Mechanisms used by chemical manufacturing firms to promote green skills among employees: a case study in Malaysia

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Abstract: Threats imposed by climate change have raised the demand for green skills. Firms that provide green skills to their employees are touted to respond quickly to green policies and develop the capabilities to implement superior strategies to mitigate climate change. This study seeks to explore the mechanisms used by manufacturing firms to promote green skills among their employees. A case study approach using semi-structured interviews was deployed to explore these mechanisms in six large chemical manufacturing firms. The results indicate that collective effort, self-realisation and continuous awareness were the three main mechanisms used by firms to promote green skills among their employees. Firms actively engage employees from every level of management together to upgrade their skills. Pay raise and promotion are used as an incentive by firms to encourage the employees to obtain green skills. This study proposes a green skills development mechanism for policy makers and managers to nurture and invigorate green skills among employees.

Keywords: green skills; green economy; environment; sustainability; green jobs.

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1 Introduction

Green growth (greening the economy) is the transition that has been inevitable during the late 21st century while green skills are integral for green growth to transpire (Bowen et al., 2016). These skills assist firms to design strategies to increase their environmental performance which then automatically provides them a competitive edge. This competitive edge is extremely important in the present business environment since all businesses will profit by going green. Furthermore, greening the economy is a national agenda of governments around the world. At present, there is no universally standardised definition of green skills (Bowen et al., 2018; Pociovăli□teanu et al., 2015). Green skill is a marriage between the characteristics of existing job skills and new job skills which reduces the adverse impact of production towards the environment. This concoction between these two skills, are continuously involve over time (Deschenes, 2015).

Therefore, how firms merge these new skills (green skills) with the present skills among their employees to improve their environmental performance is important. The existing literature focuses on the demand for green jobs and the importance of green jobs towards the economy (Aceleanu, 2015; Jenkin, 2016; Lehr et al., 2012). However, studies on the types of mechanisms used by firms to nurture green skills among their employees are still scant. Understanding these mechanisms requires greater attention since only firms know exactly the extent of green skills their employees need based on their production process and intensity. Furthermore, the definition of green skills differs from one industry to another thus, understanding the industry's specific green training is important. Determining these mechanisms can assist policy makers to design specific types of trainings and enforcement to proliferate green skills which are industry specific. On top of that, these mechanisms can help managers dictate the route and strategies to infuse their employees' existing skills with new skills to improve their environmental performance.

Understanding the mechanisms used by firms to promote green skills is extremely important in the case of Malaysia. Sustaining the path of green growth with efficient resources allocation and being socially inclusive is one of the strategic thrusts in the 11th Malaysia Plan (Malaysia, 2015). To achieve this agenda, green skills have been incorporated into TVET programs in order to develop these skills among students for them to be ready for green jobs. Incorporating green skills in education and trainings courses, furthermore, is expected to create green awareness and a sense of responsibility towards the green economy among Malaysians (Arasinah et al., 2016). Besides, as Malaysia is on the verge of Industrial Revolution 4.0 (IR4), Syarina et al. (2018) suggested that developing green skills among netzines increases employee productivity and promotes green technology in the future. Innovative training and education system support the transition process of an economy towards green economy as great technical and scientific skills are crucial in the transition process (Jagannathan, 2013).

The mechanisms used to promote green skills are explored through the lenses of resource-based view (RBV) (Barney, 1991) and dynamic capabilities theory (Teece and Pisano, 1994). Due to the scant amount of literature providing limited evidence on the mechanisms used by firms to promote green skills, these two complementary theories are used to advance this study. Both theories have proposed that firms' capabilities are important for them to sustain their competitive advantage. Therefore, it is necessary for firms to incorporate the changes taking place globally and locally within their routines to

stay relevant. For the purpose of this study, green skills are the environmental innovation (EI) that firms should prioritise in their routines. This enables them to design effective environmental strategies to solve environmental issues. This study found that the theories are relevant and firms strongly adhere to the principles proposed by these theories to provide green skills to their employees. This study contributes to the green skills and environmental strategy literature via the foundation of the RBV and dynamic capabilities theory.

Addressing the gap in the literature, this paper explores the mechanisms used by manufacturing industries to promote green skills among their employees. This study intends to engage with firms directly to identify these mechanisms because green skills are skill sets that constantly keep changing. Once firms discover a new technology or method to improve their environmental performance, then the types of skills that their employees have needs to change as well. The skills must match the new technology or method that the firms are implementing. Therefore, the mechanisms used to concurrently infuse green skills to employees are only understandable by actively engaging with the firms. This paper provides a more holistic explanation on the mix of mechanisms used by firms to create awareness and provide green skills to their employees and at the same time determine the strategy used to enforce these mechanisms.

This exploratory study will be accomplished by using a case study method, through semi-structured interviews, which will be executed on some Malaysian chemical manufacturing firms. The remainder of the paper is organised as follows: Section 2 provides the literature review; Section 3 presents the methodology, while Section 4 explains the results and the last section concludes the paper.

2 Literature review

Deriving a comprehensive and definitive definition of green skills is not only impossible but also rather impractical at many levels. Martinez-Fernandez and Hinojosa (2010) who examined an extensive literature on the impact of climate change on green jobs and skills development found that the frame of green skills changed according to the nature of the industry and at every level of production sophistication.

The construction industry, for example, is a highly complex industry that requires a solid coordination of resources and materials within the completion period of the project. Thus, a highly proficient project manager is vital for the construction project to be successful (Belassi and Tukel, 1996). The green revolution over the years has transformed the construction landscape of green building index, which has placed greater emphasis on green building construction. This in return has escalated the demand for project managers with green construction skills and sustainability as a principal priority (Russell et al., 1997; Hwang and Ng, 2013). The contribution of these project managers is multilayered, stemming from material selection, human resource management, energy conservation and others (Hwang and Ng, 2013). Thus, it is evident that the context of green skills changes at every layer of job completion making it impossible to define it comprehensively.

Therefore, green skills, according to research, is not a new spectrum but a link between a wide array of existing skills and new skills that help to mitigate the adverse environmental effects of human activity towards the environment, or in other words,

skills that provide an improved technique to manage the conditions of climate change. This broad definition of green skills is widely used and emphasised in many other green jobs related research (Deschenes, 2015; Dierdorff et al., 2009).

Green skills are imperative to increase the firm's environmental performance since they create the pathway to EIs that combat climate change. The importance of green skills to promote EI has been widely recognised (Strietska-Ilina et al., 2011). Innovation theories have long highlighted the relevance of technological capabilities, which consist of physical and knowledge capital stock to promote innovation (Rosenberg, 1976). Past studies have acknowledged the requirement of specific and advanced level of skills for firms to increase their environmental performance through innovation (Corral, 2002; Horbach, 2014).

Green skills are viewed in light of imperative resources to understand the firms' strategic positioning to solve their environmental issues. As technology push factors are fundamental for EI (Cleff and Rennings, 1999; Horbach, 2008), green skills are critical resources that enhance the firm's internal conditions to promote EI (Del Río González, 2009), and coordinate the latest technological knowledge to facilitate the in-house process of creation or adoption of EI (Del Rio Gonzalez, 2004).

Policies that promote the acquisition of green skills are powerful drivers of EI (Cainelli et al., 2012). Both internal and external trainings have the capability to uplift a firm's innovative performance (Gupta and Singhal, 1993; Laursen and Foss, 2003). The adaptation to new working skills is part of the dynamic transition to environmentally sound manufacturing. Firms that want to be ahead of their competitors in terms of successful technological advancements need to continuously invest in superior trainings for their workers (Altmann et al., 2003).

3 Methodology

A multiple case study approach using a semi structured interview method was considered for this study since it is exploratory in nature (Yin, 2003). Six large chemical manufacturing firms in Malaysia were selected through a purposive sampling technique. The reasons for choosing chemical manufacturing firms are because they are highly polluting industries and subjected to stringent environmental regulations. Therefore, they have to take extra precautionary measures to green the manufacturing processes and reflect a higher tendency to acquire green skills (Epicoco et al., 2014; Hoffman, 1999; Klassen and McLaughlin, 1996). From the list of chemical manufacturing firms, only the larger firms were considered as they had a strong financial standing and managerial expertise and a higher likelihood of getting involved in environmental activities (Aragón-Correa, 1998; Levy, 1995; Przychodzen and Przychodzen, 2015).

One key informant from each firm, who was the health safety and environment officer as he/she was the gatekeeper of all the knowledge pertaining to the firm's environmental activities (Bansal and Roth, 2000) was interviewed. This face-to-face interview lasted for about one hour. The six chemical manufacturing firms selected were named E1, E2, E3, E4, E5 and A6 in order to protect their identities. The data collection process was halted when the saturation point was reached, at the sixth interview. The data generated from the interview underwent a robust categorisation technique through the execution of a series of open axial and selective coding procedures (Strauss and Corbin,

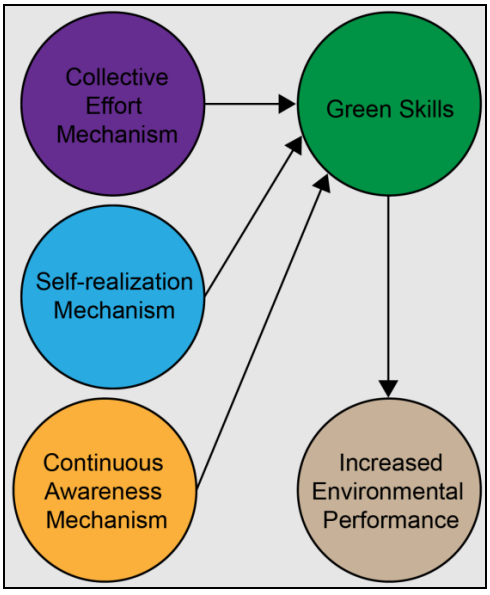
2008). In order to strengthen the analysis and findings, the categorisation was then further corroborated with the existing literature on green skills.

4 Findings and discussion

It was found that these chemical manufacturing firms had begun a quest to ensure that their employees were equipped with the relevant green skills in order to understand the importance of green skills. The inclusion of green skills within the working environment was seen curial by these firms as it invigorated other technological competencies within the firms to improve their environmental performance. The provision of a perfect mix of internal and external trainings, furthermore, was not only expected to proliferate the firm's environmental performance but also enable the firms to obtain a competitive advantage against their rivals.

Thus, in the context of achieving their environmental agenda, these firms had given a lot of attention to providing green skills to their employees. Creating awareness and providing trainings were the major platforms for these firms in order to provide green skills to their employees. An amalgamation of three mechanisms was used by these firms to create awareness and provide green skills to their employees. These three mechanisms were collective effort, self-realisation and continuous awareness (see Figure 1).

Figure 1 Green skills development mechanism framework (see online version for colours)



Source: Author's own elaboration

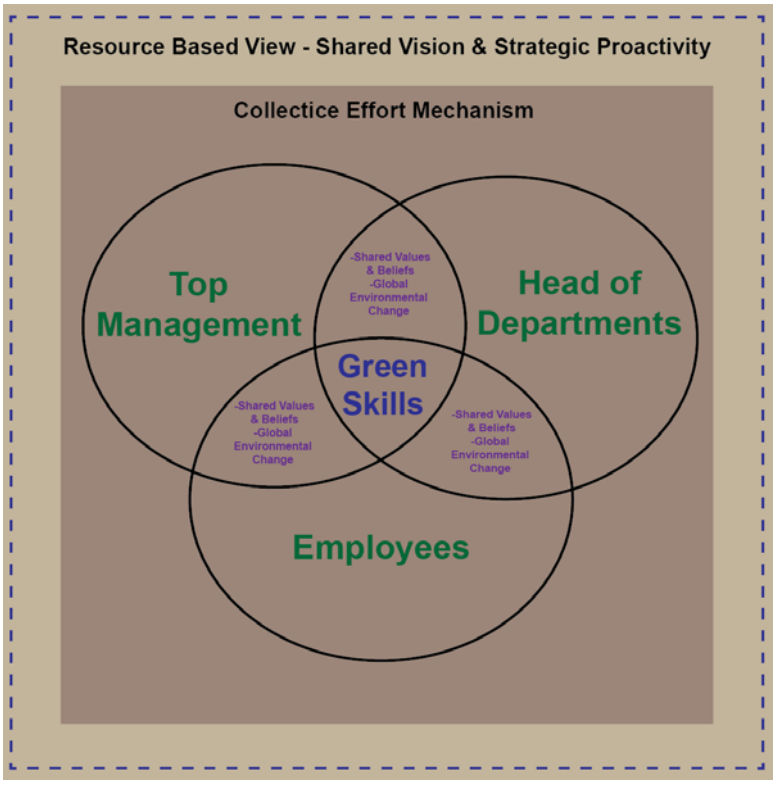
Collective effort mechanism to nurture green skills transpired when the top management, department heads and employees of these firms were engaged together through several avenues such as environmental related workshops and meetings. During these workshops and meetings, all these three parties above made decisions and conducted activities collectively. The objective of this action was to strengthen the bond and increase the

trust among the members of these firms. The relationship that was organically built, potentially accelerated the employee's environmental commitment level. At the same time, under this collective mechanism environmental issues that required urgent attention and enforcement found immediate solutions. This was explained by Respondents E3 and E1 below.

> "Environmental problems can only be solved if everyone in the organization is working together and there is a common objective to achieve… top management and the workers work hand in hand during workshops to find solutions." (Respondent E3)

> "In meetings we engage everyone together… top management and lower level management. Let everyone speak only then we build trust and find solutions faster to thriving environmental issues." (Respondent E1)

Figure 2 Collective effort mechanism through shared vision and strategic proactivity to promote green skills (see online version for colours)



Shared vision and strategic proactivity are two major aspects expedited by the RBV for the firms to formulate effective environmental strategies (Aragón-Correa et al., 2008). Among these environmental strategies is to provide green skill to the employees. Shared vision is when a firm is able to entail its entire employees to share similar values and beliefs to achieve its organisational objectives and mission (Oswald et al., 1994). Strategic proactivity, on the other hand, refers to firms actively taking into account changes that are taking place globally and locally which are pertinent to their businesses

and integrating these changes into their business model to sustain their competitive advantage (Aragón-Correa et al., 2008; Aragón-Correa, 1998). Thus, it is evident that in promoting green skills using collective effort mechanism the aspect of shared vision and strategic proactivity be present, see Figure 2. During collective decision-making, employees engage in similar beliefs and values that are the foundation of the organisation. Furthermore, the collective action allows employees from every layers of the firms (i.e., top, middle and lower) to share the recent development that is taking place within the context. Their expertise which can be assimilated to propose solutions to environmental problems faced by the firms. Therefore, it is construed that the aspects of shared vision and strategic proactivity infused through the collective effort mechanism played a crucial role in nurturing green skills among employees in order for the firms to stay intact with its mission and vision while staying competitive.

The next mechanism that drove green skills in these firms was the self-realisation mechanism. This mechanism used a voluntary route to build green skills among employees. Problems-based tasks and community engagement program were used by firms to inculcate a sense of responsibility towards the society. Employees were placed in actual situations where they were constrained by the environmental issues and required to search for suitable solutions to those problems through these problem-based tasks. The tasks were designed in ways where the employees were required to communicate with every layer or department in the organisation to obtain the solutions. This mechanism was found effective by these firms as it automatically always kept the employees alert and allowed them to obtain different environmental related information from every department within the firm. To promote green skills, community engagement program were also used under the self-realisation mechanism. Employees and the community were directly engaged through environmental activities such as recycling campaigns, school garden program and others organised by these firms. These kinds of activities were found to create a sense of belonging to a greater community, thus, imposing a greater responsibility towards the employees to protect the environment as explained by Respondents E5 and E2 below.

> "Under 'Responsible Care' campaign, promoting awareness is one of the important codes. We believe that once employees understand their responsibility towards the environment then everything will automatically fall into place. Yearly, employees have to identify 12 problems in the plant that are hazardous… this are later converted into problem based-tasks… employees must engage with other departments, find solutions and write reports." (Respondent E5)

> "The learning and development department is responsible in organizing activities and programs to promote awareness. There are often awareness activities where we engage the staff with the society. It is more of a self-realization… caring for the environment is important for the society as a whole… create sense of belonging." (Respondent E2)

Organisation and management studies have emphasised that the understanding of organisational factors, such as the culture and structure of a firm, is essential to understand how a firm reacts to external conditions and designs solutions to solve its problems (Howard-Grenville et al., 2008). Similarly, it is important for the employees to understand the culture of the firm and how each unit within the firms responds to environmental threats. This self-realisation mechanism provided the employees an opportunity to understand the culture of the firm and the liberty to voice their opinions

and accept environmental issues as a personal challenge. The learning process that is involved though this mechanism equips employees with green skills that are extremely personal to them based on their experience and enables them to be more sensitive towards environmental issues.

Based on the dynamic capabilities view, a firm's ability to regularly "create, extend, upgrade and keep the enterprise's unique asset base as relevant" is important to sustain its competitive advantage [Teece, (2007), p.1319]. Therefore, to develop unique green skills that solve environmental problems, employees were actively engaged with the current happenings related to the environment in their firms through problem-based tasks. This process provided them both the environmental awareness and technical ability to solve environmental issues.

Lastly, constant environmentally related information shared via info TV (i.e., information sharing on television within the firm's compound) and environmental programs especially 'Responsible Care' campaigns were used by these firms to nurture green skills under their continuous awareness mechanism. The objective of this route was to ensure that the employees were constantly reminded of and updated to the new environmental practices that these firms were embracing as explained by Respondents E4 and E3 below.

> "We create awareness mainly by sharing information and continuously updating the employees with the latest changes that are taking place. Our motto here is 'eco-together', so anything that we do in our organization is a collective effort." (Respondent E4)

> "…create awareness by sharing simple slides on info TV every day, which is part of our 'Responsible Care' campaign." (Respondent E3)

For all the three aforementioned mechanisms to work effectively in order to promote green skills among employees, these firms often induced various environmental trainings. The list of environmental trainings obtained from the firms during the interviews was grouped into seven categories (see Figure 3). The most popular choices of environmental trainings among these firms were on the job trainings, environmental compliance trainings and environmental regulation workshops. Thus, it was evident that these firms strongly emphasised on trainings to enable the employees to comply with environmental regulations and standards.

Besides, environmental regulation-based training, these firms also supplemented their employees with latest environmental knowledge through expert engagement programs, awareness trainings and environmental courses. It is interesting to note that some of these firms went to greater lengths to provide green skills to their employees by developing their own environmental modules, which consisted of a structured assessment system to grade their employees' environmental achievements. Furthermore, some of these firms even offered online environmental training courses.

The major agenda of the trainings was to create environmental awareness and provide the necessary technical and non-technical skills to mitigate emissions. According to Lenox and Ehrenfeld (1997), environmental integration through environmental training is a strategic avenue for the management to communicate their environmental agenda and realign the firm's capabilities for product development. The diffusion on environmental agenda took place either directly or indirectly. To ensure the employees actively participated in all the trainings and activities designed to uplift their green skills, these firms had an assessment system in place. These firms assessed their employees' green

skills attainment performance through causal learning, monitoring and fulfilment of key performance indicators (KPIs). At the same time, promotions and pay rise were also linked to the assessment system to motivate employees to acquire these skills as explained by Respondents E1, E2, E4 and E5 below.

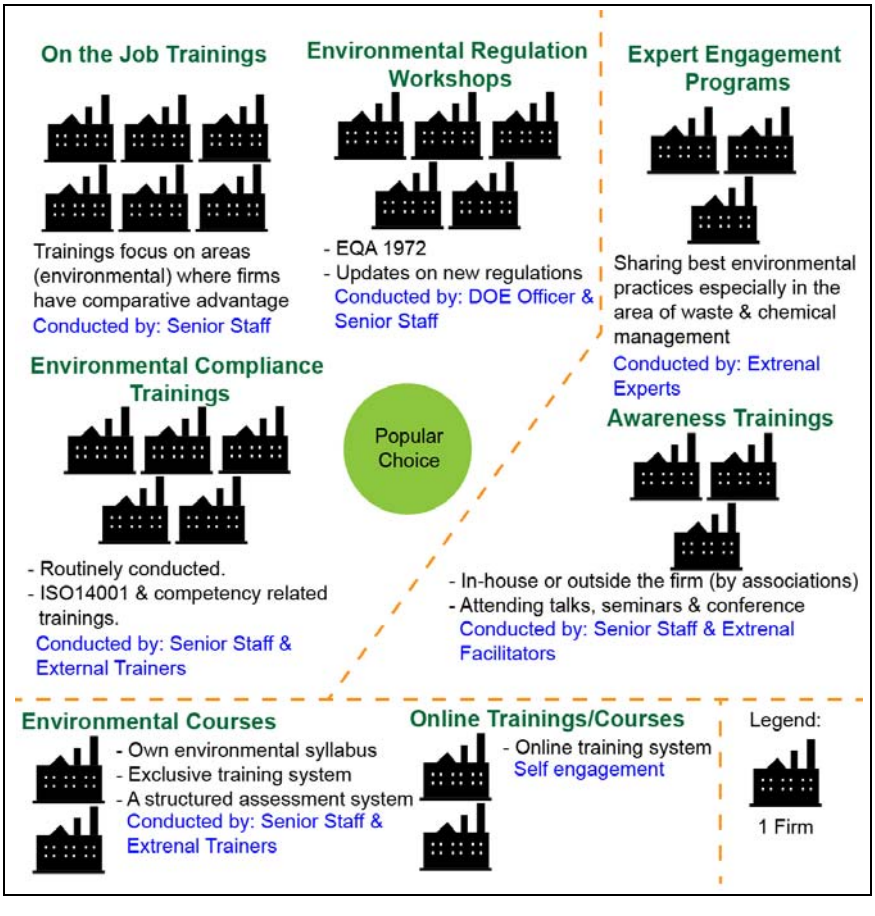
> "There is a promotion system in place, where at every stage there are trainings, exams and interviews. Environmental trainings are a substantial portion of the system and assessment. Employees need to work hard to get through all the stages." (Respondent E1)

> "There are certain KPIs that the employees need to achieve… causal learning is used to assess performance." (Respondent E2)

> "Employees are assessed through audit results and routine site visits." (Respondent E4)

> "Employees are provided with a list of trainings that they need to attend. Fulfilling these training hours is part of their KPI, which will later be taken into consideration for pay rise and promotion." (Respondent E5)

Figure 3 Types of trainings provided (see online version for colours)



The firm's environmental knowledge obtained from internal or external sources is managed using environmental database (i.e., online sever system, filing system-documented information and others). The main function of the database is to design training modules for the employees and assist the formulation of environmental strategies.

Amidst the efforts to develop green skills among the employees, these firms also faced certain challenges. These firms experienced different responses towards the proactiveness to attain green skills from their employees based on their academic qualifications. The employees' academic qualifications significantly influenced their acceptance and readiness to care for the environment. The employees with higher academic qualifications were generally more receptive towards environmental awareness and trainings as compared to those with a lower level of academic qualifications. The latter group of employees, which were mostly the general assembly workers, exhibited ignorance to following guidelines set by the organisation to protect the environment (in the case of chemical manufacturing industries). Therefore, it was always a challenge to promote the environmental awareness to this group of people and the way out was always by linking environmental activities to pay raise and promotions as explained by Respondents E3 and E4 below.

> "There is a different level of acceptance towards awareness. Employee's academic background determined the awareness that they are able to absorb. It is always challenging to spread the awareness among employees at the operational level." (Respondent E3)

> "Academic qualification influences their level of awareness. Constant awareness is required to remind those with lower academic qualification… pay rise and promotion is the only way to attract their attention." (Respondent E4)

From the results and discussion above, it can be construed that firms are taking active steps to promote green skills among their employees. This qualitative study, executed by using six manufacturing firms confirms that providing green skills to their employees is part of the firm's environmental strategy. The three mechanisms, collective effort, self-realisation and continuous effort, used by the firms exhibited high relevance to the RBV theory and dynamic capabilities theory. Firms understand that in order to remain competitive they have to solve their environmental problems. Thus, eco-efficiency is the way forward to stay competitive. Schmidheiny and Timberlake (1992) refers to 'eco-efficiency' as the production of economically valuable products and services that meets the market demand through the employment of fewer resources, thus minimising the ecological impact of their production. Therefore, the notion of eco-efficiency brings forward a strategic proposal for firms to incorporate environmental issues into their business practices and it starts by greening their employees. These firms preferred to engage their employees from the top, middle and lower level management into a learning process as a technique to provide them with green skills. They expressed that by engaging all the three parties together collaboratively through training and workshops, these firms were able to produce the best solutions to solve their environmental problems. Furthermore, educating the employees on the importance of protecting the environment and allowing them to voluntarily acquire green skills were strategies used by firms to infuse green skills among the employees. Thus, self-realisation enabled for effective acquisition of skills. To encourage the employees to give prime importance to acquire

green skills, there was an assessment via the achievements of environmental KPIs which were directly linked to pay raise and promotion.

This study contributes to the knowledge in the green skills and environmental studies literature. There is a scant amount of studies that have explored the mechanisms used by firms to promote green skills comprehensively. Furthermore, this study confirms that the RBV and dynamic capabilities theory are relevant in explaining capabilities that firms must obtain to remain competitive under the green economy agenda. This study also provided important implications for managers and policy makers. From a managerial perspective, it is essential to note that there are various mechanisms that are available to promote green skills among employees. They have to be aware that green skills are always evolving and there is never going to be a fixed set of green skills as new methods and technologies are frequently discovered to solve environmental issues. Additionally, the green skills are going to differ from one organisation to another based on their business nature. One thing that can be common and within the control of the firms is the mechanisms used to nurture these fast-evolving green skills to their employees. Therefore, firms need to strengthen these mechanisms by placing them into a formal structure. Then, it will become easier to use and control them to stimulate the achievement of the superior level of green skills.

The policy makers, on the other hand, can formulate policies that enhance the mechanisms to promote green skills that would automatically promote voluntary green innovation initiatives among firms rather than stringent technology forcing mechanism. Policy makers need to understand that firms prefer collaborative and self-realisation features in their training to promote green skills. Therefore, policy makers need to ensure that modules designed to provide green skills must incorporate those two features. The modules should also integrate problem-based tasks and a lot of community engagement programs to nurture green skills.

5 Conclusions

The demand for a work force with green skills is needed to support the green economy that allows for a low carbon, resource efficiency and sustainable economy growth. However, to understand the importance of green skills, past studies have largely investigated two main aspects of it namely, the importance of green skills to promote green growth and the growth in the area of green skills. However, there is a lack of attention given to the mechanisms that are used by firms to nurture green skills among their employees. Nurturing green skills among employees, in addition to the government's implementation of green policy action plans to develop green skills, requires sound understanding of the mechanism used by firms to inculcate green skills within their organisations. To fill this gap, the present study explored the mechanisms used by six chemical manufacturing firms to promote green skills among their employees and the enforcement techniques used by them to ensure the success of these mechanisms.

This study also found that collective effort, self-realisation and continuous awareness were the three mechanisms that these firms used collectively to promote green awareness and nurture green skills among their employees. Collective effort mechanism was executed by engaging all the employees together, both top level management and lower level management in solving the environmental issues in the organisation. This was made possible through environmental related meetings, workshops and trainings. For the

self-realisation mechanism, these firms used a voluntary route to infuse green skills among their employees. The employees were exposed to community engagement programs and problem-based tasks designed by their environmental units. Lastly, under the continuous awareness mechanism, these firms used campaigns and multimedia options to constantly share environmental related news and advancements taking place worldwide and within the organisation. These mechanisms created a strong bond among the employees in these firms, which ultimately made the learning process easier and the attainment of green skills more effective. For the mechanisms to move progressively, various trainings were offered to the staff. The frequent types of trainings offered were on the job trainings, environmental compliance trainings and environmental regulation workshops.

To ensure that the employees completely soaked themselves in the process of acquiring the green skills, various assessments and incentives were provided to them. Causal learning, monitoring and fulfilment of KPIs were among the assessments implemented. As incentives, promotions and pay rise were used to encourage greater green skills attainment.

This study provided a new impetus in the area of green skills as in terms of the mechanisms used to promote green skills. Policy makers need to consider the three mechanisms used by firms to promote green skills so that both the government policy objectives to increase green skills in the country and the firm's environmental strategy gels together. Green skills trainings and workshops designed by government agencies must carter to the niche areas demanded by firms especially the ones that enable them to increase their competitive advantage. The education ministry can also consider embedding the mechanisms and trainings purported by these firms into the academic curriculum. For managers, this study provides an array of mechanisms that can be used collectively to develop green skills effectively. The managers should also take into consideration the use of problem-based task frequently as it was found to be one of the effective avenues to train the employees in this study. This is because, the employees have to directly communicate with every department in the firm to solve the tasks given. This action automatically equips the employees with different green knowledge stemming from each department. The findings from this study are also applicable to developing countries. This is because the six companies that were interviewed are large multinational corporations that have similar shared vision and environmental proactivity with their parent companies. Furthermore, within the Asian region countries, they share almost a similar culture.

As this study is based on one industry, it limits any generalisation of the findings to other industries. Future studies should examine the mechanisms proposed in this study under other industry settings. Moreover, a qualitative study should follow to further validate the mechanisms and to support the qualitative enquiry.

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