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Business-IT Strategic Alignment Focused on Social and Technical Dimensions

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Achieving business-IT alignment is one of the main purposes and also challenges of organizations. Many studies have indicated the importance of aligning information systems (IS) function with other business functions. The main purpose of this survey is evaluating business-IT alignment focusing on social and technical dimensions of business-IT alignment in Bank Mellat. The data was collected through a questionnaire which was designed based on Capability Maturity Model Integration (CMMI) and also the models provided by Reich and Benbasat (2000), and Lee et al. (2008). By using three questionnaires, the status of social and technical dimensions of business-IT alignment has been investigated under 3 groups of questions: (a) Business-IT strategic planning alignment; (b) Business-IT processes, organization and relationships, and (c) Managing IT human resources and training users. The collected data was analyzed by applying one-tailed T-Test, ANOVA and Tukey-Kramer post- test. The results of analysis show that the status of all technical indicators was at 'Defined' stage, while there was some weakness in social dimension of business-IT alignment. Also, the overall results show that the status of business-IT alignment regarding all of the three mentioned dimensions is at 'Defined' stage. A comparative analysis of the results that has focused on the perceptions of different sample respondent groups show significant differences between the perceptions of external auditors who believe in 'Repeatable' level of business-IT alignment and other respondent groups who believe in 'Defined' level of business-IT alignment toward all three mentioned dimensions.

Keywords: Business-IT alignment, Social dimension, Technical dimension, Capability Maturity Model Integration (CMMI).
JEL Classification*:* C12, C18, D1, D21, D22, D73

1 Introduction

Many studies have indicated the importance of aligning the information systems (IS) function with other business functions (e.g., Brown and Magill,

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1994; Reich and Benbasat, 1996; Sambamurthy and Zmud, 1999). Business-IT strategic alignment is defined as the degree to which the mission, objectives and plans contained in the business strategy are shared and supported by the IT strategy (Reich and Benbasat, 1996) that can positively influence IT effectiveness (Galliers, 1991; Ciborra, 1997), leading to greater business profitability (Luftman et al. 1996; Sabherwal and Chan, 2001). Alignment involves 'applying information technology (IT) in an appropriate and timely way and in harmony with business strategies, goals, and needs' (Luftman and Brier, 1999). Failure to this alignment may seriously prevent a firm's performance and viability (Weill and Broadbent, 1998; Venkatraman, 2000). The importance of strategic alignment has been stated frequently (Earl, 1996; Labovitz and Rosansky, 1997; Corrall, 2000), which is a key concern for business executives (Luftman et al., 1996) and is ranked among the most important issues faced by IT executives (Papp, 2001; Tallon and Kraemer, 2003; Trainor, 2003).

Strategic alignment can be classified along two dimensions (Reich and Benbasat 2000): of (1) technical and (2) social. The concern of social dimension of alignment is related to the human behavior which is organized among different actors (Schlosser et al. 2012), and is focused on barriers related to weak Business-IT relationship, poor communication, limited knowledge of each other's domain, lack of leadership and culture that can impede achieving alignment (Reich & Benbasat, 2000). The success of any organization has been increasingly dependent on the people who work for the organization, therefore, the alignment on social dimension is crucial for achieving overall strategic Business-IT alignment (Lee, Kim, Paulson, & Park, 2008). Strategic and structural IT alignment has attracted more attention as they have direct influences on business performance. Relatively few researchers focused on social dimension of alignment which involves the ''relationships and cognitive linkages'' between business and IT like relationships, communication, mutual understanding, trust, and respect, cultural issues and informal structures (Schlosser, Wagner, & Coltmanm, 2012). This survey has focused on both social and technical dimensions of Business-IT alignment.

On this basis, we used the model provided by Reich and Benbasat (2000) and 'COBIT for financial reporting and also the model provided by Lee et al. (2008) to evaluate the status of social and technical dimensions of Business-IT alignment in Mellat bank of Iran. To do so, we do not separate these two dimensions definitely as that has been done in models provided by Reich and Benbasat (2000) and Lee et al. (2008), but we classify the factors affecting the

status of social and technical Business-IT strategy alignment into 3 subcategories based on 'COBIT for financial reporting' and then, we examine the perceptions of respondents towards:

(a) Business-IT Strategic Planning alignment;
(b) Business-IT Processes, Organization and Relationships, and
(c) Manage Business-IT Human Resources and Training Users.

2 Theoretical Development of Business-IT Alignment

Aligning information systems to the organizational strategy goals has appeared to be a concern for researchers and practitioners over the last decade and also has become even more severe and demanding day after day (Kissimoto and Laurindo, 2010).

The term alignment can be defined as the extent to which information systems support and have a positive relationship with the organization's objectives and strategies as defined in the business plan in an appropriate and timely way (Abdi and Dominic, 2010; Issa-Salweand, Ahmed, Aloufi, and Kabir, 2010; Bush, Lederer, Palmisano, and Rao, 2009; Newkirk, Lederer, and Johnsonm, 2008; and Luftman, 2003). Alignment is seen to assist a firm in three ways: by maximizing return on IT investment, by helping to achieve competitive advantage through IS, and by providing direction and flexibility to react to new opportunities (Masa'deh et al, 2015). Many researchers and practitioners understand that lack of alignment between business and IT strategies is one of the main reasons why enterprises fail to exploit the full potential of IT investments (Silva et al, 2006).

Business-IT alignment (BITA) has drawn researchers' attention since the mid 70 (McLean & Soden, 1977) and is one of the three main research directions in information systems literature (Tanriverdi, Rai, & Venkatraman, 2010). Besides, it is continuously ranked among the top three challenges of CEOs since 1994 (Kappelman, McLean, Luftman, & Johnson, 2013; Luftman & Ben-Zvi, 2011; Luftman & Kempaiah, 2007). For over twenty years companies have been striving to solve this gap and apply different frameworks to achieve a high level of Business-IT alignment. These results infer that there are still some factors that prevent the Business-IT alignment. The research literature has suggested that one way to improve Business-IT alignment is to identify what managerial practices inhibit it (Luftman & Brier, 1999). Actually, IT managers taking part in Business planning has affected both IT and Business planning content (Tan and Gallupe, 2006), influencing the organizations´ competitiveness (Kearns and Lederer, 2003) with Business-IT

alignment. But most of research studies have focused on strategic, intellectual, structural, functional dimensions of alignment and the corresponding factors.

3 Literature Review

Going through the literature, Business-IT alignment remains a key topic of concern among managers. Several authors presented models and frameworks to describe different domains that need to be connected in some way to achieve better alignment.

The social dimension of Business-IT alignment focuses on the people involved in the creation of alignment (Gupta and Govindarajan, 2000). Previous literature considered the social dimension of Business-IT alignment as mutual understanding and commitment to the Business and IT mission, objectives, and plans (Reich and Benbasat, 1996), and the maturity level of Business-IT executive communication and partnership (Luftman and Kempaiah, 2007). The social dimension of Business-IT alignment is the level of functional integration of human components in the business and IT process to achieve organization's goal (Lee et. al, 2008).

The technical dimension of Business-IT alignment highlights the content of plans and planning methodologies and refers to ''the state in which a high quality set of interrelated IT and business plans exist'' (alignment of strategy, plans, operations, or processes) (Luftman and Brier, 1999). The technical dimension of Business-IT alignment is the level of functional integration of governance and infrastructure between businesses and IS domains in achieving organization's goals (Luftman, 2003).

There are numerous studies which have been performed into social or technical dimension of Business-IT alignment – social dimension and technical dimension. Luftman and Brier (1999) investigated alignment of IT plans with business plans and they used Factors of alignment including statements such as IT-Business lack close relationship, IT does not prioritize well, IT fails to meet its commitments, IT does not understand business, senior executives do not support IT and IT management lacks leadership. Factors classified in three categories include connection, successful IT history and shared domain of knowledge.

Reich and Benbasat (2000) included some factors for social dimension such as shared domain knowledge between IT and business executives, IT implementation success, communications between IT and business executives, and connections between IT and business planning. These factors are key elements in creating alignment and are analyzed from a social dimension. The social dimension of alignment implies reviewing the

understanding of current objectives and the congruence of IT vision between business and IT executives.

Hussin et al, (2002) surveyed alignment between the contents of business and IT strategies with three factors including CEO commitment to IT, IT sophistication and external IT expertise which focus on shared domain knowledge. In addition, Kim and Park (2007) focused on socio-technical approach to investigate the impact of Business-IT alignment on business performance. They used two factors including sharing knowledge between business and IT technical people and maintaining IT belief in business executive/managers.

Lee et al, (2008) assessed social alignment by the level of functional integration of human components in the business and IT process to achieve an organization's goals. The survey measurement of social alignment contained the concepts of teamwork quality and mutual trust between business and IT groups. In their model, the technical alignment is assessed by the level of functional integration of governance and infrastructure between business and IT domains in achieving organization's goals.

Carolina Alaceva, Lazar Rusu (2014) focused on social barriers investigating barriers in achieving Business-IT alignment and they used four factors including shared domain knowledge, IT implementation success, communication between business & IT executives and connections between business & IT planning.

Gerow et al. (2015), asserts that top management has been concerned with IT-business strategic alignment for the past 30 years and alignment researchers have developed many models to explain how alignment generates value for firms. They investigated a 38-item instrument (8 items for intellectual alignment and 6 items for each of the other alignment types), creating the 6 types of alignment and their relationship with other constructs.

Orozco and et al, (2015), identified specific management practices that can help to improve the process of IS/business alignment and the design of IT government architecture that supports those processes. They classified relevant management practices in the process of IS/business alignment and design of ITG architectures. These findings show that at operational and tactical levels, improving the coordination of the IT investment management process can positively improve the process of IS/business alignment and impact significantly the design of ITG architectures.

Cathrin and et al. (2017), show the relevance of digital business strategies that will replace the demand for business-IT alignment and will become imperative for managers in the future. They provide a structured clarification

of the current digital knowledge-based business strategies structuring the research efforts on digital business strategies, uncovering knowledge gaps and developing an agenda for future researches.

By using the mentioned models in the survey, and also by using COBIT for financial reporting, we evaluate the status of Business-IT alignment by examining the perceptions of respondents towards the 3 groups of questions covering the three dimensions of (a) Business-IT Strategic Planning alignment; (b) Business-IT Processes, Organization and Relationships, and (c) Managing IT human resources and training users. Actually, we do not investigate the status of social and technical alignment separately, but we investigate it based on these 3 dimensions provided by COBIT containing both technical and social dimension.

4 Research Methodology

The main purpose of this research is evaluating the status of Business-IT alignment in BM of Iran. Based on the objectives of the study, the primary data was collected through a structured five-point Likert scale questionnaire instrument (equal to five stages of Capability Maturity Model Integration (CMMI): (1) as very low initial, (2) as low repeatable, (3) as moderate defined, (4) as high managed and (5) as very high optimized for the levels of Business-IT alignment. The questionnaire is focused on eliciting responses from sample respondents on the status of Business-IT alignment in BM of Iran.

The questions of the survey have high face validity in addition to being developed from the literature on Business-IT alignment and are based on clear and familiar concepts. To have the appropriate Business-IT alignment indicators, we focus on IT control processes of COBIT framework as the most reliable internal control system on information technology and also the model provided by Reich and Benbasat (2000), and the model provided by Lee et al, (2008). Majority of the questions'- statements were suggested by ITGI as the most relevant questions on IT controls through COBIT products (ITGI, 2006). Also, in a revised survey, the primary questioner was sent to reliable respondents and specifically asked about questionnaire. Feedback was taken well and revisions were made before the finalizing the structured questionnaire. So the designed questionnaire of the present study has high face validity. To determine the reliability of the questionnaire, at first, 50 questionnaires were distributed between random samples as a pilot survey, and then Cronbach's alpha was calculated. The result of reliability test revealed a high reliability coefficient of 89 percent.

The finalized questionnaire consisted of 3 dimensions on Business-IT alignment: (a) Business-IT Strategic Planning Alignment; (b) Business-IT Processes, Organization and Relationships, and (c) Managing IT human resources and training users. Each of these dimensions consisted of individual statements on Business-IT alignment to be responded by the sample respondents (Appendix A).

The main focus of the present study is on evaluating the status of Business-IT alignment in BM of Iran. The main reason for identification of mentioned bank as the sample bank, from which the sample respondents have been selected was that BM has been well-developed in electronic banking. Based on the main purpose of the present study 'studying the alignment between business and IT', the 'players' most directly involved in this process were identified to be internal users, IT experts, internal auditors, and external auditors. The sample size of respondents for significance level of 95% (α=0.05) required for each of these groups was 197 from internal users, 78 from IT experts, 80 from internal auditors, and 68 from external auditors. Regarding the possibility of non-response, the number of respondents from each group was put at 568, 185, 90 and 66 in the groups of internal users, IT experts, internal auditors, and external auditors respectively (at the significance level of 99%, α=0.05).

The samples were selected at random. 1090 questionnaires were used. The returned filled questionnaires were only 470. Out of 470 responses, 23 questionnaires were rejected because of partial completion. As a result, the number of completed responses stood at 447, which was higher than the needed sample size.

The perceptions of respondents towards the status of Business-IT alignment have been analyzed under: (a) Business-IT Strategic Planning Alignment; (b) Business-IT Processes, Organization and Relationships, and (c) Managing IT human resources and training users. The applied statistical methods were subdivided into two categories: The first category contained the statistical methods towards universal analysis among all participants regarding their total perception about Business-IT alignment. In this part, for each statement, calculated mean and median values, standard deviation and one-tailed ($\mu \geq 2.5$) t–test (α=0.05) concerning a single mean value where the variance of the population is unknown and the sample size is large (Manly, 2001; and Paneerselvam, 2007) are used to indicate the preferred business-IT alignment level for each indicator. As a supplementary analysis, quartile deviation was calculated to indicate the degree of group consensus towards the preferred alignment level. The second category contained the statistical

methods towards group analysis, which compared the perception of each group with the other groups. The one-way ANOVA test (α=0.05) was applied to indicate any significant difference among the mean values of the groups towards each one of the indicators. Then, Tukey–Kramer post-test (Kramer, 1956 and 1957) and Tukey, (1994 and 1995), as the exact and most powerful (Benjamini and Braun, 2002; and Lehmann and Romano, 2005) multiple comparison post-test, was employed to determine which groups were significantly different from the other groups. The data obtained were analyzed by using Statistical Package for Social Sciences (SPSS) program and Microsoft Excel.

5 Results and Discussions

5.1 Universal analysis

(a) Business-IT Strategic Planning Alignment

Business-IT Strategic Planning Alignment is highlighted in Table 1, which shows test with four variables. The total mean and median values stood at 2.75 and 3.00 respectively, and P=0.00<α=0.05. This shows that 'Business-IT Strategic Planning Alignment' domain was at the 'defined' stage of CMMI. The quartile deviation was 0.50 that presents a high consensus of respondents' perceptions towards 'Business-IT Strategic Planning Alignment'.

Table 1
Business-IT Strategic Planning Alignment

Sl. No.	Business-IT Strategic Planning alignment	Res.	Statistic tests					CMMI
			Mean	SD	P*	Median	QD	
1	Business-IT strategic plans	447	3.10	1.14	0.00	3.00	1.00	D
2	Communicating IT plans	447	2.40	1.05	0.98	2.00	0.50	R
3	Communicating IT activities and risks	447	2.83	1.08	0.00	3.00	0.75	D
4	Monitoring IT progress against the strategic plan	447	2.69	0.94	0.00	3.00	0.50	D
Total		447	2.75	1.09	0.00	3.00	0.50	D

*P Value (t-test, one-tailed), Note: D=Defined Stage, R=Repeatable Stage, SD=Standard Deviation and QD=Quartile Deviation, Source: Appendix B, Table B1. *Source*: Research findings

The first question ‘Business-IT strategic plans’ is related to the technical dimension of Business-IT alignment. The mean value of this indicator was 3.10 that ranked as the highest mean value of the present group. The mean value presents that the level of Business-IT alignment from the viewpoint of ‘Business-IT strategic plans’ was at ‘defined’ stage. The ‘defined’ level means not only there is an IT strategy plan and a business strategy plan, but also there is appropriate fitness between these two strategic plans. Also it means that strategic plans for IT align business objectives with IT strategies and also organizational structure and IT architecture (application, database, hardware, etc.) corresponded to each other in a good manner.

The ‘Communicating IT plans’ showed the mean and median values of 2.40 ($P=0.98>\alpha=0.05$) and 2.00 respectively. This question ‘Communicating IT plans’ was used to evaluate the social dimension of Business-IT alignment. Business-IT alignment regarding this variable was the only process that evidenced the ‘repeatable’ stage of CMMI. The ‘repeatable’ level means that the level of overall teamwork between business and IT is not high. The ‘communicating IT plans’ is based on the present managers of the maturity of company and there is not a systematic communication plan and the common committees were not developed to explain the IT plans to business sector of the company.

The third question ‘Communicating IT activities and risks’ also evaluates the social dimension of Business-IT alignment and the frequency of communication between business and IT which according to the results had the mean value of 2.83 and was at ‘defined’ stage.

The comparison of the second and third questions and the ‘repeatable’ level of ‘communicating IT plans’ and the ‘defined’ level of ‘Communicating IT activities and risks’ show that IT department has a low level of communication with business department in the process of developing and preparing strategies and overall plans and the level of teamwork between IT and business at this level is not high, but in lower levels of operation and while doing activities, IT department’s communication regarding activities and risks are frequent.

Finally, by using the fourth question ‘Monitoring IT progress against the strategic plan’, we could evaluate the technical dimension of Business-IT alignment. According to the results, this aspect was also at ‘defined’ stage with the mean value of 2.69. This ‘defined’ level means that the monitoring of IT progress was effective and the IT progress was in accordance with the objectives provided by IT strategic plan.

(b) Business-IT Processes, Organization and Relationships

Table 2 shows the alignment between 'Business and IT processes, organization and relationships', which has been tested with six variables. As evidenced in Table 3, the total mean and median values were 2.66 and 3.00 respectively, and $P(0 < \alpha) = 0.05$. According to the mean and median values and the applied test, the alignment between business and IT processes, organization and relationships were at the 'defined' level.

The first question of 'IT managers' knowledge and experience' is related to investigating the social dimension of Business-IT alignment. The results show that this indictor had the low mean value of 2.44 ($P(0.9 > \alpha) = 0.05$) and the level of Business-IT alignment in this aspect was at 'repeatable' stage. This 'repeatable' level means that IT managers' knowledge and experience is not at the satisfied level so that business group could not have great confidence on them.

The second question 'systems and data inventory' is related to the technical dimension of Business-IT alignment. The results show that 'system and data inventory' had the high mean value of 2.93 and the level of Business-IT alignment in this aspect was at 'defined' stage. This 'defined' level of existence of relevant systems and data and identification of their owner's shows the good correspondence between business process (work flow and process) and IT process (IS development process, data center operation, etc.).

The next question 'roles and responsibilities of the Business-IT department' is related to the social dimension of Business-IT alignment. The results show that the level of Business-IT alignment from the viewpoint of this indicator was at 'defined' stage with the mean value of 2.77. From this 'defined' level of alignment, we could conclude that all roles and responsibilities of IT and business department are defined, documented and understood, so both of them know their responsibilities and roles and are motivated to maintain the team.

The results show the low mean value of 2.28 which was assigned to the forth question 'IT personnel's responsibility regarding internal control' and the level of Business-IT alignment in this aspect is at 'repeatable' stage.

The fifth question 'data integrity responsibility' is related to investigating the social dimension of Business-IT alignment. The results show that the level of Business-IT alignment in this aspect was at 'defined' stage by mean value of 2.71. This 'defined' level of Business-IT alignment shows the appropriateness of definition and communication of data integrity ownerships and responsibilities, and frequent communication between IT and business in

lower levels of operation which resulted in good corresponding between business and IT processes.

Table 2
Business-IT Processes, Organization and Relationships

Sl. No.	Business-IT processes, organization and relationships	Res.	Statistic Tests					CMMI
			Mean	SD	P*	Median	QD	
1	IT managers' knowledge and experience	447	2.44	1.01	0.90	2.00	0.50	R
2	Systems and data inventory	447	2.93	1.10	0.00	3.00	1.00	D
3	Roles and responsibilities of the IT department	447	2.77	1.06	0.00	3.00	0.50	D
4	IT personnel's responsibility regarding internal control	447	2.28	1.05	1.00	2.00	1.00	R
5	Data integrity responsibility	447	2.71	0.98	0.00	3.00	0.50	D
6	Segregation of duties	447	2.84	1.01	0.00	3.00	0.50	D
Total		447	2.66	1.06	0.00	3.00	0.50	D

*P Value (t-test, one-tailed), Note: D=Defined Stage, R=Repeatable Stage, SD=Standard Deviation and QD=Quartile Deviation, Source: Appendix-B, Table B2. *Source*: Research findings

Table 3
Managing IT Human Resources and Training Users

Sl. No.	Manage IT human resources and train users	Res.	Statistic Tests					CMMI
			Mean	SD	P*	Median	QD	
1	Company's culture of integrity management	447	2.73	1.07	0.00	3.00	0.50	D
2	IT education programs	447	2.71	1.04	0.00	3.00	0.50	D
Total		447	2.72	1.06	0.00	3.00	0.50	D

*P Value (t-test, one-tailed), Note: D = Defined Stage, R = Repeatable Stage, SD = Standard Deviation and QD = Quartile Deviation, Source: Appendix-B, Table B3. *Source*: Research findings

Finally, the last question 'segregation of duties' was related to technical dimension of Business-IT alignment. The results show that this indicator with the mean value of 2.84 was at 'defined' level. The 'defined' level of alignment from the viewpoint of this indicator means the appropriateness of division of

roles and responsibilities by IT management which was resulted from good fit between IT architecture and IT plan.

(c) Manage IT Human Resources and Training Users

Table 3 presents the status of alignment in 'Managing IT Human Resources and Training Users', which includes two variables that evaluate the social dimension of Business-IT alignment. As it is shown in table 4, the total mean and median values was 2.72 and 3.00 respectively and P=0.00<α=0.05. Based on the mean and median values and the test, the status of alignment in 'managing IT human resources and training users' were at the 'defined' stage of CMMI. The results show that both variables with almost the same mean values of 2.73 and 2.71 were at 'defined' level. Both variables also show the same median value of 3.00. The quartile deviation values for both variables were equal to 0.50 indicating the existence of a high consensus of respondents' perceptions towards the alignment in managing IT human resources and training users. This 'defined' level of alignment means that team members in both business and IT groups are motivated to maintain the team.

Table 4
Business-IT Alignment

Sl. No.	Business-IT Alignment	Res.	Statistic Tests					CMMI
			Mean	SD	P*	Median	QD	
1	Business-IT strategic planning alignment	447	2.75	1.09	0.00	3.00	0.50	D
2	Business-IT processes, organization and relationships	447	2.66	1.06	0.00	3.00	0.50	D
3	Manage IT human resources and train users	447	2.72	1.06	0.00	3.00	0.50	D
Total		447	2.70	1.07	0.00	3.00	0.50	D

*P Value (t-test, one-tailed), Note: D=Defined Stage, SD=Standard Deviation and QD=Quartile Deviation, Source: Tables 2 up to 4. *Source*: Research findings

Table 4 depicts the results of conclusive analysis of the Business-IT alignment which was analyzed with three dimensions: (1) Business-IT Strategic planning alignment – containing 4 variables; (2) Business-IT processes, organization and relationships – containing 6 variables, and (3) Managing IT human resources and training users – including 2 variables.

As it is shown in Table 5, at the level of total value, the mean and median values were 2.72 and 3.00 respectively, and $P(0 < \alpha) = 0.05$. Therefore, considering the results of t-test and mean and median values, the status of Business-IT alignment was at the 'defined' stage of CMMI. At the same level, the quartile deviation was 0.50 and this presents a high consensus of respondents' perceptions towards Business-IT alignment.

'IT processes, organization and relationships' was found to have the lowest mean value of 2.66 ($P(0 < \alpha) = 0.05$). 'Business-IT strategic planning alignment' and 'managing IT human resources and training users' almost indicated similar mean values of 2.75 and 2.72 respectively. The entire components had the same median value equal to 3.00. Based on the mean and median values and the test, the status of business-IT alignment from the viewpoint of all these 3 dimensions was at the 'defined' stage of CMMI.

Finally, the overall results regarding the status of business-IT alignment based on social and technical indicators show that the status of all technical indicators were at 'defined' stage, while there were some weakness in social dimension of business-IT alignment such as weaknesses in the level of confidence between business and IT groups and also the level of teamwork between them.

5.2 Group analysis

The group analysis focuses on the perception of the sample respondent groups. The respondents included four groups of Internal Users, IT Experts, Internal Auditors, and External Auditors. In the present research, a comparative analysis has been presented with reference to Internal Users vs. IT Experts, Internal Users vs. Internal Auditors, Internal Users vs. External auditors, IT Experts vs. Internal Auditors, IT Expert vs. External Auditors, and Internal Auditors vs. External auditors. Applying analysis of variance (ANOVA) and then using a multiple comparison post-test (Tukey-Kramer) help to lump all the above mentioned paired groups. The analysis encompasses the perceptions of all respondent groups separately and together. The perceptions of respondents towards the status of business-IT alignment have been analyzed under: (a) business-IT Strategic Planning Alignment; (b) business-IT processes, organization and relationships, and (c) Manage IT human resources and training users.

Table 5
Business-IT Strategic Planning Alignment

Sl. No.	Business-IT Strategic Planning alignment	Res.	Statistic Tests			ANOVA			Post Test (Tukey-Kramer)			
			M1	M2	SD		F	P	G1	G2	G3	G4
1	Business-IT strategic plans	IU-217	3.0	3.3	1.1	D	10.56	0	3.30			
		IT-81	3.0	3.0	1.2	D			3.04	3.04		
		IA-86	3.0	3.2	1.1	D			3.15	3.15		
		EA-63	2.0	2.4	0.9	R					2.41	
2	Communicating IT plans	IU-217	2.0	2.1	0.9	R	16.42	0			2.11	
		IT-81	3.0	2.8	1.2	D			2.81	2.81		
		IA-86	3.0	2.8	1.0	D			2.83			
		EA-63	2.0	2.3	0.9	R					2.27	
3	Communicating IT activities and risks	IU-217	3.0	2.6	1.0	D	22.94	0		2.56		
		IT-81	4.0	3.6	1.1	M			3.62			
		IA-86	3.0	2.9	1.0	D				2.93		
		EA-63	3.0	2.6	1.0	D				2.60		
4	Monitoring IT progress against the strategic plan	IU-217	3.0	2.5	0.8	D	6.72	0		2.54		
		IT-81	3.0	3.0	1.1	D			3.02			
		IA-86	3.0	2.9	1.0	D			2.85	2.85		
		EA-63	3.0	2.6	1.0	D				2.56		
Total		IU-217	3.0	2.6	1.1	D	19.34	0			2.63	
		IT-81	3.0	3.1	1.2	D			3.12			
		IA-86	3.0	2.9	1.0	D			2.94	2.94		
		EA-63	2.0	2.5	1.0	R					2.46	

Note: IU=Internal Users, IT=IT Experts, IA=Internal Auditors, EA=External Auditors, SD=Standard Deviation, F=F Ratio, P=P Value, G=Group, Source: Appendix-B, Table B4. M1 is median and M2 is mean. *Source*: Research findings

(a) Business-IT Strategic Planning Alignment

Table 5 presents the results of groups' perceptions towards 'business-IT strategic planning alignment' which includes four variables: 'business-IT strategic plans,' 'communicating IT plans,' 'communicating IT activities and risks,' and 'monitoring IT progress against the strategic plan.' As it is shown in Table 6, at the level of total mean value, IT experts assigned a moderate mean value of 3.12 and internal users and internal auditors assigned still lower mean values of 2.63, and 2.94 respectively. At the same level, external auditors assigned the lowest mean value of 2.46 towards 'business-IT strategic planning alignment' IT experts assigned the highest mean value of 3.62 towards 'communicating IT activities and risks.' Internal users assigned the

lowest mean value of 2.11 towards 'communicating IT plans.' It was followed by external auditors' perceptions of the same area with a mean value of 2.27.

ANOVA test indicated significant differences among the mean values towards all the variables. At the level of total value, the calculated value of F ratio (19.34) was more than its critical value (2.63) at the significance level of 95 per cent ($P=0.00<\alpha=0.05$). Hence, ANOVA test showed significant differences towards 'business-IT strategic planning alignment.' At the same significance level, Tukey-Kramer test was applied as the multiple comparison post test to determine which groups were significantly different from other groups. The applied post-test discovered the significant differences towards 'business-IT strategic planning alignment' and its variables.

The total results show that the level of 'business-IT strategic planning alignment' from the viewpoint of internal users, IT experts and internal auditors, is at 'defined' stage in capability Maturity Model Integration (CMMI), but from the viewpoint of external auditors is at 'repeatable' stage. At the level of total value, the post-test classified the mean values into three different groups. The first group included IT experts and internal auditors, the second group included internal auditors and the third group included internal users and external auditors. It indicated that regarding 'business-IT strategic planning alignment, there were significant differences between the perceptions of IT experts and internal auditors and the perceptions of internal users and external auditors. Analysis of 'business-IT strategic plans', as one of the factors in 'business-IT strategic planning alignment', shows that the level of business-IT alignment regarding this indicator was at 'defined' stage from the viewpoint of all responders except for external auditors, who believe that it is at 'repeatable' stage. The applied post-test (Tukey-Kramer test) classified the mean values into three different groups. The first group included internal users, IT experts and internal auditors, the second group included IT experts and internal auditors and the third group included external auditors. It indicates that there were significant differences between the perceptions of external auditors and other groups regarding the status of business-IT alignment from the viewpoint of this indicator.

Analysis of the status of business-IT alignment regarding 'communicating IT plans' shows that it is at 'repeatable' stage from the viewpoint of internal users and external audit but internal audit and IT expert believe that it is at 'defined' stage. The post-test classified the mean values into three different groups. The first group included IT experts and internal auditors, the second group included internal auditors and the third group included internal users and external auditors. It indicated that the perceptions of IT experts and

internal auditors regarding ‘communicating IT plans,’ were significantly different from the perceptions of internal users and external auditors.

Analysis of ‘Communicating IT activities and risks’, shows that except for internal auditors believe in ‘managed’ level of this indicator, other groups believe in ‘defined’ level of business-IT alignment from the viewpoint of this indicator. The post-test classified the mean values into two different groups. The first group included IT experts and the second group included internal users, internal auditors and external auditors.

Finally, analysis of ‘monitoring IT progress against the strategic plan’ shows that all groups who believe that the status of business-IT alignment regarding this variable is at ‘defined’ stage. The results of Tukey-Kramer test shows the perceptions of IT expert were significantly different from the perceptions of internal users, internal auditors and external auditors.

(b) Business-IT Processes, Organization and Relationships

Table 6 presents the statistic results of perceptions of each one of the respondent groups about ‘business-IT processes, organization and relationships. 'The ‘business-IT processes, organization and relationships’ were studied in six areas. As it is shown in Table 7, at the level of total mean value, IT experts assigned a moderate mean value of 2.94 and internal users and internal auditors assigned lower mean values of 2.59, and 2.76 respectively. At the same level, external auditors assigned the lowest mean value of 2.42 for ‘business-IT processes, organization and relationships. Internal auditors assigned the highest mean value of 3.14 for ‘system and data inventory.’ It was followed by IT experts’ perception of roles and responsibilities of the IT department at the mean value of 3.10. External auditors and internal users assigned the lowest mean value of 2.11 for ‘IT managers' knowledge and experience,’ and ‘IT personnel’s responsibility regarding internal control’.

ANOVA test indicated significant differences between the mean values for all the variables. At the level of total value, the calculated value of F ratio (13.46) was more than its critical value (2.63) at the significance level of 95 percent ($P=0.00<\alpha=0.05$). Therefore, ANOVA test showed significant differences towards ‘business-IT processes, organization and relationships.’ As it is shown in Table 6, the multiple comparison post-test (Tukey-Kramer) discovered the significant differences in all groups towards ‘business-IT processes, organization and relationships’ and its variables.

Table 6
Business-IT Processes, Organization and Relationships

Si. No.	Business-IT processes …	Res.	Statistic Tests			CM	ANOVA		Post Test (Tukey-Kramer)			
			M1	M2	SD		F	P	G1	G2	G3	G4
1	IT managers' knowledge and experience	IU-217	2	2.2	0.9	R	17.2	0			2.2	
		IT-81	3	3	1.1	D			3.04			
		IA-86	3	2.6	1	D				2.6		
		EA-63	2	2.1	1	R					2.1	
2	Systems and data inventory	IU-217	3	3	1.2	D	3.75	0.01	2.95	3		
		IT-81	3	2.9	1.1	D			2.93	2.9		
		IA-86	3	3.1	1	D			3.14			
		EA-63	3	2.5	1	D				2.5		
3	Roles and responsibilities of the IT department	IU-217	3	2.7	1	D	3.84	0.01	2.71	2.7		
		IT-81	3	3.1	1.1	D			3.1			
		IA-86	3	2.8	1	D			2.79	2.8		
		EA-63	3	2.6	1.1	D				2.6		
4	IT personnel's responsibility regarding internal control	IU-217	2	2.1	1	R	4.93	0		2.1		
		IT-81	3	2.6	1.1	D			2.62			
		IA-86	2	2.4	1.1	R			2.35	2.4		
		EA-63	2	2.3	1	R			2.3	2.3		
5	Data integrity responsibility	IU-217	3	2.7	1	D	3.2	0.02	2.69	2.7		
		IT-81	3	2.9	1.1	D			2.93			
		IA-86	3	2.8	0.9	D			2.77	2.8		
		EA-63	2	2.4	1	R				2.4		
6	Segregation of duties	IU-217	3	2.8	1	D	2.87	0.04	2.82	2.8		
		IT-81	3	3	1	D			3.04			
		IA-86	3	2.9	1	D			2.91	2.9		
		EA-63	3	2.6	1	D				2.6		
Total		IU-217	3	2.6	1.1	D	13.4	0			2.6	
		IT-81	3	2.9	1.1	D	6		2.94			
		IA-86	3	2.8	1	D				2.8		
		EA-63	2	2.4	1	R						2.4

Note: IU=Internal Users, IT=IT Experts, IA=Internal Auditors, EA=External Auditors, SD=Standard Deviation, F=F Ratio, P=P Value, G=Group, Source: Appendix-B, Table B5. M1 is median and M2 is mean. *Source*: Research findings

The total results show that the level of business-IT alignment regarding 'business-IT processes, organization and relationships' was at 'defined' stage from the viewpoint of internal users, IT experts and internal auditors, but it was at 'repeatable' stage from the viewpoint of external auditors. At the level of total value, the results of post-test show significant differences between the perceptions of each one of the respondent group from others towards 'business-IT processes, organization and relationships.'

Analysis of the first indicator in this group of questions i.e. 'IT managers' knowledge and experience', shows that the status of business-IT alignment regarding this variable is at 'defined' stage from the viewpoint of internal users and external auditors, while it is at 'repeatable' stage from the viewpoint of IT experts and internal auditors. The post-test results classified the mean values into three different groups. The first group included IT experts, the second group included internal auditors and the third group included internal

users and external auditors. These indicate the similarity of the perceptions of internal users and external auditors and the significant difference between their perceptions with the perceptions of IT experts.

Analysis of 'systems and data inventory' and 'roles, responsibilities of the IT department' and 'segregation of duties' shows that all groups believe that the level of business-IT alignment regarding all these variables are at 'defined' stage. The post-test results for 'systems and data inventory' show significant differences between the perceptions of internal auditors and external auditors. The result of the mentioned test classified the mean values into two different groups. The first group included internal users, IT experts and internal auditors, the second group included internal users, IT experts and external auditors. The post test results for 'roles, responsibilities of the IT department' and 'segregation of duties' show significant differences between the perceptions of IT experts and external auditors. The results show that the perceptions of respondent groups can be classified into two different groups; the first group included internal users, IT experts and internal auditors, and the second group included internal users, internal auditors and external auditors.

Analysis of 'IT personnel's responsibility regarding internal control' shows that the status of business-IT alignment regarding this variable is at 'repeatable' stage from the viewpoint of all respondent groups except for IT expert who believe the it is at 'defined' stage. The post-test results show significant differences between the perceptions of internal users and IT expert. Therefore, this test classified the perceptions of respondent groups into two different groups: The first group included IT experts, internal auditors and external auditors and the second group included internal users, internal auditors and external auditors.

Finally, analysis of 'data integrity responsibility' shows that except for external auditors who believe that the status of business-IT alignment regarding this variable is at 'repeatable' stage, other groups believe that it is at 'defined' stage. The post-test results show significant differences between the perceptions of IT experts and external auditors. This test classified the respondent groups into two different groups. The first group included internal users, IT experts and internal auditors, and the second group included internal users, internal auditors and external auditors.

(c) Manage IT Human Resources and Train Users

Table 7 shows the statistical results of perceptions of each one of the respondent groups for 'manage IT human resources and training users,' which includes three variables. As it is shown in Table 8, at the level of total mean value, IT experts assigned a moderate mean value of 2.96 and internal users

assigned the mean value of 2.75. At the same level, internal and external auditors assigned the lower mean values of 2.55 and 2.53 to 'managing IT human resources and training users.' IT experts assigned the highest mean value of 3.15 for 'company's culture of integrity management'. Internal and external auditors assigned the lowest mean value of 2.52 towards 'IT education programs.'

Table 7
Managing IT Human Resources and Training Users

Sl. No.	Managing IT human resources and train users	Res.	Statistic Tests			CMMI	ANOVA		Post Test (Tukey-Kramer)			
			M1	M2	SD		F	P	G1	G2	G 3	G 4
1	Company's culture of integrity management	IU-217	3.00	2.68	1.11	D	5.66	0.00		2.68		
		IT-81	3.00	3.15	0.98	D			3.15			
		IA-86	3.00	2.58	1.00	D				2.58		
		EA-63	3.00	2.54	1.01	D				2.54		
2	IT education programs	IU-217	3.00	2.82	1.05	D	2.42	0.07	2.82			
		IT-81	3.00	2.77	1.00	D			2.77			
		IA-86	3.00	2.52	1.00	D			2.52			
		EA-63	3.00	2.52	1.11	D			2.52			
Total		IU-217	3.00	2.75	1.08	D	5.00	0.00	2.75	2.75		
		IT-81	3.00	2.96	1.01	D			2.96			
		IA-86	3.00	2.55	1.00	D				2.55		
		EA-63	3.00	2.53	1.06	D				2.53		

Note: IU=Internal Users, IT=IT Experts, IA=Internal Auditors, EA=External Auditors, SD=Standard Deviation, F=F Ratio, P=P Value, G=Group, Source: Appendix-B, Table B6. M1 is median and M2 is mean. *Source*: Research findings

At the level of total value, the calculated value of F ratio (5.00) was more than its critical value (2.63) at the significance level of 95 per cent ($P=0.00<\alpha=0.05$). Therefore, ANOVA test showed significant differences between the perceptions of respondent groups towards 'managing IT human resources and training users'. According to the results of post- test, the perception of IT experts is significantly different from the perceptions of internal and external auditors toward the status of business-IT alignment regarding 'managing IT human resources and training users'. This test classified the perceptions of respondents into two different groups. The first

group included IT experts and internal users, and the second group included internal users, internal auditors and external auditors.

Analysis of 'company culture of integrity management' shows that this variable is at 'defined' stage from the viewpoint of all respondent groups. ANOVA test indicated there was a significant difference between the mean values towards 'company's culture of integrity management'. The post-test results regarding this variable classified the mean values into two different groups. The first group included IT experts and the second group included internal users, internal auditors and external auditors.

ANOVA test indicated that there was no any significant difference between the mean values towards 'IT education programs' ($F_{calculated}=2.42<F_{critical}=2.63$ and $P=0.07>\alpha=0.05$). The results show that the status of business-IT alignment regarding 'IT education programs' is at 'defined' stage from the viewpoint of all respondent groups.

Table 9 highlights the results of conclusive group analysis in 3 D containing 12 variables: (1) IT strategic planning – containing four variables; (2) IT processes, organization and relationships – containing six variables, and (3) managing IT human resources and Training users – having two variables.

Table 8 presents the statistical results of perceptions of each one of the respondent groups towards 'control environment.' As it is shown in Table 9, at the level of total mean value, IT experts assigned a moderate mean value of 3.00 and internal auditors and internal users assigned lower mean values of 2.79, 2.63 respectively. At the same level, external auditors assigned the lowest mean value of 2.45 regarding control environment. IT experts assigned the highest mean value of 3.12 towards 'IT strategic planning.' External auditors assigned the lowest mean value of 2.42 towards 'IT processes organization and relationships.' It was followed by external auditors' perceptions of 'IT strategic planning' with the mean value of 2.46. Internal users, IT experts and internal auditors indicated "defined" stage of CMMI towards all the IT control processes in measuring 'control environment.' External auditors with the total mean and median values of 2.45 and 2.00, indicated the "repeatable" stage of CMMI for IT control processes towards 'control environment.'

Table 8
Business-IT Alignment

Sl. No.	Business-IT alignment	Res.	Statistic Tests			CMMI	ANOVA		Post Test (Tukey-Kramer)			
			M1	M2	SD		F	P	G1	G2	G3	G4
1	Business-IT strategic planning	IU-217	3	2.6	1.1	D	19.3	0			2.6	
		IT-81	3	3.1	1.2	D			3.1			
		IA-86	3	2.9	1	D			2.9	2.9		
		EA-63	2	2.5	1	R					2.5	
2	Business-IT processes, organization and relationships	IU-217	3	2.6	1.1	D	13.5	0			2.6	
		IT-81	3	2.9	1.1	D			2.9			
		IA-86	3	2.8	1	D				2.8		
		EA-63	2	2.4	1	R						2.4
3	Manage IT human resources and training users	IU-217	3	2.8	1.1	D	5	0	2.8	2.8		
		IT-81	3	3	1	D			3			
		IA-86	3	2.6	1	R				2.6		
		EA-63	3	2.5	1.1	R				2.5		
Total		IU-217	3	2.6	1.1	D	20	0			2.6	
		IT-81	3	3	1.1	D			3			
		IA-86	3	2.8	1	D				2.8		
		EA-63	2	2.5	1	R						2.5

Note: IU=Internal users, IT=IT experts, IA=Internal auditors, EA=External auditors, SD=Standard Deviation, F=F Ratio, P=P Value, G=Group, *Source:* Tables 6 up to 8. M1 is median and M2 is mean. *Source*: Research findings

ANOVA test indicated significant differences between the mean values towards all the IT control processes. At the level of total value, the calculated value of F ratio (19.99) was more than its critical value (2.63) at the significance level of 95 per cent ($P=0.00<\alpha=0.05$). Therefore, ANOVA test showed significant differences towards 'business-IT alignment'. At the same significance level, Tukey-Kramer test was applied as the multiple comparison post-test to determine which groups were significantly different from other groups. As it is shown in Table 9, the applied post-test found significant differences between 'business-IT alignment' and its relevant IT control

processes. At the level of total value, the post-test divided the mean values into four different groups. The first group included IT experts, the second group included internal auditors, the third group included internal users, and the fourth group included external auditors. Hence this indicated that there were complete significant differences between the perceptions of all of the four groups regarding ‘business-IT alignment’. In other words none of the respondent groups has the same perception with the other ones. Similarly, ‘business-IT processes, organization and relationships’ were found to have complete significant differences with completely differing perceptions from each of the four groups.

6 Conclusion

This paper based on Reich and Benbasat (1996) and Lee et al. (2008) models, investigated social and technical dimensions of business-IT alignment in Bank Mellat of Iran. We investigated social and technical dimensions of business-IT alignment in the related literature and COBIT literature and based on designed questionnaire that evaluated social and technical dimensions of business-IT alignment in the organization. In addition, four groups included internal users, IT experts, internal auditors, external auditors filled the questionnaires. We analyzed the results of questionnaire based quartile deviation, statistic methods towards group analysis, the one-way ANOVA test and Tukey–Kramer post-test.

Business- IT alignment has three titles including 'business-IT strategic planning alignment', 'business-IT processes, organization and relationships' and 'managing business-IT human resources and training users' that investigate social and technical dimensions in Bank Mellat. The level of 'business-IT strategic planning alignment' has four factors investigating of which shows that three factors including ‘IT strategic plans’, ‘communicating IT activities and risks’ and ‘monitoring IT progress against the strategic plan’ which are at ‘defined’ stage in CMMI. However, ‘communicating IT plans’ is at ‘repeatable’ stage. The level of ‘business-IT processes, organization and relationships’ has six variables which include four factors, namely 'systems and data inventory', 'IT personnel's responsibility regarding internal control', 'data integrity responsibility' and 'segregation of duties' are at ‘defined’ stage in CMMI but IT managers' knowledge and 'experience and roles and responsibilities of the IT department' are at ‘repeatable’ stage. The level of ‘managing business-IT human resources and training users’ has two factors of ‘company’s culture of integrity management’ and ‘IT education programs’ which are at ‘defined’ stage. The organization in social and technical

dimensions of business-IT alignment is at ‘defined’ stage and need to be improved to upper stage. Finally, the overall results regarding the status of business-IT alignment based on social and technical indicators show that the status of all technical indicators were at ‘defined’ stage, while there were some weakness in social dimension of business-IT alignment such as weaknesses in the level of confidence between business and IT groups and also the level of teamwork between them which represents that mangers are expected to focus more on the improvement of these variable.

In the next level of analysis we investigated four groups with Tukey–Kramer post-test, as the exact and most powerful multiple comparison post test to determine which groups were significantly different from the other groups. The total result in the level of ‘Business-IT Strategic Planning Alignment’ shows that Internal users, IT experts and Internal Auditors, believe to ‘Defined’ stage in CMMI but External Auditors believe to ‘Repeatable’ stage in organization and there are three different groups. The total result in the level of ‘Business-IT Processes, Organization and Relationships’ shows that Internal users, IT experts and Internal Auditors, believe to ‘Defined’ stage in CMMI but External Auditors believe to ‘Repeatable’ stage in organization and there are four different groups.

Evaluation of social and technical dimensions of business-IT alignment shows that not only, does the organization have a gap with the level of management stage in CMMI and needs to be improved to upper stage, but also social and technical alignment were not in similar level in CMMI. All of the questions that evaluated the technical dimension are at ‘defined’ stage but those in the social dimension are at ‘repeatable’ and ‘defined’ stage. In addition, four groups that filled questionnaires were not similar in their view and mainly external auditors believed to be at ‘repeatable’ stage in social dimension of business-IT alignment in BM. So, the external observer believed to be at ‘repeatable’ stage for organization and must notice it and improve social dimension in all levels of the organization.

‘Communicating IT plans’, ‘communicating IT activities and risks’, ‘IT managers' knowledge and experience’, ‘roles and responsibilities of the IT department’, ‘IT personnel's responsibility regarding internal control’, ‘company’s culture of integrity management’, ‘data integrity responsibility’, ‘company’s culture of integrity management’, ‘IT education programs’ are the subtitles of social dimensions that are at ‘repeatable’ stage except ‘communicating IT activities and risks’, ‘IT personnel's responsibility regarding internal control’ and ‘data integrity responsibility’ that are almost near technical dimensions. Other subtitles such as the concept of

communicate, culture, assessing, experience and managers' knowledge are the blind spots in most Iranian organizations. So, the organizations need to have managers with high knowledge that create and present guide lines for achieving business-IT alignment from both social and technical dimensions.

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Appendices

A: Questionnaire

(a) IT Strategic Planning;

1) Strategic plans for IT align business objectives with IT strategies. *[IT strategic plans]*

Very Low / Initial				Very High / Optimized
○	○	○	○	○

2) IT department communicates its IT plans relevant parties across the Bank. *[Communicating IT plans]*

Very Low / Initial				Very High / Optimized
○	○	○	○	○

3) IT department communicates its activities, challenges and risks on a regular basis with the executive and financial departments. *[Communicating IT activities and risks]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

4) IT organization monitors its progress against the strategic plan and reacts accordingly to meet established objectives. *[Monitoring IT progress against the strategic plan]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

(b) IT Processes, Organization and Relationships;

1) IT managers' Knowledge and experience to fulfill their responsibilities. *[IT managers' knowledge and experience]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

2) Relevant systems and data have been inventoried and their owners identified. *[Systems and data inventory]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

3) Roles and responsibilities of the IT organization are defined, documented and understood. *[Roles and responsibilities of the IT department]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

4) IT personnel understand and accept their responsibility regarding internal control. *[IT personnel's responsibility regarding internal control]*

Very Low / Initial ○ ○ ○ ○ ○ Very High / Optimized

5) Data integrity ownership and responsibilities have been communicated to appropriate data/business owners and they accepted these responsibilities. *[Data integrity responsibility]*

Very Low / Initial Very High / Optimized

○ ○ ○ ○ ○

6) IT management implemented a division of roles and responsibilities (segregation of duties) that reasonably prevents a single individual from subverting a critical process. *[Segregation of duties]*

Very Low / Initial Very High / Optimized

○ ○ ○ ○ ○

(c) Manage IT Human Resources and Educate and Train Users;

1) IT organization adopted and promoted the Bank's culture of integrity management, including ethics, business practices and human resources evaluations. *[Company's culture of integrity management]*

Very Low / Initial Very High / Optimized

○ ○ ○ ○ ○

2) IT management provide education and ongoing training programs that include ethical conduct, system security practices, confidentiality standards, integrity standards and security responsibilities of all staff. *[IT education programs]*

Very Low / Initial Very High / Optimized

○ ○ ○ ○ ○

B: Tables

Table B1
IT Strategic Planning

Sl. No.	Variables	Frequency Distribution and Weightage					Total
		1	2	3	4	5	
1	IT strategic plans	47	80	153	116	51	447
2	Communicating IT plans	88	177	116	48	18	447
3	Communicating IT activities and risks	56	108	171	81	31	447
4	Monitoring IT progress against the strategic plan	49	127	201	54	16	447
Total		240	492	641	299	116	1788

Source: Field Survey

Table B2
IT Processes, Organization and Relationship

Sl. No.	Variables	Frequency Distribution and Weights					Total
		1	2	3	4	5	
1	IT managers' knowledge and experience	84	156	151	39	17	447
2	Systems and data inventory	58	78	188	85	38	447
3	Roles and responsibilities of the IT department	60	104	188	68	27	447
4	IT personnel's responsibility regarding internal control	123	144	126	42	12	447
5	Data integrity responsibility	50	130	187	60	20	447
6	Segregation of duties	48	101	196	78	24	447
Total		423	713	1036	372	138	2682

Source: Field Survey

Table B3
Managing IT Human Resources and Training users

Sl. No.	Variables	Frequency Distribution and Weights					Total
		1	2	3	4	5	
1	Company's culture of integrity management	65	108	188	56	30	447
2	IT education programs	65	108	190	60	24	447
Total		130	216	378	116	54	894

Source: Field Survey

Table B4
IT Strategic Planning

Sl. No.	Variables	Res.	Frequency Distribution and Weights					Total
			1	2	3	4	5	
1	IT strategic plans	Internal Users	20	28	65	75	29	217
		IT Experts	9	17	26	20	9	81
		Internal Auditors	7	14	35	19	11	86
		External Auditors	11	21	27	2	2	63
2	Communicating IT plans	Internal Users	58	95	48	14	2	217
		IT Experts	10	29	17	16	9	81
		Internal Auditors	8	24	34	15	5	86
		External Auditors	12	29	17	3	2	63
3	Communicating IT activities and risks	Internal Users	36	61	92	19	9	217
		IT Experts	3	11	15	37	15	81
		Internal Auditors	7	19	38	17	5	86
		External Auditors	10	17	26	8	2	63
4	Monitoring IT progress against the strategic plan	Internal Users	21	76	105	12	3	217
		IT Experts	8	15	32	19	7	81
		Internal Auditors	10	18	37	17	4	86
		External Auditors	10	18	27	6	2	63
Total		Internal Users	135	260	310	120	43	868
		IT Experts	30	72	90	92	40	324
		Internal Auditors	32	75	144	68	25	344
		External Auditors	43	85	97	19	8	252

Source: Field Survey

Table B5
IT Processes, Organization and Relationships

Sl. No.	Variables	Res.	Frequency Distribution and Weights					Total
			1	2	3	4	5	
1	IT managers' knowledge and experience	Internal Users	43	97	63	11	3	217
		IT Experts	9	12	36	15	9	81
		Internal Auditors	11	27	34	11	3	86
		External Auditors	21	20	18	2	2	63
2	Systems and data inventory	Internal Users	33	31	89	41	23	217
		IT Experts	10	13	35	19	4	81
		Internal Auditors	6	14	37	20	9	86
		External Auditors	9	20	27	5	2	63
3	Roles and responsibilities of the IT department	Internal Users	30	54	98	20	15	217
		IT Experts	8	14	27	26	6	81
		Internal Auditors	11	16	43	12	4	86
		External Auditors	11	20	20	10	2	63
4	IT personnel's responsibility regarding internal control	Internal Users	76	63	60	14	4	217
		IT Experts	13	25	26	14	3	81
		Internal Auditors	20	33	19	11	3	86
		External Auditors	14	23	21	3	2	63
5	Data integrity responsibility	Internal Users	22	68	93	24	10	217
		IT Experts	9	17	30	21	4	81
		Internal Auditors	7	24	41	10	4	86
		External Auditors	12	21	23	5	2	63
6	Segregation of duties	Internal Users	24	51	92	39	11	217
		IT Experts	8	13	33	22	5	81
		Internal Auditors	6	19	44	11	6	86
		External Auditors	10	18	27	6	2	63
Total		Internal Users	228	364	495	149	66	1302
		IT Experts	57	94	187	117	31	486
		Internal Auditors	61	133	218	75	29	516
		External Auditors	77	122	136	31	12	378

Source: Field Survey

Table B6
Managing IT Human Resources and Training Users

Sl. No.	Variables	Res.	Frequency Distribution and Weights					Total
			1	2	3	4	5	
1	Company's culture of integrity management	Internal Users	38	48	93	21	17	217
		IT Experts	4	13	39	17	8	81
		Internal Auditors	12	29	31	11	3	86
		External Auditors	11	18	25	7	2	63
2	IT education programs	Internal Users	26	50	93	34	14	217
		IT Experts	11	16	38	13	3	81
		Internal Auditors	15	25	35	8	3	86
		External Auditors	13	17	24	5	4	63
Total		Internal Users	64	98	186	55	31	434
		IT Experts	15	29	77	30	11	162
		Internal Auditors	27	54	66	19	6	172
		External Auditors	24	35	49	12	6	126

Source: Field Survey