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# ECO-Campus: A Conceptual Model Unravelling Determinants and Perceived Outcome of Environmental Management Systems Adoption in the Malaysian Higher Education Industry

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**Abstract**

**Purpose:** Higher Education Institutions (HEIs) have been undergoing a major transformation in recent years resulting from increasing enrolment. These educational reforms contribute to economic growth and societal advancement. Unfortunately, the environmental dimension has often been overlooked. Extreme weather is impacting the onsite activities in the campus. The traditional approach of managing compliance is insufficient. HEIs play an important role in promoting Education Sustainable Development (ESD) and managing their campus in a more sustainable manner while striving to stay competitive in world ranking. A sustainability tool, Environmental Management System (EMS) can be adopted to help HEIs in addressing these challenges. Despite its advantages, adoption in the education sector is significantly low compared to other sectors. Hence, this study aim to examine the determinants of EMS adoption among HEIs in Malaysia.

**Design/methodology/approach:** Quantitative approach

**Findings**: Existing empirical studies in HEIs context are scarce. EMS is often conceived as business practice with limited theoretical implications. A holistic conceptual model is proposed by integrating innovation characteristics with institution's experience to address research gaps.

**Practical implications:** This study is expected to provide insights to management on the pre-requisites that are required for a successful adoption of EMS, inspire more HEIs to benchmark the adoption, foster knowledge sharing and accelerate the implementation of ESD.

**Originality/value:** This paper contributes theoretically to the existing literature of EMS adoption by extending theory of Diffusion of Innovation to include organizational factors. Unlike previous studies that focus solely on external pressures and performance, this paper emphasizes how

innovation characteristics and organizational experience could improve sustainability performance among HEIs.

**Keywords**: Environmental Management Systems, Adoption, Sustainable Performance, Higher education, Malaysia

**Classification:** Conceptual paper

## Introduction

Countries worldwide are implementing measures to revamp their higher education systems. These changes aim to address rising enrolment, reduce inequality in underdeveloped regions, and equip graduates with skills that align with the labor market (The World Bank, 2021). This evolution of HEIs contributes not only to national economic growth but also to societal advancement. Unfortunately, the environmental dimension has often been overlooked. (F. Li et al., 2021). Environmental degradation from human activities such as pollution, increasing scarcity of natural resources and climate change have led to an increased episodes of natural disasters. Given these global challenges, urgent action and a robust multilateral system are necessary to mitigate environmental risks (Haque & Jahid, 2021; United Nations, 2021).

These environmental issues are impacting everyone including schools. The cases of illegal waste dumping have become more prevalent in recent years. Hazardous waste generation in Malaysia increased drastically from 2, 017, 280.76 Metric Tons (2017) to 7, 185, 227.76 Metric Tons (2020) accounting for a 256% increase (Department of Environment, 2020). A total of 2.43 tons of chemical toxic waste illegally dumped in Sungai Kim in 2019 has led to an emergency in public health and closure of 111 schools in the area. Apparently, the traditional approach of managing compliance is insufficient. A more systematic and holistic approach is needed to mitigate environmental risk for a more sustainable future. In line with this, ISO play its role as sustainability tools to help organization achieve sustainable development.

Sergio Mujica, the ISO Secretary General reiterated that the adoption of ISO standards tools could realize Agenda 2030 (ISO, 2022). ISO published more than 22,000 sustainability management standards and other relevant document encompassing every area related to sustainability (Ikram et al., 2021). These standards have been adopted by 170 countries globally to support organizations and contributes directly to Sustainable Development Goals (SDGs) (ISO, 2018). To date, the total number of organizations that are ISO certified has increased from 980,322 (2008) to 1,299,837 (2020) which signified 32.6% growth (ISO, 2022b).

Although universities may not be the primary contributor for these environmental issues, it is undeniable that university play a crucial role as a learning institution, contributing by fostering and nurturing useful knowledge for future leaders, entrepreneurs, decision-makers, and academia (Ferrer-Balas et al., 2010). It is more effective to cultivate sustainability awareness at an early age through education. Education has been highlighted as one of the most significant demographic determinants of sustainable attitudes and behaviors (Nguyen et al., 2019). HEIs should be a role model by practicing sustainability in their day-to-day campus operation such as teaching, research, community program and building facilities management (Ferrer-Balas et al., 2010).

Today, HEIs have been transformed to a multipurpose institution (Teixeira & Shin, 2020). Besides fostering economic growth, innovation, reducing poverty and improving social prosperity, HEIs also play an important role in environmental awareness (The World Bank, 2021). Ideally, the role of HEI covers the three important pillars in sustainability, which is People, Planet and Profit (3P) introduced by Elkington, & Rowlands (1994). HEI is the main driver in the national approach towards achieving SDGs. United Nation (UN) has transformed awareness, knowledge, capability, proficiency, and values into sustainability effort through establishment of various education programs. In 2015, the UN reaffirmed the importance of ESD by establishing SDG4 Quality Education with 7 goals to ensure that all learners acquired the knowledge and proficiency needed to nurture sustainable development (Ferrer-Estévez & Chalmeta, 2021).

HEIs are also striving to compete in world ranking by participating in various international ranking systems to remain resilient. Managing an education institution has become a challenging task. In line with that, the ISO Standards, training, and certification offer a more systematic way to address these challenges in HEIs (BSI, 2023). Among the ISO management systems that have been commonly adopted worldwide are Quality Management Systems (ISO 9001), Environmental Management Systems (ISO14001) and Occupational Health and Safety Management System (ISO45001) (Aleixo et al., 2018; Poltronieri et al., 2018). ISO14001 EMS is chosen as focus of this study with respect to the prevalence of environmental degradation that impact the world currently.

***Environmental Management System***

Environmental Management System (EMS) is "a formal system that guides the user to formulate explicit goals, compiling relevant information for decision making, measuring progress, and improving performance" with regards to resource utilization, process time, and environmental impact (Florida & Davison, 2001). EMS serves as an effective tool that guides organizations to establish "standardized structures, procedures and processes to minimize environment impacts (Ozusaglam et al., 2018). Besides resource efficiency and competitive advantage (Iatridis & Kesidou, 2018), EMS is also as a governance tool that has been adopted by organization to strengthen compliance (Johnstone & Hallberg, 2020), promote involvement and engagement with staff and stakeholders (Horry et al., 2022), promote integration with Corporate Social Responsibility and Circular Economy (Kristensen et al., 2021).

Organizations obtain EMS certifications voluntarily as it is not mandatory (Christmann & Taylor, 2006). EMS certified by external independent parties produce more genuine results (Wu & Wu, 2019) and produce a better performance (Sweis & Jaradat, 2022). The two main standards that set out the requirements for an Environmental Management System (EMS) are ISO14001:2015 and Eco-Management and Audit Scheme (EMAS) (Marrucci et al., 2021). Both are similar to each other, devoted to the management of environmental impacts and driving environmental innovation (Khan et al., 2022). ISO14001:2015 is a globally recognized standard issued by non-government body, the International Organization for Standardization (ISO), while EMAS is regulated by European Regulation EC 1505/2017. The registration is issued by authorities (Martins & Fonseca, 2018).

Today, ISO14001 EMS has emerged as one of the most vital environmentally sustainable tools (Bravi et al., 2020). ISO 14001 EMS was first introduced by the International Organization for Standardization (ISO) in 1996 with a total of 13,994 sites certified. The number of sites that have adopted ISO14001 EMS increased to 90,554 in 2004 with the publication of the 2nd edition and 319, 496 sites in 2015 with the release of the 3rd and most recent edition. The number of sites certified with ISO 14001 increased to 740,208 worldwide in 2022 (Figure 1). In Malaysia, the adoption is also showing increasing trend from 3017 sites adopted in 2017 to 4059 sites adopted in 2022 (ISO, 2022b). This study will focus on EMS according to ISO14001 standard as it is the most extensively accepted worldwide and the adoption is continuously increasing compared to EMAS which is slowing down as the adoption is mostly led by European countries (Merli et al., 2018).

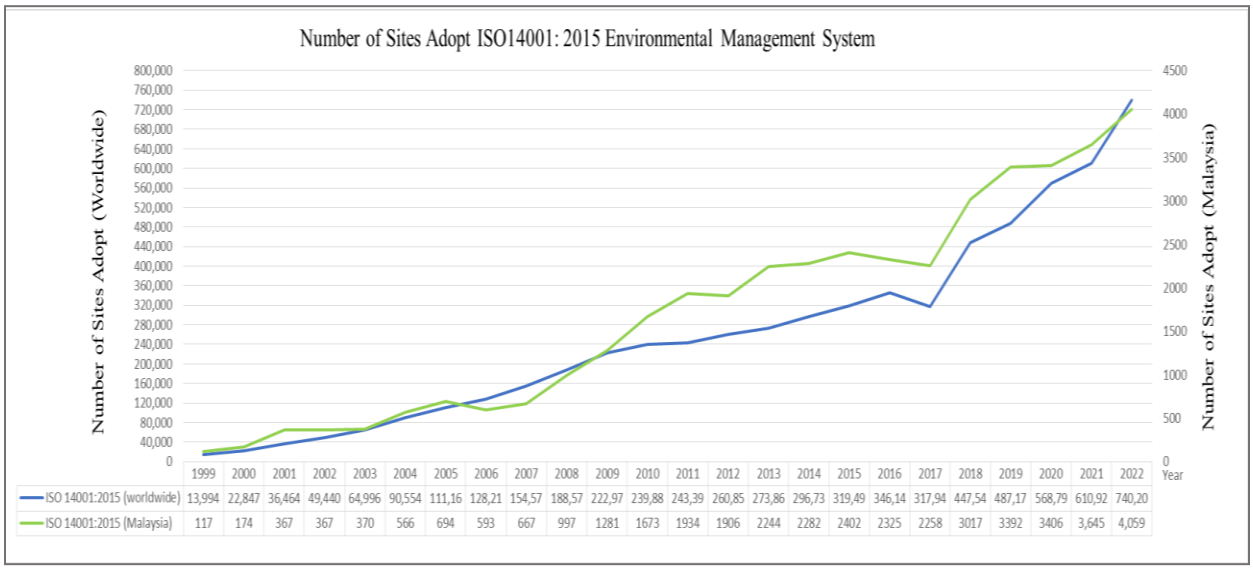

Figure 1: Number of Sites Adopted ISO14001 EMS (ISO, 2022)

***Sustainable Performance of HEIs***

The percent of gross tertiary education enrollment in Malaysia has been above the world average trend since 1998 (The World Bank, 2022). In recent years, the role of government has shifted towards global rankings instead of prioritizing education quality (Steiner et al., 2013). The desire for a high global ranking has surpassed the needs of accreditation agencies and other stakeholders (Marginson, 2006). Many universities are transforming into elite research universities to compete in world ranking. This becomes a burden for developing countries as more funding is required for research. The financial difficulty and inequality of education market became prevalent in 2020 during the Covid-19. Professionals have expressed in media that misleading trends are distracting HEI from the important developments essential for sustaining HEIs' operation (Davie, 2020). ISO 14001 EMS enable HEIs to focus on its performance while maintaining global rankings as part of competitive advantage.

Several ranking systems have been applied worldwide as part of the performance measurement (Buckner, 2022). However, there is no single standardize system to evaluate sustainability performance in universities (Disterheft et al., 2016). The four main ranking systems that assess

sustainable performance are QS World University Ranking, Times Higher Education (THE) Impact Ranking, Sustainability Tracking, Assessment & Rating System (STARS) and UI GreenMetric World University Rankings. In 2022, QS started to assess institutional commitment towards sustainable development based on environmental and social impact of their output in certain areas of sustainability development. Universiti Malaya (UM) was ranked 65th in 2021 but dropped to 70th in 2022 and 2023 (QS, 2023). This presents an opportunity for HEIs to adopt a management system for effective risk management. Additionally, UM received silver medals for its sustainability performance (QS, 2023). The pursuit of continual improvement, as outlined in ISO standard, serves a crucial aspect, enabling other HEIs to enhance sustainable performance.

Table 1: Malaysia University ranking in QS World University Ranking 2023 (QS, 2023)

| Ranking (2021) | Ranking (2023) | University | QS Star rated | Environmental Impact | Social Impact |
|---|---|---|---|---|---|
| 65 | 70 | Universiti Malaya (UM) | None | Silver | Silver |
| 143 | 123 | Universiti Putra Malaysia (UPM) | 5 | Silver | Candidate |
| 147 | 129 | Universiti Kebangsaan Malaysia (UKM) | 5 | Silver | Bronze |
| 144 | 143 | Universiti Sains Malaysia (USM) | None | Silver | Bronze |
| 191 | 203 | Universiti Teknologi Malaysia (UTM) | 5 | Silver | Unrated |
| 332 | 284 | Taylor's University | 5 | Unrated | Unrated |
| 347 | 284 | UCSI University | None | Unrated | Unrated |
| 414 | 361 | Universiti Teknologi PETRONAS (UTP) | None | Silver | Unrated |

Currently THE Impact Rankings is the only global evaluation system that comprehensively measures university performance against all SDG1-17 covering the area of research, stewardship, outreach, and teaching. Universiti Sains Malaysia (USM) stands out as the first Asian HEI that consistently ranked in the top 10 for THE impact ranking. Holding steady at the 4th position since 2022, USM achieved an overall rating of 96.9 in 2023, slightly reduced from 97.5 rating in 2022. The highest- score were SDG17 (global partnership for the goal), SDG16 (peace, justice, and strong institution), SDG 2 (Zero hunger) and SDG 1 (No poverty) (Times Higher Education, 2023). This accomplishment aligns with the vision of Transforming Higher Education for a Sustainable Tomorrow.

Table 2: Times Higher Education (THE) Impact Ranking 2023 (Times Higher Education, 2023)

| World Ranking | University | Country | Best score SDG | Overall score |
|---|---|---|---|---|
| 1 | Western Sydney University | Australia | SDG 17, 15, 12, 5 | 99.4 |
| 2 | University of Manchester | United Kingdom | SDG15, 17,11, 12 | 97.5 |
| 3 | Queen's University | Canada | SDG 16, 17, 11, 2 | 97.2 |

| | | | | |
|---|---|---|---|---|
| 4 | Universiti Sains Malaysia | Malaysia | SDG5, 7, 16. 17 | 97.5-→96.9 |

The results indicated that there are plenty of opportunities for Malaysia's HEI to improve environmental sustainability such as SDG7, 11, 12, 13, 14 and 15 besides social sustainability. Apart from QS and THE ranking, both UI GreenMetric and Sustainability Tracking Assessment & Rating System (STARS) measure different aspects to assess sustainability performance. Universiti Putra Malaysia (UPM) and Universiti Malaysia Sabah (UMS) rank 25th and 50th, respectively, in UI Green Metric World University Ranking (UI GreenMetric, 2023). UPM ranking has been improved from 27th in 2021 to 25th in 2022 and 2023. However, UM ranking dropped significantly from 32nd in 2021 to 50th in 2022 and 60th in 2023. Different from other rating systems, HEIs use STARS as a self-reporting tool that helps them to measure their sustainability performance. Universiti Malaya is the only HEI in Malaysia that participated in STARS rating program. However, it was not awarded any STARS' rating (STARS, 2023)

Table 3: UI GreenMetric World's Most Sustainable Universities in 2023 (UI GreenMetric, 2023)

| **World Ranking** | **University** | **Country** | **Energy & Climate Change, waste & water** | **Total score** |
|---|---|---|---|---|
| 25 | Universiti Putra Malaysia | Malaysia | 4175 | 8900 |
| 50 | Universiti Malaysia Sabah | Malaysia | 4075 | 8625 |
| 60 | Universiti Malaya | Malaysia | 4285 | 8585 |

***Problem Statement***

Despite the benefits of adopting ISO14001 EMS, the adoption rate is rather low especially in education sector. In a study conducted by Aleixo et al. (2018), more than 60% of HEIs in Portugal have not adopted ISO 14001 EMS. The ISO14001 EMS adoption in worldwide education sector as shown in the blue line in Figure 2 indicates a generally slow increasing trend, but with a few years of inconsistency. Specifically, there were significant reductions from 2014 to 2017 following the introduction of the latest standard in 2015. Although the adoption reached a total of 5 in 2021, the numbers dropped to 3 in 2022 (ISO, 2022b).

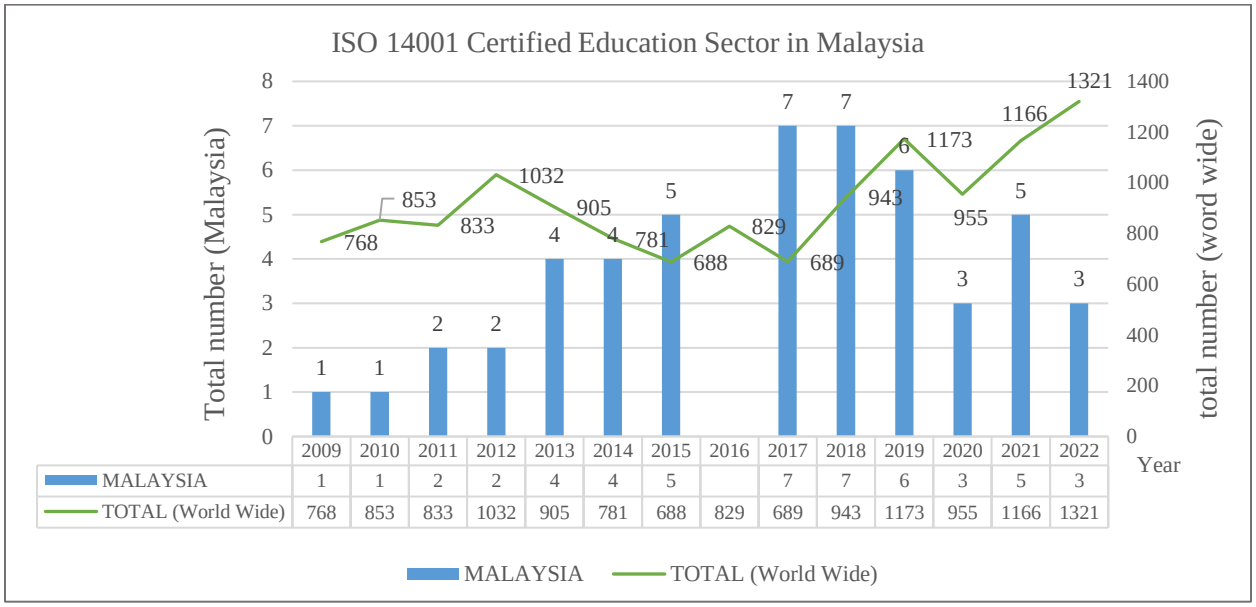


Figure 2**.** Number of Sites Adopting ISO14001 Environmental Management System

Among all sectors that adopted ISO14001 EMS worldwide, only 0.24% of certification was obtained by the education sector in 2022. A total of 1321 certifications were awarded to the education sector out of the total 511,332 certificates issued to all sectors worldwide in 2022 (Figure 3). In Malaysia, the total adoption is only 0.7%, which reflects that 3 institutions adopted ISO14001 EMS out of the total 596 HEIs in Malaysia in 2022 (ISO, 2022b; Ministry of Higher Education, 2024).

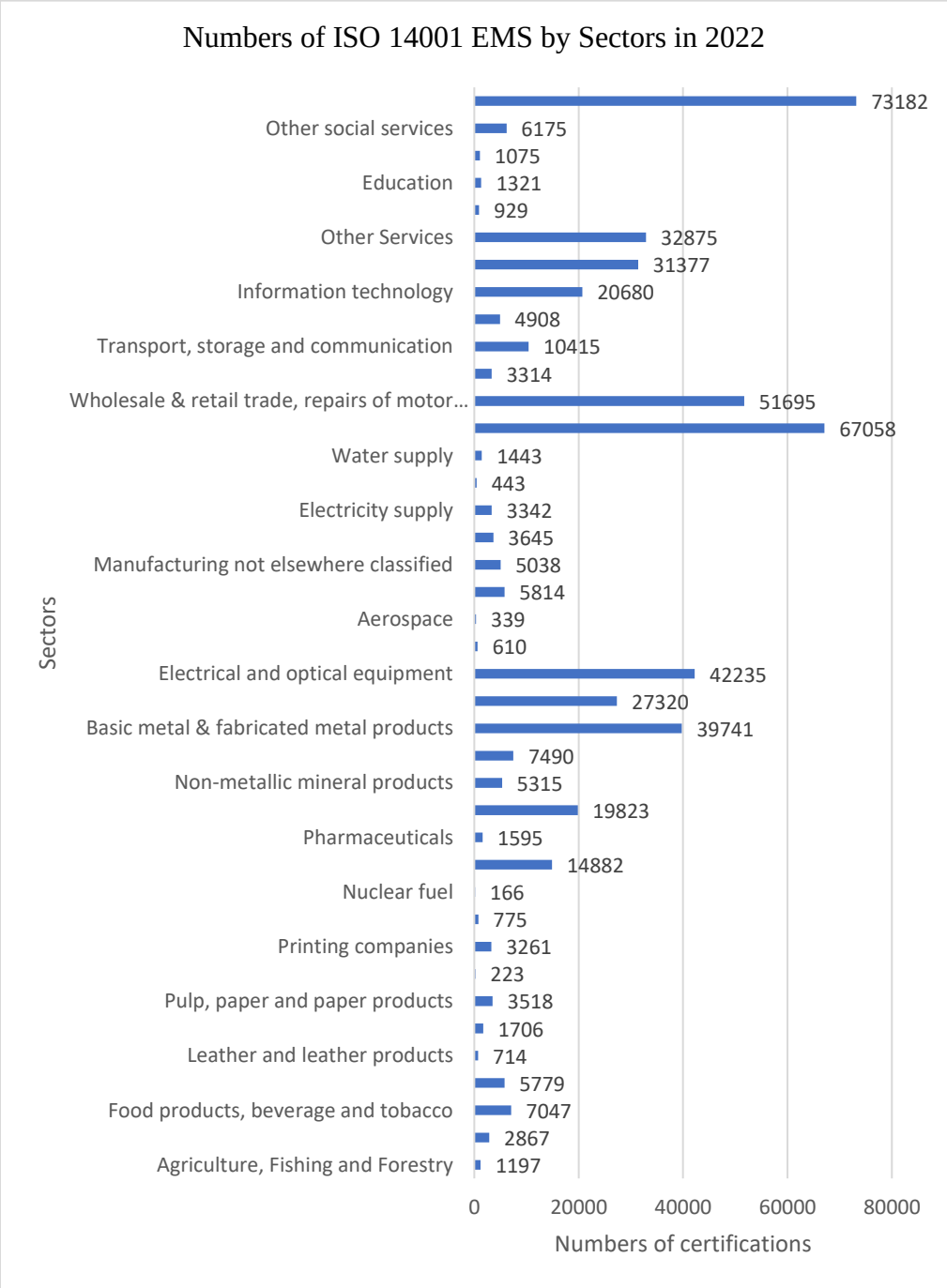


Figure 3: ISO 14001 Certification by Sectors (Globally) in 2021 (ISO, 2022b)

UN has emphasized the need to address sustainable development in education, as well as research, campus management and community as a whole. Nevertheless, there is still lack of implementation in education institutions. Very few will evidence integrative or holistic approaches to sustainability (Shiel et al., 2020). Educational institutions' professionals and management are still having doubts as to how to use education to promote the SDGs in educational institutions (Leal Filho et al., 2019).

Five years after the introduction of 2030 agenda, there is an urgent need for more aggressive mutual attention and effort (António Guterres, 2019).

Furthermore, there are questions of their implementation in organization (Cagnin et al., 2021). Moumen & El Aoufir (2017) called for further investigation on how this new revised standard could help in management system integration. It is also uncertain that education sector is aware of these amendments in the newly revised standard. ISO has published a newly revised version in 2015 that is designed to guide organizations to manage risks and opportunities, internal and external issues, needs and expectations from internal and external stakeholders (ISO, 2018). The changes involved standardization of all ISO standards with the introduction of High-Level Structure, risk-based approach, lifecycle thinking, and greater emphasis on the importance of leadership and stakeholders (ISO, 2015).

***Research Objectives***

Based on the problem statements, the research objectives are developed to:
1. Determine the factors influencing adoption of ISO14001 EMS among HEIs in Malaysia
2. Examine the moderating effect of prior experience on the relationship between innovation characteristics of EMS and EMS adoption.
3. Examine the perceived outcome of EMS adoption on sustainability performance.

***Research Questions***

Based on the objective of the research, this study will address the following research questions:
1. Does relative advantage, compatibility and adaptability positively influence EMS adoption among HEIs in Malaysia?
2. Does complexity and perceived cost negatively influence EMS adoption among HEIs in Malaysia?
3. Does prior experience moderate the relationship between all the innovative characterises and EMS adoption among HEIs in Malaysia?
4. Does adoption of ISO14001 EMS have positive perceived outcome on sustainability performance among HEIs in Malaysia?

***Significance of the Research***

This study is expected to bring value to existing literature of EMS by adding theoretical concepts into the study. This study extended Diffusion of Innovation Theory by integrating with Resource Based View theory (RBV).

Practically, this study could increase HEIs awareness of the essential pre-requisites that are required for a successful adoption and the organization context that is crucial for adoption. Policy makers, top management, and leaders in HEIs could utilize this result as guidance to strategically plan their internal resources prior to adoption. As a result, the adoption rate is expected to increase. EMS enables the adoption of various environmental practices, eco-innovation, or green innovations (Diabat & Govindan, 2011; Jum'a et al., 2021) and contributes to employment, strengthens HEI competitiveness in world ranking, and promotes environmental accountability

and transparency. The result of this study serves as a guidance to local government, policy makers to understand perception of HEIs and how management of HEIs can foster knowledge sharing through benchmarking and accelerate the implementation of ESD.

**Literature Review**

ISO 14001 EMS adoption drives sustainable development. The SDG4-IRIS framework guides HEIs to drive sustainability ESD (Ferrer-Estévez & Chalmeta, 2021). The framework consists of four dimensions, namely methodology, resources, stakeholders, and maturity model. The first dimension, "methodology" in this framework starts with Project planning, Strategic Planning, Implementation, Measurement, Evaluation, and decision making for further improvement. It is similar to the Plan, Do, Check and Act framework in ISO management system standard (Lan & Lee, 2019). Hence, ISO 14001 EMS adoption is proposed in this study as an effective "methodology" to address environmental concern and transform HEIs towards sustainability.

The decision of ISO 14001 EMS adoption is greatly influenced by prior experiences in ISO 9001 QMS certification (Tay et al., 2018), and the advantages such as improved reputation (Salim et al., 2018; Sartor et al., 2019), cost and resource efficiency, enhancement of ESG performance (Ronalter et al., 2022) and sustainable performance (Gomes et al., 2023; Ikram et al., 2019).

Study conducted by (Johnstone & Hallberg, 2020) revealed that SMEs interpret ISO14001 as requiring incessant documentation although the latest version of the standard has reduced the documentation requirements. The bureaucracy and cost for initial and subsequent certification (Salim et al., 2018; Sorooshian & Yee, 2019) present the main barriers for ISO 14001 EMS adoption besides lacking governmental incentive (Y. Li et al., 2019; Salim et al., 2018) and institutional support (Salim et al., 2018). Public grant from government is an alternative solution to cover the cost involved in ISO 14001 certification (Bravi et al., 2020). Despite the presence of barriers that might initially hinder the adoption, the overall benefits and motivation for HEIs to adopt ISO 14001 EMS outweigh these barriers. Hence, ISO 14001 EMS is seen as a positive opportunity for HEIs, as it does not bring any harm to the organization**.**

Research in the field of ESD is limited. The majority of publications related to sustainability are from Europe as sustainability is greatly encouraged by the European local government (Ferrer-Estévez & Chalmeta, 2021). Empirical study related to adoption of ISO14001 EMS is scant especially in HEI context. The majority examine the adoption of other green innovations such as GHRM (Abbas et al., 2022), GSCM (Jum'a et al., 2022; Kitsis & Chen, 2021) and 5S practise (Rhaffora et al., 2019) and CSR (Agustina et al., 2023).

Limited attention has been given to explore the available strategies or approaches (i.e. EMS) to drive all these green innovations in a single holistic way. Previous empirical studies conducted did not utilize theoretical concepts to examine the relationship between variables. For example, study conducted by Todaro et al., (2019) focuses on a finite set of exogenous and endogenous contextual factors applicable to technical aspect of EMS. Furthermore, most of the studies focused upon the effect of EMS on performance outcome. Sustainability studies in manufacturing industry are more prevalent due to their substantial exposure to environmental issues (Horng et al., 2017). Hence,

this study intends to close these gaps by investigating the determinants of ISO14001 EMS adoption among HEIs in Malaysia.

### *Underpinning theory*

Diffusion of Innovation Theory (DoI) is a well-established and most widely used theory in economics, behaviour study and numerous innovation adoption diffusion studies throughout various disciplines. Rogers (2003) affirmed that 49%–87% of the variance in innovation adoption is demonstrated by five attributes of innovation which resulted in either positive or negative outcome on the adoption. The five innovation attributes are relative advantage, compatibility, complexity, trialability and observability. Innovation not only refers to new technology or product, but also new mindsets, new processes, and practices. Roger (2003) defined innovation adoption as a decision to use and implement a new idea, practice or item by person or organization.

ISO 14001 adoption portrays the same behaviour as the adoption of new technologies, slow in the beginning of adoption stage but increasing tremendously until it reaches an optimum level following a sigmoid curve (Di Noia & Nicoletti, 2016). Hence, ISO14001 EMS is regarded as a green innovation that is relatively new to HEIs. A thorough study based on new version ISO14001 standard remains under-researched, especially in developing countries.

DoI is applied to examine the perceived innovation characteristics of Green Supply Chain Management Practices (Jum'a et al., 2022); adoption of environmental sustainability innovations (Chaudhary & Kumar, 2021); sustainability innovation adoption (Kumar & Sheoran, 2021) and adoption of computer-assisted audit tools and techniques (Siew et al., 2020). DoI is also adopted in other studies to explain the phases / stages of innovation adoption such as adoption of Building Information Modeling (BIM) in SMEs (Saka & Chan, 2020). These stages include knowledge, persuasion, decision, adoption, and confirmation (Roger, 1995).

Another theory that is relevant to adoption of ISO14001 is Resource-based view theory (RBV). RBV is a management theory that focuses on understanding how a firm's distinctive internal resources and capabilities contribute to its performance and competitive advantage. It implies that a firm's success is determined by the valuable, rare, inimitable, and non-substitutable (known as VRIN) resources it has and how effectively it can optimize those resources to gain competitiveness in the marketplace (Barney et al., 2001; Barney & Hesterly, 2015). Valuable resources enable the firm to take advantage of opportunities and/or mitigate threats in the external environment. Rare resources are those that their rivals do not commonly possess. Inimitable resources are resources that difficult for rivals to duplicate and mimic, while non-substitutable resources cannot be replaced by other means (Barney, 1991).

Resources can be tangible or intangible assets that a firm controls and organizational capability that a firm owns which are attached semi permanently to a firm (Amit & Schoemaker, 1993; Wernerfelt, 1984). Resource-based theory provides insights into how an organization can strategically discover, develop, and leverage their resources to add value, succeed financially and create long-term success in their respective industries (Othman et al., 2015).

### *Research Hypotheses*

#### *Relative advantage*

A process efficiency and its effectiveness, economic performance as well as social prestige and satisfaction are qualitative and quantitative measurement of relative advantage (Rogers, 1983). The advantages of international standards are to make it easy for an organizations achieve its optimum performance (Hina et al., 2019) by removing ambiguity, improving communication and encouraging knowledge sharing (Jiang et al., 2020). Most importantly, to ensure consistency, transparency, and sharing of sustainability practices worldwide (Ikram et al., 2021). The advantage is more significant with the release of latest ISO standard in 2015. The new high-level structure, known as Annex SL, aims to harmonize all management systems for easier integration in organizations that implemented multiple systems. Implementing a Management System promotes financial gain through efficiencies (Iatridis & Kesidou, 2018) and non-financial gain in terms of sustainability and reputation (Barbosa et al., 2022; Marrucci et al., 2021; Masuin et al., 2020). This is particularly beneficial for public HEI facing budgetary cuts since 2017 (Ahmad et al., 2021).

Okour et al., (2021) revealed that usage of Knowledge Management System in banking sector is positively influenced by relative advantages. Other studies also found that relative advantage positively affects the adoption of ISO9001 QMS in HEI (Kasperavičiūtė-Černiauskienė & Serafinas, 2018), environmental management practices in SME (Latip et al., 2021), environmental marketing strategy in hotel industry (Kumar & Sheoran, 2021) and environmentally sustainable innovation in hospital (Chaudhary & Kumar, 2021). With these results, below hypothesis is developed:

H1: Relative advantage positively influences ISO 14001 EMS adoption among Higher Education Institutions in Malaysia.

#### *Compatibility*

Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences and expectations of potential adopters (Rogers, 2003).
Research in various sectors highlights the benefits of transitioning to latest ISO 14001:2015 EMS version including alignment with the organization's strategic goals (Fonseca & Domingues, 2018).

Compatibility was found to be a positive driver for the adoption of ISO9001 QMS in HEIs (Kasperavičiūtė-Černiauskienė & Serafinas (2018). Several studies consistently showed that compatibility significant influenced the adoption of environmental management practices in SME (Latip et al., 2021), environmental marketing strategies in hotel industry (Kumar & Sheoran, 2021) and adoption of environmental sustainable innovation in hospital (Chaudhary & Kumar, 2021). Thus, hypothesis is formulated as below:

H2: Compatibility positively influences ISO 14001 EMS adoption among Higher Education Institutions in Malaysia.

***Adaptability***

Adaptability is the degree to which the user perceives the system as being adaptable to the particular organization's evolving environment from the technical and social perspective (Henfridsson & Bygstad, 2013). The new version of ISO management system accommodates the dynamic organization environment driven by globalization to ensure seamless integration (Fonseca, 2015).

Studies showed that perceived adaptability positively affects the adoption of ISO 9001 (Kasperavičiūtė-Černiauskienė & Serafinas, 2018), Electronics Record Management System (Mukred et al., 2019) in HEIs, Enterprise Social Network (Meske et al., 2019), socially assistive humanoid robot (Fridin & Belokopytov, 2014) and adaptive augmented reality (Tenemaza et al., 2016). Thus, our hypothesis posits that adaptability of ISO 14001 EMS increases the likelihood of adoption.

H3: Adaptability positively influences ISO 14001 EMS adoption among Higher Education Institutions in Malaysia.

***Complexity***

The degree to which an innovation is regarded as difficult to understand and apply is known as complexity (Rogers, 2003). Innovation that needs acquired new skill will slow down adoption process as it is inversely correlated with the rate of adoption (Chaudhary & Kumar, 2021).

Empirical studies showed that complexity hampers the adoption of environmental practises (Harley et al., 2020), sustainable business practices (Leroux & Pupion, 2018), eco-labelling (Leroux & Pupion, 2018) and elearning system (Al-Rahmi et al., 2019). Complexity also negatively affects the use of knowledge management system (Okour et al., 2021) and diminished the perceived benefits of Information security management, reducing the likelihood of adoption (Mirtsch et al., 2021). In contrast, the simpler the innovation, as evidenced in hospital context by Chaudhary & Kumar (2021), the more likely the innovation is to be adopted. Considering the concrete result from above studies, hypothesis below is proposed:

H4: Complexity negatively influences ISO 14001 EMS adoption among Higher Education Institutions in Malaysia.

***Perceived Cost***

Adoption of green practices can save cost, but it is a significant challenge for small organizations with limited human and financial resources, and lack of capability to gain cost benefits (Ashton et al., 2017; Biondi et al., 2000; Bowen, 2002).

Kasperavičiūtė-Černiauskienė, & Serafinas (2018) highlighted that cost negatively affects ISO 9001 adoption in HEIs. Lin et al., (2020) showed that perceived cost significantly affects the adoption of Green Supply Chain Management (GSCM). Jum'a et al., (2022) identified the cost of

initial set-up and additional headcount are the most significant factors that hinder GSCM adoption. Based on the above findings, the following hypothesis is established:

H5: Perceived cost negatively influences ISO 14001 EMS adoption among Higher Education Institutions in Malaysia.

***Prior experience***

The decision to adopt another management system is expected to be influenced by prior experience with other management systems (Ivanova et al., 2014). Quality and environmental management systems have the same structure and similar practice for implementation. EMS can employ the same strategies, tools, and practices to achieve an organization's objectives and targets (Pereira-Moliner et al., 2012).

In recent years, integration between QMS and EMS has gained more attention in management study due to its advantages (Molina-Azorín et al., 2015). Studies conducted by Hamdoun et al. (2018) highlighted the joint benefits of QMS and EMS in terms of innovation. However, this study will not explore the impact of integration as EMS is relatively new in HEIs. Instead, the effect of previous experience in ISO9001 QMS on the adoption of EMS will be examined in this study.

Previous empirical study conducted by Hamdoun et al. (2018) found that adoption of quality management practices favours the implementation of environmental management practices and diffusion of eco-certification (García-Quevedo et al., 2020). With the support from previous studies, it is hypothesized that:

H6: Prior experience moderates the relationship between relative advantage and ISO 14001 EMS adoption among HEIs in Malaysia.

***Conceptual Framework***

The theoretical foundation of the conceptual framework (Figure 4) is well established based on Resource-Based View (RBV) and Diffusion of Innovation (DoI). These theories were chosen because they individually provided distinct insights into the adoption of ISO 14001 EMS. Both theories are organizational level theories and comprehensive enough to cover all perspectives from internal to external factors and both positive and negative characteristics of innovation. These theories are adapted from previous literature. However, some of the variables have been removed and replaced with other variables to suit the context of this study.

First, this study seeks to understand how leaders in HEI perceive ISO 14001 EMS based on its attributes. DoI theory is used to explain the innovation attributes of ISO 14001 EMS. This theory is modified by removing variables that are not applicable and replaced with other important variables that were previously applied in similar study. The positive attributes adopted from DoI are perceived relative advantage, perceived compatibility and perceived adaptability, whereas the negative attribute adopted is perceived complexity and perceived cost. Trialability is not included in the current study because ISO 14001 EMS requires allocation of resources such as appointment of competent person and certification cost. Besides, it requires a longer time to implement.

Temporary or partial implementation may not be able to yield results. Furthermore, the manager of the organization might have already discovered the benefits of ISO14001 EMS before deciding to adopt it. Observability dimension is also excluded in the study as it is difficult to see the immediate result from adoption. Perceived adaptability is added into this conceptual framework as it is important to examine how management perceive the ISO 14001 EMS ability to adapt to organization needs.

The perceived cost is added into this conceptual model as the adoption involved various costs. Apart from the initial certification cost and annual surveillance cost, training, and implementation of environmental sustainability projects to support EMS objective and target incurred another cost. Although some organizations may find the cost a burden, the benefit of certification will supersede the relevant expenses if the ISO 14001 standard is effectively implemented. This is evidenced from a study conducted by Bashir et al., (2022), in which the adoption of ISO14001 standard has significantly improved the effectiveness of implementation in environmental sustainability practices.

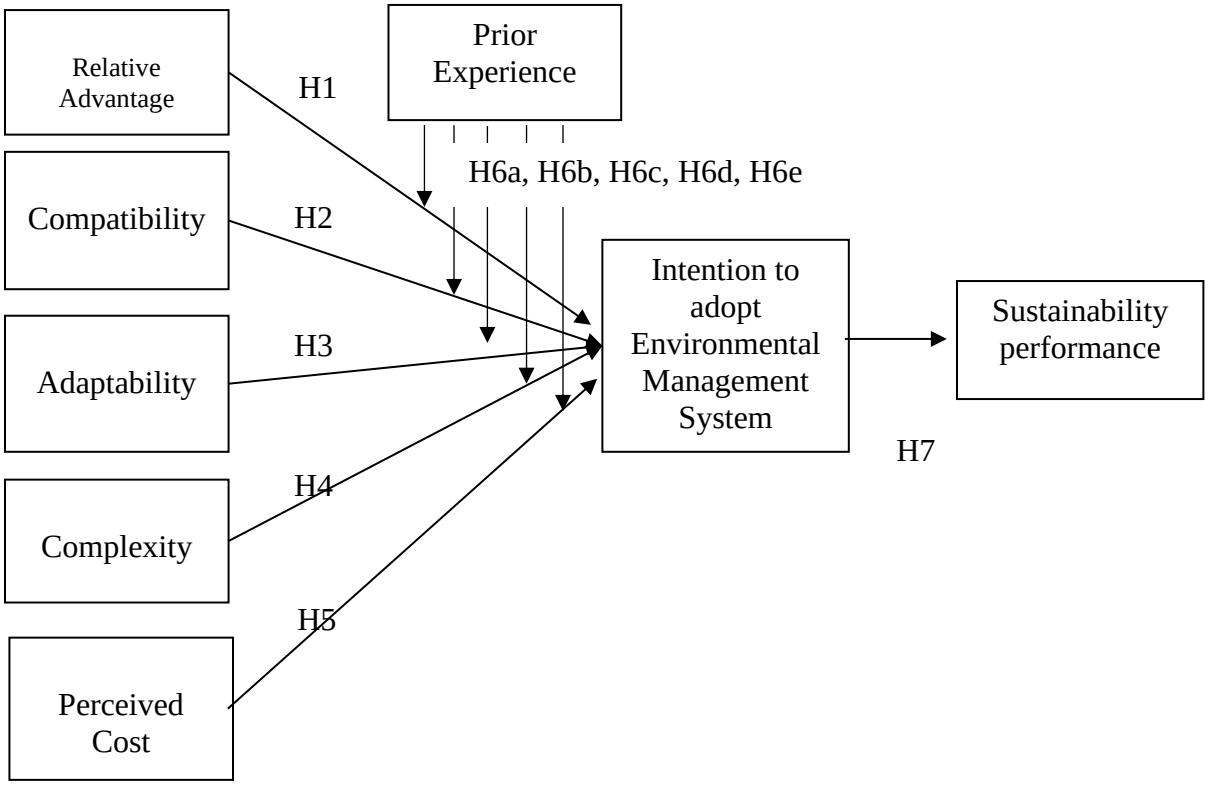


Figure 4: Conceptual Framework

The effectiveness of standard could be enhanced through a more comprehensive framework, engagement of all stakeholders and increase awareness at all levels in an organization through training (Wolfe, 1994). Hence, perceived cost plays an important role in predicting adoption of EMS. According to Rogers (1995), innovation is going through five stages of adoption process. However, due to its low level of EMS adoption in Malaysia's HEIs, extant study only focuses on the adoption stage. Last but not least, prior experience with ISO 9001 QMS is added as one of the internal resources that may affect the ISO 14001 EMS adoption in HEIs.

## Method

Quantitative research will be employed in this study as it is a common methodology for post-positivism paradigm. This research will be conducted in a structured way using a deductive approach. Hypotheses will be tested by using collected data from surveys in order to verify the established theory. Survey is developed using the measurement items adapted from previous study that have been previously validated. The questionnaire is amended to suit for use in the context of EMS. Marker variables will be added into survey questionnaire to avoid single source problem as data will be collected from the same respondent. Survey questionnaires will be distributed to both public and private HEIs in Malaysia to collect data through Google form. HEIs that have already adopted ISO 14001 EMS and HEIs without experience in other ISO or management system will

be excluded from this survey. The target respondents for this study will be senior managers who are decision makers and managers directly responsible for management system or sustainability outcomes in HEIs. The minimum sample size required as per G-power analysis is 123. A pretest will be carried out to identify potential problems. Three experienced experts who have a good understanding of EMS or management systems will be tasked with verifying the measurement validity of the questionnaires. They will be selected from public or private academic and practitioners from public listed companies.

The descriptive data collected will be analyzed using SPSS. Normality test will be conducted using web power. If the results do not adhere to multivariate normality, PLS-SEM method will be employed for further analysis to validate measurement models and estimate structural model. Confirmatory Factor Analysis (CFA) approach will be employed to validate validity and reliability of the latent variable items. Validity of the measurement model will be assessed using convergent validity (Average Variance Extracted) and discriminant validity (Heterotrait-Monotrait ratio) whereas the reliability can be measured by Outer loading and Composite Reliability (CR).

Once the measurement model has been assessed, the subsequent step involved evaluating the structural model to examine the relationships between the latent variables. Several key assessments criteria will be used to evaluate the structural model. These criteria include checking for collinearity problem, path validity coefficients, $R^2$, Effect size and predictive relevance.

## Conclusion

This study emphasizes the importance of DoI as the theoretical lens to understand the leaders' perception of innovation's characteristics to predict the adoption of EMS. The proposed model is developed based on the background and literature review. Unlike previous studies that focus solely on external pressures and effect of adoption, this paper emphasizes how innovation characteristics of EMS and organizational experience could improve adoption rate.

Understanding the latest version of ISO14001 EMS provides a comprehensive guide to help organizations manage its risk and opportunities arising from internal and external stakeholders' expectation and to address issues that impact HEIs' sustainable performance. HEIs can leverage these advantages through adoption of EMS.

The findings of this study will help management understand the pre-requisite required to improve low adoption of EMS in HEIs. Top management can strategically plan their internal resources as well as external resources such as experienced consultants. This includes allocation of budget for implementation of green practices and providing training to employees. They can leverage EMS to effectively integrate environmental and social aspects into their educational programs and campus management.

Successful adoption can inspire other HEIs, increase adoption rates, and strengthen competitiveness while promoting environmental accountability. The adoption of EMS serves as initial step toward a green initiative, paving the way for the adoption of various environmental practices, eco-innovation, or green innovations (Diabat & Govindan, 2011; Jum'a et al., 2021), aligning with the SDGs.

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