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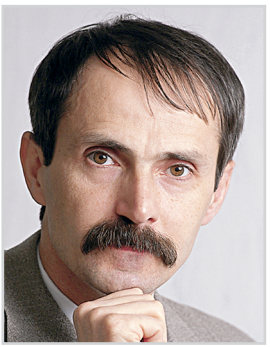

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Intermediaries motivating eco-innovation in Jordanian small and medium-sized enterprises

Abstract. This paper aims at identifying the role intermediaries in small medium-sized enterprises' (SME) quest for eco-innovation according to an empirical qualitative interview among Jordanian companies as well as applied cleaner production as an a approach which reduces environmental pollution along with positive financial benefits for the enterprise.
The lack of partnership between knowledge producers (academia) and knowledge users (industry) is tangible and unsatisfying. This also has negative impact on the innovation competitiveness of Small and medium enterprises SMEs.
SMEs can access to and benefit from crucial external knowledge through alliance with innovation intermediaries, namely, the Water and Environment Centre (WEC) at the Royal Scientific Society (RSS). Cleaner Production CP is considered the method and tool to recognize where and why a company is losing resources in the form of waste and pollution, and how these losses can be minimized.
The key finding that the proactive approach (cleaner production) is one essential push factor to trigger eco-innovations in SMEs. This finding indicates that SMEs might need facilitation for eco-innovation of different levels of support as well as, highlighting drivers and barriers for eco-innovation in SMEs.
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1. Introduction

The last decade has begun to produce broad knowledge on the specificities of sustainability-oriented innovations (SOIs) in small and medium sized enterprises (SMEs) as they are more and more recognized, as key contributors to sustainable development (Klewitz & Hansen, 2014).

SMEs are not simply smaller versions of their larger counterparts, they might require different tools or approaches to addressing social and environmental issues than those offered to large corporations (Klewitz & Hansen, 2012).

First of all, this paper explores the obstacles SMEs face when implementing changes towards sustainability. Then the paper discusses the possible role of intermediaries in this course.

This resounds with the very latest literature on innovation that highlights the importance of involving intermediaries, particularly knowledge institutions. The transfer of network and personal knowledge is expected to be valuable to overcome day-to-day problems in the change management process towards more sustainable business operations.

In addition, stakeholders made tangible efforts in bringing eco-innovation from research to market. Improving market conditions and opening up global markets as fast and strengthened actions are now required through building on the expertise of helping SMEs to benefit from introducing eco-innovative approaches into their operations. In particular, start-ups can be the ultimate incubators for eco-innovation, and can bring to market the new less environmentally damaging products, services and processes.

Generally, many SMEs are struggling to survive in an enduring global collapse and often they are becoming unwilling to release innovation, particularly eco-innovation (Hamburg, Vlăduţ, & O'Brien, 2017).

Eco-innovation certainly occurs in SMEs, but to a changing degree. SMEs may follow a sensitive, preventive, or innovation-based strategy. Three types of eco-innovation directly and indirectly affect business performance, namely, eco-organization, eco-process, and eco-product innovations.

This paper focuses on bringing eco-innovation from research to market with supportive new methodologies of personal formation that, from our perspective, have a vital role on implementing expectations efficiently to stimulate competitiveness and internationalization as well as identification of the market's requirements as rapid and concrete actions are required. SMEs must be made aware to understand the potential advantages and benefits. The study was conducted in Jordan.

Cleaner Production Unit (CPU) in the Water and Environment Centre (WEC) at the Royal Scientific Society (RSS) of Jordan has 14 years of experience in the area of Cleaner Production (CP) Assessment. The CPU has conducted CP assessment studies in various sectors, such as Food Industries, Metal Industries (Steel and Aluminum), Paints Industries, Cement Industries, Fertilizers and Chemicals Industries, and Hospitals.

This paper will emphasize on the help provided by the CP to SMEs to protect the environment by reducing pollution and waste at the source. This minimizes the environmental influence, improves production efficacy and decreases costs. CP is a proactive approach based on «anticipate and prevent philosophy» as prevention is always better than cure.

New regulations supporting competitiveness, eco-innovation and performance indicators must be frequently reviewed and updated to be flexible to meet technical and expected process and impact.

First of all, this paper outlines the literature of eco-innovation in SMEs, with particular stress on intermediaries as a second step to provide information about qualitative interview. Later on, the paper presents and discusses the findings, and finally derives proposals for future research with final remarks related to the limitations.

2. Brief Literature Review

Innovation was first and obviously characterized by Schumpeter in his study «Theory of Economical Development», first published in 1911 in Austria. Different researchers view eco-innovation from different angels and ways while the discussion on eco-innovation in SMEs is still emerging.

Eco-innovation is the development and application of a business model, formed by a new business strategy that incorporates sustainability throughout all business procedures based on life cycle thinking and in collaboration with partners across the value chain. It involves a synchronized set of modifications or novel resolutions to products, i.e. goods and services, processes, market approach and organizational structure, which leads to a company, has enhanced performance and competitiveness (SAICM, 2019).

Reid & Miedzinski (2008) presented a more comprehensive definition by saying that it is the design of new and competitive efforts of products, procedures, schemes, services and measures conceived to meet the human requirements and provide a better quality of life for everyone, with the least utilization of the life cycle of natural resources and the minimum release of toxic substances.

According to Rennings (2000), Kemp, Loorbach, & Rotmans (2007) and Arundel & Kemp (2009), eco-innovation can be defined as the manufacture, application or investigation of goods, services, production process, organizational or managerial structure or method of business that are new to the enterprise or to the customer. The anticipated outcomes are reduced environmental risks, less pollution, and fewer negative influences of the utilization of resources when compared to the corresponding alternatives (de Jesus Pacheco et al., 2018).

The study by Alhyasat et al. (2018) evaluates the intervening effect of eco-innovation (with its three constructs of eco-processes, eco-products, and eco-organization) on the relation between motivation and organization performance in Jordan Industrial Estate Company. The results endorse the mediating effect of eco-innovation on the relationship. It also considerably contributes to supporting the research-based view (RBV) theory by supporting the links between motivation, organization performance, and eco-innovation. In addition, this research supports the application of eco-innovation in industrial organizations in Jordan, particularly at the Jordan Industrial Estate Company (Alhyasat et al., 2018).

Eco-innovation is any form of innovation targeting significant and noticeable progress towards sustainable development, through decreasing the impacts on the environment or realizing a more well organized and accountable use of natural resources, including energy (Hamburg, Vlăduţ, & O'Brien, 2017; Dávid et al., 2015; Priatmoko et al., 2021).

Alhiyasat and Sharif (2018) conducted a study to identify the effect of eco-innovation on organization performance in Jordan. The Study used a questionnaire as a quantitative instrument to collect the data from a random sample of 381 employees at the Jordan Industrial Estate Corporation (JIEC). The findings of the showed that there is positive effect of eco-innovation on organization performance (Alhiyasat and Sharif, 2018).

The Study by Alzuod et al. (2019) aimed at examining the innovative performance of SMEs in Jordan as well as the moderating impact of entrepreneurial orientation on the relations among intellectual capital, organizational learning and innovative performance. Data was collected using a questionnaire survey distributed to a sample of 600 managers and/or owners of Jordanian SMEs and 325 usable questionnaires were received.

The findings show that intellectual capital, i.e. human capital and customer capital dimensions, has positive and noteworthy impact on innovative performance. Results also showed that organizational learning, that is, information acquisition, information distribution and organizational memory has positive and substantial influence on innovative performance.

The study also showed that entrepreneurial orientation (EO) regulates the relations between the customer capital and innovative performance (Alzuod et al., 2019).

The study by Alhadid & Abu-Rumman (2014) examined the impact of green innovation, i.e., the green product innovation and the green process innovation, on organizational performance. The study was applied for Jordanian industrial companies, specifically Nuqul Group in Jordan. The tools of the Study included 143 questionnaires that were developed and distributed to the higher managerial employees and the middle managerial employees (General Manager, Assistant General Manager, head of department, assistant head of department and supervisors). The most important finding of the study indicated the impact of moral green innovation in organizational performance as well as the impact of the environmental management behavior as a moderator variable between green innovation and performance organizational (Alhadid & Abu-Rumman, 2014).

The second focus of the literature review lies on a specific type of organization, that is, SMEs. These are a heterogeneous group in terms of size and sector diversity and overall. It is challenging to clearly define what an SME is because different countries adopt different criteria.

Based on the recommendation of the Economic Development Committee at Prime Ministry, on 28/10/2019 the Cabinet has approved a new classification for Micro, Small and Medium Enterprises in Jordan as follows (Table 1).

SME peculiarities indicate that they will innovate differently for sustainability. On the one hand, Literature highlights some of the SMEs disadvantages, e.g. resource constraints, lack of formalized planning, difficulty to attract finance, which may prevent them from engaging proactively in the innovation process (Vasa & Sitenko, 2011). Based on this perspective emphasized by most researcher, SMEs are examined in order to display «reactive» behavior towards environmental and social issues. On the other hand, the literature suggests that SMEs have advantages as they are characterized by being flexible and lean organization structures. This might lead to a less

Table 1:
SMEs classification in Jordan

Activity	Classification Criteria	Micro	Small	Medium
Industrial	No. of Employees Sales Value	Less than 5 Less than 100.000 JD (=120.000€)	Less than 20 Less than 1 million JD (=1.201.000€)	Less than 100 Less than 3 million JD (=3.604.000€)
Commercial	No. of Employees Sales Value	Less than 5 Less than 120.000 JD (=144.000€)	Less than 10 Less than 150.000 JD (=180.000€)	Less than 50 Less than 1 million JD (=1.201.000€)
Services	No. of Employees Sales Value	Less than 5 Less than 200.000 JD (=240.000€)	Less than 25 Less than 500.000 JD (=600.800€)	Less than 50 Less than 1 million JD (=1.201.000€)

Source: The Economic Development Committee at Prime Ministry issued Oct 31, 2019, companies in the research sample according to previous classification (medium less than 250 employees)

bureaucratic management of environmental and societal issues. The prevailing and entrepreneurial role of the owner-manager may disturb the reaction to altering markets and can ease the behavior towards product innovation.

On the one hand, SMEs are able to locate, obtain, and apply external knowledge essential for eco-innovation. On the other hand, SMEs have access to direct assistance and can consequently increase their scarce resources (e.g. time, financial and human resources). This paper focuses on public intermediaries as agents of eco-oriented change in SMEs. The following subsection describe the cleaner production initiative as one possible form of transitional methods.

Researchers have recognized innovation practices of SMEs at the process, organizational, and product level and classified these practices into concepts covering broader approaches and methods such as cleaner production or eco-efficiency.

SMEs engage in cleaner production to accelerate production processes and increase productivity through cleaner technologies. By achieving greener manufacturing procedures, SMEs can deal with sector precise environmental obstacles. Cleaner production empowers smaller companies to respond to regulations by embracing cleaner technologies, or to promote the industry standards in the light of ecological modernization. Hence, cleaner production may yield far more innovation potential than just enhancements at the process level in case SMEs achieve learning effects at the organizational level (Klewitz & Hansen, 2014).

The role of intermediaries in eco-innovation was discussed by different authors. Environmental issues were identified as sources of strategic change of innovation research. Eco-innovation practices such as cleaner production, life cycle assessments, and eco-design found their way into firms (Klewitz & Hansen, 2014).

Intermediaries are universally understood as third-party organizations that support to achieve the sought-after objectives and may provide an essential external impulse, motivation, and advice to start or continue with environmental protection. Such intermediaries include various types like governments and local authorities, NGOs, universities, and consultancies.

To be a suitable candidate for eco-innovation, a company should also be able to distinguish the importance of the long-term sustainability threats faced by their industry, and to be ready to take action to turn these threats into opportunities. This process requires strong leadership and culture at the company that should be open, responsive and willing to take on big challenges.

Therefore, there are significant demands placed on a company when trying to implement eco-innovation. However, companies that are eager to take on the challenge of eco-innovation should be aware that potential rewards are equally big and can contribute to their long-term survival and success.

However, identifying one appropriate company within a value chain that is ready and keen on taking on the challenge of eco-innovation may not be sufficient. Tackling the type of important and complex threats, that eco-innovation is intended to address, will largely involve alliance and teamwork across the value chain. Working with customers is indispensable to understand their needs and requirements and to evaluate the acceptability of alternative solutions. Working with suppliers is often requested to support changes to the design or production of products or raw material. Furthermore, where an eco-innovation includes new technology, skills or competencies that are not yet available in the value chain, it may be necessary to bring in external partners such as research institutions and universities to bridge these gaps. Consequently, instead of focusing on one particular company, eco-innovation will demand the support of various organizations across the value chain and beyond.

Cleaner Production Unit (CPU) of Jordan was established in 2004 through the support of Secretariat of Economic Affairs (SECO) on behalf of the Swiss Government and is hosted at the Royal Scientific Society (RSS), a national Non-for Profit Organization. The CPU aims at supporting the industry in Jordan through Resource Efficient and Cleaner Production (RECP) approach, which offers the industry the opportunity to run business effectually, and in the same time, to reduce the risks related to price instability and to disturbance on material supply chains as well as increasing energy costs.

RECP approach enables industry to enhance resource productivity by capturing saving opportunities in energy, water and raw material consumption.

The United Nations Environment Programme (UN Environment) defines cleaner production (CP) as the constant application of cohesive preventive environmental strategy applied to procedures, products, and services in order to increase eco-efficiency and decrease risks to humans and the environment.

- For production procedures: CP conserves raw materials and energy, eliminates toxic raw materials, and decreases the quantity and toxicity of all emissions and wastes.
- For products: CP includes the reduction of negative influences along the product's life cycle starting from raw material extraction to its ultimate disposal.
- For services: CP includes environmental concerns into designing and delivering services (Cleaner Production Unit, 2018).

3. Purpose and Methodology of the Study

There is no sufficient research in developing countries focusing on eco-innovation related to sustainability performance of business practices, so the main research question is to investigate if sustaining change is reached through the collaboration with an innovation intermediary.

Innovation intermediaries can strengthen an SME's aptitude through providing direct support at the level of gathered information and knowledge as well as providing testing, validating and training as well as evaluating the effectiveness of eco-innovations.

Therefore the main research question is - Which practices of sustainability-oriented products, processes, and organizational innovations occur in SMEs and how do they interact? The research pinpoints drivers and barriers for eco-innovation and highlights the effects induced through collaboration between SMEs and local authorities. The main hypotheses of the research are as follows:

H1:

Small and medium enterprises requisite facilitation for eco-innovation from different types of intermediaries (public and private) with different level of support.

H2:

Small and medium enterprises are able to locate, acquire, and utilize external knowledge indispensable for eco-innovation.

H3:

The model of cleaner production has supported SMEs to implement changes in order to have a long lasting positive impact on the environment.

This paper is based on an investigative qualitative interview among Jordanian SMEs that have participated in «cleaner production program», an intermediary based program that aims at introducing organizations to the concept of sustainable development through the implementation of eco-innovations.

The data was collected by interviews and information found at company web sites. The interviews took place between January and February 2021.

Regarding the database, data is collected about cleaner production implemented in the sample firms (Table 2). The information is sector-specific and introduces innovative cleaner production procedures accomplished by companies who took part in CP cleaner production approach from 2004-2020.

The interview guideline comprised the following three sections: company structure, the approach of Resource Efficient and Cleaner Production (RECP), and the role of intermediaries, which is, the Water and Environment Centre (WEC) at the Royal Scientific Society (RSS).

The purpose of the interviews was to identify the common points and the different points between responses. Therefore, in order to analyze the collected data, a thematic approach was chosen following an iterative process that looks for emerging patterns and themes in the data.

Table 2:
Company characteristics of the sample

Company code	Industry	No. of employees	Position of interviewee	Market and Customer Focus	Source of data
Al - Qawafel Ind. Agr. Co (C1)	Agricultural fertilizers organic pesticides	100	Marketing Analyst and Coordinator	80% of the production is exported to different countries.	Interview
Nutridar (C2)	Infant and baby milk, cereal, and herbal tea	143	Senior validation and calibration officer	Local 50% and regional 50%	Interview
Habeba Sweet (C3)	Arabic Sweets production	100	Plant Manager	Jordan, GCC & North America	Interview
Al-Baha Company for Caustic-Chlorine Industry (C4)	Chemical	200	Manager of Environmental Health and Safety (EHS)	Jordan, Morocco, Iraq, Africa, Palestine.	Interview
National Paints Factories Co. Ltd (Sayegh Group - Resin Factory) (C5)	Resin manufacturing	54	-	50% local market, 50 % export to Arab countries	Website
Arabian Steel Pipes manufacturing (C6)	Metal.	150	-	63 % local market, 37 % export to Iraq, Syria, Germany and France.	Website
Jordan Valley Food Industrial Co. (C7)	Food industry	75	-	65 % National market, 35 % global such as Canada, Germany, USA, United Arab Emirates and Russia	Website
SIGMA Detergents L.L.C. (C8)	Household and industrial detergents.	61	-	Jordan, Saudi Arabia, Kuwait	Website
Farm Dairy (C9)	Dairy Products	150	Quality Manager	Jordan, GCC	Interview
National Paints Factories Co. Ltd (Sayegh Group - Resin Factory) (C5)	Resin manufacturing	54	-	50% local market, 50 % export to Arab countries	Website

Source: Own research

4. Results and Discussion

The research findings are structured as follows: first, the eco-innovations attained by the sample companies are presented. Subsequently, drivers and barriers encountered are displayed. Finally, the effects and significance of collaboration with intermediaries are laid out.

Based on the Cleaner Production database, the accomplished eco-innovations and the perceived benefits by the SMEs are analyzed in Table 3.

The examined companies were mostly involved in the categories of waste / waste disposal, energy, and hazardous materials. According to the database, the companies derived both environmental and economic benefits from eco-innovation, whereby financial benefits prevail.

Based on the preliminary findings on the nature of eco-innovation realized in SMEs, this paper turns to the qualitative data from interviews and corporate documents for more in-depth analysis of drivers and barriers as well as the role of the complex intermediary constellation (Table 4).

The identified drivers for eco-innovation in our sample were gathered in consistence with the business case for sustainability drivers as identified by Schaltegger & Wagner (2011) namely, profit and sales margin; reputation and brand image: attractiveness for employees; risk management as well as cost and cost reduction (Reid & Miedzinski, 2008).

The key eco-innovation driving factors are cost efficiency, company image, and proactive contact by external initiatives and the desire for continuous improvement; cost, cost reduction, and risk. Management, avoiding negative environmental impacts and legislation compliance are the primary drivers. In addition, improving energy efficiency, becoming more attractive to employees (creating a common company culture), reputation and brand image, and profit and sales (pressuring suppliers to meet sustainable standards) were other underlined aspects (de Jesus Pacheco et al., 2018).

The preliminary phase of the eco-innovation procedure and the pointed drivers were the potential revenues, technological advancements, personal reasons, positive experiences and improvement of the SME corporative image (Bocken et al., 2014).

As one interview, applying CP for four years stated, «monitoring wastes, and toxic gases and liquids resulting from each production facility can lead to significant positive impact on the whole market as well as the optimization of the processes and work flow by implementing the newest production technologies».

SMEs should pay consideration mostly to resource constraints (people, time, money), SMEs specific actions, technological support, responsiveness, and training programs that should be taken into account to enhance the cooperation with external stakeholders (government, universities, other SMEs, research centers), cost reduction and risk management (avoiding negative environmental impacts and compliance), eco-innovation as relevant and strategic to the sector and to the customers (de Jesus Pacheco et al., 2018).

Table 3:
Areas of cleaner production implemented

Category of measure	CP Program role (the intermediate)	Companies involved *	Stated benefits Company Statement
Integrated Solid Waste Management (ISWM) is more widespread than Waste Management, since it covers the 3Rs (reduce, reuse and recycle/recovery) by applying the CP concept in Waste Management through waste minimization starting from the design step of the products.	Water and Environment Centre (WEC) at the Royal Scientific Society (RSS) conducted many solid waste management studies merging the two concepts together: ISWM and CP Solid Waste Transfer Station, Solid Waste Landfills, In-Flight Waste Audit and Municipal Solid Waste Composition.	C1, C3, C4, C6, C8, C9	Increased production quality. «The company believes that dropping its impact on the environment, and adding value throughout its value chain and its stakeholders leads to worthy business Sense».
Risk Assessment (RA) and Management prevents potential hazards on health and environment. Major Hazard Risk Analysis (MHRA) which is dealing with major issues affecting the whole region (macro analysis), i.e. outside the borders of the facility or plant, and Process Risk Analysis (PRA), which is addressing the plant itself (micro issues), i.e. inside the borders of the facility or plant.	Water and Environment Centre (WEC) at the Royal Scientific Society (RSS) conducted MHRA study for Petroleum Products and Chemicals Tank Farm, MHRA study for Ammonia Storage and PRA for Fertilizers and Chemicals Plants.	C1, C3, C6, C8	Optimize production process. «Our contribution to the CP assessment project enabled us to have the satisfaction of activity helping to protect our environment, while reducing the costs and optimizing our process at the same time».
Chemical Management	This helps the company to develop its overall chemical safety by setting out a process for identifying hazards and risks in the storage and handling processes, as well as providing appropriate risk reduction measures and developing the action plan.	C1, C4, C5, C6, C8	«Activate advanced analytics to drive growth while balancing risk versus reward».
Environmental Noise Pollution Modelling (ENPM) software is used to enable the prediction of noise propagation outdoor.	Conducted ENPM studies for Power Plants, studies for Cement Industries, for Solid Waste Landfill and ENM studies for Solid Waste Transfer Station	C1, C3, C6, C7	
Cutting cost	Reduction of manufacturing costs, Improvement of competitiveness, Quality improvement, Improvement of work environment, Reduction of environmental impacts	C1, C2, C3, C4, C5, C6, C7, C8, C9	A higher yield, better quality and lower costs for water and wastewater disposal Save energy and water «Reducing energy consumption leading to minimizing carbon footprint. Reducing water consumption. Reducing consumption of raw materials. These are the basic keys to Resource Efficient and Cleaner Production (RECP) as well as improving the quality». Plant manager, **Habibah & Sons Co.**
Air Quality Measurement Air pollution can lead to health problems and damage the environment, property, and climate change.	Air Studies Division (ASD) with cooperation with governmental and private institutions monitor the levels of air pollutants in the ambient air, inside work environment, from stationary sources and from vehicles emissions.	C1, C4, C5, C8, C7, C9	Most of air quality measurements (ambient air, stack emission and work environment) provided by ASD are carried out according to the requirements of ISO 17025. «Utilizing green energy reducing the omitted CO2» **Farm Dairy**
Energy	Reducing the consumption of Energy (electricity and fuel) and raw materials	C1, C2, C3, C4, C5, C6, C7, C8, C9	«Cutting energy consumption is a management objective that could help us decrease the costs»
Life Cycle Assessment is a comprehensive ecological assessment that identifies the energy, material and waste flows of products, processes and services and their influence on the environment. This cradle to grave evaluation starts with the design of the product and progresses through the extraction and use of its raw materials, manufacturing or processing with associated waste stream, storage, distribution, use and its disposal or recycling. The objective is to identify changes, at every stage of the life cycle that can lead to environmental benefits and overall cost savings.	Life Cycle Assessment Unit (LCAU) (WEC) at the (RSS) owns an accredited, licensed and valid software to assess the environmental burden generated from the consumption of natural resources and to evaluate and compare the pollution emitted from the processes among the life cycle of a product or service.	C1, C3, C6, C8, C9	LCAU has conducted many LCA studies such as: The LCA studies on using coal, pet-coke and alternative fuels instead of heavy fuel oil in cement industries. The LCA study on using of bio-solids instead of chemical fertilizers in the agriculture sector and soil reclamation.

*Note: Each company can undertake multiple measures in multiple categories

Source: Own research

Table 4:
Drivers for implementing cleaner production

Identified drivers	Interview Responses [a b]	Quotation from interview
Cost and cost reduction	9	«By reducing the waste, controlling Numeric Control NC and proper implementation of rework to manage returns, leading to reduce both materials and time waste and accordingly, increasing profit» (**Dairy Farm**) «Cutting energy consumption is a management goal that could help us reduce costs» (Managing Director, **Nutridar**)
Improve energy efficiency	6	«Efficiency in production also contributes to saving valuable resources, such as energy and water, for the national economy. Therefore, the economic benefits of RECP extend far beyond lowering production costs for businesses as it also contributes to additional growth, sustained job creation, and supports the long-term resource resilience of Jordan» (Plant Manager, **Habibah**)
Risk Management	5	«Cleaner production is added to its historical contribution being the first to get ISO 9000 and first to establish landfill pools in hazardous Disposal site. The company pursues staff performance improvement and tries to benefit from the new ideas» (General Manager, **Arabian Steel Pipes**)
Reputation and brand image, improve company image	9	«The company believes that decreasing its impact on the environment, and adding value throughout its value chain and its stakeholders make good business sense» (General Manager, **Al Qawafel**)
Become part of a network	5	«I think it must have a continuous program to build efficient experience among society in different industrial sectors and follow up the implementation of such program along with some financial and technical supports» (Manager of Environmental Health and Safety (EHS), **Al-Baha Company**)
Benchmarking with other organizations	6	«The cleaner production assessment leads us to focus on getting sustainable and eco-efficient solutions to optimize our production process» (**Sayegh Group**)
Continuous improvement	9	«The project has added a positive effect in stimulating companies to seriously search for alternative materials less harmful to the environment and product development, and also created a spirit of honest competition between companies to search for everything that is new» (General Manager, **Sigma**) «Optimization of the farm's processes and work flow by implementing the newest production technologies» (**Farm dairy**)
Compliance with environmental legislation	6	«Minimize environmental compliance costs with progressively strict governmental legal regulations and standards and decrease business risks» (Plant Manager, **Habibah**)

Legend: a - Number of times mentioned by the interviewee; b - Interviewees mentioned several themes more than once.

Source: Interviewee's own perception

All investigated companies are active members in cleaner production. According to the interviewees, the barriers influencing the integration of eco-innovation into business activities are lack of funding, access to skills and knowledge and access to technical assistance. One interviewee put it like this: «The top management should be engaged in this shift and must be aware of the results gained. The team also requisite awareness since some processes need to change. It is always recommended to work with certified agencies when it comes to energy audit. I always try to learn the way the experts think because they leave at the end of the project so I can figure future opportunities».

«The absence of the indispensable information and expertise, despite the potentials and expected benefits to improve the competitive advantage of the enterprise, but these opportunities cannot be exploited as a result of the lack of information on clean technology».

«Required investments and the inaccessibility of related accreditation or regulatory parties».

Cost is another barrier that affects the application of eco-innovation into business activities.

«They do need more financed initiatives with multi-component programs to facilitate the alteration towards sustainable consumption and production. I think more efforts are needed to promote comprehensive and sustainable industrial development». As clarified by a plant manager in one of the studied companies.

Effects and relevance of collaboration with intermediaries

The studied companies showed that a variety of process, product and organizational innovations were achieved after the contribution in cleaner production. This part discusses the previously presented hypothesis and main research question.

The cleaner production unit at RSS works as an intermediate reinforce of the SMEs capacity for eco-innovation in the form of process, product and organization innovation.

Process innovation: - This intends to reduce cost, increase quality and provision of products or services and comprise improved techniques in auxiliary support activities. For example, Sigma

Company is involved in a new business model to produce powder and liquid laundry detergents that replace hazardous chemicals such as Formamide, which are classified as poisonous to the reproduction and affect the health of workers and consumers. The Company is opting for preservatives with the lowest sensitizing effects in order to significantly decrease skin irritation resulting from the exposure to those materials. The company concluded the new detergent formulations, which are tested to ensure they meet the high quality standards.

The intermediate role namely cleaner production unit at RSS is Environmental and Social Impact Assessment (ESIA) is «a process for forecasting and evaluating the probable environmental and social influences of a proposed project, evaluating alternatives and designing proper mitigation, management and monitoring measures».

Product innovation: This can take the form of major or minor alterations in material used, technical specification and in the characteristics of the product or services. For example, a joint team from RSS CP Unit and Arabian Steel Pipes manufacturing company worked cooperatively to implement the CP assessment for the company. The efforts included thorough company visits, identifying and evaluating CP options, applying a number of alternatives and setting an action plan for the follow- up of CP at the company.

The CP team highlighted the stimulating unit where many options have been identified and implemented, such as lessening losses from degreasing bath, mending the isolation of the steam pipes, stopping leakages in steam valves and junctions, using a new additive material to prevent ash formation, using organic passivation material instead of chromium, and delivering training for the staff to improve process quality control.

The company is going to improve heat recovery from burning gases in order to enhance energy saving. The company started to examine the possibility of using natural gas instead of diesel and looking for a cost effective technology for acid recovery.

Organizational innovation: This refers to new or expressively developed procedures, methods and actions that change firm practices relation and decision. The companies applied for the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF), developed their Environmental Management System (EMS) policy statements and were provided with precise strategies to incorporate Resource Efficient Cleaner Production (RECP) in their EMS system. During the project implementation period, one of the companies that have designed RECP integrated EMS system, piloted the environmental audit/measurements and applied for Lloyd's audit to get ISO 14001 certification.

Moreover, companies with high prospective for water savings but did not have meters realized the prominence of monitoring water in a systematic way, and have decided to install meters for key water consumers. Additionally, three companies altered their accounting systems to attain better tracking of materials and losses.

The results indicate that SMEs need facilitator for eco-innovation, intermediary provided different levels of support through different types of providing technical assistance in integrated Solid Waste Management (ISWM), Risk Assessment (RA) and Management, Air Quality Measurements, Environmental Noise Pollution Modeling (ENPM), Noise Measurements and Assessment (NMA), Chemical Management, Air Quality Modeling, and Environmental and Social Impact Assessment (ESIA) which is «a process for envisaging and assessing the potential environmental and social influences of a proposed project, assessing alternatives and designing suitable mitigation, management and monitoring measures».

A specialized team has performed many studies according to the local and international standards as the World Bank Group Guidelines. ESIA team is supported by a pool of practiced engineers and technicians as well as well-qualified administration and financial staff.

Water and Environment Centre (WEC) has conducted many ESIA studies in different areas, such as ESIA study for Exploration of Copper Ores, ESIA study for Fertilizers and Chemical Complex, ESIA study for Solid Waste Transfer Station, ESIA study for Landfill, ESIA studies for Power Plants (solar, oil shale, coal and pet coke), ESIA study for Seawater Desalination Plant, ESIA study for Animal Farm, ESIA studies for Wastewater Treatment Plants and ESIA studies for Cement Factories.

Environmental Audit (EA) is «a management tool including a methodical, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing in the aim of assisting to safeguard the environment by facilitating management and control of environmental practices and assessing obedience with the company's policies, which

would include meeting regulatory requirements» as defined by the Council of the European Communities CEC in 1993.

There are two types of EA: Voluntary EA (management systems audit) and Mandatory EA (compliance audit). The Water and Environment Centre (WEC) at the Royal Scientific Society (RSS) has more than 20 years of experience in conducting EA studies.

Environmental Audit team has steered many EA studies according to the national and international legislations and guidelines.

In our sample, Small and medium enterprises are able to locate, acquire, and make use of external knowledge required for eco-innovation. With the support of local authorities, international imitative and knowledge producers like universities and external consultant.

The interviewee's responses to this question as follows: «By absorbing skillful staff and communication with external parties», «Concentration on Non-Product Output (NPO) in every production procedure and always trying to minimize it», «Through other international educational institutions to realize a high level of distinction». «Through the company's departments and through seminars and educational workshops.»

This echoes with the literature on innovation that stresses the significance of the participation of intermediaries, particularly knowledge institutions (Ar & Baki, 2011) and Bigliardi & Dormio (2009), who found that information from knowledge institutions is much more pertinent for promoting innovation than that of networks (industry or regional).

The SMEs in our sample, found it easier to translate eco-innovation into tangible business practice through the direct support provided by CP unit and through providing direct support at the level of gathered information and knowledge as well as processing, testing, validation and training, and the level of appraising the efficiency of eco-innovations.

Furthermore, many studies indicated that intra-organizational teamwork helps to overcome problems of knowledge deficiencies and thereby enhancing absorptive capacity and improve organization performance. Alzuod et al. (2019) found that entrepreneurial orientation (EO) moderates the relationship between customer capital and innovative performance. The study by Alhiyasat & Sharif (2018) revealed that there is a positive impact of eco-innovation on the organization's performance.

The study by Alhadid et al. (2014) examines the effect of green innovation (green product innovation, green process innovation) on the organizational performance. The most essential finding of the Study is having an influence of the moral green innovation in organizational performance. Also, there is an impact of the environmental management behavior as a moderator variable between green innovation and performance organizational.

Nevertheless, other factors of prior knowledge have a robust influence on the adoption of eco-innovation. Some of these include strong leadership, flawless strategic mission, creative and innovative staff, government legislation, networking, cooperation, partnership, and forbearance for failure and cost.

5. Conclusions and Further Research

Cleaner production is not simply a question of changing equipment. It is a matter of altering attitudes and behavior in doing business, applying knowledge, and improving production processes as well as the product itself. Under future market conditions, companies will have to distribute competitively priced products, which meet the customer's satisfaction and to produce in an environmental sound manner.

As the research sample is in the industrial sector, it is recommended to conduct further studies about companies in the services sector. Although in practice, the hotels facilities were assessed on CP potentials and precise recommendations were provided for each facility. We are looking for other services to join and implement CP in their business activities.

A potential justification why some businesses ended their path towards further eco-innovations is that Jordan has developed a national green growth plan with the support of donors. On the green growth agenda, the water sector of Jordan is a good case as it has some potentials that can be utilized within the government's push to implement green growth strategies.

First, the difficult hydrological and physical preconditions, (e.g. big boost differences, high costs of transporting water from the source to the cities), make cost- and resource-efficient technologies and procedures even more pressing and can fuel innovation in this sector.

Second, Jordan with its «vast tracks of sun-bleached and windswept land» holds a good potential for renewable energy generation, especially in solar and wind energy, but also in biogas production to deliver trustworthy and clean energy for water supply. Renewables are highly required to reduce the energy dependence on the neighboring countries and to decrease the energy subsidy cost for the water sector.

Third, the refugee crisis has added more strains on the local economy, but offers some opportunities as well. Donor organizations are keen on supporting Jordan into framing the discourses about water mismanagement and the need to reform (Engelmann et al., 2019).

One of the interviewees presented the following message in order to further promote to eco-innovation in Jordan: «Providing mechanisms to finance the transfer of green environment technologies by improving the access of such technologies facilitate the implementation and employee training».

Attention should be paid to the importance of long-term support for those SMEs, during their pursuit of sustainability. Research should be conducted in order to have greater understanding on the influences of industry norms and values. It would be interesting to analyze the influence of the direct contact to end-consumers as well as analyzing similar programs focusing on other features of eco-innovation or even broader sustainability-oriented innovation. Through such a comparison, we could develop better insight into which kind of programs works for which type of sustainability challenge, or if overall, more incorporated programs are crucial to deal from the beginning with the challenge to take an integrative approach to sustainability-oriented innovation management.

6. Research Limitations

The limitations of the research are related to the location (Jordan, industrial sector, SMEs), time (interviews were taken in January and February 2021), and the procedural tool (interview).

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