

# An Investigation of Leadership Styles During Adoption of E-government for an Innovative City: Perspectives of Taiwanese Public Servants

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- Pei-Hsuan Hsieh (1) Email author (peihsuan@mail.ncku.edu.tw)
- Wen-Sung Chen (2)
- Chi-Jui Lo (1)

1. National Cheng Kung University, , Tainan, Taiwan
2. China University of Technology, , Taipei, Taiwan

Chapter

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## Abstract

The governments of many countries are now striving to use technology to move official services to the Internet, thereby enabling citizens to enjoy more convenient access. The Taiwanese government has expended significant effort toward adopting technologies for establishing e-government. In Taiwan, all governmental units are non-profit service providers, and all personnel, including e-government leaders, are public servants whose performances do not influence salaries and positions. However, the existing literature contains no in-depth investigations of the important roles played by e-governmental leaders, also the public servants, who direct adoption of online services. This study, therefore, investigates public servants' styles of leadership as perceived by subordinates during the process of developing an e-government. This study also explores the influence on perceptions from subordinates' demographic variables, such as age, educational level, gender, and years of service. As a result, this study finds that the e-governmental leaders in Taiwan function better from a transformational style of leadership. However, the public servants' educational levels have a significant impact on perceptions of direct supervisors' styles of leadership. Finally, this study suggests encouraging subordinates to participate in on-the-job training to increase abilities and opportunities for undertaking more challenging tasks.

## Keywords

E-government   Innovative cities   Leadership styles   Public servants  
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# 1 Introduction

Governments of many countries are now striving to use technology to move official services to the Internet, enabling citizens to have more convenient access. Adopting technologies by the government represents an innovative process which can help create an innovative organizational form of e-government. Citizens' enjoying more and more services provided by governments' development and implementation of technologies conceptualizes smart cities (Alawadhi et al. [2012](#); Anthopoulos and Fitsilis [2013](#); Gil-Garcia and Aldama-Nalda [2013](#); Lee and Lee [2014](#); Nam and Pardo [2011](#); West et al. [2009](#)).

Taiwanese governments, city- and county-level service units, have expended significant effort toward adopting technologies for both services and infrastructures necessary for e-governments. All personnel, including e-governmental leaders, in Taiwanese governments are public servants, and the official service units operate as service providers in Taiwan. With regard to the organizational characteristics of e-government, the literature suggests that adoption of online services, such as those offered by private companies, involves a process of innovation (Chowdhury et al. [2006](#); Ho [2002](#); Molinari [2012](#); Ndou [2004](#); Gil-Garcia [2012](#); Scholl and Scholl [2014](#)). E-governmental leaders play important roles in the innovation process; however, unlike private companies, the official service units represent nonprofit organizations, and e-governmental leaders' performances do not influence salaries and positions (Berman et al. [2013](#); Puccio et al. [2007](#); Weerakkody [2013](#)). The existing literature contains no in-depth investigation of the key roles played by e-governmental leaders' adopting technologies. The leadership styles perceived by e-governmental leaders' subordinates when they accept tasks or commands is worthy of exploration.

This study, therefore, investigates public servants, especially e-governmental leaders' styles of leadership, as perceived by subordinates. It also explores the influence of subordinates' demographic variables such as age, educational level, gender, and years of service on perception of their supervisors' styles of leadership. Motivated by the intended purposes and current literature, this study presents a new research approach that employs visual sensibility testing, a derivative of cognitive psychology, to investigate, accurately, the public servants' perceptions of direct supervisors' styles of leadership during the process of adopting the innovative organizational form of e-government.

## 2 Literature Review

The American government's 1993 national development retrospective report, *Reengineering Through Information Technology*, was the first proposal for the concept of e-government, also known as digital government, online government, and connected government. The proposal emphasizes the importance of reforming government's operating methods. The United Nations Division for Public Economics and Public Administration, and the American Society for Public Administration, in the 2002 report, *Benchmarking E-government: A Global Perspective—Assessing the Progress of the UN Member States*, formulates a broad definition of e-government. The report asserts that "e-government can include virtually all information and communication technology platforms and applications in use by the public sector." A subsequent report provides a more concrete definition: "e-government is defined as utilization of the Internet and the World-Wide Web for delivering government information and services to citizens."

The government of Taiwan began developing e-government in 1995 and focused on accelerating the development of Internet applications in administrative agencies. After participating in the *Internet 1996 World Exposition*, Taiwan's Executive Yuan, the Research, Development and Evaluation Commission (RDEC), formally defined e-government in 1997 as "the overall concept characterized by the use of information and communications technology (ICT) to form internal and external networks, and the employment of different information services and facilities for government agencies, enterprises, and citizens at their convenient times, locations and methods to provide automated services." The four-stage e-governmental program, implemented from 1998 to 2016, is currently in its fourth stage which has a vision of "service without boundaries, improving everyone's life," and includes three aspects necessary for completion: internal operational management, external public service, and fair participation strategies.

The summary of definitions of e-government proposed in the literature (Bolívar et al. [2010](#); Graham and Aurigi [1997](#); Gil-Garcia [2012](#); Ndou [2004](#); Weerakkody [2013](#); Scholl and Scholl [2014](#)) reveals that the use of ICT and Internet applications are the key elements for initiation and development of e-government and campaigns to promote digital government. Governmental websites represent services' useful and basic platforms, which can simplify administrative processes, provide online services, strengthen cooperation and commercial interchange between agencies in all cities and counties, and finally increase the degree of transparency of enacted policies.

## **2.1 Development of E-government in Taiwan**

Compared to other countries with emerging economies, the development of Taiwan's e-government is, arguably, mature. With an informational infrastructure established throughout Taiwan, governmental agencies transmit documents in electronic forms and publicize information on governmental websites. The digital divide among citizens, including minorities and those living in remote areas, has shrunk in Taiwan as citizens are enabled to access applicable information, submit applications for obtaining copies of individual records, or apply for a driving certificate. In view of the development of e-government in Taiwan, officials promised to provide citizens with secure and reliable services and ultimately expect citizens' satisfaction with e-governmental services (Huang and Wu [2007](#)).

To provide e-government services, new operating methods through acquisition of various types of informational technology (IT), such as systems for online documents, require public servants' familiarization. With the assistance of IT, public servants have the authority to respond to and transmit decision-making information, allowing rapid reactions (Alawadhi and Scholl [2013](#); Daniel and Doran [2013](#); Fountain et al. [2011](#); Katz and Halpern [2013](#); Weerakkody [2013](#); Scholl et al. [2012](#)). In addition, the use of IT enables public servants to quickly discover problems and then propose solutions, thereby enhancing the effectiveness of decision making (Chowdhury et al. [2006](#); Bolívar et al. [2010](#); Katz and Halpern [2013](#); Scholl et al. [2012](#)). Also, the style of leadership of e-governmental leaders has changed delegation of authority to subordinates at central or local levels. However, while public servants enjoy greater autonomy and authority from e-government, they bear responsibility for organizing vast amounts of information. The expectation is for public servants to increase senses of accomplishment from efficient completion and high quality responses to policies.

Traditionally, Taiwanese government tends to have a hierarchical structure that is formal and centralized. Such structure has long hampered communication and mutual understanding between officials and subordinates. Currently, the government's organizational structure has evolved to fewer barriers. Official agencies at central or local levels are able to better interact and to respond to rapidly changing societal conditions; however, due to the adoption of various informational technologies, another challenge for public servants has arisen from dissimilar degrees of familiarity with IT, which affects evaluations of administrative performance.

In sum, Taiwan's e-governmental services should boost administrative efficiency and effectiveness. While public servants ensure implementation of e-governmental policies, they must maintain awareness of the organizational changes in operations due to differences in styles of leadership.

## **2.2 E-governmental Leaders and Styles of Leadership**

In the literature, the concepts of leader and manager have varying definitions in terms of roles and responsibilities (Bass 1999; Bossink 2007; Dargan and Shucksmith 2008; Isaksen and Tidd 2006; Kotter 2012; Maccoby 2000; Mumford et al. 2002; Robbins and Coulter 2002). A leader is usually able to influence the behaviors of organizational members for improving quality, performance, production, and services. However, a leader may not enjoy a formal appointment from an organization as a manager who possesses the authority to reward or sanction employees for actions assigned by an organization. In other words, if a manager possesses a leader's ability to influence organizational members' behaviors to achieve objectives while performing managerial functions within the organization's formal hierarchy, this manager's particular style of leadership, in practical terms, produces a leader.

The conventional style of leadership of officials cannot effectively yield innovative administrative methods, and subordinates are without motivation to actively set goals or draft new strategies for tasks when superiors' active support and encouragement is absent (Johnson 1998). As a result, the public may find that the government's delivery of services appears unreliable. Taiwanese public servants, in the past, often perceived themselves as situated in a huge national organizational system and could exert no influence on any governmental plans. Sometimes, suggesting or disseminating innovative ideas concerning governmental policies produced internal conflicts and sanctions for these employees and their direct supervisors.

Differently, e-governmental leaders should cultivate creativity, and then encourage creative transformation within their organizations (Puccio et al. 2007). In addition, e-governmental leaders should fully understand the benefits, motivations, effects, and needs of providing online services. Leaders must consider the public as partners and understand the public's needs for services to meet those needs. Thus, the emphasis is cooperation, direct communications, multidirectional networks, rapid feedback, and responses through advantages of emerging, new, informational systems. Also, e-governmental leaders should encourage subordinates to accept all changes during the processes of e-governmental development, despite potential crises and challenges encountered due to huge responsibilities required for adopting informational technologies (Anthopoulos and Fitsilis 2013; Fountain et al. 2011; Ho 2002; Ndou 2004). In other words, the foundation to ensure long-term success of an innovative organization is innovative leadership, in which proper interaction between individuals, processes, and environments is always present. In

addition, the literature underwrites the necessity of a close relationship between an innovative organization and innovative leadership (Chortatsiani [2003](#); Chowdhury et al. [2006](#); Isaksen and Tidd [2006](#); Podsakoff et al. [2000](#); Scholl et al. [2012](#)).

Classification of leadership encompasses three styles: transactional, transformational, and laissez-faire (Bass [1999](#); Bass and Avolio [1994, 1997](#); Burns [1978](#); Howell and Higgins [1990](#); Podsakoff et al. [2000](#)). Earlier in the twentieth century, most leaders employed transactional leadership, focusing on mutually beneficial transactions by emphasizing the personal benefit gained from the organization. Today's innovative organizations employ transformational leadership, which prescribes leaders' striving to enhance subordinates' morale, motivations, and behavior. A so-called laissez-faire style of leadership implies that the leader does not seek feedback or encourage subordinates with compensation. The leader may be unaware of problems occurring from the process of implementing a decision and interferes little in subordinates' affairs. Such style of leadership commonly accompanies slow decision making.

Accordingly, except the laissez-faire style of leadership, leaders employing either transactional or transformational styles can produce significantly high performance in the organization. Specifically, the transformational style has greater influence on performance than the transactional style since the former inspires trust, respect, and loyalty among subordinates (Bass [1999](#); Howell and Higgins [1990](#)). In addition, transformational leadership, as perceived by an organization's members, can directly initiate radical organizational change since the leaders tend to change members' values and beliefs, develop potential, and enhance confidence, thereby motivating contributions to the organization beyond expectations (Bass and Avolio [1994](#)).

## **2.3 Measurement of Perceived E-government Styles of Leadership**

To measure subordinates' perceptions of supervisors' styles of leadership, Bass and Avolio ([1997](#)) developed an important reference, the Multifactor Leadership Questionnaire (MLQ), to measure the attributes of transformational, transactional, and laissez-faire leadership. The MLQ has undergone several revisions and has had wide application in varied industries and differing cultural contexts. Prior studies verified the effectiveness of using the MLQ to identify the characteristics of a style of leadership (Antonakis et al. [2003](#); Rowold and Heinitz [2007](#)). In the MLQ, the transformational style has four aspects: personal charm, encouragement, intellectual stimulation, and individual concern. The transactional style has two aspects: contingent compensation by reward and passive management by exception. The laissez-faire style has only one aspect: a laissez-faire attitude.

In addition, previous literature concerning "perceived style of leadership" often uses terms such as consideration, concern for people, and relationship-oriented personality to describe a leader's willingness to establish relationships of mutual trust with subordinates and to understand subordinates' feelings (Robbins and Coulter [2002](#)). Thus, the measurement of this type of perception is more appropriately drawn from cognitive psychology, which discusses the relationship between the researcher's symbolic stimulus and participants' consistent responses. The study by English and Steffy ([1997](#)) used movies and short films to represent symbolic stimulus and to clearly portray the characteristics of a style of leadership among different occupations, during different time frames, and in different places. Research participants viewed the films that clearly portrayed the styles of leaderships' differences between genders, among different cultures, and from different historical backgrounds. The participants observed leaders' actual thinking processes, types

of followers developed, and consequences of leaders' decisions. The current study uses a similar technique, the visual sensibility testing method, to measure a participant's psychological perceptions of a style of leadership (VanRullen and Thorpe 2001). This method has two stages: viewing different visual inputs (i.e., animated scenarios) and describing realizations derived from those inputs.

### **3 Research Methods**

The purpose of this study is to investigate the leadership styles among governmental officials as perceived by subordinates during the process of institutionalizing e-government. In addition, the study explores the influences of subordinates' demographics: age, educational level, gender, and years of service. Notably, the study's context is Taiwan, where all personnel employed by government are "public servants." The scope of this study focuses on the development of e-government at the city level despite Taiwanese governing bodies consisting of city- and country-level service units.

#### **3.1 Research Participants**

The study began with submitting an official proposal to one city-level government. After receiving a confirmation from an official in the middle of January 2009, this study recruited participants from 31 governmental agencies, which verifiably were continuously developing e-governmental systems, and the personnel were using mature systems to provide e-government services to citizens. Then, the city-level, e-governmental leaders' direct subordinates from those agencies received invitations by e-mail to participate in the study. The e-mail provided links to different animated scenarios presenting styles of leadership and a questionnaire. With the consent of the e-governmental leaders, the subordinates responded freely to the questions which sought perceptions of supervisors' styles of leadership as represented in the animated scenarios. The study collected demographic data with the same instrument.

#### **3.2 Questionnaire Development**

Based on the purposes and the literature review, this study developed an online questionnaire which adapted each aspect of leadership style into animated scenarios from the textual form proposed by Bass and Avolio (1997). Also, this study draws from perspectives of cognitive psychology to employ visual sensibility testing to avoid repeating prior studies (Antonakis et al. 2003; Avolio et al. 1988; Den Hartog et al. 1997; Rowold and Heinitz 2007), which used Likert-type scales to measure different aspects of leadership. Arguably, previous studies' questionnaires produced unclear descriptions and induced a low willingness to participate (Klooster et al. 2008). Therefore, the current study presents a new approach by designing animated scenarios (Macromedia Flash 8) of styles of leadership to induce visual stimuli and employs the Bass and Avolio concepts of MLQ to develop the questionnaire's items.

To ensure reliability of the animated scenarios, this study attended to the time necessary to process animated information. Although humans can scan multiple, complex images and rapidly understand the content, the average time needed to view an image and immediately prepare a response is roughly 75 ms (VanRullen and Thorpe 2001). Thus, the design for animated scenarios in this study paused for approximately 75–80 ms, and participants had sufficient time and had the opportunity to repeat the number of times a given scenario

appeared before responding directly to a screen (Biederman 1972; Boyce and Pollatsek 1992; Hegarty 1978). Since this study seeks to investigate perceptions of leadership style without attempting to assess the degree of expression of a style, emphasis was on immediate, accurate comparisons of personal experiences and animated scenarios. Thus, this study's options for responses were: "have seen" the scenarios, "have not seen," the scenarios, and "not sure."

The study's online questionnaire consisted of two parts. The first part presented seven aspects distributed among three styles of leadership. The transformational style included four aspects, the transactional style included two aspects, and the laissez-faire style included one aspect. Two animated scenarios along with descriptions presented all seven aspects. The second part requested participants' demographic data, including age, educational level, gender, and years of service.

To ensure the validity of the animated scenarios' content, a pilot study with 57 students who had received on-the-job training in a known governmental department responded, in writing, without bias, to the scenarios. Then, according to the students' written responses, revisions to the descriptions of the scenarios ensured interpretive accuracy for the primary instrument. Since the characteristics of each leadership style appeared clearly in the scenarios, the description of each scenario would obtain accurate results (Muenjohn and Armstrong 2008). The design of the final instrument for the research contained 14 animated scenarios and 14 questions:

1. 1.

Transformational leadership—personal charm: (1) A leader emphasizes that everyone must have the same goals. (2) A leader hopes that subordinates will communicate any doubts or questions concerning goals.

2. 2.

Transformational leadership—encouragement: (1) Leaders clearly express the urgency of future goals. (2) A leader uses pictures or metaphors with symbolic meaning for encouragement.

3. 3.

Transformational leadership—intellectual stimulation: (1) A leader encourages subordinates to view problems from many different angles. (2) A leader guides subordinates in reconsidering or doubting previous conceptions to facilitate breakthroughs.

4. 4.

Transformational leadership—individual concern: (1) A leader is willing to spend time guiding subordinates. (2) A leader expresses concern for subordinates who tend to be ignored.

5. 5.

Transactional leadership—contingent compensation and reward: (1) A leader understands what subordinates expect to obtain after accomplishing the leader's expectations. (2) As long as subordinates cooperate fully with the leader, they can obtain what they want.

6. 6.

Transactional leadership—passive management by exception: (1) A leader only notices certain incidents of unmet standards. (2) A leader will be satisfied with subordinates' work situation only when all work is going smoothly.

7. 7.

Laissez-faire leadership—laissez-faire attitude: (1) A leader will avoid involvement when important or troublesome matters occur. (2) A leader has trouble finding the crux of a problem when difficulties arise.

### **3.3 Data Collection and Analysis Methods**

This study expected to collect more than one hundred responses from the online questionnaire to measure the 14 variables presented as animation in conjunction with the sentences describing the animations. The expected number of responses coincides with the suggestion of Hair et al. (2010) that the sample should be at least five times the number of measured variables. A password-protected database collected the responses when participants clicked a "Submit" button upon completion.

Organization of the participants' responses to the 14 animated scenarios assigned one positive point for a "have seen" option, one negative point for a "have not seen" option, and no point for a "not sure" option. In the transformational leadership section of the questionnaire, the possible range of responses is 8 to -8; while, in the non-transformational leadership section, including transactional and laissez-faire styles of leadership, the range of responses is 6 to -6. Subtraction determined a net score, per participant for these two sections. If a participant's scoring was greater than 2 points, the conclusion is that perception of the participant's actual leader is a display of innovative style of leadership (i.e., transformational style). Conversely, a score of 2 points or fewer indicates a perception of non-transformation leadership.

The participants' demographic data, organized by categorical variables, included age (29 years and under, 30–39, 40–49, and 50 years and older); gender (male and female); educational level (high school and below, university or college, graduate school); and years of service (4 years and under, 5–16 years, and 17 years and more). Recording and encoding of all data occurred in a Microsoft Excel® spreadsheet.

This study used SPSS 15.0 (Statistical Package for the Social Science) as a data analysis tool to calculate the frequencies and percentages of the participants' demographics. Responses to each animated scenario underwent reliability analyses to determine whether or not the responses obtained by the same group of participants in the same context were consistent. Since Cronbach's alpha was in excess of 0.70, a high level of reliability exists for the



responses. Conversely, a value of less than 0.35 suggests low reliability; also, for analysis of validity, Pearson’s correlation suggests preference for a smaller coefficient of correlation among questions of different styles of leadership (Hair et al. [2010](#)). A coefficient in excess of 0.80 indicates a high level of correlation; a value between 0.40 and 0.80 indicates some correlation, and a value of less than 0.40 indicates low correlation. Finally, a Chi-square test presenting a cross-tabulation investigated which demographic variables caused significant differences among subordinates’ perceptions of direct superiors’ styles of leadership.

## 4 Research Results

This study received 336 valid responses (response rate: 28 %) from the public servants of the city-level e-government in Taiwan. A summary of the demographic data of the participants appears in Table 1. The reliability analysis of the participants’ responses to the questions concerning perceptions of direct superiors’ styles of leadership revealed a Cronbach’s alpha of 0.734 from all responses (transformational leadership: 0.655, non-transformational leadership: 0.665). This result indicates that this study’s new approach possessed a high level of reliability (Hair et al. [2010](#)). Also, Pearson’s test for correlation coefficient yielded a value of 0.248, which indicates a low level of correlation between the participants’ scores for transformational and non-transformational leadership. In other words, the animated scenarios designed for this study were highly distinctive and could represent two completely different styles of leadership. These two analyses support the data’s reliability and validity.

**Table 1**

Frequency and percentage of each demographic variable

| Background variable |                        | Frequency Percentage (%) |      |
|---------------------|------------------------|--------------------------|------|
| Gender              | Male                   | 138                      | 41.1 |
|                     | Female                 | 198                      | 58.9 |
| Age                 | 29 and under           | 62                       | 18.5 |
|                     | 30–39                  | 105                      | 31.3 |
|                     | 40–49                  | 111                      | 33.0 |
|                     | 50 and older           | 58                       | 17.3 |
| Educational level   | High school and under  | 37                       | 11.0 |
|                     | College and university | 216                      | 64.3 |
|                     | Graduate school        | 83                       | 24.7 |
| Years of service    | 4 and under            | 109                      | 32.4 |
|                     | 5–16                   | 108                      | 32.1 |
|                     | 17 and more            | 119                      | 35.4 |

#### 4.1 Participants' Perceptions of Supervisors' Leadership Styles

Since the dependent and independent variables were categorical, a Chi-square test investigated the influence of demographic variables for significant differences among participants' perceptions of supervisors' varying styles of leadership, and Table 2 summarizes the Chi-square results. Apparently, participants' educational levels had a significant influence (Chi-square = 17.785,  $p = 0.000$ ) on responses.

**Table 2**

Chi-square test results of participants' responses to perceptions influenced by background variables

| Demographic variable/perception |   | <i>A</i>     | <i>B</i>    | $\chi^2$ | <i>p</i><br>value  |
|---------------------------------|---|--------------|-------------|----------|--------------------|
| Gender                          | Male                                    | 84 (39.8 %)  | 54 (43.2 %) | 0.373    | 0.542              |
|                                 | Female                                  | 127 (60.2 %) | 71 (56.8 %) |          |                    |
| Age                             | 29 and under                            | 39 (18.5 %)  | 23 (18.4 %) | 4.339    | 0.227              |
|                                 | 30–39                                   | 74 (35.1 %)  | 31 (24.9 %) |          |                    |
|                                 | 40–49                                   | 64 (30.3 %)  | 47 (37.6 %) |          |                    |
|                                 | 50 and older                            | 34 (16.1 %)  | 24 (19.2 %) |          |                    |
|                                 |   | 14 (6.6 %)   | 23 (18.4 %) |          |                    |
| Educational level               | High school and under                   | 152 (72.0 %) | 64 (51.2 %) | 17.785   | 0.000 <sup>a</sup> |
|                                 | College and university, graduate school | 45 (21.3 %)  | 38 (30.4 %) |          |                    |
|                                 | 4 and under                             | 71 (33.6 %)  | 38 (30.4 %) |          |                    |
| Years of service                | 5–16                                    | 72 (34.1 %)  | 36 (28.8 %) | 2.576    | 0.276              |
|                                 | 17 and more                             | 68 (32.2 %)  | 51 (40.8 %) |          |                    |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

\* $p < 0.01$

Then, to determine which educational levels accounted for this difference, the calculated adjusted residual (AR) value (Haberman 1978) derived standardized values obtained by

subtracting expected frequencies from observed frequencies. The probability distribution of standardized AR values approaches a normal distribution, and if the *p* value derived using the two-tailed test is 0.01, the critical AR value is 2.58. Table 3 shows that a significant difference exists between “high school and under” and “college and university” groups, implying that participants with an educational level of “high school and under” perceived direct supervisors’ style of leadership tending toward non-transformational leadership (AR = 3.3); while, the other group perceived direct superiors exhibiting transformational leadership (AR = 3.9). Although participants with an educational level of “graduate school” perceived superiors tending toward non-transformational leadership, no significant AR value appears.

**Table 3**

AR values for the variable: educational level

| Educational level      | A            | B           | Sum          |
|------------------------|--------------|-------------|--------------|
| High school and under  | 14 (6.6 %)   | 23 (18.4 %) | 37 (11.0 %)  |
| AR value               | - 3.3        | 3.3         |              |
| College and university | 152 (72.0 %) | 64 (51.2 %) | 216 (64.3 %) |
| AR value               | 3.9          | - 3.9       |              |
| Graduate school        | 45 (21.3 %)  | 38 (30.4 %) | 83 (24.7 %)  |
| AR value               | - 1.9        | - 1.9       |              |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

AR adjusted residual

## 4.2 Cross-Analyses and Chi-square Tests for Background Variables

Table 4 summarizes the results of the cross-analysis and Chi-square testing of gender and the three other demographic variables (i.e., age, educational level, and years of service). Differences in participants’ responses exist between gender and educational levels (Chi-square = 18.422; *p* = 0.002). Table 5 reveals that “female” respondents with a “high school and under” education perceived supervisors displaying non-transformational leadership (AR = 2.9).

**Table 4**

Results of cross-analysis with gender and three additional variables

| Demographic variable/perception |                        | <i>A B</i>  |             | <i>A B</i>  |             | $\chi^2(p \text{ value})$    |
|---------------------------------|------------------------|-------------|-------------|-------------|-------------|------------------------------|
|                                 |                        | Male        |             | Female      |             |                              |
| Age                             | 29 and under           | 15 (7.1 %)  | 11 (8.8 %)  | 24 (11.4 %) | 12 (9.6 %)  | 7.804 (0.350)                |
|                                 | 30–39                  | 32 (15.2 %) | 19 (15.2 %) | 42 (19.9 %) | 12 (9.6 %)  |                              |
|                                 | 40–49                  | 19 (9.0 %)  | 14 (11.2 %) | 45 (21.3 %) | 33 (26.4 %) |                              |
|                                 | 50 and older           | 17 (8.1 %)  | 10 (8.0 %)  | 17 (8.1 %)  | 14 (11.2 %) |                              |
| Educational level               | High school and under  | 5 (2.4 %)   | 7 (5.6 %)   | 9 (4.3 %)   | 16 (12.8 %) | 18.422 (0.002 <sup>*</sup> ) |
|                                 | College and university | 54 (25.6 %) | 23 (18.4 %) | 98 (46.4 %) | 41 (32.8 %) |                              |
|                                 | Graduate school        | 25 (11.8 %) | 24 (19.2 %) | 20 (9.5 %)  | 14 (11.2 %) |                              |
|                                 | 4 and under            | 29 (13.7 %) | 22 (17.6 %) | 42 (19.9 %) | 16 (12.8 %) |                              |
| Years of service                | 5 ~ 16                 | 23 (10.9 %) | 14 (11.2 %) | 49 (23.2 %) | 22 (17.6 %) | 7.610 (0.179)                |
|                                 | 17 and more            | 32 (15.2 %) | 18 (14.4 %) | 36 (17.1 %) | 33 (26.4 %) |                              |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

<sup>\*</sup>  $p < 0.01$

**Table 5**

AR values for variables of gender and educational levels

| Demographic variable/perception |                        | <i>A</i>    | <i>B</i>    | Sum          |
|---------------------------------|------------------------|-------------|-------------|--------------|
| Male                            | High school and under  | 5 (1.5 %)   | 7 (2.1 %)   | 12 (3.6 %)   |
|                                 | AR value               | − 1.5       | 1.5         |              |
|                                 | College and university | 54 (16.1 %) | 23 (6.8 %)  | 77 (22.9 %)  |
|                                 | AR value               | 1.5         | − 1.5       |              |
|                                 | Graduate school        | 25 (7.4 %)  | 24 (7.1 %)  | 49 (14.6 %)  |
|                                 | AR value               | − 1.8       | 1.8         |              |
| Female                          | High school and under  | 9 (2.7 %)   | 16 (4.8 %)  | 25 (7.4 %)   |
|                                 | AR value               | − 2.9       | 2.9         |              |
|                                 | College and university | 98 (29.2 %) | 41 (12.2 %) | 139 (41.4 %) |
|                                 | AR value               | 2.5         | − 2.5       |              |
|                                 | Graduate school        | 20 (6.0 %)  | 14 (4.2 %)  | 34 (10.1 %)  |
|                                 | AR value               | − 0.5       | 0.5         |              |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

Table 6 summarizes the results of the cross-analysis of different age groups and two additional background variables (i.e., educational level, years of service). Since the number of cells with a frequency of less than 5 exceeds 20 % of the number of all cells, the Chi-square test is not applicable (Greenwood and Nikulin 1996).

**Table 6**

Results of the cross-analysis of age and two additional variables

| Demographic<br>variable/perception |                           | <i>A</i>          | <i>B</i>          | <i>A</i>          | <i>B</i>          | <i>A</i>          | <i>B</i>          | <i>A</i>          | <i>B</i>          |
|------------------------------------|---------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                    |                           | 29 and<br>under   |                   | 30–39             |                   | 40–49             |                   | 50 and older      |                   |
| Educational<br>level               | High school<br>and under  | 1 (0.5<br>%)      | 2 (1.6<br>%)      | 2 (0.9<br>%)      | 0 (0.0<br>%)      | 5 (2.4<br>%)      | 12 (9.6<br>%)     | 6 (2.8<br>%)      | 9 (7.2<br>%)      |
|                                    | College and<br>university | 27<br>(12.8<br>%) | 14<br>(11.2<br>%) | 55<br>(26.1<br>%) | 16<br>(12.8<br>%) | 45<br>(21.3<br>%) | 22<br>(17.6<br>%) | 25<br>(11.8<br>%) | 12 (9.6<br>%)     |
|                                    | Graduate<br>school        | 11 (5.2<br>%)     | 7 (5.6<br>%)      | 17 (8.1<br>%)     | 15<br>(12.0<br>%) | 14<br>(6.6<br>%)  | 13<br>(10.4<br>%) | 3 (1.4<br>%)      | 3 (2.4<br>%)      |
|                                    | 4 and under               | 38<br>(18.0<br>%) | 23<br>(18.4<br>%) | 30<br>(14.2<br>%) | 15<br>(12.0<br>%) | 3 (0.9<br>%)      | 0 (0.0<br>%)      | 0 (0.0<br>%)      | 0 (0.0<br>%)      |
| Years of<br>service                | 5–16                      | 1 (0.5<br>%)      | 0 (0.0<br>%)      | 42<br>(19.9<br>%) | 16<br>(12.8<br>%) | 26<br>(12.3<br>%) | 18<br>(14.4<br>%) | 3 (1.4<br>%)      | 2 (1.6<br>%)      |
|                                    | 17 and more               | 0 (0.0<br>%)      | 0 (0.0<br>%)      | 1 (0.5<br>%)      | 0 (0.0<br>%)      | 36<br>(17.1<br>%) | 29<br>(23.2<br>%) | 31<br>(14.7<br>%) | 22<br>(17.6<br>%) |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

Table 7 summarizes the results of the cross-analysis of educational levels and years of service and reveals existing differences (Chi-square = 20.284;  $p = 0.009$ ). Table 8 shows that participants with an educational level of “high school and under” and years of service of “17 and over” perceived supervisors displaying non-transformational leadership (AR = 2.7).

### Table 7

Results of the cross-analysis of educational levels and years of service

| Demographic variable/perception |             | <i>A</i>              | <i>B</i>    | <i>A</i>               | <i>B</i>    | <i>A</i>        | <i>B</i>    | Chi-square value<br>( <i>p</i> value) |
|---------------------------------|-------------|-----------------------|-------------|------------------------|-------------|-----------------|-------------|---------------------------------------|
|                                 |             | High school and under |             | College and university |             | Graduate school |             |                                       |
|                                 | 4 and under | 2 (0.9 %)             | 2 (1.6 %)   | 48 (22.7 %)            | 19 (15.2 %) | 21 (10.0 %)     | 17 (13.6 %) |                                       |
| Years of service                | 5–16        | 2 (0.9 %)             | 5 (4.0 %)   | 55 (26.1 %)            | 18 (14.4 %) | 15 (7.1 %)      | 13 (10.4 %) | 20.284 (0.009 <sup>*</sup> )          |
|                                 | 17 and more | 10 (4.7 %)            | 16 (12.8 %) | 49 (23.2 %)            | 27 (21.6 %) | 9 (4.3 %)       | 8 (6.4 %)   |                                       |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

<sup>\*</sup>  $p < 0.01$

**Table 8**

AR values from the cross-analysis of educational levels and years of service



| Demographic variable/perception | <i>A</i>    | <i>B</i>    | Sum           |
|---------------------------------|-------------|-------------|---------------|
| High school and under           | 4 and under | 2 (0.6 %)   | 2 (0.6 %) 4   |
|                                 | AR value    | – 0.5       | 0.5 1.2 %     |
|                                 | 5–16        | 2 (0.6 %)   | 5 (1.5 %) 7   |
|                                 | AR value    | – 1.9       | 1.9 2.1 %     |
|                                 | 17 and more | 10 (3.0 %)  | 16 (4.8 %) 26 |
|                                 | AR value    | – 2.7       | 2.7 7.7 %     |
| College and university          | 4 and under | 48 (14.3 %) | 19 (5.7 %) 67 |
|                                 | AR value    | 1.7         | – 1.7 19.9 %  |
|                                 | 5–16        | 55 (16.4 %) | 18 (5.4 %) 73 |
|                                 | AR value    | 2.5         | – 2.5 21.7 %  |
|                                 | 17 and more | 49 (14.6 %) | 27 (8.0 %) 76 |
|                                 | AR value    | 0.3         | – 0.3 22.6 %  |
| Graduate school                 | 4 and under | 21 (6.3 %)  | 17 (5.1 %) 38 |
|                                 | AR value    | 1.0         | – 1.0 11.3 %  |
|                                 | 5–16        | 15 (7.1 %)  | 13 (3.9 %) 28 |
|                                 | AR value    | – 1.1       | 1.1 8.3 %     |
|                                 | 17 and more | 9 (2.7 %)   | 8 (2.4 %) 17  |
|                                 | AR value    | – 0.9       | 0.9 5.1 %     |

*A* refers to responses tending toward transformational leadership; *B* refers to responses tending toward non-transformational leadership

## 5 Discussions, Suggestions, and Conclusions

This study investigates the perceptions of city-level Taiwanese public servants' perceptions of direct supervisors' leadership during the process of adopting an innovative organization of e-government. Analysis results of the data obtained from participants viewing animated scenarios and responding to questions, online, reveal that participants' educational levels could significantly influence perceptions of direct superiors' leadership styles. Particularly, the participants with lower educational levels and employed for more than 17 years tended toward perceiving non-transformational leadership. This is true for most senior public servants who have long employment in governmental agencies right after receiving high school or under educations. These individuals engage in simple tasks, and thus easily perceive supervisors displaying transactional or laissez-faire styles of leadership. Recently, due to the development of e-government in Taiwan, public servants with higher levels of academic achievement have entered public service and gain empowerment from supervisors to attend to more challenging tasks, beyond routine assignments. Certainly, the supervisors, of IT-assisted areas of responsibility will assume greater duties for leading governmental activities, and thus the attendant style of leadership, as perceived by subordinates, will be different.

Overall, this study finds that city-level, e-governmental leaders gain benefit from instituting a transformational style of leadership, and are better able to change direct subordinates' values when performing assigned tasks during the process of adopting online services. For example, supervisors should interact with subordinates, actively monitor subordinates' working processes, and specifically encourage subordinates' interest in continuing education. As a result, subordinates may recognize additional capabilities, willingly commit to achieving the goals of implementing e-governmental processes, and display dedication to adoption of online services. Since subordinates with low educational levels typically receive routine assignments, little opportunity exists to interact with their supervisors. Consequently, this study suggests encouraging subordinates to participate in on-the-job training to allow increased opportunities to undertake more challenging tasks.

In addition, this study finds that a significant variance exists between male and female public servants' perceptions of styles of leadership according to levels of education. In particular, female public servants with educational levels of high school or less displayed a tendency to perceive non-transformational leadership. According to the findings, reported by Kim (2005), among public servants of Seoul, South Korea's city government, the most significant differences in satisfaction exist between males and females. In terms of salary, autonomy, and opportunities for promotion, male public servants in Seoul display greater satisfaction than female public servants. Dollar et al. (2001) also found that, in a sample of 100 countries, women employed in governmental units obtained relatively fewer opportunities for promotion. Thus, the current study suggests that leaders should attend more closely to female public servants with relatively low levels of education to ensure that both female and male public servants can jointly provide online services during implementation of e-government. Additionally, since the supervisors may not know subordinates' educational levels due to confidentiality, assigning tasks may reveal the subordinates' capabilities. Thus, this study recommends that leaders assign challenging tasks at appropriate times to subordinates, provide substantive rewards when warranted, and entrust employees with different types of tasks.

The value of completing this study lies in creating awareness among public servants in governmental units, especially e-governmental leaders or supervisors, of their roles in innovation-oriented organizations. E-governmental leaders need to accept responsibility

for these key roles in the process of adopting the innovations necessary for implementing e-governmental policies and procedures. Consequently, awareness of the impact of a style of leadership on administrative performance is essential. Future e-governmental leaders may also consider employing online leadership methods to achieve the objectives of providing e-governmental services (Berman et al. [2013](#); Brown and Gioia [2002](#); Chowdhury et al. [2006](#); Hahm et al. [2013](#); Larry [2008](#); Zhao et al. [2014](#)) similar to those multinational, profit-seeking organizations which adopt advanced technologies and systems for implementing effective policies (Bolívar et al. [2010](#); Fountain et al. [2011](#); Yiu [2012](#)). In brief, e-governmental leaders may consider employing online leadership methods to achieve the objectives of providing services. Finally, future studies may further explore differences in perceptions of direct supervisors' leadership among personnel employed in Eastern and Western governments.

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