Exploring the importance and implementation of COBIT processes in Saudi organizations
An empirical study

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Abstract

Purpose – The purpose of this paper is to explore the importance and implementation of the *Control Objectives for Information and Related Technology* (COBIT) processes in Saudi organizations.

Design/methodology/approach – An empirical survey, using a self-administered questionnaire, was conducted to achieve this purpose. A total of 500 questionnaires were distributed to a selected sample of organizations in Saudi Arabia. Of these, 127 valid questionnaires – representing 25.4 percent response rate – were collected and analyzed using the Statistical Package for Social Sciences (SPSS) version 16.

Findings – The results of this paper reveal that the majority of respondents perceive the importance of the COBIT processes and domains, but a lower percentage believe that such processes are adequately implemented in their organizations. It is observed that banks, financial institutions, and service organizations show more concern and application of COBIT processes compared with other organizations. The results also reveal that IT specialists, internal auditors, and executive managers perceive and appreciate the importance of COBIT processes more than the others.

Practical implications – The results of this paper will enable Saudi organizations to better understand, implement, evaluate, and manage information technology governance (ITG) for their businesses success. The paper provides useful information for executive managers, IT managers, accountants, auditors, and academics to understand the implementation phase and impact of COBIT on ITG in Saudi organizations.

Originality/value – The paper provides useful information for executive managers, IT managers, accountants, auditors, and academics, to understand the implementation phase and impact of COBIT on ITG in Saudi organizations.

Keywords Communication technologies, Information systems, Developing countries, Saudi Arabia

Paper type Research paper

1. Introduction

For many organizations, information and the technology that supports it represents the organization's most valuable assets. Information and information technology (IT) represent a significant expense in most organizations; however, IT is hard to value or price, has a decreasing half-life and has increasing risk exposure (Lainhart, 2000; Boritz, 2005). The increased reliance on IT has exposed many organizations around the world to a host of new risks. Management of these risks requires the efforts of various parties within the organizations (Hadden, 2002). Therefore, implementing effective information technology governance (ITG) has become a necessity as organizations have developed essential dependencies on IT for their successes (Bodnar, 2006).

The *Control Objectives for Information and Related Technology* (COBIT) addresses the need for management and control of information and related IT (Information Systems Audit and Control Foundation, 1998). COBIT is a methodology for managing and controlling information and IT risks and vulnerabilities. COBIT recognizes that effective management of information and related IT is a very important factor to the success and survival of organizations (Lainhart, 2000). COBIT is also one of the important ITG frameworks and supporting tools that allows IT managers to communicate and bridge the gap between business risks, control needs, value creation and technical issues (Lainhart, 2000; Bodnar, 2003; Hardy, 2006; and Williams, 2006). COBIT has been created by the Information Systems Audit and Control Association (ISACA), and the IT Governance Institute (ITGI) in 1992. The first edition of COBIT was published in 1996; the second edition in 1998; the third edition in 2000, and the online edition became available in 2003. The fourth edition of COBIT was issued in December 2005.

According to Bodnar (2006), COBIT 4.0 is directed at helping management discharge its responsibilities with respect to an organization's IT assets by "bridging the gaps" between business risks, control needs, and technical issues. COBIT also provides "good practices" across a domain and process framework and presents activities in a manageable and logical structure. COBIT helps management to optimize the organization's information investments and provide measures that may serve as benchmarks to be judged against when activities and events do not go according to plan.

COBIT has 34 objectives which have been categorized under four domains: planning and organization, acquisition and implementation, delivery and support, and monitoring (Lainhart, 2001; Hadden, 2002; Bodnar, 2003 and 2006; Brown and Nasuti, 2005b; Violino, 2005; Hardy, 2006). COBIT's framework also identifies which of the seven information criterion (effectiveness, efficiency, confidentiality, integrity, availability, compliance, and reliability), as well as which IT resources (people, applications, technology, facilities and data) are important for the IT processes to fully support the business objective (Bodnar, 2003). COBIT is now being increasingly used as a generally accepted framework ITG by IT auditors who map to Sarbanes-Oxley (SOX) requirements. The standard is becoming vital as companies strive to comply with regulations and the requirement the SOX Act. COBIT was actually released as an IT process and control framework, linking IT to business requirements (Chan, 2004; Ramos, 2004; Brown and Nasuti, 2005b, Violino, 2006).

According to Lainhart (2000) COBIT is now achieving worldwide recognition as the authoritative source on IT Governance, IT Control Objectives, and IT Audit. It is being used globally in a variety of ways by private industry, public accounting firms, governments, and academia. It is being used by boards of directors, audit committees, chief executive officers (CEOs), heads of governmental organizations, chief information officers (CIOs), security managers, and information systems auditors.

This paper is organized in seven sections as follows: The first section introduces the statement of research problem; while the second section highlights the research objectives, and section three introduces the research questions. Section four introduces and analyzes the literature review and previous studies related to the COBIT and IT Governance. Section five describes the research methodology used in the paper. In section six, the main results of the empirical survey is analyzed and discussed. Finally, the last section introduces the conclusion and recommendations for further research.

2. Research objectives

The paper explores the current status of COBIT processes in Saudi organizations. It investigates and assesses the importance and performance of ITG in Saudi organizations using COBIT guidelines. This paper intends to investigate the significant differences among Saudi organizations as well as respondent groups regarding their perception of the importance and efficiency of implementation of COBIT processes in Saudi environment. The paper introduces a roadmap for Saudi organizations which look forward to compliance with COBIT and adoption of ITG principles.

3. Research questions

The paper attempts to answer the following research questions:

RQ1. How important is each of the COBIT processes for Saudi organizations?

RQ2. Are the COBIT processes well performed in Saudi organizations?

RQ3. Are there any significant differences among Saudi organizations regarding the importance of COBIT processes for the purpose of ITG?

RQ4. Are there any significant differences among Saudi organizations regarding the implementation of COBIT processes?

RQ5. Are there any significant differences among respondent groups regarding their perception of the importance of COBIT processes in Saudi organizations?

RQ6. Are there any significant differences among respondent groups regarding the implementation of COBIT processes in Saudi organizations?

4. Literature review

Despite the fact that COBIT and its related sources have been intensively investigated by many academic authors, there are few published papers in the literature which investigate how the standard is utilized (Williams, 2006; Ridley *et al.*, 2004; Brown and Nasuti, 2005b; Guldentops *et al.*, 2002; Fedorowicz, and Ulric, 1998; Tongren and Warigon, 1997). On the other hand, Brown and Nasuti (2005b) stated that the ITGI does provide the investigator an excellent source of case studies on COBIT outcomes. Case studies from the ITGI, as well as personal contacts in companies that are currently following COBIT, are two primary sources available to assist in the evaluation of the implementation of COBIT in an IT organization.

Council (2006) also argued that despite myriad literature on COBIT, there existed very little rigorous research. Council addressed the shortage of COBIT research area and introduced the unexplored challenges of medium sized institutions of higher learning. He also provided guidance to practitioners for implementing ITG programs to medium sized institutions of higher education.

Hardy (2006) argued that organizations need a strong governance model in place to approve, prioritize and manage IT investments on an ongoing basis. This is necessary to align IT investments with the business requirements needed to deliver IT value to an organization. The process of ITG must involve the business units at the highest level in a partnership with IT to ensure that effective strategic alignment is achieved.

However, COBIT (1998) provided a useful instrument to help organizations get started evaluating their own ITG systems. The ITG self-assessment checklist helps auditors to determine each of the COBIT processes. COBIT also provides a sound approach for implementing IT governance-related initiatives in a well-controlled environment.

In his paper, Lainhart (2001) introduced many successful case studies belonging to different organization types that have customized COBIT for their unique needs and managed their IT governance. Hadden (2002) examined the role of audit committees in monitoring IT risk using a self-administered survey, mailed to 1,000 audit committee members in US companies. The instrument was developed from the 34 high-level control objectives identified in the COBIT model. The results of the paper indicateds that audit committee IT expertise, company size, and financial service industry classification were positively associated with perceived audit committee oversight of IT risks. The results also revealed that audit committee oversight assessments were partially affected by prior COBIT experience.

In recent years, control and governance of internal services such as IT have become quite critical in organizations due to the enormous size of their expenditure. But surprisingly, a recent paper by the ITGI that covered 335 CEOs and CIOs in 21 countries, reported that while more than 91 percent of executives recognize that IT is vital to the success of their businesses, more than two-thirds of CEOs were not comfortable answering questions about governance and control over their IT processes. The paper validates that the major problem continues to be "the inadequate view of how well IT is performing" (Son *et al.*, 2005).

In 2005, a survey was carried out by Price Waterhouse Coopers on behalf of the ITGI. The results of the survey revealed that 75 percent of organizations currently using COBIT found it either very useful or somewhat useful, while 15 percent of the respondents were undecided and less than 10 percent had a negative response. The main negative issue identified by the respondents was the perceived complexity of the framework (Williams, 2006).

The IT Process Institute (2006) conducted a paper to investigate the affect of IT controls on operations, security, and audit measures. The paper was designed to explore the importance of the IT controls in the improvement of performance, by studying the top-performing IT organizations. The paper aimed to identify the specific IT controls that have the greatest impact on performance improvements for organizations. The paper surveyed respondents from 98 IT organizations in many industries. The survey asked a broad range of questions designed to support analysis of COBIT control activities and key operations, security, and audit performance measures. The results of the paper provideds empirical evidence that performance is improved when IT organizations focus ongoing audit- and control-related resources on those foundational control activities that have been proven to improve performance measures. The results of the paper also revealed the presence of a correlation between control activities and performance measures indicates that the best practices outlined in the COBIT framework improve performance measures.

Council (2006) investigated the difficulty of implementing COBIT's Systems Security using the case study of South Louisiana Community College (SLCC). The paper examineds the managerial aspects of introducing COBIT's fifth delivery and support process (DS5), successes, and the needs of a medium sized institution of higher education. The paper revealed that COBIT DS5 matched the environment at SLCC with

a few exceptions and modifications. The paper also provided a useful guidance to practitioners for implementing ITG programs in medium sized institutions of higher education.

Hardy (2006) studied the case of Unisys as one the leading international IT services companies in the USA. Unisys adopted COBIT to provide an effective IT control and ITG framework. As a result of implementing COBIT, business processes within IT were improved and SOX-related controls were established. Unisys has also utilized COBIT as a guideline for developing its approach for outsourcing work to third parties by identifying processes and tasks within the domains of COBIT that can be outsourced. The results of this paper revealeds that Unisys' business process within IT had improved as a result of using COBIT for ongoing SOX compliance and other ITG -related projects.

Tuttle and Vandervelde (2007) empirically examined internal consistency of the conceptual model that underlies the COBIT internal control framework as it applies to an audit setting (including operational, compliance, and financial audit settings). The results of the paper revealed that that superimposing COBIT'S conceptual model onto audit relevant assessments made by a panel of highly experienced IT auditors confirmed the internal consistency between the underlying constructs of COBIT. The results also revealed that COBIT's conceptual model predicts auditor behavior in the field related to their seeking help and giving help as evidenced by their postings to a general IT audit. The paper provides further collaborating evidence as to whether the extent to which auditors seek and give IT audit assistance reflects the conceptual model underlying the COBIT framework.

Abu-Musa (2007) carried out an empirical paper is to explores the current performance of ITG in Saudi organizations using the balanced scorecard model introduced by the ITG Institute (ITGI, 2005a, b). The results of the paper reveal that the vast majority of respondents reported the importance of ITG performance measures. A majority of them reported it had been measured, but a smaller number believe that such measures have actually been used in evaluating the ITG performance in their organizations. The results of the paper suggest that Saudi organizations should achieve better governance of their IT in order to ensure that an organization's IT strategy is aligned with and supports the overall organization's strategy– that IT supports the organization's ability to exploit opportunities and maximize benefits. The results also suggest that Saudi organizations should use their IT resources more responsibly and manage their IT-related risks appropriately in order to champion the IT development for the success of their businesses.

5. Research methodology
In this paper empirical survey, using a self-administered questionnaire (see the Appendix), was conducted to explore and evaluate the importance and performance of ITG in Saudi organizations. The questionnaire was developed based on the COBIT self-assessment checklist of ITG introduced in its fourth edition. The questionnaire was pre-tested on selected members of academic staff and accounting practitioners, and it was piloted on a selected sample of Saudi organizations. Comments and suggestions were considered in the development and revision of the final questionnaire. The ITG 34 high-level control objectives were grouped into four domains: plan and organize, acquire and implement, deliver and support, and monitor

and evaluate, in accordance with COBIT's domains and processes in the forth edition issued in 2005.

A total of 500 copies of the revised questionnaires were randomly distributed to different organizations (manufacturing companies, merchandising companies, banks, services companies, oil and gas companies, governmental units and others) in five main cities (Al-Khoubar, Dammam, Dhahran, Jeddah, and Riyadh) in Saudi Arabia. After excluding incomplete and invalid questionnaires, the research ended with 127 valid and usable questionnaires – representing a 25.4 percent response rate.

A reliability test was carried out on the collected data using the Cronbach Alpha model, to explore the internal consistency of the questionnaire, based on the average inter-item correlation. The result of the reliability test shows that the questionnaire design is highly reliable, and the collected data are highly reliable and consistent ($\alpha = 0.8421$). The student test (t-test) was also carried out to investigate if there were any significant differences between early responses (90 questionnaires) and late responses (37 questionnaires). The results of the student test revealed no significant differences between early and late responses (at significance level $p = 0.05$), providing evidence of a representative and unbiased research sample.

The collected data were processed using the Statistical Package for Social Sciences (SPSS) version 16. Descriptive statistics of the collected data were analyzed for the purpose of understanding the main characteristics of the research variables. Non-parametric tests such as Kruskal-Wallis were carried out on the collected data to investigate the significant differences among respondent groups as well as organization types related to the investigated COBIT's processes research objects. The enclosed ITG self-assessment checklist would help managers, IT users and IT auditors to determine for each of the COBIT processes for compliance with COBIT and adoption of ITG principles.

6. Results and discussion

COBIT framework relies on a process model that is organized around a system life cycle approach containing four primary domains. These four domains are labeled: plan and organize; acquire and implement; deliver and support; and monitor and evaluate. Within each domain there are specific processes that an organization should address to achieve detailed and specific IT related control objectives. COBIT structure covers all aspects of information and the technology that supports it. By addressing these 34 high-level control objectives and with reference to the organization's policies and standards, the business-process owner can ensure that an adequate control system is provided for the IT environment. In addition, corresponding to each of the 34 high-level control objectives is an audit guideline to enable information-systems auditors in reviewing IT processes against COBIT's recommended control objectives that provide management assurance and advice for improvement (Lainhart, 2000; ITGI, 2005a, b, p. 116; Tuttle and Vandervelde, 2007).

The collected data show that 26 of the respondents are manufacturing companies and 24 are merchandising companies, representing 20.5 percent and 18.9 percent of the total responses, respectively, (Table I). While 33 respondents are banks and financial institutions (26 percent) and 15 of the respondents – representing 11.8 percent of the total responses – are health care and medical organizations. 18 respondents are

The research sample according to business type			The research sample according to respondent type		
Type of business	Frequency	%	Job title	Frequency	%
Manufacturing	26	20.5	Executive manager	13	10.2
Merchandising	24	18.9	Internal auditor	25	19.7
Banking	33	26	EDP auditor	11	8.7
Health care	15	11.8	IT specialist	20	15.7
Oil and gas	9	7.1	Controller	11	8.7
Government	9	7.1	Accountant	35	27.6
Other	11	8.7	Other	12	9.4

Table I.
Research sample

equality divided between the oil and gas industry and the governmental sector, representing 7.1 percent of the total response each. Finally, 11 respondents (8.7 percent of the total) belong to other organizations, such as fisheries, hotels, car rental organizations, décor and carpentry firms, publishing and printing organizations, accounting and auditing firms, construction companies, and design organizations.

Table I also shows that 35 of the respondents representing 27.6 percent of the total response) are accountants and 25 respondents (19.7 percent) are internal auditors. 20 respondents (15.7 percent) are IT specialists and 11 respondents (8.7 percent) are EDP auditors. 13 respondents are executive managers, and 11 respondents (8.7 percent) are controllers.

The responses to the questionnaire, and their statistical analysis, are given in Table II for the importance of COBIT domains and processes to Saudi organizations, and in Table III for the performance in COBIT domains and processes by Saudi organizations. Both these tables are placed at the end of this paper. Figures 1-8 are used to illustrate features of the responses in the discussion.

6.1 Planning and organization of IT
The COBIT's objective is to help IT users to understand the needs of the business and to put practices in place to meet them as efficiently as possible. COBIT monitors IT implementation efforts, providing measures for success and constant improvement. Lainhart (2000) argued that organizations must satisfy for their information, as for all assets, the requirements for quality, fiduciary, and security. Management must also balance the use of available resources including data, facilities, technology, application systems, and people. In order to accomplish these responsibilities, as well as to achieve its expectations, management must establish an adequate system of internal control. Management, through its corporate governance, must ensure that due diligence is exercised by all individuals involved in the management, use, design, development, maintenance, or operation of information systems. An IT control objective is a statement of the desired result or purpose to be achieved by implementing control procedures within a particular IT activity.

It is argued that the importance of ITG can be appreciated if one considers that large organizations spend over 50 per cent of their capital investment on IT (Ridley et al., 2004). It is also expected that management place more importance on IT areas that have high risk. The relationship between risk and important COBIT processes for business objectives are also recognized (Lainhart, 2001). The more important the IT

	Not important at all (1)		Not so important (2)		Uncertain (3)		Important (4)		Very important (5)		Kruskal-Wallis Business Type		Kruskal-Wallis Job Type	
	No.	%	No.	%	No.	%	No.	%	No.	%	Z	Significant	Z	Significant
Planning and organization														
P01 Define a strategic IT plan	3	2.4	10	7.9	10	7.9	26	20.5	78	61.4	12.399	0.054	21.143	0.002
P02 Define the information architecture	8	6.3	6	4.7	12	9.4	29	22.8	72	56.7	9.133	0.166	25.468	0.000
P03 Determine the technological direction	2	1.6	3	2.4	23	18.1	31	24.4	68	53.5	27.248	0.000	10.396	0.109
P04 Define the IT organization and relationships	3	2.4	6	4.7	16	12.6	47	37	55	43.3	12.910	0.044	28.117	0.000
P05 Manage the IT investment	6	4.7	15	11.8	9	7.1	21	16.5	76	59.8	5.039	0.539	11.161	0.084
P06 Communicate management aims and direction	0	0	2	1.6	13	10.2	47	37	65	51.2	16.039	0.014	7.477	0.279
P07 Manage human resources	0	0	0	0	12	9.4	20	15.7	95	74.8	3.512	0.742	10.429	0.105
P08 Ensure compliance with external requirements	4	3.1	0	0	15	11.8	39	30.7	69	54.3	15.534	0.016	6.185	0.403
P09 Assess risks	6	4.7	4	3.1	17	13.4	21	16.5	79	62.2	3.508	0.743	10.955	0.090
P10 Manage projects	6	4.7	1	0.8	11	8.7	28	22	81	63.8	5.909	0.433	12.927	0.044
P11 Manage quality	4	3.1	1	0.8	17	13.4	23	18.1	82	64.6	3.378	0.760	5.404	0.493
Acquisition and implementation														
AI1 Identify solutions	2	1.6	0	0	12	9.4	35	27.6	78	61.4	9.522	0.146	13.761	0.032
AI2 Acquire and maintain Application software	5	3.9	0	0	17	13.4	27	21.3	78	61.4	21.361	0.002	18.347	0.005
AI3 Acquire and maintain Technology architecture	4	3.1	0	0	24	18.9	51	40.2	48	37.8	30.616	0.000	13.824	0.032
AI4 Develop and maintain IT procedures	2	1.6	0	0	25	19.7	21	16.5	79	62.2	6.539	0.366	14.026	0.029
AI5 Install and accredit systems	6	4.7	0	0	18	14.2	48	37.8	55	43.3	15.811	0.015	13.940	.030
AI6 Manage changes	8	6.3	7	5.5	17	13.4	25	19.7	70	55.1	7.576	0.271	15.061	0.020
Delivery and support														
DS1 Define service levels	7	5.5	0	0	16	12.6	23	18.1	81	63.8	7.112	0.311	23.331	0.001
DS2 Manage third-party services	4	3.1	14	11	21	16.5	19	15	69	54.3	15.868	0.014	14.920	0.021
DS3 Manage performance and capacity	0	0	0	0	10	7.9	34	26.8	83	65.4	11.806	0.066	16.782	0.010
DS4 Ensure continuous services	2	1.6	2	1.6	17	13.4	20	15.7	86	67.7	14.666	0.023	10.237	0.115

Table II.
Importance of the COBIT domains and processes in Saudi organizations

		Not important at all (1)		Not so important (2)		Uncertain (3)		Important (4)		Very important (5)		Kruskal-Wallis Business Type		Kruskal-Wallis Job Type	
		No.	%	No.	%	No.	%	No.	%	No.	%	Z	Significant	Z	Significant
DS5	Ensure systems security	2	1.6	0	0	4	3.1	16	12.6	105	82.7	3.091	0.797	15.014	0.020
DS6	Identify and attribute costs	0	0	0	0	20	15.7	25	19.7	82	64.6	8.143	0.228	16.909	0.010
DS7	Educate and train users	4	3.1	9	7.1	8	6.3	28	22	78	61.4	11.899	0.064	15.649	0.016
DS8	Assist and advise IT customers	8	6.3	6	4.7	31	24.4	38	29.9	44	34.6	12.881	0.045	27.244	0.000
DS9	Manage the configuration	4	3.1	3	2.4	30	23.6	42	33.1	48	37.8	13.42	0.042	21.643	0.001
DS10	Manage problems and incidents	4	3.1	0	0	20	15.7	34	26.8	69	54.3	10.108	0.120	20.923	0.002
DS11	Manage data	2	1.6	0	0	15	11.8	43	33.9	67	52.8	4.805	0.569	11.239	0.081
DS12	Manage facilities	2	1.6	4	3.1	13	10.2	42	33.1	66	52	22.025	0.001	10.020	0.124
DS13	Manage operations	4	3.1	0	0	10	7.9	36	28.3	77	60.6	15.784	0.015	6.761	0.344
	Monitoring														
M1	Monitor the processes	2	1.6	2	1.6	23	18.1	21	16.5	79	62.2	5.641	0.465	13.874	0.031
M2	Assess internal control adequacy	4	3.1	6	4.7	31	24.4	26	20.5	60	47.2	3.056	0.802	30.187	0.000
M3	Obtain independent assurance	4	3.1	8	6.3	21	16.5	29	22.8	65	51.2	8.279	0.218	11.823	0.066
M4	Provide for independent audit	10	7.9	0	0	23	18.1	22	17.3	72	56.7	6.335	0.385	5.244	0.513

Table II.

		Bad (1) No.	%	Not so good (2) No.	%	Uncertain (3) No.	%	Good (4) No.	%	Very good (5) No.	%	Kruskal-Wallis business type Z	Significant	Kruskal-Wallis job type Z	Significant
	Planning and organization														
PO1	Define a strategic IT plan	11	8.7	11	8.7	41	32.3	22	17.3	42	33.1	5.789	0.447	8.579	0.199
PO2	Define the information architecture	7	5.5	16	12.6	26	20.5	36	28.3	42	33.1	8.253	0.220	6.033	0.419
PO3	Determine the technological direction	16	12.6	4	3.1	39	30.7	29	22.8	39	30.7	12.274	0.056	6.138	0.408
PO4	Define the IT organization and relationships	16	12.6	7	5.5	37	29.1	13	10.2	54	42.5	8.172	0.226	12.435	0.053
PO5	Manage the IT investment	15	11.8	17	13.4	29	22.8	21	16.5	45	35.4	6.497	0.370	2.855	0.827
PO6	Communicate management aims and direction	6	4.7	11	8.7	47	37	25	19.7	38	19.9	3.974	0.680	7.503	0.277
PO7	Manage human resources	12	9.4	11	8.7	25	19.7	31	24.4	48	37.8	5.984	0.425	6.525	0.367
PO8	Ensure compliance with External requirements	15	11.8	6	4.7	38	19.9	23	18.1	45	35.4	10.973	0.89	6.399	0.380
PO9	Assess risks	10	7.9	15	11.8	34	26.8	22	17.3	46	36.2	3.723	0.714	6.669	0.353
PO10	Manage projects	9	7.1	10	7.9	32	25.2	31	24.4	45	35.4	10.318	0.112	8.190	0.225
PO11	Manage quality	11	8.7	9	7.1	42	33.1	19	15	46	36.2	9.228	0.161	9.600	0.143
	Acquisition and implementation														
AI1	Identify solutions	17	13.4	11	8.7	38	19.9	31	24.4	30	23.6	3.926	0.667	7.197	0.303
AI2	Acquire and maintain application software	16	12.6	12	9.4	42	33.1	19	15	38	29.9	5.107	0.530	5.928	0.431
AI3	Acquire and maintain technology architecture	13	10.2	7	5.5	53	41.7	25	19.7	29	22.8	11.209	0.082	12.982	0.043
AI4	Develop and maintain IT procedures	14	11	10	7.9	37	29.1	17	13.4	49	38.6	9.375	0.154	10.753	0.096
AI5	Install and accredit systems	7	5.5	16	12.6	31	24.4	27	21.3	46	36.2	12.577	0.050	3.309	0.769
AI6	Manage changes	11	8.7	10	7.9	47	37	25	19.7	34	26.8	3.589	0.732	2.916	0.819
	Delivery and support														
DS1	Define service levels	4	3.1	11	8.7	51	40.2	17	13.4	44	34.6	5.475	0.484	2.518	0.866
DS2	Manage third-party services	9	7.1	11	8.7	39	30.7	16	12.6	52	40.9	4.769	0.574	3.671	0.721
DS3	Manage performance and capacity	7	5.5	12	9.4	30	23.6	33	26	45	35.4	5.230	0.515	5.100	0.531
DS4	Ensure continuous services	11	8.7	10	7.9	35	27.6	24	18.9	47	37	2.838	0.829	4.609	0.595
DS5	Ensure systems security	5	3.9	8	6.3	29	22.8	25	19.7	60	47.2	3.711	0.716	3.426	0.754
DS6	Identify and attribute costs	6	4.7	11	8.7	33	26	32	25.2	45	35.4	4.143	0.657	1.682	0.946
DS7	Educate and train users	10	7.9	8	6.3	30	23.6	40	31.5	39	30.7	5.577	0.472	7.344	0.290

(*continued*)

Table III.
Performance of COBIT
domains and processes in
Saudi organizations

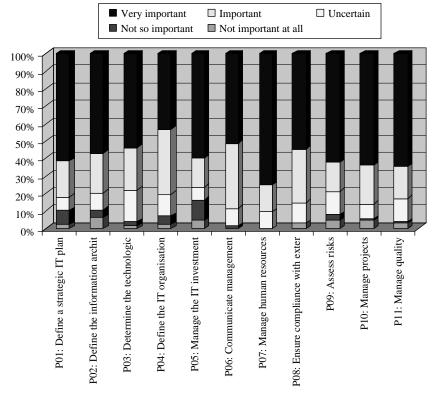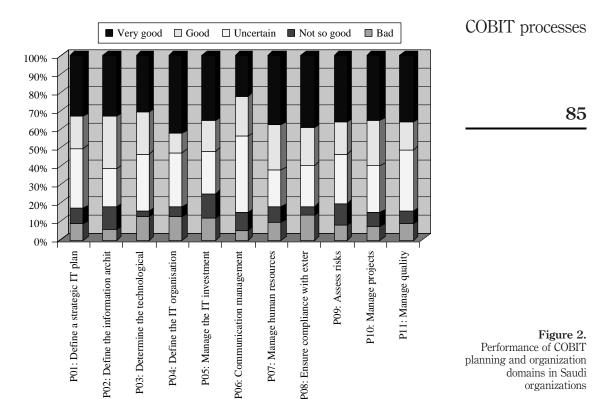|		Bad (1) No.	%	Not so good (2) No.	%	Uncertain (3) No.	%	Good (4) No.	%	Very good (5) No.	%	Kruskal-Wallis business type Z	Significant	Kruskal-Wallis job type Z	Significant
DS8	Assist and advise IT customers	16	12.6	8	6.3	35	27.6	31	24.4	37	29.1	4.367	0.627	7.298	0.294
DS9	Manage the configuration	6	4.7	6	4.7	42	33.1	23	18.1	50	39.4	6.850	0.335	7.750	0.257
DS10	Manage problems and incidents	8	6.3	14	11	30	23.6	31	24.4	44	34.6	7.629	0.267	5.337	0.501
DS11	Manage data	8	6.3	5	3.9	31	24.4	34	26.8	49	38.6	3.839	0.698	3.937	0.685
DS12	Manage facilities	10	7.9	16	12.6	30	23.6	28	22	43	33.9	1.573	0.955	5.438	0.489
DS13	Manage operations	8	6.3	11	8.7	29	22.8	27	21.3	52	40.9	6.141	0.408	4.605	0.595
Monitoring															
M1	Monitor the processes	15	11.8	12	9.4	34	26.8	25	19.7	41	32.3	9.430	0.151	7.235	0.300
M2	Assess internal control adequacy	18	14.2	17	13.4	38	29.9	25	19.7	29	22.8	6.505	0.369	8.631	0.195
M3	Obtain independent assurance	16	12.6	14	11	40	31.5	16	12.6	41	32.3	2.243	0.896	8.920	0.178
M4	Provide for independent audit	15	11.8	28	22	25	19.7	24	18.9	35	27.6	2.688	0.847	19.501	0.003

Table III.

Figure 1.
Importance of COBIT
planning and organization
domains in Saudi
organizations

process, the more likely auditors are to seek assistance when a question arises (Tuttle and Vandervelde, 2007).

The results of this paper show that the vast majority of the respondents (approximately 82 percent) confirmed the importance of defining a strategic IT plan for their organizations (Figure 1). However, as Figure 2 shows, only 50.4 percent of the respondents reported that their implementation COBIT process P01 (defining a strategic plan) was adequate (either good or very good). The vast majority of the respondents (90.5 percent) (Figure 1) also reported that COBIT process P07 (managing human resources) was either important or very important, but only 62.2 percent believe that implementation of COBIT process P07 is adequate in their organizations (Figure 2).

Although 88.2 percent of the respondents confirmed the importance of COBIT process P06 (communicating management aims and direction to different levels of organizations for the purpose of ITG success) (Figure 1), only 60.4 percent reported that implementation of COBIT process P06 was adequate in their organizations (Figure 2). The majority of respondents (approximately 86 percent) confirmed the importance of COBIT planning and organization process P10 (managing IT projects), and almost 83 percent believed that this should be done while managing quality (COBIT process P11) (Figure 1), but lower percentages (59.8 percent and 51.2 percent, respectively) reported that actual implementation of P10 and P11 was adequate in their organizations (Figure 2). Again, although 85 percent of respondents believe that COBIT process P08

(ensure compliance of IT with external requirements) is important (Figure 1), only 53.5 percent considered their implementation of this process to be adequate (Figure 2).

Figure 1 also shows that more than three-quarters of the respondents considered that COBIT planning and organization processes P02 (defining the information architecture), P03 (determining the technological direction), P05 (managing the IT investment), and P09 (assessing IT risks), are important. However, only half of the respondents considered their performance in the implementation of those processes to be adequate (Figure 2). Tuttle and Vandervelde (2007) argued that, given the importance of IT to organizational performance and the direct link between the primary components of the business value model and the IT resources of COBIT, one can expect risk assessments for a particular process to correlate with the IT resources it affects.

The results of the Kruskal-Wallis tests show significant differences among Saudi organizations regarding the importance of the following planning and organization of IT' COBIT processes: defining the strategic IT plan; determine the technological direction; define the IT organization and relationships; communicate management aims and direction; and ensure compliance with external requirements at significance level $p = 0.05$ (Table II). It is also observed that, in all cases banks and health care organizations show higher priority to this issue compared to other organizations. Furthermore, the results of the Kruskal-Wallis tests reveal significant differences in the
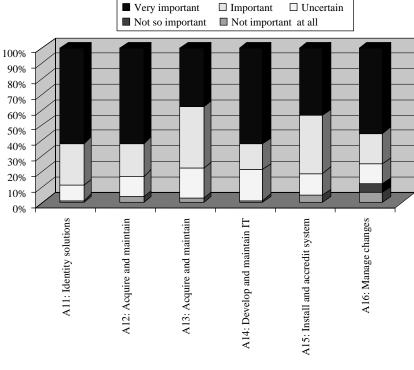
Figure 3.
Importance of COBIT
acquisition and
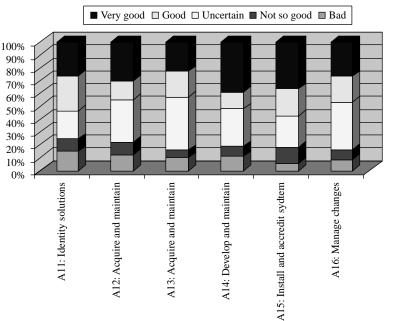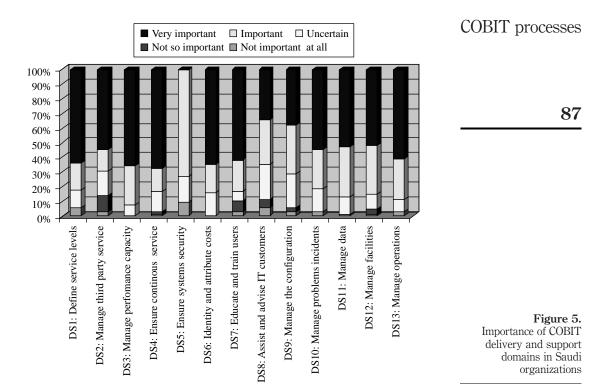implementation domains
in Saudi organizations

Figure 4.
Performance of COBIT
acquisition and
implementation domains
in Saudi organizations

Figure 5.
Importance of COBIT delivery and support domains in Saudi organizations

opinions of the respondents groups regarding the importance of defining a strategic IT plan; determining the technological direction; defining the IT organization and relationships; and managing the IT projects in their organizations at $p = 0.002$ (Table II). It is also observed that executive managers, IT specialists, and EDP auditor show more concern to these issues comparing with the others.

On the other hand, the results of the Kruskal-Wallis tests show no significant differences among both businesses types and job types regarding the importance and the performance of implemented activities of related planning and organization of IT processes in Saudi organizations at significant level $p = 0.05$ (Table III).

6.2 Acquisition and implementation

Organizations' management has many expectations and requirements from IT. Lainhart (2000) states that management requires increasing quality, functionality, and ease of use, decreasing delivery time, and continuously improving service levels, while demanding that this be accomplished at lower costs. Many organizations recognize the potential benefits that technology can provide successful organizations; however, they must understand and manage the risks associated with implementing new technologies. Thus, management needs to have an appreciation for and a basic understanding of the risks and constraints of IT in order to provide effective direction and adequate IT controls.
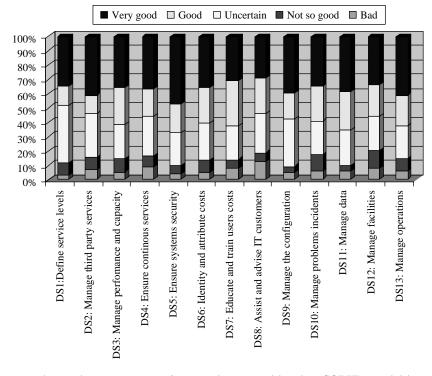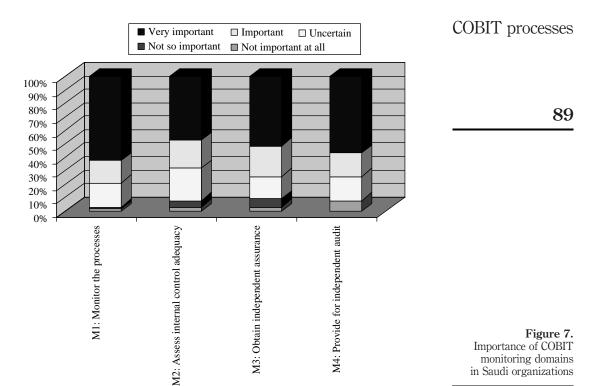
Figure 6.
Performance of COBIT delivery and support domains in Saudi organizations

Figure 3 shows that 89 percent of respondents consider that COBIT acquisition and implementation process A11 (identifying IT solutions) is important. However, only 48 percent consider their performance in this process to be adequate (Figure 4). Similarly, while 82.7 percent of respondents regarded COBIT process A12 (acquiring and maintaining application software) to be important (Figure 3), only half of the respondents understood their implementation of this process to be adequate (Figure 4).

Again, Figure 3 shows that, although about 78 percent of respondents consider COBIT and implementation processes A13 (acquiring and maintaining IT architecture) and A14 (developing and maintaining IT procedures) to be important, only 42.5 and 52.5 percent, respectively, understand these COBIT processes to be adequately implemented in their organizations (Figure 4). The results also reveal that, while about 80 percent of respondents believed in the importance of COBIT processes A15 (installing and accrediting systems) and A16 (managing changes in a professional way) (Figure 3), only a low percentage considered these processes to be adequately implemented in their organizations (Figure 4).

The results of the Kruskal-Wallis tests reveal significant differences among Saudi companies regarding the importance of the following COBIT process: acquiring and maintaining application software and technology architecture, and installing and accrediting IT systems at significant level ($p = 0.05$). On the other hand, the results of the tests do not reveal any significant differences among respondent groups for the same issue at significance level $p = 0.05$ (Table II). Regarding the adequacy of acquisition and implementation of IT COBIT processes, the results of the

Figure 7.
Importance of COBIT
monitoring domains
in Saudi organizations

Kruskal-Wallis tests show a significant difference among Saudi organizations regarding the adequacy of implemented processes of installing and accrediting IT systems. While, significant differences among respondent groups have appeared regarding the adequacy of implemented procedures of acquiring and maintaining IT architecture at significance level $p = 0.05$ (Table III).

6.3 Delivery and support

The IT Process Institute (2006) stated that many IT executives consider spending on IT audit and control activities as a necessary burden required compliance with industry regulations such as SOX. The increasing costs related to implementing and maintaining IT controls have prompted many IT executives to frame IT control investment decisions in terms of minimizing ongoing cost. A more productive perspective for making IT control investment decisions is to view IT controls as an effective way to better manage and improve IT operations, security, and audit processes.

In considering the COBIT delivery and support processes, the results (Figure 5) show that more than 95 percent of respondents consider that process DS5 (ensure systems security) is important, but only 70 percent of them believe that they have implemented this process adequately (Figure 6). Again, more than 92 percent of respondents (Figure 5) agreed on the importance of COBIT process DS3 (manage performance and capacity), but only 61.4 percent were satisfied with the adequacy of its implementation (Figure 6).
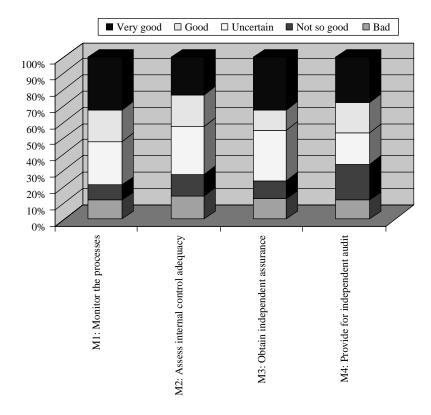
Figure 8.
Performance of COBIT
monitoring domains in
Saudi organizations

It is also observed that, while approximately 82 percent of respondents believe in the importance of COBIT delivery and support process DS1 (define service levels) (Figure 5), only 48 percent reported that the process was adequately implemented in their organization (Figure 6). It is also observed that more than 85 percent of respondents consider COBIT processes DS11, DS12 and DS13 (manage data, facilities, and operations) to be important (Figure 5). However, a lower percentage believes that their organizations have adequate implementation of these COBIT processes (Figure 6).

Figure 5 shows that 83.4 percent of respondents consider COBIT delivery and support process DS4 (ensure continuous services) to be important and 69.3 percent consider DS2 (manage third-party services) to be important. However, Figure 6 shows that a lower percentage confirmed that such processes were not adequately implemented in their organizations.

Figure 5 shows that around 84 percent of the respondents considered COBIT delivery and support processes DS6 (identify and attribute costs) and DS7 (educate and train users) to be important, but Figure 6 shows that only 60 percent were satisfied with the adequacy of performance in these processes. It is also observed that a high percentage of the respondents considered after-sale service as important factor to select among IT vendors. They consider that the ability of the vender to manage customers' problems and incidents, and assisting them to solve it are very important issues, but a

lower percentage of them seemed to be satisfied with the current services provided by the IT vendors in their organizations.

The statistical results of the Kruskal-Wallis tests reveal significant differences among Saudi organizations regarding the importance of the following IT delivery and support activities: managing third-party services, ensuring continuous services, assisting and advising IT customers, managing IT configurations, and managing IT facilities and operations at significance level $p = 0.05$ (Table II). The results of the Kruskal-Wallis tests also show significant differences in the opinions of different respondents groups regarding the importance of managing facilities and operations of IT delivery and support processes at $p = 0.05$ (Table II). According to the results of the Kruskal-Wallis tests, it seems that there are no significant differences among different Saudi organizations as well as different respondent groups regarding the regarding the adequacy of implemented processes of IT delivery and support in Saudi organizations at $p = 0.05$ (Table III).

6.4 Monitoring

The increasing costs related to implementing the IT controls necessary to comply with various regulations have prompted many IT managers to endorse IT control investment decisions in terms of minimizing the ongoing cost of IT controls. The IT Process Institute (2006) argued that IT managers can reframe ongoing IT control resource decisions in terms of performance improvement potential, instead of cost reductions. If IT managers consider IT controls as an effective way to improve IT operating performance through better management of IT operations, security, and audit processes. Accordingly, IT managers can allocate resources more effectively to those areas that are related to improvements in key performance measures for the success of their organizations.

Figure 7 shows that the COBIT monitoring process M1 (monitoring processes) was considered important by almost 79 percent of respondents, while only 52 percent of respondents were satisfied with the adequacy of their performance in this process (Figure 8).

Approximately, 67 percent of respondents considered COBIT monitoring process M2 (assess internal control adequacy) to be important (Figure 7), but only 42.5 percent of them were satisfied with the performance of this process in their organizations (Figure 8). Moreover, 74 percent of respondents reported the importance of COBIT monitoring processes M3 (obtain independent assurance) and M4 (provide independent audit) (Figure 7), but few of them (around 45 percent) confirmed the adequacy of implementing these processes in their organizations (Figure 8).

According to the results of the Kruskal-Wallis tests, it seems that there are no significant differences among Saudi organizations regarding the importance of monitoring activists of COBIT domains and processes at significant level $p = 0.05$ (Table II). However, the results of the Kruskal-Wallis tests show significant differences among different respondents groups regarding the importance of monitoring IT processes and assessing the adequacy of internal controls in Saudi organizations (at $p = 0.05$). Executive managers, IT specialists and internal auditors show higher ranks for the importance of such processes comparing with the others (Table II). The results of the Kruskal-Wallis tests show no significant differences among Saudi organizations regarding the performance and the adequacy of implemented monitoring

activities at $p = 0.05$ (Table III). However, the results of the Kruskal-Wallis tests reveal a significant difference among respondents groups for providing independent audit of IT activities in Saudi organizations at significance level $p = 0.05$ (Table III).

The results of this paper is to consistents with Hardy (2006) point of view that effective implementing of international ITG control frameworks, such as COBIT, would help organizations to take full advantage of their information, thereby maximizing benefits, mitigating risks, and capitalizing on business IT-related opportunities. Effective governance and control over IT enables organizations to achieve the basic principles of IT value – on-time and within budget delivery of quality IT that achieves its promised benefits. Management can then use COBIT to translate this into increased competitive advantage, customer satisfaction, employee productivity and profitability, and reduced time for order/service fulfillment, and customer wait time.

7. Conclusion

Implementing effective ITG has become a necessity as many Saudi organizations have developed critical dependencies on IT. COBIT is increasingly recognized as one of the most important guidelines for ITG, which provides organizations with a useful tool to get started evaluating their own ITG systems. COBIT introduces an ITG framework and support toolset that allows IT managers to bridge the gap between control requirements, technical issues and business risks in their organizations.

The current exploratory paper empirically investigateds the importance and implementation of COBIT processes in Saudi organizations using a self assessment questionnaire. The paper explored impact of emerging COBIT to evaluate and enhance the ITG in Saudi organizations. From a practical standpoint, managers and practitioners alike stand to gain from the findings of this paper. The results of the paper revealed that the majority of Saudi organizations recognize the importance of COBIT process for the success of their businesses, but many of them reported the inadequacy of implementation. The results also revealed that banks, financial institution, health care, and services organizations showed more concern for the importance and implementation of COBIT processes in Saudi business environment. The results also showed that IT specialists, internal auditors, and executive managers perceive and appreciate the importance of COBIT processes more than the others.

The paper provides useful information for senior management, IT management, accountants, auditors, and academics to understand the implementation phase and impact of COBIT on the ITG in Saudi organizations. The paper intends to develop a roadmap for Saudi organizations that are looking forward to compliance with COBIT and adoption of ITG principles. It is recommended to extend the scope of the paper to other countries in the Middle East (e.g. Egypt) and Gulf countries (e.g. Bahrain, Kuwait, and United Arab Emirates) to explore the potential influence of cultural and other differences on their perception of the importance and implementation of COBIT processes in their organizations.

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Further reading

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Appendix. Research questionnaire

Dear Sir

I am conducting a study entitled "Exploring the COBIT Processes for information technology governance in Saudi Organizations". COBIT provides companies with an important tool to evaluate there own IT governance systems. The enclosed IT Governance Self-assessment checklist would help managers, IT users and IT auditors to determine for importance and adequacy of implantation of COBIT domains and processes in Saudi organizations.

Please take a few (approximately 10) minutes to complete the enclosed questionnaire. You have our personal and professional assurance that all responses will remain anonymous.

Yours Sincerely,

1. General Information

1. Do you currently work in? (Please, tick)

❒ Manufacturing ❒ Retail Merchandising
❒ Banking ❒ Wholesale Merchandising
❒ Oil and Gas ❒ Government
❒ Health Care ❒ Other - please list _____

2. How many accounting professionals are employed in your firm? (Please, tick)

❒ 1- 5 ❒ 6-10
❒ 11-15 ❒ 16-20
❒ Over 20

3. How many information system specialists are employed in your firm? (Please, tick)

❒ 1- 5 ❒ 6-10
❒ 11-15 ❒ 16-20
❒ Over 20

4. What is your current job title? (Please, tick)

❒ Executive manager ❒ IT specialist
❒ Internal auditor ❒ Controller
❒ EDP auditor ❒ Accountant
❒ External auditor ❒ Other - please list _____

5. How many years of experience do you have at your current position? _____

(*continued*)

2. COBIT's Domains and Processes Self-Assessment Checklist

IT Governance Self-Assessment Checklist
(Please circle the most appropriate number for the importance and performance of the COBIT domains and processes in your organization)

Importance					COBIT's Domains and Processes	Performance				
Not Important at all (1)	Not So Important (2)	Uncertain (3)	Important (4)	Very Important (5)		Bad (1)	Not So Good (2)	Uncertain (3)	Good (4)	Very Good (5)
					PLANNING AND ORGANIZATION					
1	2	3	4	5	P01 Define a Strategic IT Plan	1	2	3	4	5
1	2	3	4	5	P02 Define the Information Architecture	1	2	3	4	5
1	2	3	4	5	P03 Determine the Technological Direction	1	2	3	4	5
1	2	3	4	5	P04 Define the IT Organization and Relationships	1	2	3	4	5
1	2	3	4	5	P05 Manage the IT Investment	1	2	3	4	5
1	2	3	4	5	P06 Communicate Management Aims and Direction	1	2	3	4	5
1	2	3	4	5	P07 Manage Human Resources	1	2	3	4	5
1	2	3	4	5	P08 Ensure Compliance with External Requirements	1	2	3	4	5
1	2	3	4	5	P09 Assess Risks	1	2	3	4	5
1	2	3	4	5	P10 Manage Projects	1	2	3	4	5
1	2	3	4	5	P11 Manage Quality	1	2	3	4	5
					ACQUISITION AND IMPLEMENTATION					
1	2	3	4	5	AI1 Identify Solutions	1	2	3	4	5
1	2	3	4	5	AI2 Acquire and Maintain Application Software	1	2	3	4	5
1	2	3	4	5	AI3 Acquire and Maintain Technology Architecture	1	2	3	4	5
1	2	3	4	5	AI4 Develop and Maintain IT Procedures	1	2	3	4	5
1	2	3	4	5	AI5 Install and Accredit Systems	1	2	3	4	5
1	2	3	4	5	AI6 Manage Changes	1	2	3	4	5
					DELIVERY AND SUPPORT					
1	2	3	4	5	DS1 Define Service Levels	1	2	3	4	5
1	2	3	4	5	DS2 Manage Third-Party Services	1	2	3	4	5
1	2	3	4	5	DS3 Manage Performance and Capacity	1	2	3	4	5
1	2	3	4	5	DS4 Ensure Continuous Services	1	2	3	4	5
1	2	3	4	5	DS5 Ensure Systems Security	1	2	3	4	5
1	2	3	4	5	DS6 Identify and Attribute Costs	1	2	3	4	5
1	2	3	4	5	DS7 Educate and Train Users	1	2	3	4	5
1	2	3	4	5	DS8 Assist and Advise IT Customers	1	2	3	4	5
1	2	3	4	5	DS9 Manage the Configuration	1	2	3	4	5
1	2	3	4	5	DS10 Manage Problems and Incidents	1	2	3	4	5
1	2	3	4	5	DS11 Manage Data	1	2	3	4	5
1	2	3	4	5	DS12 Manage Facilities	1	2	3	4	5
1	2	3	4	5	DS13 Manage Operations	1	2	3	4	5
					MONITORING					
1	2	3	4	5	M1 Monitor the Processes	1	2	3	4	5
1	2	3	4	5	M2 Assess Internal Control Adequacy	1	2	3	4	5
1	2	3	4	5	M3 Obtain Independent Assurance	1	2	3	4	5
1	2	3	4	5	M4 Provide for Independent Audit	1	2	3	4	5

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