A Comparative Study on the Education for Sustainability (EfS) Skills and In-role Performance Effectiveness in the Context of the Malaysian and the Japanese Academic Ecosystems

Majid Ghasemy[*] and James A. Elwood[**]

Abstract. This international comparative study focuses on examining the impacts of Education for Sustainability (EfS) expertise and self-organization, as two aspects of EfS skills and knowledge, on personal and interpersonal outcomes, which is one of the EfS effective in-role performance dimensions. We collected data from 664 academics in Malaysia and Japan, screened the data, and utilized partial least square structural equation modeling (PLS-SEM) to test our model. Our findings indicated that both predictors were statistically significant and practically relevant in predicting the outcome variable. In addition, our permutation-based multigroup analysis revealed no significant differences between academics from the two countries in terms of the paths within the model. Notably, the model, based on estimation using the aggregate data, showed a medium level of out-of-sample prediction power. We also examined and interpreted country-specific results and suggested avenues for future research in EfS leadership.

Keywords: Education for Sustainability (EfS) leadership, academic leadership capability framework, EfS expertise, self-organization, EfS effective in-role performance, personal and interpersonal outcomes, Japan, Malaysia

Introduction

A complex, intertwined set of social, cultural, economic, and environmental changes has been rapidly unfolding across the world (Ghasemy et al., 2022; Scott et al., 2012). In addition, the ongoing Covid-19 pandemic has made the situation even more complicated and unpredictable in such sectors and industries as healthcare (Zhang et al., 2021), hospitality (Demirović Bajrami et al., 2021; Wong et al.,

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2021), and higher education (de Boer, 2021; Ghasemy & Elwood, 2022; Jung et al., 2021; Mok & Montgomery, 2021). Focusing on higher education, while much has been written about the rapid and seemingly inevitable changes occurring in the higher education ecosystem because of global reform (Butler, 2020), the issue of embedding transformative change through the implementation of sustainability principles in the educational systems has become ever more important due to the emergence of complex situations (e.g., epidemics and climate change) (Holdsworth & Thomas, 2020). For instance, although the Covid-19 pandemic has been a catalyst for digital transformation of higher education, it has had a huge impact on the financial sustainability of institutions and those systems with a high level of internationalization, and heavy dependence on funding sources such as international students were hit harder by the Covid-19 pandemic due to the closure of major national borders and the sharp curtailment of international student mobility (Mok & Montgomery, 2021; Welch, 2021). Despite the usage and importance of online teaching and learning in this unprecedented situation (Mok & Montgomery, 2021), research, which is another important function of universities (Shuib & Yew, 2017), was also affected, especially in laboratories and clinics, many of which restricted access until recently or even closed (Welch, 2021). With respect to graduate employability, the negative economic impacts of Covid-19 in different countries such as Australia and Japan were highly unpredictable, especially regarding how the labor market for the graduates would be restructured (Saito & Pham, 2020). Even though universities and colleges have been hit hard in this unprecedented context, their role in societies is still crucial for two reasons: (a) helping address the challenges posed by these developments, and (b) producing leaders capable of managing these challenges successfully in the future (Scott et al., 2012). Undoubtedly, from a strategic standpoint, fostering future leaders is a significant duty in academic settings because of the imminent retirement of the baby boomers and the perceived lack of planning for leadership succession within higher education (Scott et al., 2008; Scott et al., 2012). This mirrors the fact that leadership in higher education is being tested by external forces that are challenging the traditional academic culture (Butler, 2020). Therefore, a more relevant leadership philosophy would be prudent and, as proposed by Scott et al. (2012), turnaround leadership for sustainability in higher education is required if higher education institutions are to respond to these needs. More specifically, this form of leadership acknowledges the challenge of systemic change facing higher education institutions as they grapple with addressing the four pillars of social, cultural, economic, and environmental sustainability in their operations, research, teaching, and engagement activities (Mader et al., 2013; Scott et al., 2012). It is important to note that the competencies and capabilities of this leadership style, which are seen as predictors of Education for Sustainability (EfS) in-role performance effectiveness (Ghasemy, 2017; Ghasemy, Sufean, Megat Ahmad Kamaluddin, et al., 2017), have been manifested in the academic leadership capability framework (Scott et al., 2012). Although the content of academic leadership development programs can be updated and improved based on this framework, evidence in the higher education literature indicates that the framework has not been sufficiently used and tested in empirical studies. Therefore,

one of the primary motivations for this study is to test a model that is built upon the academic leadership capability framework, which explains the relationships between two dimensions of EfS skills and expertise (or competencies) and one dimension of EfS in-role performance effectiveness. Notably, leadership behaviors can be practiced by everyone, and fostering behaviors that encourage and facilitate sustainable transitions at different levels of higher education institutions is important (Azizi, 2022). In this process, both formal and informal leaders contribute to successful implementation of change and transformation programs. Formal leaders are usually found within the management sphere to serve organizational interests (institutional interests in our case) (Andersen, 2009), while informal leaders such as senior academics without formal leadership or administrative positions do not hold formal positions but are seen as intellectual/academic leaders who are resourceful in utilizing their experience, networks, and intellectual capacity (Evans, 2017; Macfarlane, 2011). Thus, in this study and consistent with Ghasemy et al. (2022), both formal and informal leaders were considered.

With this short overview and due to reasons such as (a) the under-explored issue of EfS leadership in higher education (Ghasemy et al., 2022; Scott et al., 2012), (b) insufficient comparative studies on sustainability issues in higher education research, (c) insufficient studies guided by the academic leadership capability framework (e.g., Scott & McKellar, 2012; Ghasemy et al., 2016; Ghasemy, Sufean, Megat Ahmad Kamaluddin et al., 2017; Ghasemy et al., 2018), and (d) analytical/methodological shortcomings in PLS-SEM applications observed in quantitative higher education research over a course of 20 years as reported by Ghasemy et al. (2020), this study investigates the effects of two dimensions of EfS skills and knowledge (i.e., EfS expertise and self-organization) on personal and interpersonal outcomes (which is one dimension of EfS in-role performance effectiveness) and makes a group comparison between Japan and Malaysia through a rigorous PLS-SEM analysis. To achieve this objective, data were collected from academics (i.e., formal, and informal leaders) affiliated with public and private universities in Malaysia and Japan. Briefly, results showed that while both EfS expertise and self-organization were significant and relevant predictors of personal and interpersonal outcomes, EfS expertise was a stronger predictor based on the aggregate-level and country-specific models.

Theoretical grounds and literature review

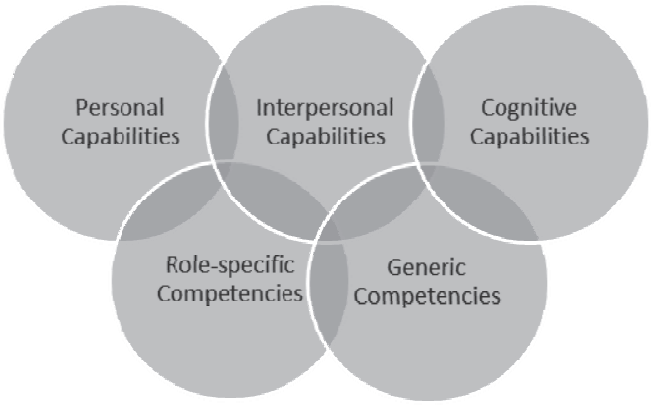
Capabilities are the abilities to learn, they are associated with creativity, their focus is on future trends, and they are essential qualities to handle unsettled, unstable, uncertain, and complex situations. Competences are relevant skills and knowledge to deliver or perform, they are related to performance, their focus is on the present time, and practicing them in stable and predictable situations is productive and efficient (Scott et al., 2008). Different studies have focused on identifying essential capabilities and competencies of academic leaders although, in principle, many of these behaviors can be practiced

by informal academic leaders who are lecturers or intellectual leaders without formal leadership positions (for more details see Evans, 2017; Macfarlane, 2011). For instance, Bobe and Kober (2015) used data from 116 Australian heads of schools/departments (formal leaders) and identified three components, namely, research, teaching and networking capabilities. Examples of such capabilities that can be possessed by informal leaders include (a) direct access to, and experience with, high quality databases to use in empirical research, (b) ability and experience in pursuing original research projects and generating publications, and (c) expertise and resources to place students for work experience while studying. In another study, Black (2015) identified 41 academic leadership capabilities and categorized them into 4 major groups namely, vision and goals, hands-on leadership, improvement and learning, and work details and the big picture. A few of these capabilities that can be practiced by informal leaders include (a) setting clear, short-term achievable goals, (b) understanding cultural differences and managing people's expectations and views sensitively, (c) Being receptive to (and seek out) alternative solutions, and (d) anticipating unexpected outcomes. Furthermore, Asif and Searcy (2013) introduced some main capabilities related to three aspects of HE performance excellence (research performance, program design and delivery, and service performance) of which many indicators such as academic collaboration and community service are relevant to informal leaders. As one last example, Aziz et al. (2005) reviewed the literature surrounding department heads' task and performance dimensions and identified the 20 most highly-rated knowledge, skills, and abilities for success from department heads' as well as directors' perspectives in the American higher education context. A few of these skills that are also relevant to informal leaders include (a) the ability to acquire external funding for the department or program, (b) the ability to promote high quality teaching in the department or program, and (c) skill in reducing, resolving, and preventing conflict among faculty members.

The current study is underpinned by the academic leadership capability framework (Fullan & Scott, 2009; Scott et al., 2008). Based on this framework exhibited in Figure 1, there are three types of leadership capabilities (personal, interpersonal, and cognitive capabilities) as well as two types of managerial competencies (generic and role-specific competencies) that are interconnected and essential for in-role performance effectiveness.

Researchers have found that special competencies are required to understand leadership situations (Yukl & Mahsud, 2010). Indeed, having competencies (i.e., role-specific and generic) is necessary but not sufficient for identifying demonstrably effective academic leaders (Scott & McKellar, 2012). An effective formal or informal leader is one who is not only effective in routine day-to-day situations but who also excels when change occurs or the unexpected happens (Fullan & Scott, 2009). The two types of competencies of the academic leadership capability framework are referred to as EfS skills and knowledge in the context of sustainability and, as elaborated by Scott et al. (2012), the four dimensions of EfS skills and knowledge include EfS expertise, management, university operations, and self-organization.

For EfS in-role performance effectiveness, five dimensions have been introduced by Scott et al. (2012): personal and interpersonal outcomes, learning and teaching outcomes, recognition and reputation, financial performance, and effective implementation as well. The framework has guided other studies such as Scott and McKellar (2012) in the context of higher education in Australia and New Zealand, the international study of Turnaround Leadership for Sustainability in Higher Education (TLSHE) carried out by Scott et al. (2012), and a more recent comparative study on EfS leadership in the context of the Malaysian and Japanese higher education ecosystems conducted by Ghasemy et al. (2022). With respect to applied research underpinned by this framework, a review of the literature identified some studies, most of which fall in the context of the Malaysian higher education (e.g., Ghasemy et al., 2016).



Source: (Ghasemy et al., 2022; Scott et al., 2012)

Figure 1. Academic leadership capability framework

Several studies have indicated that competencies predict in-role performance effectiveness. For example, in the context of the Malaysian higher education system, academic managerial competencies impacted in-role performance effectiveness for Malaysian academic leaders, who include vice-chancellors, deputy vice-chancellors, deans, directors, deputy deans, deputy directors, heads of departments, and professors without any formal positions (Ghasemy, Sufean, & Megat Ahmad Kamaluddin, 2017). Similarly, in the context of public research and comprehensive universities, both generic and role-specific competencies of lecturers were found to be significant, relevant, and equally important predictors of in-role performance effectiveness (Ghasemy, Sufean & Megat Ahmad Kamaluddin, 2017). In addition, these competencies were identified as significant and relevant predictors of in-role performance effectiveness in the context of the Malaysian public and private focused universities (Ghasemy et al., 2018).

Thus, in the current study two dimensions of EfS skills and knowledge (or generic and role-specific competencies) are posited to influence personal and interpersonal outcomes as one dimension of in-role performance effectiveness. There are theoretical grounds for the influence of competencies

on performance in academic settings (for more details, see Scott et al., 2008; Fullan & Scott, 2009; Ghasemy, 2017). The theoretical model is shown in Figure 2.

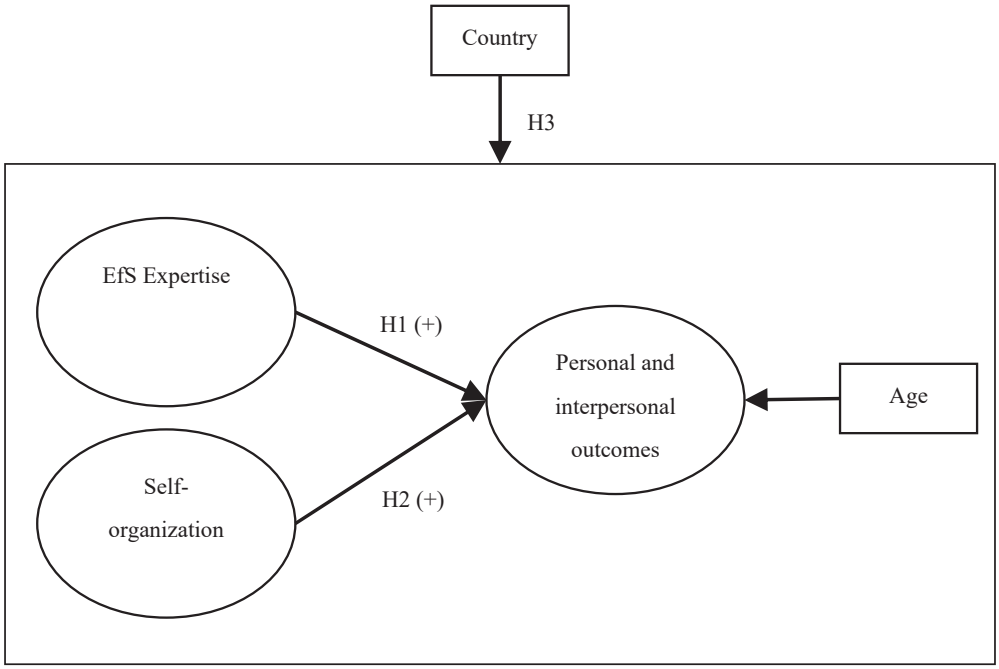


Figure 2. Theoretical model

Based on theoretical grounds and empirical findings for the effect of competencies on in-role performance effectiveness, the following two hypotheses were developed. While there are additional dimensions of EfS skills and knowledge (or the competencies) and EfS in-role performance effectiveness (Scott et al., 2012), we only focused on two dimensions of EfS skills and knowledge and one dimension of EfS in-role performance effectiveness due to reasons such as meeting sample size requirements.

H1 (+): Academics' EfS expertise positively contributes to their personal and interpersonal outcomes.

H2 (+): Academics' self-organization positively contributes to their personal and interpersonal outcomes.

Moreover, given the availability of data, we considered performing a multigroup analysis between the academics from Malaysian and Japanese universities to test the following hypotheses:

H3: Malaysian and Japanese academics differ in terms of the effects of selected EfS skills and knowledge on personal and interpersonal outcomes.

H3a: Malaysian and Japanese academics differ in terms of the effect of EfS expertise on personal and interpersonal outcomes.

H3b: Malaysian and Japanese academics differ in terms of the effect of self-organization on personal and interpersonal outcomes.

It is worth noting that age serves as a control variable in our study (Bernerth & Aguinis, 2016).

Higher education in Japan and Malaysia

To contextualize our study, we provide a brief outline of higher education in Malaysia and Japan. These two East Asian countries have ambitious internationalization programs (for more details, see Wan, Morshidi et al., 2020; Ghasemy, Farhah et al., 2021; Sanders & Wong, 2021; Saito & Kim, 2019) and the desire to achieve sustainable development goals (SDGs) (e.g., Ghasemy, Rosa-Díaz & Gaskin, 2021; Ghasemy et al., 2022).

Higher education in Malaysia, a multi-ethnic, multi-lingual, and multi-cultural society, includes public and private institutions as well as other types of institutions such as faith-based and institutions founded by national and state corporations, political parties, and ethnic interest groups (Wan, Lee et al., 2020). Moreover, Malaysia has made significant efforts to achieve SDGs (e.g., Morshidi et al. (2020)) and given the important role of higher education in this country's economic development and the demands for knowledge generation and innovation, higher education has been made a priority by the Malaysian government (Norzaini et al., 2011).

With respect to Japan, higher education has been growing in this country since World War II (Saito & Pham, 2020) and diversity as well as a hierarchical structure have been two of the main features of Japanese higher education system (Huang, 2015). Similar to Malaysia, Japan has taken many initiatives to improve education for sustainable development (ESD) in the universities and meet the SDGs (Nomura & Abe, 2010). Moreover, this country has pursued and invested in higher education internationalization as a matter of national policy although it seems that international partnerships and developing external networks are often more focused on the process of internationalization than transforming domestic programs (Sanders & Wong, 2021).

Focusing on comparative studies, one study which had examined the relationships between the governments and the national quality assurance agencies in Japan, Australia, Malaysia, and Taiwan, found that while a state-controlled governance model remained popular in these countries, autonomy and independence were viewed by the quality assurance agencies in these countries as a considerable challenge (Hou et al., 2020). In another comparative study on the strategies for the emergence of global higher education market in Malaysia, Japan, and Singapore (Yonezawa, 2007), the national policies for higher education industry were examined and the balance between flexibility and consistency of the image and definition of higher education was highlighted. Moreover, Yonezawa (2007) pointed out that both Japan and Malaysia have experienced a qualitative change in the nature of higher education, especially in its overlapping role with the knowledge industry. In terms of attitudes

and behaviors, Ghasemy and Elwood (2022) focused on the nexus of job satisfaction, individual-level organizational citizenship behavior (OCBI), and academic motivation and found that while the effect of academics' job satisfaction on their OCBI was mainly transmitted through their academic motivation, the lecturers from Japan and Malaysia did not show a statistical difference in terms of the relationships between these three variables. Finally, Ghasemy et al. (2022) focused on EfS leadership in higher education and inferentially compared academics from Japan and Malaysia in terms of sustainability-related issues. Their findings based on path modeling methodology consistently indicated that all the EfS leadership-related issues (e.g., capabilities, competencies, and in-role performance effectiveness) were more important for academics affiliated with the Malaysian public and private universities. They also descriptively compared their samples from these two countries with an international sample participated in the study by Scott et al. (2012) to provide more insights about the importance of EfS leadership in higher education. While these studies are informative, the relative paucity of studies that compare the two high education systems highlights the need for continued study of the education sector in these respective countries.

Method

Design and analytic procedure

Our study is quantitative in approach and a cross-sectional survey in design (Creswell & Creswell, 2018). We utilized PLS-SEM methodology (Ghasemy et al., 2020) to estimate our model and perform complementary analyses (Henseler, 2018). Our other reason to use PLS-SEM was the need for latent variable scores to perform follow-up analyses (Ghasemy et al., 2020) such as nonlinear relationships assessment (Sarstedt et al., 2020). We also used EQS 6.4 (Bentler, 2006; Bentler & Wu, 2018) for data screening and the SmartPLS 4 statistical package (Ringle et al., 2022) for the main and complementary analyses.

Measures and covariates

We used the 4-item EfS expertise scale, the 4-item Self-organization scale, and the 5-item personal and interpersonal outcomes scale, all developed by Scott et al. (2012), to measure the three latent variables in this study. The participants were given a symmetric and equidistant Likert scale (Ghasemy et al., 2020) anchored with 1 (Low importance) and 5 (high importance) to rate the items. We also added age, as a widely used control variable in social science research (Bernerth & Aguinis, 2016), to the model to address endogeneity (Hult et al., 2018). The items of the final models (aggregate-level and country-specific models) appear in Appendix A1. As displayed in Appendix A1, while a few indicators of the scales are directly related to EfS such as *being on top of current developments in EfS*,

knowing how to develop and report on key EfS Metrics, and *achieving effective alignment of planning, budget, and resources with EfS initiatives*, other indicators are more generic and are indirectly connected to EfS. Examples in this regard include *being able to manage my own ongoing professional learning and development* and *connecting successfully with key external stakeholders* and *being able to manage my own ongoing professional learning and development*.

Population, sample, and data screening

Academics affiliated with the Malaysian and Japanese public and private universities constitute the population in our study. Subject to the availability of the email addresses via the universities' websites, we created a database with 32,391 email addresses containing 23,050 of academics from the Malaysian institutions as well as 9,341 of academics from the Japanese institutions. Of the total of 687 surveys obtained via a simple random sampling method, 23 were incomplete and thus not suitable for the analysis. Therefore, we considered data screening using the data from $N = 664$ academics. Given the low rate of missingness (less than 1% for each item), in line with (Tabachnick & Fidell, 2013), missing values were replaced with the median of the items. In addition, specifying and estimating the initial model using the EQS 6.4 resulted in detection of two (2) multivariate outliers which, in turn, were removed from the dataset. Hence, our final sample size to estimate the model was $N = 662$. It is noteworthy that the normalized estimate of multivariate kurtosis (Mardia, 1970, 1974; Yuan et al., 2004) was 71.89 and after deleting two multivariate outliers, it was reduced to 65.07. This was greater than 5 and, as discussed by Bentler (2006), indicative of the multivariate non-normal nature of our data. Although we considered the non-parametric PLS method in estimating the model from an explanatory-predictive perspective (Ghasemy et al., 2020), in general, normal and non-normal data can also be conveniently analyzed through approaches such as the parametric PLSe2 method (Bentler & Huang, 2014; Ghasemy, 2022; Ghasemy, Hazri, & Gaskin, 2021) or other covariance-based structural equation modeling (CB-SEM) approaches such as the Satorra-Bentler (S-B) methodology (Satorra & Bentler, 1988, 1994). From the statistical power standpoint and given that we had three predictors pointing to our outcome variable, the results of the power analysis (Cohen, 1988) showed that the minimum sample size should be 103 to properly estimate the model with a statistical power of 80% and at 5% significance level to observe R^2 values of at least 10%. Therefore, we did not face any issues related to the sample size adequacy. The detailed demographic profile of the respondents appears in Table 1.

Table 1. Demographic profile of the academics

Variable	Japan (*N = 108*)		Malaysia (*N = 554*)		Total (N = *662*)	
Gender						
Female	13	12.04	312	56.32	325	49.09
Male	95	87.96	242	43.68	337	50.91
Age						
35 or younger	6	5.56	79	14.26	85	12.84
35-45	16	14.81	219	39.53	235	35.50
45-55	33	30.56	171	30.87	204	30.82
55-65	49	45.37	72	13.00	121	18.28
65 or older	4	3.70	13	2.35	17	2.57
Marital status						
Single	13	12.04	134	24.19	147	22.21
Married	95	87.96	420	75.81	515	77.79
University type						
Public	84	77.78	382	68.95	466	70.39
Private	24	22.22	172	31.05	196	29.61
Administrative/leadership position						
Yes	59	54.63	249	44.95	308	46.53
No	49	45.37	305	55.05	354	53.47
Experience outside higher education						
Yes	58	53.70	373	67.33	431	65.11
No	50	46.30	181	32.67	231	34.89

Results

Measurement model evaluation

We followed the guiding principles for a proper PLS-SEM analysis in higher education research (Ghasemy et al., 2020) and evaluated the factor loadings as well as reliability and validity measures. In addition, a one-tailed percentile bootstrapping test was conducted to generate the confidence intervals for reliability and validity measures. As shown in Appendix A2, all factor loadings were above 0.7, the average variance extracted (AVE) values and the lower bound of their one-tailed percentile confidence intervals were above 0.5, and the reliability measures of Cronbach's Alpha, rho_A, and composite reliability (CR) as well as their lower and upper bounds of confidence intervals were larger than 0.7 and, desirably, smaller than 0.95. This was indicative of acceptable levels of convergent validity and the reliability of the scales.

In addition, the results with respect to discriminant validity assessment based on the hetrotrait-monotrait (HTMT) approach (Franke & Sarstedt, 2019; Henseler et al., 2015) are presented in Appendix A3. These indicated discriminant validity was satisfactory based on the $HTMT_{0.85}$ criterion since all the HTMT values and the upper bound of their one-tailed percentile bootstrap confidence intervals were below 0.85.

Structural model evaluation

To evaluate the structural model, the following were assessed in accordance with the guidelines proposed by Ghasemy et al. (2020): collinearity between the predictors, significance and relevance of the path coefficients, the R^2 of the outcome variable, the predictors f^2 effect sizes, and R^2 decomposition values. In addition, a PLSpredict analysis (Shmueli et al., 2019) was conducted to assess the model's out-of-sample predictive power followed by the nonlinear relationships assessment as a structural model robustness check (Ghasemy et al., 2020; Sarstedt et al., 2020).

Table 2. Aggregate-level results with respect to structural model evaluation

Outcome	Predictor	Hypothesis/path	Estimate (β)	*p* value	PCI	f^2	VIF	τ	Sig? / Supported?
Personal and interpersonal outcomes (R^2 = 0.519)									
	EfS Expertise	H1 (+): EfS Expertise→Personal and interpersonal outcomes	0.451	0.000	[0.382, 0.524]	0.229	1.843	0.305	Yes
	Self-organization	H2 (+): Self-organization→ Personal and interpersonal outcomes	0.336	0.000	[0.263, 0.408]	0.126	1.861	0.214	Yes
	Age	Age→ Personal and interpersonal outcomes	0.022	0.395	[-0.028, 0.074]	0.001	1.013	-0.001	No

PCI = percentile confidence interval; f^2 = effect size; VIF = variance inflation factor; τ = R^2 decomposition value; The effects of the predictors on the outcome variables were assessed based on a one-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level; The effects of the covariate on the outcome variables were assessed based on a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level.

As shown in Table 2, the results of the one-tailed percentile bootstrapping test (Aguirre-Urreta & Rönkkö, 2018) with 10,000 subsamples and at a 5% significance level provided support for both of our directional hypotheses H1(+) and H2(+) with the effect of EfS expertise (β = 0.451, $p \leq 0.000$, f^2 = 0.229) being stronger than the effect of self-organization (β = 0.336, $p \leq 0.000$, f^2 = 0.126) on the outcome variable. Both the significant predictors also had relevance for managerial practices and policy development due to the size of the path coefficients. The predictors explained 51.9% (R^2 = 0.519) of the variation in personal and interpersonal outcomes, indicating a moderate level of explanatory power (Ghasemy et al., 2020). More specifically, based on the R^2 decomposition values, the unique contribution[1] of EfS expertise was τ = 0.305, and with respect to self-organization, this value was τ = 0.214. In addition, no evidence of collinearity between the predictors was observed since the variance inflation factors (VIFs) were smaller than 3. Moreover, age, based on the results of

[1] τ = (zero-order correlation between the predictor and the outcome) X (path coefficient for the effect of the predictor on the outcome)

a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level, was not identified as a significant predictor of the outcome variable ($\beta = 0.022$, $p = 0.395$, $f^2 = 0.001$).

The focus in the next step of the structural model evaluation was on the outcome variable, so a PLSpredict analysis (Shmueli et al., 2019) was conducted with the default settings of 10 folds and 10 repetitions (see Appendix A4). All the Q^2_predict statistics based on the PLS method were positive. Additionally, the root mean square error (RMSE) statistics for four out of five indicators were smaller based on the PLS compared to the linear model (LM). This was suggestive of a medium level of out-of-sample predictive power of the model (Shmueli et al., 2019).

For the last step of the structural model evaluation, nonlinearity between the predictors and the outcome was examined as a structural model robustness check (Ghasemy et al., 2020; Sarstedt et al., 2020). In doing so, quadratic effects were added and a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level was conducted. The results revealed that neither of the quadratic effects was statistically significant, thus providing support for the linear relationships within the structural model (see Appendix A5 for more detail).

The final aggregate-level model is shown in Figure 3 as well.

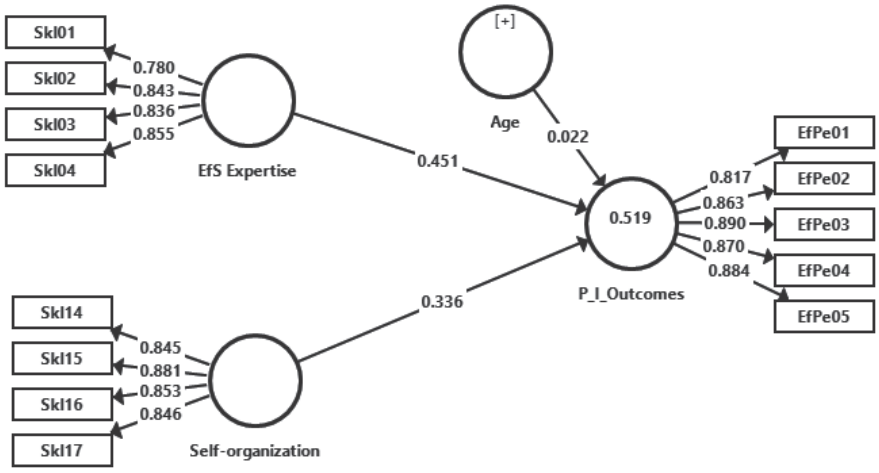


Figure 3. Final aggregate-level model (N = 662)

Multigroup analysis

To test H3, measurement invariance was examined based on the three-step measurement invariance of composite models (MICOM) approach (Henseler et al., 2016) followed by a permutation-based multigroup analysis (Chin & Dibbern, 2010). As displayed in detail in Appendix A6, configural invariance (step 1) was confirmed in lieu of identical item configuration per construct for each group,

identical data treatment procedures, and identical algorithm settings, as well as compositional invariance (step 2). Thus, group comparison was feasible.

The results of the permutation-based multigroup analysis (Chin & Dibbern, 2010) appear in Table 3. The path coefficients across the two groups were comparable, indicating that differences between the Malaysian and Japanese groups in terms of the relationships within our model were not significant. Therefore, both H3a and H3b were rejected. It is worth noting that in both samples, the effect of EfS expertise on personal and interpersonal outcomes was larger than the effect of self-organization on the outcome variable. Also, age was not a statistically significant predictor of personal and interpersonal outcomes based on the data from both samples.

Table 3. Multigroup analysis results

Path / Hypothesis	β_{Japan}	$\beta_{Malaysia}$	$\beta_{difference}$	CI	*p* value
Age→Personal and interpersonal outcomes	0.043	0.042	0.001	[-0.139, 0.143]	0.985
H3(a): EfS Expertise→Personal and interpersonal outcomes	0.459	0.432	0.028	[-0.231, 0.236]	0.815
H3(b): Self-organization→Personal and interpersonal outcomes	0.309	0.316	-0.007	[-0.241, 0.237]	0.955

CI = confidence interval; CI based on a two-tailed test with 5,000 permutations and at a 5% significance level.

Figure 4 and Figure 5 display country-specific models. Detailed country-specific results appear in Appendices A7 to A11.

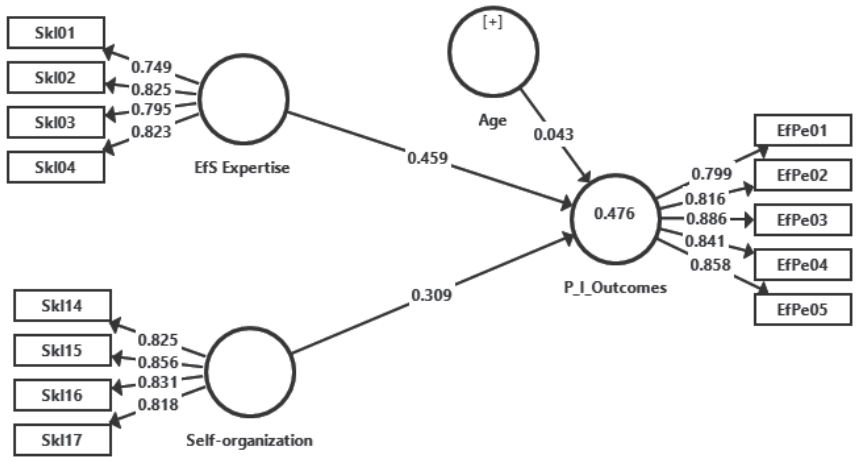


Figure 4. Final model based on Japan data (N = 108)

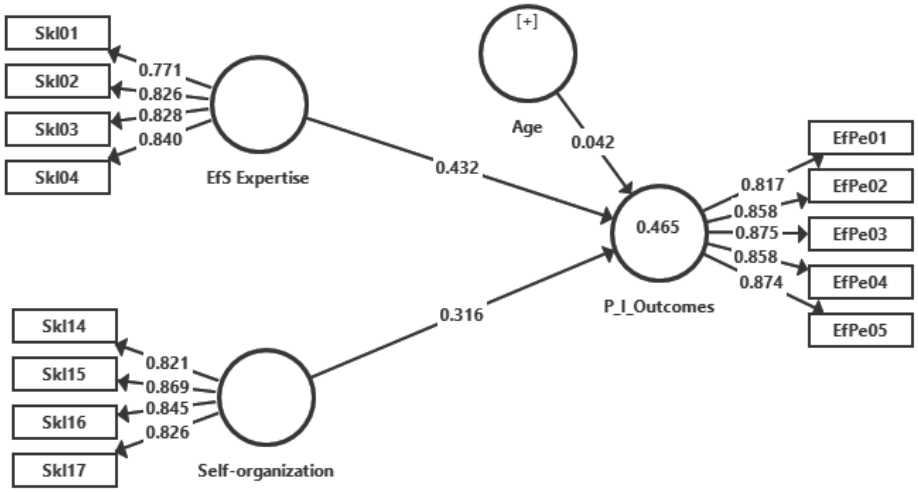


Figure 5. Final model based on Malaysia data (N = 554)

Discussion and concluding remarks

In this study, the focus was on two Japanese and the Malaysian higher education landscapes and the effects of two dimensions of EfS skills and knowledge (i.e., EfS expertise and self-organization) on one dimension of EfS in-role performance effectiveness, namely, personal and interpersonal outcomes (for more details about these variables see, Scott et al., 2012; Ghasemy et al., 2022). The effect of age as a control variable, on the outcome variable in the model was investigated. Additionally, a group comparison between the two countries was conducted in terms of the relationships within our model. To test the hypotheses, data were collected from academics affiliated with both public and private universities, screened, and analyzed using PLS-SEM methodology (Ghasemy et al., 2020) to evaluate measurement and structural models; thereafter, a PLSpredict analysis (Shmueli et al., 2019) and a structural model robustness check (Sarstedt et al., 2020) were performed. Briefly, our results provided support for H1 and H2. However, no significant differences between the Malaysian and the Japanese lecturers were observed with respect to causal relationships between the variables; therefore, H3 (i.e., H3a and H3b) was not supported.

From a theoretical standpoint, a cross-sectional model was developed and validated which defines the relationships among the variables of interest in our study from a predictive-explanatory perspective. More specifically:

1. Support was found for the influence of EfS expertise and self-organization on personal and interpersonal outcomes at the aggregate and country levels. These effects were both

statistically significant and practically relevant (see aggregate-level and country-specific path coefficients). These findings were in general consistent with the findings of Ghasemy, Sufean, Megat Ahmad Kamaluddin, et al. (2017), and Ghasemy et al. (2018) in the context of Malaysian higher education.

2. The effect of EfS expertise, compared to self-organization, on personal and interpersonal outcomes was stronger based on the aggregate and country-level models.
3. Age did not show any influences on the outcome variable in any of the presented models.
4. No statistically significant difference was found between the academics from the two countries in terms of the relationships between the variables in the model. In addition, reviewing the country-specific psychometric properties of the measurement models showed that the loadings, reliability, and validity statistics were very similar across the two groups. This is reasonable given the similarities between the two higher education systems in terms of the level of centralization in their governance/management systems (Saito & Kim, 2019; Wan, Morshidi, et al., 2020), the ambitions to be internationalized (Ghasemy, Farhah, et al., 2021; Sanders & Wong, 2021), and their initiatives to achieve sustainable development goals (Ghasemy et al., 2022; Morshidi et al., 2020; Nomura & Abe, 2010).
5. Nearly 50% of personal and interpersonal outcomes was explained by the two predictors at the aggregate and country levels. This indicated a moderate level of explanatory power (Ghasemy et al., 2020).
6. Based on the PLSpredict results (Shmueli et al., 2019), the aggregate-level model and the model estimated based on the data from the Malaysian context exhibited a medium level of out-of-sample predictive power and the country-specific model for Japan showed a high level of out-of-sample predictive power.
7. Nonlinearity between the variables was not present to a significant degree in any of the aggregate-level and country-specific models, which indicates the robustness of the structural models (Sarstedt et al., 2020).

In terms of the practical implication of the findings, our results have the following implications:

1. Given the high factor loadings of the EfS expertise and self-organization items in the aggregate and country-specific models, the content of staff professional development programs should be updated to reflect these indicators (e.g., time management, work organization, key EfS metrics development, IT utilization, and higher education learning program development) if academics' personal and interpersonal outcomes achievement is desired. Relatedly, the indicators of personal and interpersonal outcomes (e.g., external stakeholders network expansion as well as effective alignment of planning, budget, and resources with EfS initiatives) should be highlighted when the content of academics'

development programs are updated, or the performance of lecturers is assessed.

2. Due to the stronger effect of EfS expertise compared to self-organization on personal and interpersonal outcomes, policies should focus more on this aspect of EfS skills and knowledge.
3. Since age did not show a significant effect on personal and interpersonal outcomes, policies to enhance personal and interpersonal outcomes can be formulated irrespective of academics' age in both the Japanese and the Malaysian higher education systems.

Limitations and future research

This study is not without limitations. First, the focus was on two dimensions of EfS skills and knowledge and one dimension of EfS effective in-role performance. Therefore, future research should address the effects of other domains and sub-domains of academic leadership capability framework on EfS in-role performance effectiveness dimensions. Second, the size of the Japanese sample, compared to the Malaysian sample, was small. Thus, replicating this study using larger samples would be prudent. Third, age was the sole control variable considered in this model. Thus, other evidence-based or theory-driven demographic variables could be considered as covariates in future research. Fourth, given the explanatory-predictive nature of this comparative study, PLS-SEM methodology was utilized. Therefore, a replication of this study using the state-of-the-art PLSe2 methodology (Bentler & Huang, 2014; Ghasemy, 2022; Ghasemy et al., 2021) would be wise. This methodology, arguably, has the advantages of both maximum likelihood (ML) and PLS methods (Ghasemy, Hazri, & Gaskin, 2021). Last, given the considerable overlap between dimensions of academic leadership capability framework, statistical validation of this framework is recommended in future research (for the statistical validation of academic managerial competency scale, see Ghasemy, Hazri, Nordin et al., 2021).

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Ethics: The procedures were in accordance with the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards. No consent was required, since the participation was voluntary, information was anonymized, and the paper does not include images that may identify the participants.

Data availability statement: Our dataset (N = 662) to estimate the final models was published on Harvard Dataverse and is accessible via https://doi.org/10.7910/DVN/5HM5QC.

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Appendices

Appendix A1. Items of the final models

Construct	Code	Item
EfS Expertise	Skl01	Having a high level of up-to-date knowledge of what engages higher education students in productive learning
	Skl02	Understanding how to develop an effective higher education learning program
	Skl03	Being on top of current developments in EfS
	Skl04	Knowing how to develop and report on key EfS Metrics
Self-organisation	Skl14	Being able to use I.T. effectively to communicate & perform key work functions
	Skl15	Being able to manage my own ongoing professional learning and development
	Skl16	Being able to make effective presentations to a range of different groups
	Skl17	Being able to organize my work and manage time effectively
Personal and interpersonal outcomes	EfPe01	Producing future EfS leaders
	EfPe02	Connecting successfully with key external stakeholders
	EfPe03	Establishing a collegial and collaborative working environment
	EfPe04	Achieving high levels of staff/faculty engagement, support, and commitment
	EfPe05	Achieving effective alignment of planning, budget, and resources with EfS initiatives

Appendix A2. Aggregate-level results with respect to loadings, reliability, and convergent validity (N = 662)

Construct	Item	Loading	Alpha	rho_A	CR	AVE
Personal and interpersonal outcomes	EfPe01	0.817	0.916	0.917	0.937	0.749
	EfPe02	0.863	[0.902, 0.928]	[0.904, 0.929]	[0.928, 0.945]	[0.720, 0.776]
	EfPe03	0.890				
	EfPe04	0.870				
	EfPe05	0.884				
EfS Expertise	Skl01	0.780	0.848	0.854	0.898	0.687
	Skl02	0.843	[0.826, 0.867]	[0.835, 0.873]	[0.885, 0.910]	[0.658, 0.716]
	Skl03	0.836				
	Skl04	0.855				
Self-organization	Skl14	0.845	0.879	0.881	0.916	0.733
	Skl15	0.881	[0.857, 0.898]	[0.861, 0.901]	[0.903, 0.929]	[0.699, 0.765]
	Skl16	0.853				
	Skl17	0.846				

CR = composite reliability; AVE = average variance extracted; The values in brackets are the lower and upper bounds of the one-tailed percentile confidence intervals with 10,000 subsamples at a 5% significance level.

Appendix A3. Aggregate-level results with respect to discriminant validity based on the HTMT criterion (N = 662)

Construct	EfS Expertise	Self-organization
Self-organization	0.782	
	[0.733, 0.828]	
Personal and interpersonal outcomes	0.765	0.709
	[0.716, 0.813]	[0.656, 0.759]

The values in brackets are the lower and upper bounds of the one-tailed percentile confidence intervals for HTMT statistics generated using 10,000 subsamples at a 5% significance level.

Appendix A4. Aggregate-level results with respect to PLSpredict analysis

Construct	Item	PLS results		LM results	$RMSE_{PLS}$-$RMSE_{LM}$ ≤0
		RMSE	Q^2_predict	RMSE	
Personal and interpersonal outcomes	EfPe01	0.731	0.347	0.734	Yes
	EfPe02	0.701	0.359	0.699	No
	EfPe03	0.655	0.394	0.658	Yes
	EfPe04	0.636	0.400	0.636	Yes
	EfPe05	0.673	0.418	0.673	Yes

LM = linear model; RMSE = root mean square error;

Appendix A5. Aggregate-level results with respect to robustness check (quadratic effects)

Quadratic effects	Estimate	*p* value	PCI	f^2
Quadratic Effect (EfS Expertise)→Personal and interpersonal outcomes	-0.021	0.518	[-0.086, 0.042]	0.001
Quadratic Effect (Self-organization)→Personal and interpersonal outcomes	0.005	0.878	[-0.056, 0.061]	0.000

The quadratic effects were assessed based on a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level.

Appendix A6. MICOM results

Latent variable	Configural invariance	Compositional invariance				Full measurement model invariance						
		Original correlation	5.00%	*p* value	Partial invariance	Mean difference (Japan - Malaysia)	Confidence interval	Equality of means	Variance difference (Japan - Malaysia)	Confidence interval	Equality of variances	Full invariance
EfS Expertise	Yes	1.000	0.997	0.813	Yes	-0.946	[-0.210, 0.201]	Not equal	0.241	[-0.344, 0.312]	Equal	No
Self-organization	Yes	1.000	0.998	0.962	Yes	-1.016	[-0.212, 0.206]	Not equal	0.494	[-0.398, 0.365]	Not equal	No
Personal and interpersonal outcomes	Yes	0.999	0.999	0.072	Yes	-0.911	[-0.211, 0.200]	Not equal	0.435	[-0.411, 0.361]	Not equal	No

Appendix A7. Country-specific results with respect to loadings, reliability, and convergent validity

Construct	Item	Japan (N = 108)					Malaysia (N = 554)				
		Loading	Alpha	rho_A	CR	AVE	Loading	Alpha	rho_A	CR	AVE
Personal and interpersonal outcomes	EfPe01	0.799	0.896	0.903	0.923	0.706	0.817	0.909	0.91	0.932	0.734
	EfPe02	0.816					0.858				
	EfPe03	0.886					0.875				
	EfPe04	0.841					0.858				
	EfPe05	0.858					0.874				
EfS Expertise	Skl01	0.749	0.811	0.819	0.875	0.638	0.771	0.833	0.838	0.889	0.667
	Skl02	0.825					0.826				
	Skl03	0.795					0.828				
	Skl04	0.823					0.840				
Self-organization	Skl14	0.825	0.853	0.860	0.900	0.693	0.821	0.861	0.865	0.906	0.706
	Skl15	0.856					0.869				
	Skl16	0.831					0.845				
	Skl17	0.818					0.826				

Appendix A8. Country-specific results with respect to discriminant validity based on the HTMT criterion

Construct	Japan (N = 108)		Malaysia (N = 554)	
	EfS Expertise	Self-organization	EfS Expertise	Self-organization
Self-organization	0.703		0.753	
Personal and interpersonal outcomes	0.737	0.646	0.729	0.667

Appendix A9. Country-specific results with respect to structural model evaluation

Path/Hypothesis	Japan (N = 108, R^2 = 0.476)			Malaysia (N = 554, R^2 = 0.465)		
	Estimate	*t* statistic	*p* value	Estimate	*t* statistic	*p* value
Age→Personal and interpersonal outcomes	0.043	0.674	0.500	0.042	1.390	0.165
EfS Expertise→Personal and interpersonal outcomes	0.459	6.128	< 0.000	0.432	8.647	< 0.000
Self-organization→Personal and interpersonal outcomes	0.309	3.413	< 0.000	0.316	6.527	< 0.000

The effects of the predictors on the outcome variables were assessed based on a one-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level; The effects of the covariate on the outcome variables were assessed based on a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level; All VIF values were below 2.

Appendix A10. Country-specific results with respect to PLSpredict analysis

Construct	Item	Japan (N = 108)				Malaysia (N = 554)			
		PLS results		LM results	$RMSE_{PLS}$-$RMSE_{LM}$ ≤0	PLS results		LM results	$RMSE_{PLS}$-$RMSE_{LM}$ ≤0
		RMSE	Q^2_predict	RMSE		RMSE	Q^2_predict	RMSE	
Personal and interpersonal outcomes	EfPe01	0.908	0.321	0.935	Yes	0.694	0.317	0.702	Yes
	EfPe02	0.967	0.143	1.034	Yes	0.644	0.344	0.643	No
	EfPe03	0.801	0.315	0.857	Yes	0.625	0.328	0.629	Yes
	EfPe04	0.765	0.344	0.813	Yes	0.610	0.330	0.615	Yes
	EfPe05	0.793	0.364	0.853	Yes	0.647	0.350	0.650	Yes
		High out-of-sample predictive power				Medium out-of-sample predictive power			

Appendix A11. Country-specific results with respect to robustness check (quadratic effects)

Path	Japan (N = 108)		Malaysia (N = 554)	
	Estimate	*p* value	Estimate	*p* value
Quadratic Effect (EfS Expertise)→Personal and interpersonal outcomes	0.051	0.442	-0.034	0.448
Quadratic Effect (EfS Self-organization)→Personal and interpersonal outcomes	-0.060	0.420	0.019	0.586

p values generated based on a two-tailed percentile bootstrapping test with 10,000 subsamples and at a 5% significance level.