Aligning CIO Characteristics to Business Strategy: An Empirical Investigation

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Abstract
This paper examines the match between Chief Information Officer (CIO) characteristics and the organization’s business strategy and how this match will influence the impact of IS on the organization’s business performance. Based on the study of typologies of business strategy, alignment between IS and business strategy and upper echelon theory, a conceptual model is proposed. Survey data from 81 CIOs/IS managers is collected to empirically test the model. The results indicate that a match between business strategy and CIOs of certain repertoires of competencies, experiences and personalities could lead to better organizational performance. Specifically, the impact of IS on business performance in aligned organizations is significantly better than it is in misaligned ones.

1. Introduction
Consider this question: If you are hiring a Chief Information Officer (CIO) for the organization, who do you look for? This research seeks to answer this question.

In a diverse, ever-changing marketplace, organizations are constantly seeking to harness technology to improve their core competency and gain competitive advantage. Explicitly, knowing how to apply Information Systems (IS) in an appropriate and timely way and in harmony with business strategies, goals, and needs could bring the organization to steps closer to business success [1]. In other words, aligning IS strategy to business strategy becomes a critical issue in most organizations [2]. Indeed, there is an increasing amount of research and understanding on the linkages between business and IS strategies [3, 4], the role of partnerships between IS and business management [5], and the need to understand the transformation of business strategies resulting from the competitive use of IS [6].
2. Conceptual Model and Hypotheses

Notwithstanding the growing research in strategic leadership [10], the causal relationship between managers and strategy is still a source of considerable debate. Particularly, whether managers determine strategies or whether established strategic position impacts the recruitment and promotion decisions of upper echelon executives is often a question pondering researchers till now [8]. Despite the absence of consensus on the causal forces, it is clear that the match, fit or alignment between managers and strategic direction is crucial to success.

Figure 1 depicts the conceptual model that examines the fit between CIO characteristics and business strategies and the effects of this fit on the impact of IS on the organization’s business performance. In the following sub sections, the alignment between business and IS strategy will be discussed first followed by the reasoning for matching CIO characteristics to business strategy.

2.1. Business Strategy and Its Alignment with IT/IS Strategy

In the realm of strategic management theory, the central role of managerial influence is best reflected in typologies of strategic orientation [8]. One of the most well-established business strategy typologies is Miles and Snow’s [12] three viable strategic types which include Prospector, Defender and Analyzer. Based on the summary of Sabherwal and Chan [4], there are good reasons to believe that different IS strategies would be appropriate for the three business strategies [13]. These three strategies differ in information management sophistication [14], in the level of IT investment [15], and in their influence on the attributes of formal control systems [16].

According to Miles and Snow [12], Prospectors are organizations whose prime capability is that of finding and exploring new product and market opportunities. For a Prospector, maintaining a reputation as an innovator in product and market development may be as important as (in some cases even more important than) high profitability. They invest heavily in product research and development (R&D) and environmental scanning, which require high level of technological flexibility. However, the emphasis on innovativeness and flexibility often leads to a lack of controls and low operational efficiency. In the research of the alignment between IS strategy with Prospector strategy, Sabherwal and Chan [4] suggest that “IS for flexibility” strategy—focusing on flexibility especially in market information systems and strategic decision support systems, will be suitable for Prospectors.

In contrast, Defenders stress on operational efficiency and economics of scale. They seal off a stable and a narrow niche in the total potential market by producing only a limited set of products directed at this segment of the market [12]. Significant attention from the Defenders is devoted to controlling operating cost, thus their technology choices favor inflexible but cost-efficient methods. Furthermore, they do not tend to search outside their domain for new opportunities, and rarely make major adjustment in their technology [4]. Most of their research and development efforts are related to process improvement instead of product innovation. The IS strategy that is aligned with Defenders is “IS for efficiency” strategy which emphasizes on internal and inter-organizational efficiencies in organizational information systems rather than on flexibility [4].

In summary, different business strategies require different IS strategies. Prospectors desire for flexibility and innovation in their IS strategy, Defenders emphasize on cost containment and stability, and Analyzers endeavor to simultaneously achieve both. Following the argument of Thomas and Ramaswamy [8], because of its hybrid nature, the
strategic and managerial attributes of Analyzers are not as clear as those of the Prospectors and Defenders. The present study, thus, focuses on the two extreme types—Prospector and Defender and it is believed that this is a necessary first step toward a fuller understanding of the attributes of Analyzers in future research.

2.2. Alignment between CIO Characteristics and Business Strategy

From the “strategy decides manager” perspective, by contending that organizations pursuing different strategies would be led by managers with different characteristics, Miles and Snow [12] acknowledge the necessity of matching managers to strategy. Given the distinct orientations of Prospectors and Defenders, they proposed that the managers of these organizations would have different repertoires of skills and competencies [12].

From the “manager decides strategy” perspective, upper echelon theory [11] argues that managers matter in shaping an organization’s strategic choices, because strategic choices do not lend themselves to calculable solutions and include a large behavioral component. They reflect, to a large extent, the values, principles and preferences of decision makers. When confronted with a complex and incomprehensible situation, a decision maker would typically bring his cognitive bases and values to bear on the situation, and formulate an eventual perception and response to the situation. Strategic choices are thus an outcome of selective perceptions and interpretations based on the values and cognitive thoughts of managers.

Reconciling these two perspectives, we propose the examination of a match between manager and strategy instead of looking into the causal relationship between these two. Based on the discussion of business-IS strategy alignment in the previous section, it can be inferred that Prospectors and Defenders have distinctively different requirement on IS strategy, one focusing on “IS for flexibility”, the other on “IS for efficiency”. Thus, they will also expect to have CIOs with different characteristics to come up with different, but appropriate IS strategy to align with the organization’s business strategy.

H1: CIOs of Prospectors and Defenders will have distinctively different profiles of demographic and personality characteristics.

2.2.1. Alignment between CIO Characteristics and Business Strategy

Upper echelon theory suggests that observable managerial characteristics such as age, tenure, educational level could manifest the givens that a manager brings to a strategic situation. Similarly, Miles and Snow [12] suggest that Prospectors and Defenders should be led by CEOs with different age, tenure and educational level. In light of this, these three demographic characteristics are chosen as our focus of study.

Age. As previously discussed, the IS strategy for Prospector needs to be flexible and innovative. Prospectors, then, need to identify CIOs who can formulate and implement such IS strategy to align with the business needs. Upper echelon theory implies younger CIOs are more inclined to pursue innovative and risky IS strategies then older CIOs. Several studies have attempted to provide explanations for such a relationship. First, according to learning theory (e.g., Chown 1960), older CIOs may have greater difficulty grasping new ideas and learning new behaviors. Cognitive abilities seem to diminish with age, including learning ability, reasoning and memory [17]; hence, older CIOs may have less of the physical and mental stamina needed to exploit IS for innovativeness and flexibility; Second, younger CIOs are more likely to have received their education more recently than older CIOs, thus, their technical knowledge should be superior and more current [18]. Third, older CIOs may be at a point of their lives where financial security and career security are most important. Their spending traits and expectations about retirement income are established [11]. Indeed, Barker and Mueller [19] argue that innovation is risky as the cost is realized immediately (i.e., fund is taken away from current profitability) but any pay-off tends to occur in the long term. Given that older CIOs may have fewer years before retirement, the pay-off from IT investment may not be realized on time to translate into higher salary and bonuses for them. Thus, they tend to formulate IS strategy that is stable and cost efficient, which matches the needs of Defenders. In contrast, because their career and financial security concerns have a broader time horizon, younger CIOs can be more risk-seeking in adopting more innovative and flexible IS strategy, which will align with the Prospectors’ business requirement. Thus, we hypothesize:

H1a: CIOs of Prospectors are more likely to be younger than CIOs of Defenders.

Tenure. Upper echelon theory also implies that years of inside service by CIOs are negatively related to strategic choice involving new changes. This is because as the years of tenure increase, the CIOs may have more psychological commitment to the organizational status quo [20] and become more
strongly committed to implementing their own paradigms of how the IS strategy should be run [21]. Furthermore, long tenure may result in insulation and a narrowing of the CIO’s perspective [22]. Long-tenured CIOs may also have developed inertia in their environmental scanning activities, reducing the intensity and scope of their scanning activities. They may also refrain from making changes and investment in keeping the IS strategy innovative and flexible over time [23]; instead, they may prefer to emphasize stability and efficiency, which suits the Defenders’ needs for IS strategy.

**H1b: CIOs of Prospectors are more likely to have shorter tenure in the organization than CIOs of Defenders.**

**Educational level.** Inferring from upper echelon theory [11], we may propose that the amounts of formal education CIOs have had are positively associated with innovativeness and flexibility in IS strategy in organizations. Prior studies (e.g., Kimberly and Evanisko [24]) also indicate that higher levels of education are associated with a person’s ability to generate and implement creative solutions to complex problems. This ability may explain why people who are more educated have higher tendency to possess more flexible and receptive attitude toward innovation [24]. The association between educational level and both cognitive ability and attitudes toward innovation may suggest that CIOs with a higher educational level are more likely to adopt IS strategies that are innovative and flexible—features consistent with Prospectors’ needs for IS strategy. In contrast, less educated CIOs are associated with more conservative, risk-averse IS strategies—features consistent with the Defenders’ needs for IS strategy [8]. We thus hypothesize:

**H1c: CIOs of Prospectors are more likely to have higher level of education than CIOs of Defenders.**

**2.2.2. Personality Traits of CIO and Business Strategy**

Previous studies examining the relationship between the executive’s personality characteristics and the organization’s strategy often focus on traits such as need for achievement, locus of control, flexibility, risk-taking propensity, dogmatism, persuasiveness, and tolerance of ambiguity [25, 26, 27]. The personality traits examined in these papers do not follow a specific taxonomy; hence, they do not completely encompass all the attributes that could potentially drive an organization’s strategy. In addition, there is some conceptual overlap among several attributes discussed in the papers [28]. Hence, in this paper, we adopt the “Big Five” taxonomy [29] to analyze the personality traits of a CIO.

Costa and McCrae [30] argue that it is possible to generalize to the full range of personality traits only if a comprehensive taxonomy of personality is systematically examined. Several lines of evidence suggest that the Big Five model provides such taxonomy [31]. This taxonomy is also currently considered the most valuable in personality research [32], mostly because of the replicability of the five factor structure across different theoretical frameworks, using different assessment approaches including questionnaires and lexical data, in different cultures, employing different languages, and using ratings from different sources [33].

The first dimension, extraversion, consists of sociability, positive emotionality, ambition and excitement-seeking. The second dimension is neuroticism. A person who is high in neuroticism tends to exhibit a high level of insecurity, is suspicious and low in self-confidence. The third dimension is agreeableness, which is the trait of being easier to get along with. The forth dimension is conscientiousness, which characterizes a person who is responsible, dependable, persistent, and oriented toward work. The last dimension is openness, which describes a person who is imaginative, creative, curious, unconventional, broad-minded, and adventurous [30]. Our present focus will be on openness and extraversion which are perceived to be most relevant in strategic formation behavior [32].

**Openness.** Previous empirical studies show a strong relationship between openness and propensity toward innovation. Inferring from the study of Kets De Vries and Miller [34], one may suggest that CIOs who are low in openness, and who are inflexible, rigid and un-adaptive are often associated with IS strategies that are extremely inflexible and anachronistic as the CIOs’ insular tendencies cause them to ignore environmental conditions [27]. Conversely, CIOs with high openness seek out new information. There is strategies are responsive to the environment. They emphasize reacting and adapting to changing conditions through innovation and flexibility. From another aspect of openness, which is being adventurous and risk-taking, Lewin and Stephens [35] argue that managers who are more adventurous and who possess high risk propensity show more willingness to innovate. They become restless in a stable, certain situation. Innovative IS strategies require the CIOs to be flexible, sensitive and broad-minded in order to scan the environment to detect opportunities for innovation. It also requires the CIO to be adventurous since such IS strategy...
typically involves some uncertainty. We thus hypothesize:

**H1d:** CIOs of Prospectors are more likely to possess higher level of openness than CIOs of Defenders.

**Extraversion.** According to the Trait Theory of Personality, people high on extraversion have been found to prefer higher levels of environmental stimulation, task variety, complexity and cognitive arousal [36]. This indicates that the CIO with higher extraversion may be more inclined toward innovative and flexible IS strategies which are highly involved with cognitive arousal, complexity and task variety. In line with the reasoning in openness, extraversion is also found to be positively associated with uncertainty preference in portfolio theory [37], which implies that people high on extraversion may show more willingness to undertake more uncertain innovations. Furthermore, Bateman and Grant [38] have found that people high in extraversion also tend to take actions to influence environmental change by scanning for opportunities, showing initiatives, taking action and persuading people. Since changes are an inherent part of innovative and flexible IS strategy and change resistance is typically encountered during implementation of such strategy, pro-activeness and persuasiveness are necessary characteristics in the CIO to carry out such IS strategy. If openness is related to the CIO’s sensitivity to changes and willingness to accept innovation, extraversion is also related to the CIO’s ability and charisma to captivate people in carrying out the innovative IS strategy.

**H1e:** CIOs of Prospectors are more likely to possess higher level of extraversion than CIOs of Defenders.

### 2.3. Performance Benefit of Alignment between CIO and Business Strategy

CIOs characteristics, both demographics and personality, will affect the organization’s IS strategy [9, 39], which in turn needs to be matched with the organization’s business strategy [40]. An organization that has a CIO whose characteristics fit the requirements of the organization’s business strategy (e.g. a Prospector with a younger, more open and more extraverted CIO) will have a better alignment between IS and business strategy, which will in turn benefit organizational performance in terms of employee productivity, operational efficiency, operational cost, customer satisfaction, relationships with partners, revenue, profit and market share [4].

**H2:** The impact of IS on organization’s business performance for Prospectors and Defenders that are able to achieve an alignment between characteristics of CIOs and the requirements of the business strategies will be significantly better than that of their counterparts that do not achieve such alignment.

### 3. Research Methodology

Survey methodology is used to test our model because it provides a basis for establishing generalizability, allows replicability, and has statistical power. The survey was endorsed by the IT Management Association (ITMA), an influential non-profit organization in East Asia with a significant subscriber base of IT professionals and managers.

We adapted the operationalization of demographic variables mainly from Barker and Mueller [19]. We measured CIO age by asking respondents to indicate the age range to which they belong. We took this approach to minimize the discomfort respondents might experience when responding to sensitive questions such as about age. We measured educational level by asking respondents to provide the highest degree they had obtained (1= Diploma; 2= Bachelor; 3=Master; 4=PhD; and 5=others). We re-coded one response containing “Others” as 1 without loss of generality because that respondent only had high school qualifications. We measured tenure by asking how many years the respondent had been in the position of CIO or Head of IT in his current organization of affiliation.

We adapted personality variables mainly from the International Personality Item Pool. Business strategy attributes were measured using 7-point Likert scales, ranging from 1 (strongly disagree) to 7 (strongly agree). The questionnaire items were adapted from [4] (Table 1).

<table>
<thead>
<tr>
<th>Risk Aversion</th>
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<tbody>
<tr>
<td>1. Our business decisions generally follow “tried and true” paths.</td>
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<tr>
<td>2. We adopt a rather conservative view when making major decisions.</td>
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<tr>
<td>3. In general, our mode of operations is less risky than that of our competitors.</td>
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<th>Proactiveness</th>
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<tr>
<td>1. We generally increase capacity (i.e., prepare to handle a greater volume of business) before our competitors do the same.</td>
</tr>
<tr>
<td>2. We are usually the first ones to introduce various products and/or services in the market.</td>
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<th>Openness</th>
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<tr>
<td>1. I love to read challenging material.</td>
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<tr>
<td>2. I am quick to understand things.</td>
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<tr>
<td>3. I love to think up new ways of doing things.</td>
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<tr>
<td>4. I like to challenge the norms.</td>
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<th>Extraversion</th>
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Prior research does indicate that managerial assessments of company performance are highly correlated with objective performance indicators and hence, following Sabherwal and Chan [4], we relied on perceptual measures of business performance. These measures include (1) employee productivity, (2) operation efficiency, (3) operation cost, (4) customer satisfaction, (5) relationship with partners, (6) revenue earnings, (7) profit, and (8) market share. These items were measured using seven-point Likert scales that compared the company to its competition, ranging from 1 (much worse than the competitor) to 7 (much better than the competitor).

To assess face and content validity, we presented the survey instrument to the head of ITMA and two experienced CIOs for their comments and advice. Based on their suggestions, we made some minor modifications in the wording and framing of the questions. Subsequently, we uploaded the revised instrument onto the web pages, and asked three IT professionals to comment on the layout and presentation of the questionnaire. To avoid information overloading, we incorporated further suggestions to shorten some pages. When the three IT professionals thoroughly tested and found no problems with the instrument, we informed ITMA to proceed with the survey administration.

3.1. Survey Administration

We placed a survey package consisting of a cover letter stating the study objective, the survey instruction, and the survey questionnaire on a web server. ITMA put up a link on their website to our online survey questionnaire. It also selected suitable members (holding the title of IS/IT manager, IT Director, CIO, Chief Technical Officer) as respondents, and sent the survey invitation letter containing the URL web link and a password via e-mail to the members on our behalf. This approach was taken to protect the privacy of ITMA members. Together with our decision not to collect any personally identifiable information, separating sending tasks from receiving tasks in the administration of the survey enabled us and the endorsers to enforce strict anonymity and confidentiality for our respondents. The survey invitation was extended to 318 selected senior ITMA members who fit the job profile of a CIO and should be cognizant of IT usage and operations in their organizations, and should thus be able to provide valid and accurate information.

To increase the response rate, we subsequently provided other options. First, the survey package was sent as an e-mail attachment to two organizations that reported problems in accessing the online survey website. Second, 10 packages were sent by conventional mail to organizations that preferred a paper-based survey. One week before the closing deadline of the survey, the head of ITMA also sent reminders to the pre-selected members to respond.

Of the 318 pre-selected members, 95 responded, yielding a response rate of 29.87%. This response rate is acceptable, given the unsolicited nature of the survey and the high profile of the target respondents, i.e., the CIOs [41]. Responses from six respondents, however, were incomplete. We omitted these from further analysis because we could not recover the missing data due to the anonymous nature of our survey. It is to note that our respondents came from organizations with diverse characteristics in terms of industry, number of employees, and number of IT professionals employed. As we had no detailed information on the non-respondents, we conducted a response bias test (using student’s t-test) by comparing early respondents against late ones (determined by the median value) across all control and independent variables.

4. Data Analysis

Each response was assessed based on the answers to questions on risk aversion and pro-activeness. Organizations with responses of high risk aversion and low pro-activeness were classified as defenders. Organizations with responses of low risk aversion and high pro-activeness were classified as prospectors. Others were labeled as analyzers. 8 analyzers were excluded from further analysis as discussed in Section 2.1.

The hypothesis testing process comprises three distinct steps. The first step classified the organizations as defenders or prospectors. The second step, we compared the CIO characteristics of prospectors against CIO characteristics of defenders along two broad dimensions: CIO demographic characteristics (CIO age and CIO educational level) and CIO personality (extraversion and openness). Chi-square tests (see table 2) and analysis of variance (see table 3) were used to determine whether the theoretically expected CIO profiles were in fact associated with the distinct strategic postures.

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Table 1. Business Strategy Attributes (adapted from [4])

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. I feel comfortable around people.</td>
<td></td>
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<tr>
<td>2. I talk to a lot of different people at parties.</td>
<td></td>
</tr>
<tr>
<td>3. I know how to captivate people.</td>
<td></td>
</tr>
<tr>
<td>4. I am skilled in handling social situations.</td>
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1 We maintained the separation of sending and receiving tasks in these new modes of data collection.
Chi-square analyses were used to test the categorical variables: CIO age, CIO tenure and CIO educational level. Our results in CIO demographic characteristics suggest that there is a significant difference between defenders and prospectors in term of age (t = 2.533, p < .05; Mann Whitney U test of z = -2.454, p < .05) but not with respect to tenure (t = 1.371, p > .10; Mann Whitney U test of z = -1.159, p > .10) and educational level (t = -1.243, p > .10; Mann Whitney U test of z = -1.258, p > .10). Hence, hypothesis H1a is support but not H1b and H1c. Comparatively, our results in CIO personality suggest that prospectors show significantly more extraversion and openness compared to defenders (see Table 3). In this regard, hypothesis H1d and H1e are supported.

The third step, we assessed the performance impact of the business strategy-CIO match. A match was considered to have been achieved when at least 3 of the 4 CIO attributes corresponded to the organizations’ strategic type. For instance, a matched prospector should be younger, have higher qualification, and possess higher extraversion and higher openness than the average CIO in the sample. Performance differences between organizations achieving alignment and other organizations (misaligned) were assessed through analyses of variance (ANOVA) (see Table 4). It is important to recognize that the two groups, aligned organizations and misaligned organizations are comprised of prospectors and defenders. Further analysis was also conducted to compare aligned-prospectors with misaligned organizations (see Table 5). As the number of aligned-defenders was relatively small (N=6), further analysis comparing defenders with misaligned organizations were not conducted.
5. Discussion

Drawing on the study of typologies of business strategy [12], alignment between IS and business strategy [4] and upper echelon theory [11], we propose and test a conceptual model (1) to examine the alignment between CIO characteristics and the organization’s business strategy and (2) to measure the impact of such alignment on organization’s business performance. Our survey results indicate that different business strategies will match with CIOs with different repertoires of competencies, experiences and personalities. The impact of IS on business performance in aligned organizations is significantly better than it is in misaligned ones.

Before we discuss the implications of the study, it is imperative that we are aware of the study’s limitations. First, there is a possibility of common method bias in this study. We have collected our data on both independent and dependent measures through self-reporting at a single point in time. This approach might have given rise to respondents giving answers they believed the survey researchers expected to receive. We minimized these effects in two ways: we implemented the online web-based survey questionnaire in such a way to prevent respondents from back-trekking to change their answers, and we presented the pages of the survey items in a random manner to discourage respondents from figuring out the relationship between the independent and dependent variables that we were trying to establish. The anonymous nature of the survey would also mitigate the likelihood that respondents provided self-serving answers or answers they believed we expected.

Second, our dependent variable organizational performance is measured through CIO’s self-reporting response. While CIO may be cognizant to provide such information, this inevitably may affect the objectivity of the measurement as it may only represent the CIO’s perception of how IT is used in the organization and there could be an inherent bias in the CIO’s perceptions of the phenomenon. One way to address this issue is to adopt some objective measurements of how IT is used in an organization; another way is to ask CEO or business manager to comment on the IT and business strategy issues in addition to seeking similar comments from the CIO.

Notwithstanding the limitations, our findings have the potential to advance both theory and management practice in the following areas. First, our research is among the first to empirically study the alignment between CIO characteristics and business strategy since previous research attention has only been paid to the relationship between the CEO and an organization’s business strategy and performance in the upper echelon literature. Given the increasing penetration of IS into business and the more and more intensive involvement of CIOs in organizational business strategy formulation, this is a much needed perspective. Our results show that different business strategies will match with CIOs with different repertoires of competencies, experiences and personalities (i.e. CIOs of Prospector are likely to be younger and possess higher level of openness and extraversion than CIOs of Defenders) and the impact of IS on business performance in aligned organizations is significantly better than it is in misaligned ones.

Second, instead of focusing only on the observable characteristics (e.g. age, tenure, educational level) of the CIO, we also explore their underlying psychological traits such as openness and extraversion. The results indicate that psychological, behavioral processes (openness and extraversion) may be far more important than demographic characteristics (tenure and educational level) in describing a CIO. This may stimulate some debate on the upper echelon perspective concerning the impact of observable characteristics vis-à-vis the underlying psychological characteristics of top managers on strategic choices. The significance of personality variables and the non-significance of demographic variables such as tenure and educational level are of thought-provoking implications. Clarke [42] argued
that personality traits are likely to be more permanent and consistent during the lifetime of an individual. Our study has shown that a CIO can be more accurately described by “permanent” characteristics such as openness and extraversion than by “evolving” characteristics such as tenure and educational level. This may suggest that aspects of upper echelon theory that focus on certain demographic characteristics may not necessarily generalize across all functional areas (e.g. IS).

Third, we seek to add to the nascent literature that aims to develop theory-based arguments about the profiles of CIOs in organizations. In terms of management practice, understanding the alignment between CIO characteristics and organization’s business strategy and the benefits of this alignment would be particularly valuable to the recruitment, development and management of key IS personnel.

6. References


