



**A STUDY ON THE RELATIONSHIP BETWEEN WORK
CHARACTERISTICS AND EMPLOYEE INNOVATIVENESS: A CASE
OF BORDER MANAGEMENT ORGANIZATIONS IN TAIWAN'S
INTERNATIONAL HARBORS**

Jung-Yao Hung¹ and Rui-Hsin Kao^{2*}

Assistant Professor, Department of Supply Chain Management, National Kaohsiung Marine University No.142, Haijhuang Rd., Nanzih Dist., Kaohsiung City 81157, Taiwan.

Associate Professor, Department of Ocean and Border Governance, National Quemoy University, 1University Rd Jinning Township, Kinmen 892 Taiwan (R.O.C).

Corresponding Author:- **Rui-Hsin Kao**

E-mail: toptop074@yahoo.com.tw

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ABSTRACT

The present study, a cross-level study, used Taiwan's frontline immigration officers as the study subjects and examined the innovativeness of immigration officers from the knowledge-oriented and socially-oriented aspects and inspected the effect of self-efficacy on the association between knowledge characteristics (KCs; knowledge characteristic, KC) and innovativeness. This study also explored the cross-level, direct and indirect effects of social characteristics (SCs; social characteristic, SC) and collective efficacy on the self-efficacy and innovativeness of immigration officer. In this study, a total of 231 questionnaires were collected. The results of this study showed that at the group level, SCs have positive effect on collective efficacy and at the individual level, KCs have positive effects on self-efficacy and employee innovativeness. Moreover, self-efficacy has positive effects on innovativeness and exerted a mediating effect between KCs and innovativeness. Lastly, SCs and collective efficacy showed a cross-level contextual effect on self-efficacy and innovativeness.

INTRODUCTION

In the 2015 World Competitiveness Yearbook (WCY), published by the International Institute for Management Development of Switzerland, Taiwan was ranked eleventh (11) among the 61 countries assessed. Even though the ranking of Taiwan improved in economic performance, government efficacy, business efficacy, and infrastructures, these four major WCY indices jumped from 12th in 2014 to 9th in 2015. However, in government efficacy, it was still behind several other Asian countries or districts, like Hong Kong (No. 2) and Singapore (No. 3). Hence, Taiwan has to work on her government efficacy.

Studies have shown that innovativeness is critical for organizational efficacy, while having employee willing to implement organizational innovative measures is even

more critical for organizational success [1]. For government departments, the main force driving innovation is the fast change in the natural and social environment, such as climate changes and the public's expectation for government departments to provide quality services. To deal with the current conditions, government departments need to employ more integrative innovative service procedures and measures [2]. The National Immigration Agency (NIA) is a government department responsible for border management and immigration counseling, and therefore, NIA employees have to interact with travelers entering or leaving Taiwan and new immigrants. According to the interactive theory, Gronroos [3] pointed out that service efficacy is about employees



and customers sharing and creating experiences during service. Therefore, the frontline immigration officer, who has to interact with the public frequently, needs to be willing to accept organizational innovation and implement innovative measures in order to meet the public's expectation on government services. As a result, an immigration officer who is responsible for border management was chosen to be the research subject.

Innovativeness is the degree by which employees are willing to accept organizational innovation and implement innovative measures. A key question here is how should the government encourage innovativeness in immigration officers? At the individual level, the researchers of this study considered that in order to help immigration officers accept organizational innovation and implement innovative measures, it is important to consider the work content and characteristics of border management. Conventionally, the most important contribution made by the work design model (WDM) is the demonstration of the motivational power of work characteristics, which could enhance the employee's feeling, thereby improving their performance [4-5]. As a result, if organization members could recognize their value and demonstrate their specialties, they will not only gain a sense of satisfaction from the work, but also identify with the organization, become more interested in their work and willing to work for the organization and improve their work performance [6-7]. Morgeson and Humphrey [8] proposed a more comprehensive WDM and developed a work design questionnaire (WDQ) covering different work dimensions, including task characteristics, KCs, SCs, and contextual characteristics; which are the four types of work characteristics. According to the connotation of work characteristics, WDQ is beneficial for researchers to take a broader perspective when exploring impacts from work characteristics on work performance [5], while KCs can be applied to reflect the level, the assorted knowledge, skills or abilities required at work and to determine if an individual is capable of carrying out or completing a task from this highly differentiated, specialized, knowledge and technology concentrated era [9].

According to Morgeson and Humphrey [8], for Taiwan's NIA, its work design contains many KC aspects. For example, the work content of border management at harbors comprises (1) passport check, which involves identifying the authentication of documents and identity of travelers and (2) interviewing travelers entering Taiwan for the purpose of getting married and this task involves identifying the authenticity of the marriage. To perform the work successfully, the employee has to possess and use various types of knowledge, skills, and professional abilities. In this case, the government should work on designing work characteristics of immigration officers to improve their innovativeness based on technological diversity, information processing, and specialization of KCs. Apart from the relationship between KCs and innovativeness, it can be found from relevant studies that

work characteristics also affect behavior through the mediating effect of psychological factors (such as internal motivation and self-efficacy) [10-11]. Many work design studies [12] pointed out that when employees are highly confident about attaining their work goals, their work performance improves. Since innovation is a unique kind of thought or act, in order for innovation to be accepted or implemented, it is important to have both a robust motivation and strong faith in completing the innovation task. In addition, numerous relevant studies on innovativeness [13-14] also stressed that people with high work motivation and confidence have higher innovativeness. Therefore, self-efficacy may stimulate the innovator to have faith in completing an innovative task through motivation and this faith is a critical factor in enhancing innovativeness in employees.

As a result, innovation for both public and private organizations is a crucial foundation for enhancing service performance and assuring the organization's survival. Nonetheless, the researchers of this study have found from the literature that few innovation studies had examined innovation in border management from the aspect of work design. Moreover, only a small number of scholars so far had explored the impact of self-efficacy on enhancing the innovativeness of immigration officers. Therefore, the researchers of this study would like to discuss the association between KCs, self-efficacy, and innovativeness of immigration officers from an individual level to bridge the gap and provide suggestions for the immigration department's dissemination of innovation.

For the group level, the work design concept has gradually shifted from job position-based job design to the overall operation-based work design to cover both the external environmental and contextual factors [15], so as to accommodate the focus of flexibility by the present managerial trend. Morgeson and Humphrey [8] proposed the concept of extended WDM (EWDM) and developed the so-called WDQ that covers various work dimensions. Apart from assessing conventional motivation-oriented work design elements, EWDM can also be applied to evaluate the background characteristics of work. Although EWDM provides a broader scope of work content, it does not include organizational or contextual impacts, the two fundamental issues of organizational studies, which must be put into consideration. Torraco [11] pointed out that employee work behavior and outcome evaluation should be multidimensional and work design has to be constructed based on all levels, ranging from the individual and departmental to group or even organization level, in order to meet the contemporary organization operation. If the individual is the minimum unit of work, then the social contextual effect will be greater than that of the departmental, group, or organizational level. All members of the same department or organization will be affected by the environmental design and respond in consistent actions. However, the work content of individual members may differ as knowledge or mission characteristics vary.



This formed a cross-level work design theory model. That is, at the overall level, they are the characteristics of environmental context and social relations of the organization and at the individual level; they are the operational characteristics of individual members of the organization [5].

When constructing a cross-level WDM, researchers do not only have to consider cross-level emphasis, but also need to consider the individual-level mediating and the cross-level moderating effects among the variables. Moreover, it is also necessary to employ an appropriate strategy for the analysis. According to the work characteristic issue discussed in this study, positive experience accumulation will improve an individual's task completing self-efficacy, because positive work characteristics effectively enhance organization members' attitude, behavior, and work outcomes [16]. As a result, self-efficacy is a very suitable mediating variable of the study. From the cross-level organizational characteristics, a very important phenomenon can be observed from the hierarchical data analysis and that the lower-level variables can generate higher-level variables of the same measurements through aggregation and these high-level variables are the so-called contextual variables [17]. The assessment of immigration officer's innovativeness is important, because whether immigration officers of Taiwan's International Harbors accept organizational innovation and are willing to implement innovative measures, are critical factors determining whether NIA can perform border management authentically and meet public needs. Furthermore, at the group level, self-efficacy is affected by collective efficacy, which is about whether the members of a group have confidence in the group's ability in organizing, implementing, and achieving tasks assigned to the group [16]. When performing a group task, the group is driven by interactions of knowledge and skills of its members [18]. From the social cognitive perspective, human behavior is affected by both individual and contextual factors and group is a key contextual factor influencing individual group members [19]. Therefore, collective efficacy will also affect an individual's confidence in completing the task, that is, self-efficacy. In addition, an individual's innovativeness may be affected by the group members' great confidence in the group's task completion ability or sense of belonging. As a result, the author expanded the self-efficacy concept to the concept of collective efficacy [16] and considered that above personal efficacy, there is collective faith, which is a belief that an organization or group possesses the task completion ability and such faith generates a positive, cross-level effect on each immigration officer's innovativeness.

In addition, from the characteristics of organizational studies, since they often involve organization-individual interaction, there is a high correlation among individuals at the same overall level. Also, the data between individuals and overall levels is nested, clustered, and embedded [20].

As a result of this additional relationship, influenced by organizational culture and climate, employees in the same company or members in the same team carry similar personality, that is, organization-specific [4]. Hence, when studying the organizational attitude or behavior of employees at a single level, it is possible that the conclusion drawn at one level will become the inference at another level and inter-variable relationship will become stronger or weaker and even change the defects among variables [21]. For this reason, cross-level analysis prevents the existing defects at a level and presents the fuller feature of organizational context [22].

To NIA's border management executing organizations, as employees are embedded in the department (immigration officers are members of a brigade) which in turn is embedded in the organization (for example, the Kaohsiung Airport Border Affairs Brigade is a sub-unit of the Border Affairs Corps), the inter-variable relationship involves a hierarchical structure. Since the subject of this research presents the characteristics of a cross-level organization, researchers must consider the need for cross-level hierarchy data. Therefore, in this research, social work characteristics (SWCs) and collective efficacy were treated as a group-level variable to investigate its effect on the individual level innovativeness of immigration officers, so as to compensate for the openings in past cross-level studies.

The study, which is a multi-level model analysis, treated an individual's self-efficacy as a mediating variable and used SCs and collective efficacy as cross-level direct and indirect variables to examine the various knowledge-oriented and social-oriented dimensions of the work design model on an individual's innovativeness.

Literature review and hypotheses development

Extended work design model

In expanding the work design theories and viewpoints, Morgeson and Humphrey [8] proposed EWDM, which encompasses task characteristics (TCs), KCs, SCs, and contextual characteristics (CCs). Morgeson and Humphrey [8] also developed a WDQ scale of 21 factors and in this scale, KCs denote critical knowledge, techniques, or abilities required to complete a task. From the literature, Morgeson and Humphrey [8] also summarized five key KC evaluation indicators: job complexity, information processing, problem-solving, skill variety, and specialization. As for SCs, they are used to assess the strength of an individual's association to other people, because of the work that the individual is engaged in. In a work environment with sophisticated and highly specialized work division, the completion of a work assignment often requires group operation and interpersonal cooperation. As a result, SCs also affect an individual's implementation of work. Some common SCs are social support, interdependence, interaction outside the organization. Feedback from others and interdependence can be divided into initiated interdependence and received



interdependence. In short, EWDM and WDQ do not only assess the job design model of Hackman and Oldham [23], but also evaluate the social and contextual factors of work [4]. Therefore, the present study used WDQ to evaluate the work characteristic model.

Hierarchical variation in motivational characteristics and SCs

According to the WDQ content, TC (task variety) and KC (kill variety) are relatively overlapped both in terms of concepts and measurements. For example, the variety factor of TC and KC means are similar and can both be viewed as a motivational work characteristic and individual difference at the individual level [4]. KCs reflect the level of various knowledge, skills, or professional abilities required by employees to complete the work. Also, the work design of the border management organization of international harbors contains numerous KC factors, such as the knowledge, skills, and professional abilities required by employee to carry out and complete passport inspection, document validation, and the interview of new immigrants. Therefore, this study used KC to assess the motivational work characteristics of immigration officers.

On the other hand, SC and CC, which are the two dimensions measured by WDQ, are different from the two aforementioned motivational factors. Empirical data also showed that these two work characteristics are forecasting outcome variables that are significantly different from those by TC or KC. Taking SC in an organization work context as an example, social support, work interdependence, and feedbacks from others are a type of interpersonal context rather than a critical factor that directly affects an individual's work performance. Nevertheless, interpersonal context would affect group behavior and performance by establishing the so-called collective mental pattern (e.g., cohesion, sense of trust, or collective efficacy) [24]. Therefore, in a group-oriented work environment, SC reflects the positive interpersonal context perceived by an individual at the workplace. A stronger SC denotes more influence from the positive support from the work environment (or the group background) of the individual. Hsieh et al. [5] discovered that this collective interpersonal contextual effect can be demonstrated by the positive collective efficacy association of the group.

Since the subject of this research consists of a group, to ensure that the contextual effect of SWCs can be measured, this research eliminated the effect outside the organization as practiced by Hsieh [5] and others and expressed the SWCs perceived by individuals with factors within the organization. Thereafter, from the data analysis point of view, although SWCs can be treated as individually different variables at the individual level, but as a compiled organizational or group construct, it does not emphasize member consistency and consensus and it is an ideal contextual variable [25-26].

This research defined SWCs as a group variable. That is to say, the construct's existence (such as collective efficacy) is reflected by means of compilation with the average value of the possible dissensus concepts, individually perceived by organizational members [27]. The SWCs investigated in this research fulfilled this characteristic. In actual analysis, this research defined SWCs by means of compilation to examine their effect on both group and individual variables.

Hypotheses development

Mediating variables in the work-design model

In an organizational environment, an individual is not only affected by personal factors, but also by departmental/group factors or organizational factors. Under a multi-level research framework, the overall behavior demonstrated is based on the work context and social conditions of an organization and these in turn affect the overall organizational/group perception followed by the performance of the group/organizational and the individual levels [28]. Therefore, at the group level, SCs may affect collective efficacy and relevant studies [5], that also discovered this possibility. On the other hand, group-level behavior may originate from job design induced internal motivation of employee and improves an individual's behavior and performance by increasing the work responsibility, implications, and feedbacks [23].

This behavior may be involved in work meaningfulness, responsibility, feedbacks, and other psychological conditions and can be viewed as a crucial component for building organization members' self-confidence and personal value. Self-efficacy plays a critical role in affecting personal intention, behavior, and performance. Also, the effect of how an employee interprets success is far more potent than that of success itself, self-efficacy is a more reliable indicator forecasting an individual's future intention or behavior [23]. As a result, people's viewpoints of their own ability would influence the self-regulation system affecting their success, performance, and continuous motivation and this system in turn would affect their behavior and performance [29]. As mentioned earlier, KC is important for self-efficacy, while self-efficacy functions as a mediating motivation system between KC and personal intention. For example, Huang and Huang [8] and Hsieh et al. [5] empirically demonstrated that self-efficacy is a mediating variable between work characteristics and personal innovativeness (organizational citizenship behavior or performance). Taken together, two hypotheses of different levels were developed.

H1: SWCs positively affect collective efficacy (H1)

H2: KCs positively affect self-efficacy (H2a) and self-efficacy also positively affects individual level service-oriented OCBs (H2b); at the same time, KCs positively affect individual level innovativeness by mediating the effect of self-efficacy (H2c).



Cross-level effect of work characteristics

Raudenbush and Bryk [20] pointed out that under a multi-level organizational structure, group-level variables affect the individual-level outcome variables. Therefore, SC not only affects collective efficacy, but also affects individual-level self-efficacy. Moreover, SC may also affect the expression of innovativeness by employees.

In this study, SC was defined as a group/department-level variable instead of the conventionally defined individual-level variable. Therefore, in this case, SC was a contextual variable [17]. From a statistical point of view, a contextual variable is the average of low-level variables at the high level and the effect of a contextual variable is actually the impact from such an average on the examined intercept or slope [25-26]. Previous studies demonstrated that interpersonal relationship stimulates employee's work motivation [30] and enhances the meaningfulness of work. These studies also demonstrated positive behavioral results [31]. Therefore, for group research and group work analysis, social factors are indispensable variables [32-33], and in this study, two hypotheses on the cross-level direct effects were tested.

- H3a: SWCs positively affect individual level self-efficacy.
- H3b: SWCs positively affect individual level innovativeness.

Bandura [5] pointed out from the viewpoint of social learning theories that people's collective efficacy affects their cognition on how much efforts they should put in and the decision of whether they should persist, when results of group effort does not meet their expectation. From a different perspective, social cognitive theory expounded that three factors, personal, behavioral, and environmental factors, interact to further determine the behavior of an individual. The norms, binding power, consensus, and friendship formed by collective efficacy also create an atmosphere that influences the performance of the individuals of a group [5].

Collective efficacy originates from self-efficacy. From the connotation, collective efficacy can be seen as the intensity of the belief that employees in a group can sense that they can solve problems and improve life through joint efforts [16]. It is a collective believe in a group or an organization that they can achieve certain tasks [34]. Therefore, collective efficacy can be seen as an environmental factor. When members of a group have higher sense of collective efficacy, members of the group will work hard to achieve the goals, which in turn increases the sense of effectiveness for the individuals [35]. The social cognitive theory also thinks that an individual's perception toward his own and the group's abilities also affect his behaviors and behaviors of employees are restricted by the group norms developed from the belief of collective efficacy [36]. Therefore, when an employee's behaviors are inconsistent with the belief shared by the group, the group members will sanction the employee. Such power generated from the norms that affects the

belief of collective efficacy is the factor of social persuasion discussed in the social cognitive theory. This explains why employees' collective efficacy affects the sense of self-efficacy in individuals, as well as their behaviors. As mentioned earlier, collective efficacy also affects an individual's innovativeness. From a theoretical perspective, the nature of collective efficacy, according to Bandura [12], is a group's collective belief that affects people's performance by influencing their behavior and contributions. In this study, it was treated as a group-level variable. In addition, collective efficacy is also the outcome of the interaction of group members in a dynamic process and therefore, it affects the group members in terms of what the group should do and how much effort should be put in. According to the social cognitive perspective, collective efficacy is a critical context affecting each group member [19]. As a result, collective efficacy would also influence an individual's belief in completing a task, that is, self-efficacy. Meanwhile, an individual's innovativeness may be influenced by a strong belief in completing a group task or a sense of group belonging of the members and therefore, the following two hypotheses of cross-level direct effects were tested.

- H4a: Collective efficacy positively affects individual level self-efficacy.
- H4b: Collective efficacy affects individual level innovativeness.

Cross-level moderation of work characteristics

There is an important hypothesis in cross-level analysis: apart from affecting individual level variables, group level variables can possibly affect the explanation of individual level variables on outcome variables, that is, the cross-level interaction [17]. In terms of statistical techniques, group level variables play the role of moderators affecting the explanatory power (slope effect) of individual variables on outcome variables [20].

The study examined the effect of work design on self-efficacy and innovativeness under a multi-level model. Apart from treating self-efficacy as a mediating variable, the researchers also thought that the group-level contextual variables may also exert some cross-level moderating effect on the individual-level variables and influences. That is, the group-level and the individual-level explanatory variables may act together on the outcome variables by generating a cross-level interaction.

The multi-level analysis principle and hypothesized association are presented below: SWCs and collective efficacy (expressed by Z1 and Z2) does not only directly affect individual innovativeness (Y), but also possibly produce interaction with individual level KCs and self-efficacy (expressed in X1 and X2) to affect individual level innovativeness. Their relationships are expressed in the following mixed equation:

$$Y_{ij} = \gamma_{00} + \gamma_{10} X_{ij} + \gamma_{01} Z_j + \gamma_{11} Z_j X_{ij} + u_{0j} + u_{1j} X_{ij} + \varepsilon_{ij}$$



In the above equation, γ_{10} is the influence (slope) of KCs or self-efficacy, γ_{01} is the influence (slope) of SCs or collective efficacy, and γ_{11} is the slope of Z^*X , reflecting the strength of the effect on individual SCs (or collective efficacy) and KCs (or self-efficacy) together. That is, it is the slope of the explanation of variables on the second level of the slope on the first level. Referring to the design of this research, SCs ($Z1$) and KCs ($X1$) (or self-efficacy) together can cause two types of cross-level interaction, that is, $Z1*X1$ and $Z1*X2$, on individual level self-efficacy and innovativeness, while collective efficacy ($Z2$) and self-efficacy together can bring mutual effect on individual level innovativeness, that is, $Z2*X2$, thus enabling the development of three cross-level moderating effect hypotheses:

H5a: SCs and KCs have an interactive effect on self-efficacy.

H5b: SCs and self-efficacy have an interactive effect on individual service innovativeness.

H6: Collective efficacy and self-efficacy have an interactive effect on individual innovativeness.

METHOD

Research framework

Following the literature review and hypotheses, the analysis of the present study is presented with the following four sections: 1) individual-level causes and effects as well as mediating effects; 2) group-level causes and effects as well as mediating effects (SCs → collective efficacy); 3) cross-level effects (SCs → self-efficacy; SCs → individual-level innovativeness; CE → self-efficacy; CE → individual-level innovativeness); and 4) cross-level moderating effects (SCs and KCs → self-efficacy; SCs and self-efficacy → individual-level innovativeness; collective efficacy and self-efficacy → individual-level innovativeness). The research framework is presented in Figure 1.

Analytical strategy

This research adopted cross-level analysis. Apart from aggregating contextual variables, mediating and moderating effects must be examined progressively. Hierarchical linear modeling (HLM) is a statistical technique suitable for investigating cross-level interaction. The analysis strategy of this research included: first, confirmatory factor analysis (CFA) was applied to verify if SCs, KCs, self-efficacy, collective efficacy, and innovativeness were measurable independent constructs. Next, structural equation modeling (SEM) was applied to estimate if self-efficacy had mediating effect in the correlation between KCs and individual innovativeness. Then, to measure the characteristics of group level variables (SCs and collective efficacy), this research measured intraclass consistency with r_{wg} proposed by [28],

that is, the measurement of the perception consistency on various research variables in different members of the same unit (e.g., a harbor border affairs brigade). Lastly, interclass difference was measured with eta-squared (η^2) in ANOVA and the intraclass correlation coefficient (ICC) in HLM, to verify the variation of organizational level characteristics.

Sampling

This research selected the harbor border affairs brigades (or branches) of the Border Affairs Corps of Taiwan NIA as the research unit, with frontline immigration officers as the research sample. Since the work content of immigration officers includes document examination and identity verification of inbound and outbound travelers and the interview of foreign spouses on their first entry, to ensure the reliability of the team level data and good data quality, the following restrictions were imposed on sample selection: (1) the service length of each frontline immigration officer must be three months or more to ensure a better understanding of the scope and content of the work; (2) at least ten members were selected from each border affair brigade and each member was a frontline immigration officer; and (3) to ensure team number expansion and balance regional and job characteristics, samples were selected from the 16 harbor border affairs brigades (or branches) of the Border Affairs Corps of Taiwan NIA.

Research variables and measuring approaches

The variables examined in this study were divided into three types: the individual-level, group-level, and control variables. Each type is as discussed below.

Self-efficacy and collective efficacy

The self-efficacy scale was modified with reference to the “Personal Efficacy Belief Scale” developed by Riggs et al. [37]. The self-efficacy scale contained ten five-point Likert scale (where 1 for strongly disagree through 5 strongly agree). Collective efficacy is the sense of organizational or team efficacy measured based on the perceived efficacy in implementing a task or mission of the team or organization to which an individual belongs in the same environmental context. The collective efficacy score was modified with reference to the “Collective Efficacy Belief Scale” developed by Riggs et al. [37]. The scale contained seven five-point Likert scales. Huang and Huang[38] applied both scales developed by Riggs et al. [37] in the research team study, whose reliability coefficient was 0.76 (self-efficacy) and 0.84 (collective efficacy), respectively. Two independent factors were obtained from the exploratory factor analysis and factor validity was good [5].

Work characteristics (KCs and SCs)

To measure the work characteristics, the study chose the WDQ developed by Morgeson and Humphrey



[8], but because of the analysis strategy of the multi-level model, it was necessary to keep down the number of variables. Moreover, considering the work characteristics of the subjects of this study, the researchers of this study chose KC for assessing the robustness of individual member's motivational work characteristics. This measure also cut down the number of test questions to facilitate the multi-level analysis [5]. KC questions cover five dimensions: job complexity, information processing, problem-solving, skill variety, and specialization; each dimension had four questions. Four subscales were used to assess SC, namely: social support, interdependence, interaction outside the organization, and feedback from others. The SC score was generated by totaling the scores of these four subscales. The score of each group member was more than that processed by the multi-level collective composition model to obtain the group average, which was also the group-level SC score. The level of between-group variation was assessed by the interclass coefficient (ICC1) and this research defined this variable by compiling the overall variable, without considering the opinion consistency among members, that is, ICC (2) was disregarded [39].

Likert-type 5-point scale was used for questions in WDQ (1 being "strongly disagree," and 5 being "strongly agree"). The subscale reliability and validity were verified using the Morgeson and Humphrey [8] test, in which an ideal model fit was obtained for confirmatory factor analysis in terms of factor validity. Internal consistency reliabilities (Cronbach's α coefficient) were all above 0.80, while the r_{wg} coefficient between work groups ranged between 0.68 and 0.92 [5]. All relevant constructs were in line with theoretical expectations, and there was an adequate level of reliability and validity.

Innovativeness

Innovativeness was an individual-level dependent variable for assessing the immigration officer's level of innovativeness for the organization's new measures and it is helpful in understanding frontline immigration officer's willingness for change, problem-solving, and creativity. In this study, innovativeness was assessed using the innovativeness scale developed by Hurt et al. [40] with some modification for the characteristics of Taiwan's NIA. In total, there were 20 questions.

Control variables

As this research analyzed variables at individual and group levels, intervening variables may exist in both levels. At the individual level, past studies indicated that the service length of an individual in a group may affect interpersonal interaction and employee behavior [5]. This research thus included the service length of members of border affairs brigades as a control variable. In addition, as the age and education attainment of members of border affairs brigades may also affect analysis data [21], both items were treated as variables in this research. At the team

level, past studies indicated that team scale is crucial to operate and the greater the scale, the greater the heterogeneity [41] and its effect on service-oriented OCB also intensifies [42]. This research thus treated the scale of each unit under border affairs brigades as a control variable. In fact, the control variables at both individual and team levels used in this research have been generally used by many other researchers.

RESULTS

Basic analysis

Of the 231 responses collected, 204 were valid from 160 males and 44 females. The respondent gender structure was closed to the employee gender structure of Taiwan NIA. Most or 48% of respondents had one degree and 39.1% graduated from the Taiwan Police College. In addition, the average service length in immigration work and respective units of respondents was 8.38 and 6.26 years, respectively and the average number of members was 21.01 people/unit. Most respondents were transferred from the police and began engaging in immigration work when they were in the force. Also, most of them had worked at the same NIA unit (such as the same brigade) for a longer time after their transfer. Therefore, the survey of this research can better reflect the current status of NIA's border management work.

To test whether KCs, SCs, collective efficacy, self-efficacy, and innovativeness are different underlying constructs, this study used the LISREL maximum likelihood to compare them in a CFA. Table 1 shows indicators in the CFA. The observed values of the study variables presented in Table 1 have revealed that there are five different underlying constructs. Table 2 shows the mean, standard deviation, and α coefficient of each variable in this study, as well as the relevant coefficients between variables. It can be found from Table 2 that the reliabilities of all the study variables are greater than 0.8 and also, there is a positive correlation among majority of the variables. In addition, this study used statistical software SPSS for Windows 22.0 for HLM analysis [5].

Testing of aggregated data

Regarding aggregation data examinations, James [43] recommended examining member score consistency with intraclass correlations (ICCs), where ICC (1) reflected that the score of members in the same team was consistent. The ICC (1) of SCs was 0.19 and collective efficacy was 0.21. According to Bliese [27], the criteria for ICC (1) were 0.05 to 0.30. Therefore, ICC (1) is significant. In addition, the group effect F-value of SWCs, collective efficacy, and service-oriented OCB is also significant (SCs $\eta^2=0.437$, $F=6.25$, $p<0.001$; collective efficacy $\eta^2=0.359$, $F=4.47$, $p<0.001$).

To further prove the suitability of aggregation, this research also calculated the r_{wg} average of SCs and collective efficacy: 0.79 and 0.83. The r_{wg} of all three variables complied with the 0.70 criterion recommended



by James et al. [44]. These aggregate statistics suggested that this research could implement group level study by aggregating individual level data.

Hypothesis testing

Hierarchical regression analysis

This research examined group level hypotheses and the effect of control variables on both individual level and group level variables with hierarchical regression analysis (HRA). From the results shown in Table 3, it is clear that the effect of SWCs in model 2 is significant ($\beta=0.416$, $p<0.001$). After adjustment, $R^2=0.284$ and F-value ($p<0.001$) is significant, suggesting that group level SCs have strong explanatory power on collective efficacy; hence, H1 is supported. Also, in group level control variables, Table 3 shows that the effect of team scale on collective efficacy is insignificant. In individual level control variables, Table 3 shows that age positively affects individual innovativeness.

Test results from structural equation modeling

This research examined the overall fitness of individual level hypotheses and the correlation among variables with the statistics software LISREL 8.71. The results showed that the overall fitness of individual level hypotheses is good ($\chi^2/df = 2.93$, GFI = 0.94, NNFI = 0.92, PGFI = 0.68, RMSEA = 0.044). In addition, as shown in the path coefficient of research variables, the correlation between KCs and self-efficacy ($\gamma = 0.41$; $t = 3.67$, $p<0.001$) and between self-efficacy and innovativeness ($\gamma = 0.31$; $t = 2.33$, $p<0.05$) is significant; except for KCs and innovativeness ($\gamma = 0.12$; $t = 0.71$, $p>0.05$) whose correlation is insignificant.

Therefore, H2a and H2b are supported. To test the mediating effect of self-efficacy, this research examined the correlation between TOWCs and service-oriented OCB before SEM implementation. Table 1 shows that their correlation was significant ($\gamma = 0.205$, $p<0.05$) and became insignificant ($\gamma = 0.06$; $t = 0.88$, $p>0.05$) after SEM implementation. According to Kenny et al. (1998), self-efficacy has a complete mediating effect on the correlation between KCs and innovativeness. In addition, as the product of the path coefficients from KCs to self-efficacy and from self-efficacy to innovativeness is 12.71 (0.41×0.31); this suggests that the mediating effect on the correlation between KCs and innovativeness is 12.71%. Therefore, H2c is supported.

Hierarchical linear model testing

The Null Mode

To test if the correlation between individual and group variables and innovativeness of immigration officers is significant, this research constructed a HLM null model for the explanatory variable to verify if there are significant differences among border affairs brigades (branches). As shown in Table 4, the variance significance among groups is above zero ($\tau_{00}=0.095$, $df=15$, Wald $Z=3.013$, $p<0.01$),

suggesting that the employee innovativeness of individual border affairs brigades (branches) is different.

Context Effects (Intercepts-as-Outcomes Models):

To explain the intercept variance at level 1, this research tested self-efficacy and individual innovativeness with HLM's intercepts-as-outcomes models, with group level SCs and collective efficacy as the explanatory variables at level 2. H3a, H3b, H4a, and H4b predict that group level SCs and collective efficacy will positively affect individual level self-efficacy and innovativeness. Parameter γ_{01} was applied to estimate significance and test if group level variables have contextual effect on group level variables. From Table 4, it is clear that SCs have cross-level effect on self-efficacy ($\gamma_{01}=0.381$, $SE=0.135$, $t=2.35$, $p<0.05$) and innovativeness ($\gamma_{01}=0.459$, $SE=0.192$, $t=3.51$, $p<0.001$); collective efficacy has cross-level effect on self-efficacy ($\gamma_{01}=0.363$, $SE=0.127$, $t=2.01$, $p<0.05$) and individuals' innovativeness ($\gamma_{01}=0.471$, $SE=0.144$, $t=3.65$, $p<0.001$). Therefore, H3a, H3b, H4a, and H4b are supported. Contextual effect shows that under a multi-level organization framework, group level variables will affect individual level outcome variables, that is, the difference in SCs and collective efficacy perception among groups also affects self-efficacy and individuals' innovativeness.

Moderating Effects (Slopes-as-Outcomes Model):

This research examined H5a, H5b, and H6 with the slopes-as-outcomes model. From the results shown in Table 4, the slope of SCs between KCs and self-efficacy is not insignificant ($\gamma_{11}=0.021$; $t=0.132$, $p>0.05$). In addition, SC was also insignificant for the slope between self-efficacy and innovativeness ($\gamma_{11}=-0.101$; $t=-0.096$, $p>0.05$). Therefore, hypotheses 5a and 5b were supported. In addition, the slope of collective efficacy between self-efficacy and individuals' innovativeness is insignificant ($\gamma_{11}=0.277$; $t=2.09$, $p<0.05$); therefore, H5c is supported. This result suggests that group level explanatory variable collective efficacy has significant effect on the individual level of self-efficacy and innovativeness.

DISCUSSION AND CONCLUSION

The objective of this study was to explore the nature of relationship between work characteristics, self-efficacy, collective efficacy, and innovativeness of the border management organizations of the international harbors of Taiwan. The researchers of the study also used the HLM to analyze if the group-level SCs and collective efficacy have a cross-level contextual and moderating effect on the individual-level variables. The study results showed that the cross-level effect of group-level variables on the KCs, self-efficacy, and innovativeness of the frontline immigration officer can be significant. It was found that the present findings are consistent with the findings of previous studies [28]. Hence, the KCs of Taiwan NIA have a motivating power that allows immigration officers to possess more knowledge, skills, or abilities required for



completing the tasks and thereby improve their confidence in and feeling about completing the tasks. Moreover, the richness, significance, and challenging nature of the tasks, prompt the immigration officer to accept the organization's innovative ideas that are novel and result in breakthrough. This finding revealed that an organization's KCs and interpersonal, as well as social context may have a profound impact on an individual's self-efficacy and innovativeness. Therefore, to enhance the self-efficacy of immigration officers and encourage the acceptance of organizational innovation and to be more willing to implement innovative measures, Taiwan's NIA should create a good working environment and increase their sense of responsibility and implications of work, as well as provide more work-related feedbacks to allow the frontline immigration officers to receive support and approval from others at work and to complete their works with help from their colleagues. These are important because they enable an individual to have confidence in completing individual as well as organizational tasks, thereby enhancing their innovativeness.

On the other hand, even though collective efficacy was found to have a moderating effect on the individual-level variables, no moderating effect was found from SCs on individual-level variables, and the latter was the opposite of not only the researchers' initial hypothesis, but also the multi-level analysis principle of the cross-level interaction of the group-level variable [20]. This finding shows that the impact on employee innovativeness from collective efficacy and self-efficacy was greater than the impact from the group-level SCs and this phenomenon may be due to the following reasons. (1) High work specialty of immigration officer: According to the border administration work characteristics of Taiwan's NIA, the education background of the research participants and the finding of the present study, there is a strong correlation (0.466) between self-efficacy and innovativeness. The researchers considered that the immigration officer's self-efficacy may play a critical role on the immigration officer's innovativeness; it does not only directly affect and moderate innovativeness, but also influences innovativeness by interacting with collective efficacy. The researchers of this study considered that because immigration officers of international harbors are highly specialized, they usually need to have a clear knowledge body, receive high education, and have autonomy at work [45]. As a result, they may have more confidence in completing their tasks. (2) As mentioned earlier, collective efficacy is a type of work environment context and when the members implement their group tasks, the power driving the group is mainly from the knowledge and skill interaction among the members. The great confidence of members in their group in completing the tasks or have a strong sense of belonging can affect their personal innovativeness. Therefore, among the group-level variables, the collective efficacy of group task completion has a greater cross-level moderating effect than the

interpersonal context-oriented SCs on personal innovativeness. (3) Collective efficacy is confidence shared within the group members and it can affect the members' perception on what the group should do and how much effort should be invested. It also indirectly affects an individual's acceptance level of group innovation and the willingness for implementing novel measures. Therefore, the effect of collective efficacy on the group-level variables is not only direct and cross-level, but also indirect and cross-level.

Theoretical and practical implications

This study showed that HLM has two advantages in the analysis and interpretation of multi-level border management organizations. First, in terms of the evaluation of the cross-level and direct contextual effect and the indirect cross-level effect of the group-level variables, HLM is a robust and potent method of measurement. Secondly, the use of HLM statistical analysis enables the researchers to identify and verify the various sources of the variance, enabling the study to interpret the multi-level type of data and better understand the various attitude and behavior of the frontline immigration officer of border management organizations of Taiwan's International Harbors in the multi-level organization.

In contrast to the theoretical implications, the study also showed the critical value in practice. First, appropriate work design enables employees to comprehend and adapt to their work condition, provides them with feedbacks from work, and boosts their confidence to help them have faith in organizational reform and willingly accept the implementation of organizational innovation. Secondly, the administrative department can vertically extend the employees' work content, such as enriching and specializing their work content, to boost their sense of responsibility and honor and to help them better understand the meaning of their work to increase work KCs, thereby enhancing their confidence in completing the work and innovativeness. Third, the border management organizations require smooth information processing procedure to enable them handle, analyze, and monitor the information at work. Fourth, the border management organizations should provide immigration officers with job training and enhance their work related skills and expertise, in order to improve their problem-solving ability and strengthen their capacity to implement measures of organizational innovation.

Lastly, in contrast to self-efficacy, immigration officers need to have the collective efficacy improved, because in the work design of a border management organization, the completion of tasks relies heavily on intense collaboration. By so doing, they can recognize their mission in completing the group tasks and gain confidence in completing the tasks. Moreover, the group member will also cultivate great confidence in the group in completing the tasks or gain a sense of belonging, which may affect their personal innovativeness. From the practical



viewpoint, the researchers of this study considered that border management organizations should strengthen the cohesiveness of the group members and make a good use of work teams to increase the members' sense of responsibility and honor, which should be the core concept and enhance the ability of immigration officers to complete

group tasks, such that the organization can boost the immigration officer's confidence in completing the work and gain a sense of value of the work through the increased confidence in completing the group tasks. Consequently, they will also be more willing to accept organizational innovation and implement innovative measures.

Table 1. Goodness of Fit Indicators for Individual-Level Variables

Research Variable	χ^2/df		GFI		NNFI		PGFI		RMSEA	
	Observed value	Ideal value	Observed value	Ideal value	Observed value	Ideal value	Observed value	Ideal value	Observed value	Ideal value
KCs	2.67	1.00 ~3.00	.95	>.9	.96	>.9	.60	≥.5	.041	≤.05
SCs	2.46		.97		.98		.68		.035	
Collective efficacy	2.58		.96		.97		.62		.039	
Self-efficacy	2.92		.93		.94		.54		.048	
Innovativeness	2.11		.98		.99		.72		.032	
Hypothesized model	2.76		.95		.95		.58		.045	
References	Schumacker and Lomax [46]		Bentler [47]		Bagozzi and Yi [48]				Browne and Cudeck [49]	

Table 2. Descriptive Statistics, Correlation Coefficient, and Alpha Coefficient

Variable	M	SD	α coefficient	Research Variables						
				(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) KCs	3.105	.412	.851	1.000						
(2) Self – efficacy	3.404	.601	.833	.421***	1.000					
(3) Innovativeness	3.425	.615	.809	.326**	.466***	1.000				
(4) SCs	3.824	.323	.901	-.049	.288*	.201	1.000			
(5) Collective efficacy	3.583	.362	.872	.104	.376**	.366**	.485***	.244*	1.000	

Note. (1)–(3) = individual-level research variables; (4)–(5) = group-level research variables. KCs = knowledge characteristics; SCs = social characteristics; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3. Hierarchical Regression Analysis

Model Independent variables (group-level)	Model number			
	1	2	3	4
Group size (control variables)	-.045	-.003		
SC (independent variable)		.416***		
F	.316	21.178***		
Adj. R ²	.011	.284		
Model Independent variables (individual-level control variables)				
Age			.047	.091
Education level			.041	.037
Years of service			.059	.044
F			.562	.601
Adj. R ²			-.016	.009

Note. Dependent variable: Model 1 and 2 are for collective efficacy; model 3 for self-efficacy; model 4 for individual innovativeness; SCs = social characteristics.



Table 4. Hierarchical Linear Modeling Results for Hypotheses 3–6

Variable	γ_{01}	τ_{00}		γ_{11}
1. The null model		.095***	3. Moderating effects (slopes-as-outcomes model)	
2. Context effects (intercepts-as-outcomes model)			(5) SCs (KCs – Self-efficacy)	.012 (.107)
(1) SCs – Self-efficacy	.381** (.135)		(6) SCs (Self-efficacy – Individual innovativeness)	–.101 (.261)
(2) SCs – Individual innovativeness	.459*** (.192)		(7) Collective efficacy (Self-efficacy – Individual innovativeness)	0.277* (0.165)
(3) Collective efficacy – Self-efficacy	.363** (.127)			
(4) Collective efficacy – Individual innovativeness	.471*** (.144)			

Note. The numbers in bracket are standard error; (1) to (4) are the contextual effects of group-level variables on individual-level variables. For example, SCs–Self-efficacy is the contextual effect of group-level SCs on the individual-level self-efficacy. (5) to (7) are the moderating effect of group-level variables on the relationship between individual-level independent variables and the dependent variable. For example, group-level SCs (KCs–Self-efficacy) moderates the relationship between the individual-level independent variables (KCs) and the dependent variable (self-efficacy). The table lists the indicators for tested hypotheses only. KCs = knowledge characteristics; SCs = social characteristics; * $p < .05$; ** $p < .01$; *** $p < .001$.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

STATEMENT OF HUMAN AND ANIMAL RIGHTS

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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