sistemlik derleme yönteminde gerçekleştirilen uygulamalı bir çalışmadır. Çalışma popülatiyonu, bilimsel veri tabanları ve mevcut elektronik dergilerde indeksli tüm İngilizce makalelerden oluşuyordu. Incelenen makaleler arasında 36 uygun makale çalışmaya veri çarkma formu ve arama stratejisi ile toplanmış ve içerik analizi kullanılarak analiz edilmiştir.

 Buluşlar: Sonuçlar, 36 maddeden dördüncüünün ilkelerelere, 33 eti alanlarına ve 24 eti yönetim çerçevesine sürecine sahip makaleye de yoğunlüğünü göstermiştir. Bu ilkeler ISO 38500, ITIL V3, TOGAF, Prens 2, COBIT, Val IT’nin IT çerçevelerine ilgilidir. Alanal CMMI, ITIL, PMBOK, COBIT, ISO 27001, COSO, Val IT, P2CMM çerçeveleri içeriyordu. Süreçler ayrıca Val IT, P2CMM, COBIT, ISO 27001 ve 27000, ITIL, PMBOK ve CMMI çerçevelerine de atıfta bulundu.

 Sonuç: Bu bilgilerle dayanarak ve bu çalışmada elde edilen çerçevelerin ilkelerelere, etki alanlarına ve süreçlerine genel bir bakış, hastanelerin BT birimlerinin yöneticileri ve yetkilileri BT Hizmet Yönetimi için uygun bir yönetim çerçevesi, süreçlerin ve proje yönetiminin yileştirilmesi açısından olması riskleri belirleyebilir.

Anahtar Sözcükler: Sağlık bilgi teknolojisi, yönetim, karar verme

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INTRODUCTION

Organizations are increasingly dependent on IT and information systems are seamlessly growing more popular every day. IT is a critical factor of success in the organization and provides many opportunities to gain competitive advantages such as operational efficiency, saving money, reduction of human error and is a tool to increase efficiency. Information technology creates new opportunities of business, generating income and costs saving as well (1-6).

IT governance can be considered as part of the governance of the organization, information management and information related to resources in the same way as human resources and other assets of the organization to be managed. Also, it is argued that IT operations can be considered as a business within another business, with the governance structures and operating principles of that business (7).
Therefore, this study aimed to extract the principles and domains and processes of technology in the health care services through the deployment of EHR and technology in the health field has been noted as well. For example, the third IT governance in health domain (28). In Iran, the issue of the use of information and technology at the strategic and tactical levels of the organization (27).

In the information systems in the health field, IT governance management of projects, allocating IT budgets unbalanced, fragile IT operational to information systems. Most parts of hospital information systems lack proper including the effects of state and federal laws for the use of information electronic records of patient and confidentiality of patient's information, is the care quality for the use of information technology, improving the standard using prior workers in information technology in education and health centers have also been mentioned as management challenges of human resource in information technology, lack of knowledge, and lack of educational programs most of these frameworks have different functionality in different scopes (7, 20, 21).

Rau defines IT governance as the following: "The way of communication and interaction of senior managers with IT managers to ensure investments in information technology that enables them to achieve business strategy in an effective and efficient manner." (18). Therefore, IT governance cannot exist in isolation and must be a subset of enterprise governance. This responsibility is not only a duty of IT management but the board of directors and executive management as well. According to the writings of the IT Governance institute "it is an integral part of the enterprise governance and includes leadership and organizational structures and processes to ensure that IT maintains and expands organizational goals and strategies." (19). There is no simple, complete and ready IT governance framework while there is a number of frameworks available such as Control objectives for Information and Related Technologies (COBIT), Information Technology Infrastructure Library (ITIL) and ISO 17799, which can be a useful starting point for the development of IT governance. On the other hand, most of these frameworks have different functionality in different scopes (17, 20, 21).

Lack of IT specialist human resources, their initial resistance to the use of information technology, lack of knowledge, and lack of educational programs have also been mentioned as management challenges of human resource in using prior workers in information technology in education and health centers (6, 22, 23). Moreover, pressure for optimal management of costs and increase the care quality for the use of information technology, improving the standard of electronic records of patient and confidentiality of patient's information, is including the effects of state and federal laws for the use of information technology governance in educational centers and health authorities (22, 24).

National health care systems are faced with significant challenges in relation to information systems. Most parts of hospital information systems lack proper management. For example, conditions for the development of hospital information system are not appropriate (12). In addition, issues such as poor management of projects, allocating IT budgets unbalanced, fragile IT operational management, security management, and data protection are including problems in the information systems in the health field. Therefore, IT governance frameworks provide a good solution for many of these challenges; (25, 26).

Because IT governance provides a framework for decision-making and implementation of IT-related plans with respect to the goals, processes, people and technology at the strategic and tactical levels of the organization (27).

The aforementioned preface explains the need to paying specific attention to IT governance in health domain (28). In Iran, the issue of the use of information technology in the health field has been noted as well. For example, the third objective of the subgroup of IT in the map of healthcare system reform of the Islamic Republic of Iran has focused on the optimal use of information technology in the health care services through the deployment of EHR and equitable and classified access to information related to health care (29). Therefore, this study aimed to extract the principles and domains and processes of IT governance frameworks of the studies carried out until 2014.

**METHOD**

This is an applied study carried out in the qualitative method of systematic review. At this stage, the research community included all English-language articles indexed in scientific databases and electronic journals, Ovid Medline, PubMed, Science Direct, ProQuest, Springer, and google scholar.

A data extraction form was used to extract the principles, domains, and processes of governance frameworks out of related articles. The form provided by the researchers on the basis of the articles and related documentation and was used after its content and formal validity was confirmed by the supervisor and consultant.

**Procedures and criteria for selecting studies**

The studies that had all the inclusion criteria but none of the exclusion criteria entered the review. The inclusion criteria are:

1. Are published in English.
2. Discuss the principles, domains, and processes of IT governance frameworks in particular.
3. Access to full-text exists.

Given that, access to some of databases resources and journals and the retrieval of full-text articles are not possible for different reasons such as political or financial reasons, and given that using articles in review is possible if they are available full-text, this case was considered as the inclusion criteria.

The contexts dealing with IT governance frameworks in general and not mentioning about the principles, domains, and processes of IT governance.

Due to the fact that it was possible that the articles about IT governance frameworks entered search without reference to the principles, and domains, and processes of IT governance, in this part, the articles not dealing with the principles, domains, and processes of IT governance, were excluded from the study.

At the stage of data analysis, the study choice process was multistage. At first, the entrance criteria were used to be able to investigate cases obtained from internet search databases. Except the cases certainly excluded of the review, the titles and abstracts resulting from the search that seemed potentially relevant to the review, were included in review to evaluate their articles' full text. Two reviewers independently checked all the titles and summaries. Kappa coefficient was used to measure the agreement between people about to enter the papers into or exit them from the review (κ ± 0.0). Differences between the reviewers' opinions were resolved by obtaining that of a third reviewer. Decisions on including or excluding the studies were made after re-examining the full text of all potentially relevant articles. The principles, domains, and processes of the ML eligible for inclusion the study extracted through content analysis (conventional analysis), and were included in data extraction forms. However, taking qualitative and quantitative approach to these studies into account, use of meta-analysis was not possible.

In summary, Systematic Review was carried out in two steps. The first step was to determine the principles, domains and processes of IT governance frameworks using systematic review methodology. In this step, scientific databases and electronic journals, PubMed, Science Direct, ProQuest, Springer, Ovid MEDLINE, Google scholar, with keywords "IT Governance", "Information Technology Governance", "COBIT 4.1", "COBIT 5", "ITIL v3", "PMBOK"; "ISO 21500"; "CMMI"; "Risk Information Technology"; "ISO 27001"; "ISO 38500" and "TOGAF" and their aligned ones of medical subject headings applying entrance criteria of English and time range of 1946 to 2014 were searched and 567 articles were obtained.

In the second step, the duplication of the articles was checked and 420 repetitive articles were removed as a result, and 147 abstract and full text articles remained. Controlling duplicate articles was conducted by controlling title, authors, abstract, full text, and the relevant journal and there was no superiority between were, but the most complete version of the paper was included in the study.
Then, these studies were investigated in terms of whole content focus on IT governance frameworks and as a result, 84 articles were removed due to lack of enough focus of the content on IT governance frameworks.

Meanwhile, the authors were contacted via e-mail three times to access the full text of abstracts that eventually, 27 articles were removed because of lack of access to the full text. Finally, 36 articles (with all the criteria for inclusion) were checked and the principles, domains, and processes of IT governance frameworks extracted from them and recorded in data extraction form.

RESULTS

Findings showed that 6827 papers were obtained in the initial search by the researchers (Table 1).

Table 1. Finding in the initial search through scientific databases and electronic journals

| Database or Journal | Number of articles | Database or Journal | Number of articles |
|---------------------|--------------------|---------------------|--------------------|
| Google Scholar      | 6714               | ProQuest            | 24                 |
| PubMed              | 17                 | Ovid                | 15                 |
| Springer            | 10                 | Science Direct      | 47                 |

Study Selection Process

The study selection process in this part was multi-phase. Firstly, the inclusion criteria were freely used to investigate cases obtained from internet search of databases. Except the cases certainly excluded of the review, the titles and abstracts resulting from the search that seemed potentially relevant to the review, were included in review to evaluate their articles’ full text. Final decisions on including or excluding the studies were made after re-examining the full text of all potentially relevant articles. Challenging duplicate articles on various bases (420 cases), the article given at the first database of surfing were considered.

Table 2. Summarizing the findings of the systematic review of the principles, domains, and processes of IT governance framework

| Code No. | Author name/Publication year | ITG principles | ITG domains | ITG processes | Code No. | Author name/Publication year | ITG principles | ITG domains | ITG processes |
|----------|------------------------------|----------------|-------------|--------------|----------|------------------------------|----------------|-------------|--------------|
| 1        | Sunthonwutinum et al 2008(30)| *              | *           | *            | 19       | De Haes et al 2009(31)       | -              | *           | -            |
| 2        | Sheikhpuro et al 2012(32)   | -              | *           | *            | 20       | Noblin et al 2011(33)        | -              | -           | *            |
| 3        | Cortina et al 2010(34)      | -              | *           | *            | 21       | Rusmala et al 2013(35)       | -              | *           | -            |
| 4        | Maria de Fatima et al 2005(36)| -              | *           | *            | 22       | Mataracioglu et al 2011(37)  | -              | *           | -            |
| 5        | Knahl 2009(38)              | -              | *           | *            | 23       | Yuwono et al 2012(39)        | -              | *           | *            |
| 6        | Kishore et al 2012(40)      | -              | *           | *            | 24       | Nabiollahi et al 2011(41)    | -              | *           | -            |
| 7        | Yucalar et al 2009(42)      | -              | *           | *            | 25       | Susanto et al 2011(43)       | -              | *           | -            |
| 8        | Lixandroiu et al 2011(44)   | *              | *           | *            | 26       | Ramadhani et al 2012(45)     | -              | *           | *            |
| 9        | Simonsson et al 2005(46)    | -              | *           | *            | 27       | Goecken et al 2008(47)       | -              | *           | -            |
| 10       | Tanovic et al 2012(48)      | -              | *           | *            | 28       | Wessels et al 2006(49)       | -              | *           | -            |
| 11       | Omran 2012(50)              | -              | *           | *            | 29       | Dister et al 2013(51)        | -              | *           | -            |
| 12       | Bhattacharjya et al 2006(52)| -              | *           | -            | 30       | Liao et al 2012(53)          | -              | *           | -            |
| 13       | Radovanovic et al 2010(54)  | -              | *           | *            | 31       | Al Omari et al 2012(55)      | -              | *           | -            |
| 14       | Zakaria et al 2010(56)      | *              | *           | -            | 32       | Ferreira et al 2011(57)      | -              | *           | *            |
| 15       | Costin et al 2011(58)       | -              | *           | -            | 33       | Sanjuan et al 2013(59)       | -              | *           | *            |
| 16       | Gheorghe et al 2010(60)     | -              | *           | *            | 34       | Lianyi et al 2012(61)        | -              | *           | *            |
| 17       | Othman et al 2011(62)       | -              | *           | -            | 35       | Ven et al 2008(63)           | -              | *           | -            |
| 18       | Kraker et al 2011(64)       | -              | *           | *            | 36       | Kozina et al 2010(65)        | *              | *           | *            |

DISCUSSION

Surfing foreign databases to achieve the principles, scopes, and processes of IT governance frameworks led to achieve 567 articles. Early evaluation of the titles and abstracts showed that 147 full-text articles were eligible for consideration. Based on a review of all articles remaining, 111 studies were excluded because they did not match with the purpose and criteria for this study, and finally 36 articles remained for more detailed analysis.

The findings showed that four of the 36 articles devoted to the principles of IT governance frameworks (30, 44, 56). These principles were related to IT governance frameworks of ISO 38500, Information Technology Infrastructure Library Version Three, TOGAF, Prince two, control objectives for information and related technology five, control objectives for information and related technology four and one Val IT.
Chief among principles are: responsibility, strategy, business, operation, compliance, human behaviors, organizational architecture, application architecture, IT architecture, business justification, definition of organization structure for the project management team, product-based planning, project division into the controlled and manageable and flexible steps, responsive to stakeholder needs, covering investment to the end, the use of an integrated framework, enabling a comprehensive way, the separation of governance from management, business requirements, the benefits of information technology, information technology and information processes, maximum benefit for the organization, management of team work, a strong business continuity and protection of intellectual property.

As well, 33 of the 36 articles dealt with the scopes of IT governance frameworks (30, 32, 34, 36, 38, 40, 42). These scopes were relevant to IT governance frameworks CMMI, Information Technology Infrastructure Library, PMBOK, control objectives for information and related technology four and one, Information Technology Infrastructure Library version three, ISO 27001, IT governance, COSO, Val IT, and P2CMM. Some of these areas included planning and organizing, funding and implementation, delivery and support, monitoring and evaluation, value governance, portfolio management, investment management, project setup, project start, project directing, stage management, product delivery management, close or end project, planning, security policies, security unit of information, asset management, human resources security, environmental security, operations management, access control, information systems development and maintenance, compatibility, security incident management, service delivery, support services, IT infrastructure management, application programs management, and security management. Finally, 24 of the 36 articles studied dealt with processes of IT governance frameworks (30, 32-34, 36, 38-43, 45-48, 50, 51, 54, 55, 57, 59, 61, 64, 65). These IT governance frameworks were related to Val IT processes, P2CMM, control objectives for information and related technology, ISO 27000, ISO 27001, Information Technology Infrastructure Library, PMBOK, and CMMI. Some of the most important of these processes included: demand management, financial management, information security management, information security management system, allowed services / ports and protocols, probable risk management of procedures and instructions, security policies, access to information and data classification, scheme and security plan, capacity management, monitoring, capacity management, availability management, assess the potential risks associated with the availability, monitoring availability, ongoing management of IT services, logistics management, assignment management and deployment, asset management and configuration, validation and test services, ongoing management, change management, operations management, problem management, budget management, assessment and evaluation of the internal control system, quality management, human management, enterprise architecture management, stakeholder confidence through transparency, knowledge management, management of services agreements, innovation management.

The results of this study are recommended to be used to design IT governance framework in the field of health care. IT department managers and directors of the health and care centers could identify appropriate governance framework for IT Services, management of probable risks, and project management based on this information and an overview of the principles, scopes and processes of governance frameworks listed or they could create better and more comprehensive framework tailored to the specific business needs of their own, inspired by them.

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Conflict of interest

No conflict of interest was declared by the authors.

REFERENCES

1. Bryman A, Nilsen B. Samhällsvetenskapliga metodern: Liber ekonomi; 2002.
2. Ross JW, Beath CM, Goodhue DL. Develop long-term competitiveness through IT assets. Sloan management review. 1996;37:1-12.
3. Broadbent M, Weil P. Management by maxim: How business and IT managers can create IT infrastructures. Sloan management review. 1997;38:77-92.
4. Abu-Musa AA. Evaluating the security controls of CAIS in developing countries: the case of Saudi Arabia. The International journal of digital accounting research. 2006;6:3.
5. Sadoughi F, Davaridolatabadi N, Ahmadi M, Shahi M. Theoretical Approach to Elderly Care Management Information Systems: Lesson learned from literature review. The AYER. 2015;1:375-85.
6. Shahi M, Sadoughi F, Ahmadi M. Information Technology Governance Domains in Hospitals: A Case Study in Iran. Global journal of health science. 2014;7:200-8.
7. De Haes S, Van Grembergen W, editors. IT governance structures, processes and relational mechanisms: Achieving IT/business alignment in a major Belgian financial group. System Sciences, 2005 HICSS’05 Proceedings of the 38th Annual Hawaii International Conference on; 2005: IEEE. 
8. Council ACG, Exchange A5. Principles of good corporate governance and best practice recommendations: Australian Stock Exchange Limited; 2003.
9. Abu-Musa AA. Exploring information technology governance (ITG) in developing countries: an empirical study. The International journal of digital accounting research. 2007;7:6.
10. Hughes C. Values and Decision-Making. In: Ethical and Legal Issues in Human Resource Development. Palgrave Macmillan, Cham, 2019. p. 31-51.
11. Weill P, Ross JW. IT governance: How top performers manage IT decision rights for superior results: Harvard Business Press; 2004.
12. Van Grembergen W. Strategies for Information technology governance: IGI Global; 2004.
13. Korac-Kakabadse N, Kakabadse A. IS/IT governance: Need for an integrated model. Corporate Governance. 2001;1:9-11.
14. Gregory, Robert Wayne, et al. IT Consumerization and the Transformation of IT Governance. MIS Quarterly, 2018;42:1225-53.
15. Peterson RR. Integration strategies and tactics for information technology governance. Strategies for information technology governance. 2004:37-80.
16. Duffy J. IT Governance and business value part 1: IT Governance–An issue of critical importance. IDC document. 2002(27291).
17. Patel NV. An emerging strategy for e-Business IT Governance. Strategies for information technology governance. 2004:81.
18. Sambamurthy V, Zmud RW. Arrangements for information technology governance: a theory of multiple contingencies. Mis Quarterly. 1999:261-90.
19. Rau KG. Effective governance of IT: Design objectives, roles, and relationships. Information Systems Management. 2004;21:35-42.
20. De Haes S, Van Grembergen W. Enterprise Governance of IT. In: Enterprise Governance of Information Technology. Springer, Cham, 2015. p. 11-43.
21. Symons C. IT governance framework. Forrester Best Practices March. 2005;29:2005.
22. De Haes S, Van Grembergen W, editors. Information technology governance best practices in Belgian organisations. System Sciences, 2006 HICSS’06 Proceedings of the 39th Annual Hawaii International Conference on; 2006: IEEE.
23. Davaridolatabadi N, Sadoughi F, Meidani Z, Shahi M. The Effect of Educational Intervention on Medical Diagnosis Recording Among Residents. Acta Informatica Medica. 2013;21:173.
24. Shahi M, Sadoughi F, Davaridolatabadi N, Ebrahimhi K. HIS interoperability among health care centers: Case of Iran. Life Science Journal. 2013;10(7s).
25. Kuhn K, Giuse D, Lapao L, Wurst S. From Hospitals to Regional Networks, to National Infrastructures, and Beyond. Methods Inf Med. 2007;46:500-2.
26. Lapão LV. Survey on the status of the hospital information systems in Portugal. Methods of Information in Medicine. 2007;46:493-9.
27. Williams TG. IT investments can add business value. Healthcare financial management: journal of the Healthcare Financial Management Association. 2002;56:34-8.
28. Safdari RD, H. Eshragyan, R. Barzeker, H. Human Factors Influencing the Adoption of Information Technology by Operational Managers Tehran University of Medical Sciences. Journal of Payavard. 2011;5:24-31.
29. Health Mo. Map of Iran’s System Reform based on Islamic-Iranian pattern for development 2012 [cited 2012 25 July]. Available from: http://siast.behdast.gov.ir/uploads/29_1041_Heaalth%20Map%20Book%20esf and.pdf.
30. Sunthowonwutin W, Chooprayoon V. A Benchmarking Study of Standard Frameworks for Information Technology Governance. 2008.
31. De Haes S, Van Grembergen W, Van Brempft H. Demonstrating the value of COBIT and Val IT IT governance: a theory of multiple contingencies. MIS Quarterly. 2008.
32. Sheikhpour R, Modiri N. A best practice approach for integration of ITIL and ISO/IEC 27001 services for information security management. Indian Journal of Science & Technology. 2012;5:2170-6.
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33. Noblin AM, Cortelley-Ward K, Tons S. Electronic Health Record Implementations: Applying the Principles of Monitoring and Controlling to Achieve Success. The health care manager. 2011;30:45-50.
34. Cortina Sp, Piccard M, ValdÄ«s O, Renaud A. A Challenging Process Models Development: The ITIL v3 Lifecycle Processes. 2010.
35. Rusmsale S, Sayahri R. Evaluation of Infrastructure Information Technology Governance Using CONIT 4.1 Framework. 2013.
36. de Fájtimmattiello-Franccisco M, Arias R, Massakis Hirata C, editors. A Comparative Study between PMBOK/DoD and ECSS/Management Process for Software Acquisition. DASIA 2005-Data Systems in Aerospace; 2005.
37. Mataraociglu T, Ozkan S. Governing Information Security in Conjunction with COBIT and ISO 27001. International Journal of Network Security & Its Applications. 2011.3:288-93.
38. Knahl MH. A Conceptual Framework for the Integration of IT Infrastructure Management, IT Service Management and IT Governance. Proceedings of World Academy of Science: Engineering & Technology. 2009;52.
39. Yuwono B, Triputra RN, Nasri M. Information Technology Plan as an IT Governance Maturity Driver. Jurnal Sistem Informasi. 2012;5:50-5.
40. Kishore R, Swinarski ME, Jackson E, Rao HR. A Quality-Distinction Model of IT Capabilities: Conceptualization and Two-Stage Empirical Validation Using CMMi Processes. Engineering Management, IEEE Transactions on. 2012;59:457-69.
41. Nabiollahi A, Alias RA, Sahibuddin S. Involvement of Service Knowledge Management System in Integration of ITIL V3 and Enterprise Architecture. American Journal of Economics and Business Administration. 2011;3:165.
42. Yucaif F, Erddogan S. A Questionnaire Based Method for CMMI Level 2 Maturity Assessment. Journal of Aeronautics & Space Technologies/Havacilik ve Uzay Teknolojileri Dergisi. 2009;4.
43. Susanto H, Almunawar MN, Tuan YC. i-SolFramework View on ISO 27001. Information Security Management System: Refinement Integrated Solutionâ€™s Six Domains. Journal of Computer, Asian Transaction. 2011.
44. Lixandrou R, Maican C, editors. A study on measuring the performance of systems using the IT business intelligence corporate governance standard: Cobit 4.1. Proceedings of the 12th WSEAS international conference on Mathematics and computers in biology, business and acoustics; 2011: World Scientific and Engineering Academy and Society (WSEAS).
45. Ramadhani DP, Kurniati AP, Maharani W. IT Governance Analysis of XYZ Hospital Based on COBIT 4.1. 2012.
46. Simonsson M, Hultgren E, editors. Administrative Systems and Operation Support Systems–A Comparison of IT Governance Maturity, proceedings of the CIGRE International Colloquium on Telecommunications and Informatics for the Power Industry, Cuernavaca, Mexico; 2005.
47. Goeken M, Alter S, editors. IT Governance Frameworks as Methods. ICEIS (3-2); 2008.
48. Tanovic A, Androulidakis I, Orucievic F, editors. Advantages of the new ITIL V3 model in the implementation of the IMS system. 11th WSEAS International Conference on Applications of Computer Engineering (ACE’12); 2012.
49. Wessels E, Loggenberg J, editors. IT governance: theory and practice. Conference on Information Technology in Tertiary Education, Pretoria, South Africa; 2006: Citeseer.
50. Omran A, editor AGILE CMMI from SMEs perspective. Information and Communication Technologies: From Theory to Applications, 2008 ICTTA 2008 3rd International Conference on; 2008: IEEE.
51. Disterrer G. ISO/IEC 27000, 27001 and 27002 for Information Security Management. Journal of Information Security. 2013;4.
52. Bhattacharya J, Chang Y, editors. Evolving IT governance practices for IT and business alignment: a case study in an Australian institution. Proceedings of the 4th Annual Conference on Information Science, Technology and Management, 2006.
53. Liao K-H, Chueh H-E. Medical Organization Information Security Management Based on ISO27001 Information Security Standard. Journal of Software (1796217X). 2012;7.
54. Radovanovic D, Radojevic T, Lucic D, Sarac M, editors. Analysis Of Methodology For IT Governance and Information Systems Audit. International Scientific Conference; 2010.
55. Al Omari L, Barnes PH, Pitman G, editors. Optimising COBIT 5 for IT governance: examples from the public sector. Proceedings of the ATISR 2012: 2nd International Conference on Applied and Theoretical Information Systems Research (2nd ATISR2012); 2012: Academy of Taiwan Information Systems Research.
56. Zakaria NA, Razak RA, Dahalin ZM. Assessment of Enterprise Architecture (EA) Implementation Using The Open Group Architecture Framework (TOGAF). 2010.
57. Ferreira M, Tereso A, Ribeiro P, Fernandes G, Loureiro I. Project Management Practices in Private Portuguese Organizations. Procedia Technology. 2011;9:608-17.
58. Costin D, Militaru C. Asset Management Towards ISO/IEC 27001: 2005 Accreditation of an Information Security Management System. Revista De Management Comparat International/Review of International Comparative Management; 2011;12:245-50.
59. Sanjjuan AG, Froese T. The Application of Project Management Standards and Success Factors to the Development of a Project Management Assessment Tool. Procedia-Social and Behavioral Sciences. 2013;74:312-21.
60. Gheorghe M. Audit Methodology for IT Governance. Informatica Economica. 2010;14(1).
61. Lianying Z, Jing H, Xining Z. The Project Management Maturity Model and Application Based on PRINCE2. Procedia Engineering. 2012;29:3691-7.
62. Othman MFI, Chan T, Foo E, Nelson KJ, Timbrell GT, editors. Barriers to information technology governance adoption: a preliminary empirical investigation. Proceedings of 15th International Business Information Management Association Conference; 2011.
63. Ven K, Van Grembergen W, Dehaes S, Verelst J. Using COBIT 4.1 to guide the adoption and implementation of open source software. Information Systems Control Journal. 2008;3:31-5.
64. Krakar Z, Ålgema L, Rotim ST. Cobit4 Framework for IT Governance–Analysis and experience. FOI, retrieved. 2011:25-06.
65. Kozina M, Popoviç D. VAL IT Framework and ICT benefits. 2010.